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Physical rehabilitation for older people in long-term care (Review)

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[Intervention Review]

Physical rehabilitation for older people in long-term care

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ABSTRACT

Background

The worldwide population is progressively ageing, with an expected increase in morbidity and demand for long-term care. Physical rehabilitation is beneficial in older people, but relatively little is known about effects on long-term care residents. This is an update of a Cochrane review first published in 2009.

Objectives

To evaluate the benefits and harms of rehabilitation interventions directed at maintaining, or improving, physical function for older people in long-term care through the review of randomised and cluster randomised controlled trials.

Search methods

We searched the trials registers of the following Cochrane entities: the Stroke Group (May 2012), the Effective Practice and Organisation of Care Group (April 2012), and the Rehabilitation and Related Therapies Field (April 2012). In addition, we searched 20 relevant electronic databases, including the Cochrane Central Register of Controlled Trials (*The Cochrane Library,* 2009, Issue 4), MEDLINE (1966 to December 2009), EMBASE (1980 to December 2009), CINAHL (1982 to December 2009), AMED (1985 to December 2009), and PsycINFO (1967 to December 2009). We also searched trials and research registers and conference proceedings; checked reference lists; and contacted authors, researchers, and other relevant Cochrane entities. We updated our searches of electronic databases in 2011 and listed relevant studies as awaiting assessment.

Selection criteria

Randomised studies comparing a rehabilitation intervention designed to maintain or improve physical function with either no intervention or an alternative intervention in older people (over 60 years) who have permanent long-term care residency.

Data collection and analysis

Two review authors independently assessed risk of bias and extracted data. We contacted study authors for additional information. The primary outcome was function in activities of daily living. Secondary outcomes included exercise tolerance, strength, flexibility, balance, perceived health status, mood, cognitive status, fear of falling, and economic analyses. We investigated adverse effects, including death,

morbidity, and other events. We synthesised estimates of the primary outcome with the mean difference; mortality data, with the risk ratio; and secondary outcomes, using vote-counting.

Main results

We included 67 trials, involving 6300 participants. Fifty-one trials reported the primary outcome, a measure of activities of daily living. The estimated effects of physical rehabilitation at the end of the intervention were an improvement in Barthel Index (0 to 100) scores of six points (95% confidence interval (CI) 2 to 11, P = 0.008, seven studies), Functional Independence Measure (0 to 126) scores of five points (95% CI -2 to 12, P = 0.1, four studies), Rivermead Mobility Index (0 to 15) scores of 0.7 points (95% CI 0.04 to 1.3, P = 0.04, three studies), Timed Up and Go test of five seconds (95% CI -9 to 0, P = 0.05, seven studies), and walking speed of 0.03 m/s (95% CI -0.01 to 0.07, P = 0.1, nine studies). Synthesis of secondary outcomes suggested there is a beneficial effect on strength, flexibility, and balance, and possibly on mood, although the size of any such effect is unknown. There was insufficient evidence of the effect on other secondary outcomes. Based on 25 studies (3721 participants), rehabilitation does not increase risk of mortality in this population (risk ratio 0.95, 95% CI 0.80 to 1.13). However, it is possible bias has resulted in overestimation of the positive effects of physical rehabilitation.

Authors' conclusions

Physical rehabilitation for long-term care residents may be effective, reducing disability with few adverse events, but effects appear quite small and may not be applicable to all residents. There is insufficient evidence to reach conclusions about improvement sustainability, cost-effectiveness, or which interventions are most appropriate. Future large-scale trials are justified.

PLAIN LANGUAGE SUMMARY

Physical rehabilitation for older people in long-term care

Rehabilitation treatments may be effective in improving the physical health of older people in long-term care. In 2010, 7.6% of the world's population were over 65 years old, and this is predicted to increase to 13% by 2035. It is expected that this will lead to a rise in demand for long-term residential care. This has increased interest in ways to prevent deterioration in health and activities of daily living, for example, walking and dressing, among care home residents. Physical rehabilitation (interventions based on exercising the body) may have a role, and this review examines the evidence available. This review included 67 trials, 36 of which were conducted in North America, 20 in Europe, and seven in Asia. In total, 6300 participants with an average age of 83 years were involved. Most interventions in some way addressed difficulties in activities of daily living. This review investigates the effects of physical rehabilitation on activities of daily living, strength, flexibility, balance, mood, cognition (memory and thinking), exercise tolerance, fear of falling, death, illness, and unwanted effects associated with the intervention, such as injuries. While variations between trials meant that we could not make specific recommendations, individual studies were often successful in demonstrating benefits to physical health from participating in different types of physical rehabilitation.

BACKGROUND

Physical function in older people in long-term care

Elder residents of long-term care are amongst the frailest in our population, with significant healthcare and social care needs (Bowman 2004; Continuing Care Conference 2006). Increasing age is associated with increasing disability. In developed countries, long-term care for older people is often provided in institutional settings for those with physical or mental conditions that preclude independent living (Continuing Care Conference 2006). It is reported that care-home residents spend the majority of their time inactive, with low levels of interaction with staff (Holthe 2007; Sackley 2006a).

Decreasing mobility and increasing dependency have many adverse effects. For residents in care homes, it may lead to increased incidence of pressure sores, contractures, cardiovascular decon-

ditioning, urinary infections, and loss of independence (Butler 1998). Sedentary behaviour is adversely associated with chronic disease risk factors and all-cause mortality (Balboa-Castillo 2011; DH 2011). Mobility problems and reduced physical activity compound health difficulties by directly affecting physical and psychological health and reducing opportunities to participate in social activities; social isolation negatively impacts on mood and self-esteem, which can then further adversely affect physical health (Marmot 2003; NICE 2008). Residents identify mobility as of central importance to quality of life and well-being (Bourret 2002), and residents with dementia wish for more day-time activities (Hancock 2006). Physical ill-health and disability are the most consistent risk factors for depression in later life, with reports suggesting that, rather than illness per se, it is the resulting functional limitations, including social participation and meaningful relationships, that increase the risk of depression (Braam 2005; Zeiss 1996).

Physical rehabilitation

Physical rehabilitation is defined as those interventions that aim to maintain or improve physical function of an individual. In a care-home setting, this typically involves increasing the physical exertions of an individual (active), although passive rehabilitation involving external stimulation (e.g. whole body vibration) is also in use. The focus of this review is active rehabilitation, which may be in the form of specific exercises or physical activity as a part of some other purposeful or leisure activity. It may be provided in a group format or individually; generic or tailored; and delivered by rehabilitation professionals (e.g. physiotherapist), care staff, or self-directed.

How the intervention might work

Physical activity provides positive benefits for people over 65 years old for a range of outcomes: mood (Blake 2009; Windle 2010), decreased disease risk, and overall health (DH 2011). For frail institutionalised older people, systematic reviews indicate that physical training can positively affect fitness for some participants (Chin A Paw 2008; Rydwik 2004a; Weening-Dijksterhuis 2011); the level of effect may be related to level of frailty (Chin A Paw 2008). A recent review of the effects of physical activity for older people with dementia (not all of whom were in institutions) reports some benefits to walking, getting out of chairs, lower limb strength, and flexibility (Potter 2011). Included studies in the reviews were generally small and of variable quality.

Why it is important to do this review

Dramatic increases in life expectancy over the last century are likely to result in a significant increase in the demand for long-term care. Between 1985 and 2010 the proportion of the world's population over 65 years old grew by a quarter, from 6.0% (291 million) to 7.6% (524 million), and is expected to increase to 13% by 2035, exceeding a billion people globally (United Nations 2011). However, this prospect of longevity may be associated with a concomitant increase in morbidity and requirement for long-term care in a residential setting. Annual healthcare costs among those living in long-term care (USD 45,400 per annum) are over four times greater than the average for the elderly population in the USA in 1998 (Lubitz 2003). This means that despite much shorter life expectancy, total costs of care for those institutionalised at 70 are much greater than for the rest of the population (Lubitz 2003). Of those aged 65 or over, in the USA in 2004, 1.3 million (3.6%) were living in nursing homes (Jones 2009), while in England and Wales in 2001, 310,000 (3.7%) were living in care homes (ONS 2003). Projections of the use of long-term care are unreliable (US Department of Health and Human Services 2003) as they rely on a variety of factors other than population projections, including finances; changes in the prevalence of disability; and social, technical, and organisational changes to the provision of assistance with independent living, including informal care. However, even if usage rates reduced by a third, approximately 2 million people would require nursing-home care in the USA by 2030, a significant increase on current amounts (Sahyoun 2001).

An encouraging evidence base is being developed about rehabilitation programmes appropriate to the circumstances and needs of older people. In addition, governing bodies world wide are responding to the pressures exerted by current demographic patterns by placing increased emphasis on promoting health and independence in old age, which may result in greater investment in rehabilitation services. This review examines the evidence for the effectiveness of physical rehabilitation for older people in long-term care. This is an update of a Cochrane review first published in 2009; it includes an additional 18 studies and now formally quantifies some of the pooled results using meta-analytical methods.

OBJECTIVES

To evaluate the benefits and harms of rehabilitation interventions directed at maintaining, or improving, physical function for older people in long-term care through review of randomised and cluster randomised controlled trials.

METHODS

Criteria for considering studies for this review

Types of studies

We included all studies that were randomised controlled trials (RCTs) or cluster RCTs that evaluated physical rehabilitation programmes for older people in long-term care.

Types of participants

Older people who reside in a care home or hospital as their place of permanent abode. We defined older people as those aged 60 years or over, and we included all participants in studies where the mean age is 60 or over. The term 'care home' was as defined in a previous review (Ward 2003):

- provides communal living facilities for long-term care;
- provides overnight accommodation;
- provides nursing or personal care; and
- provides for people with illness, disability, or dependence.

We included studies that addressed a defined subgroup of care-home residents, such as stroke survivors or residents with dementia. We excluded trials in which only a proportion of participants met the inclusion criteria, unless outcome data pertaining to these participants were reported separately.

Types of interventions

Physical rehabilitation was defined as those interventions that aim to maintain or improve physical function. We included studies that compared a rehabilitation intervention designed to maintain or improve physical function with either no intervention or an alternative intervention. We excluded interventions that primarily addressed cognitive deficits, mood disorders, or both, unless they also aimed to improve the physical state. We evaluated interventions by content, not by the personnel implementing them (e.g. physiotherapist, occupational therapist). We excluded studies where the intervention and control groups received the same physical rehabilitation intervention with the only differential being a non-rehabilitative component. We reported comparisons of physical rehabilitation versus control (no physical rehabilitation, but including other interventions such as social visits) and comparisons of physical rehabilitation (experimental) versus physical rehabilitation (control), where the experimental intervention is hypothesised by the study authors to be more rehabilitative than the control. During the review process, the review team reached consensus to exclude those trials in which physical exercise was a component of a multifaceted intervention primarily aimed at falls prevention as this topic is addressed in other Cochrane reviews (Cameron 2005; Gillespie 2003).

Types of outcome measures

Outcome measures did not form part of the eligibility criteria for studies in this review. Outcomes of interest are listed below.

Primary outcomes

- Function in activities of daily living (ADL) measured either with an independence scale (e.g. the Barthel Index (BI), the Functional Independence Measure (FIM)) or tests of ability in ADL, such as mobility or transfers (e.g. Timed Up and Go (TUG) test, 6-metre walk test). Activities of daily living typically include eating, bathing, dressing, continence, personal care, mobility, and transfers.

Secondary outcomes

- Exercise tolerance (e.g. number of repetitions)
- Muscle power (e.g. isokinetic and isometric dynamometry)
- Flexibility (e.g. joint range of movement)
- Balance (e.g. Berg Balance Scale, Functional Reach test)
- Perceived health status (e.g. Sickness Impact Profile, Nottingham Health Profile)
- Mood (e.g. Geriatric Depression Scale)
- Cognitive status (e.g. Mini-Mental State Examination (MMSE))
- Fear of falling (e.g. Falls Efficacy Scale)
- Economic analyses

Adverse outcomes

- Deaths from all causes
- Morbidity
- Falls and other serious adverse events

Timing of outcome assessment

Our original intention was to focus on those studies that comprised a minimum of one month of follow up. However, only a minority of studies reported any follow up. Therefore, for consistency, the outcomes were assessed at the end of the intervention. We also reported follow up in the narrative synthesis. We anticipated disparity between studies, and this was given due consideration in the review.

Search methods for identification of studies

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

The extensive nature of this topic was reflected in the search of a wide range of resources, both electronic and non-electronic. We searched for trials in all languages and arranged translation of papers published in languages other than English. The search dates given below are those up to which the trials found have been fully incorporated into the review.

Electronic searches

We searched the trials registers of the following Cochrane Groups: the Stroke Group (last searched 17 May 2012), the Effective Practice and Organisation of Care Group (last searched 2 April 2012), and the Rehabilitation and Related Therapies Field (last searched 4 April 2012). In addition, we searched the following databases:

- the Cochrane Central Register of Controlled Trials (*The Cochrane Library,* 2009, Issue 4) (Appendix 1);
- the *Cochrane Database of Systematic Reviews* (searched 21 December 2009);
- Cochrane Other Reviews (DARE) and Methods Studies resources (*The Cochrane Library,* 2009, Issue 4);
- MEDLINE (1966 to 18 December 2009) (Appendix 2);
- EMBASE (1980 to 18 December 2009) (Appendix 3);
- Cumulative Index to Nursing and Allied Health Literature (CINAHL) (1982 to 21 December 2009) (Appendix 4);
- Allied and Complementary Medicine Database (AMED) (1985 to 21 December 2009) (Appendix 5);
- PsycINFO (1967 to 21 December 2009) (Appendix 6);
- Physiotherapy Evidence Database (PEDro) (searched 4 April 2012);
- British Nursing Index (1994 to 1 October 2007);
- Applied Social Sciences Index and Abstracts (ASSIA) (1987 to 21 December 2009);
- International Bibliography of the Social Sciences (IBSS) (1951 to 21 December 2009);
- Database of Abstracts of Reviews of Effects (DARE) (searched 21 December 2009);
- Health Management Information Consortium (HMIC) database (searched 21 December 2009);
- NHS Economic Evaluation Database (NHS EED) (searched 21 December 2009);
- Health Technology Assessment (HTA) database (searched 21 December 2009);
- ISI Web of Knowledge (searched 21 December 2009);
- Google Scholar (searched 2006 to 14 January 2010);
- Index to Theses (http://www.theses.com/) (searched 7 January 2010); and
- ProQuest Dissertations & Theses (PQDT) database (searched 22 December 2009).

For this update, we stopped searching the British Nursing Index, because its collection is similar to CINAHL, and our institution no longer subscribes to it.

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

On 19 August 2011, we again searched the Cochrane Central Register of Controlled Trials, the *Cochrane Database of Systematic Reviews*, Cochrane Other Reviews and Methods Database, MEDLINE, EMBASE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Allied and Complementary Medicine Database (AMED), Applied Social Science Index and Abstracts (ASSIA), International Bibliography of Social Sciences (IBSS), PsycINFO, Database of Abstracts of Reviews of Effects (DARE), Health Management Information Consortium Database (HMIC), NHS Economic Evaluation Database (NHS EED), Health Technology Assessment (HTA) Database, ISI Web of Knowledge, Google Scholar, Index to Theses, and Proquest Dissertations and Theses. We did not fully assess the records retrieved from these searches, but we screened the titles, sought the full text of potentially eligible studies, and assessed them further for eligibility. We added potentially relevant trials to the 'Characteristics of studies awaiting classification' tables.

In addition, we searched the National Research Register (www.nrr.nhs.uk/) in December 2007 (now defunct), and in January 2010 we searched Current Controlled Trials (www.controlled-trials.com) and HSRProj (Health Services Research Projects in Progress, www.nlm.nih.gov/hsrproj/);

Searching other resources

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

1. scanned reference lists of relevant studies;
2. contacted investigators and subject area experts and requested additional information from authors of relevant trials;
3. searched the following available proceedings of the Chartered Society of Physiotherapy Annual Congress (1990, 1995, 1997, 2000, 2003, and 2005); and
4. searched the following available proceedings of the World Congress of Physical Therapy (1953, 1963, 1967, and 1982).

In view of the comprehensive nature of the electronic search we did not handsearch journals. We also contacted the Cochrane Dementia and Cognitive Improvement Group (August 2006) and the Cochrane Health Promotion and Public Health Field, now the Cochrane Public Health Group, (August 2006) who indicated that their own field registers would not contain studies of relevance to this topic.

Data collection and analysis

Selection of studies

Two review authors independently assessed titles and abstracts (where necessary) of the records identified from the electronic searches and excluded obviously irrelevant studies. We obtained the full texts of all remaining studies, and at least two members of the review team assessed these for eligibility based on the predetermined inclusion criteria. We resolved disagreements at a consensus meeting.

Data extraction and management

Two review authors independently extracted and recorded data using a standardised electronic data collection form. A third author combined these data sets; we combined numerical data automatically where there was consensus. We resolved discrepancies by discussion and, where possible, we contacted study authors to provide clarification or additional data if necessary.

For continuous outcome data and ordinal outcome data, we converted the results from all studies into estimated difference in means, and the standard error for this difference.

Assessment of risk of bias in included studies

Two review authors independently assessed risk of bias in included studies using The Cochrane Collaboration's tool for assessing risk of bias (Higgins 2011). We assessed risk in the categories of sequence generation (was assignment truly random?), allocation concealment (could group assignment be foreseen and therefore subverted?), blinding of participants and personnel (could participants and care staff identify treatment allocation?), blinding of outcome assessment (could outcome assessors identify treatment allocation?), incomplete outcome data (could attrition or exclusions have resulted in bias?), selective reporting (did authors report all prespecified outcomes) and any other risks of bias, using the criteria provided (Higgins 2011). We assessed the blinding of outcome assessment separately for observed measures of function in ADL (such as the TUG test) and reported measures of function in ADL (such as the BI) as these were entered into meta-analyses and were likely to have involved different assessors and involved different difficulties with blinding. We assessed each category as having low, high, or unclear risk of bias. We resolved any disagreements by discussion and contacted study authors for clarification if appropriate. We did not actively seek pre-study protocols unless they were referenced within a report or had been identified through our literature searches.

Measures of treatment effect

We treated ordinal data as if they were continuous. For continuous data, we combined the estimates for each study using the mean difference (MD). For dichotomous data, we combined the estimates for each study using the risk ratio (RR).

Unit of analysis issues

In cross-over trials, we only included data from the first period of the trial in meta-analyses to guard against carry-over effects. Where a trial comprised of more than one exercise group (e.g. Christofoletti 2008; MacRitchie 2001), we used the group with the greatest rehabilitative component to compare with the group with the least intervention.

Where cluster randomised studies presented an estimate of effect that properly accounted for the cluster design, this was used. Where this was not the case, we assumed that the intra-cluster correlation coefficient (ICC) was the same as for other studies included in the review for that outcome. We calculated an average ICC for the outcome and corrected the values for each unadjusted study by the design effect (see Higgins 2011). Where the ICC for an outcome was not available from the other included studies we attempted to find an appropriate estimate from external databases (e.g. Elley 2005; Health Services Research Unit 2004; Ukoumunne 1999). Where no appropriate estimate was available, we presented unadjusted estimates. In all cases, we presented sensitivity analyses excluding cluster studies.

Dealing with missing data

Because of the long-term nature of the interventions and the frailty of the population, we anticipated a high rate of loss to follow up because of death, deviating from the intention-to-treat (ITT) principle. Where multiple analyses were reported, we used the data that most closely resembled an available case analysis (i.e. all available data are analysed in the intervention groups to which participants were assigned, without imputation of missing data), but we did not exclude studies that had only performed other analyses. However, as described above, we assessed incomplete outcome data as a risk of bias and, as described below, we stratified studies by risk of bias; therefore, we accounted for large deviations from the ITT principle in the analysis. We used the generic inverse-variance approach to facilitate inclusion of studies presenting results in different ways, so we converted standard deviations, confidence intervals, or both, for each group separately to standard errors for the difference in means. Where data were missing, we made every effort to derive the appropriate measure from the available data. For example, we derived data from graphs and converted a variety of measures of time taken to cover set distances and walking speeds to metres per second.

Assessment of heterogeneity

We explored heterogeneity through stratified forest plots, quantified in terms of the proportion of the total variation in study estimates that is due to heterogeneity (I^2 statistic) (Higgins 2002) and tested using the Q statistic, with $I^2 > 50\%$ or $P < 0.2$ used to identify significant heterogeneity.

Assessment of reporting biases

We assessed small study effects, e.g. publication bias, using contour-enhanced funnel plots centred around the null hypothesis and informed by the test of the intercept from a regression of estimates on their standard errors (Egger's test), with $P < 0.1$ being used to indicate significant asymmetry.

Data synthesis

The included studies were heterogeneous. They examined different types of intervention and evaluated them with a wide battery of outcome measures. Such variety limited the feasibility of conducting meta-analyses. We chose to perform meta-analyses of measures of ADL, our primary outcome, and mortality.

Where we performed meta-analyses, for all outcomes, we presented random-effects meta-analyses because of the anticipated large heterogeneity caused by different populations and interventions involved in the trials. When results were presented at several time points, we used the time closest to the end of intervention unless a better analysis was available at another time point. For continuous or ordinal data, where results were presented in terms of change from baseline or adjusted for baseline, this was used in preference. We used a generic inverse-variance approach for continuous and ordinal data. We used the Mantel-Haenszel approach for dichotomous outcome data.

We originally intended to combine results in a fixed-effect meta-analysis where sufficient homogeneity existed. However, because of the extensive heterogeneity in the interventions, we used a random-effects meta-analysis as our primary approach, but still report the results of fixed-effect models as sensitivity analyses.

There were many different ways of measuring various ADL, so to reduce heterogeneity in the meta-analysis we focused on studies reporting the BI, FIM, Rivermead Mobility Index (RMI), TUG test, and certain measures of walking speed. For walking speeds and timed walks over a fixed distance, we converted the time to walk a fixed distance into speed (m/s) over that distance, to include as many similar studies as possible. However, we decided a priori to only include distances of less than 10 metres, to reduce heterogeneity introduced by very different designs. Of the remaining studies, there were an insufficient number assessing the same outcome to include in further meta-analyses. Those that appeared to assess similar outcomes were often measured in entirely different ways, assessing very different activities requiring varying functional ability. We therefore chose not to attempt to combine these quantitatively, even using standardised mean difference, because they were not actually assessing the same outcome.

For outcomes where a narrative synthesis is provided, we summarised those studies that reported a statistically significant difference in a direction that favoured the intervention or the control ($P < 0.05$) and those that do not. We described limitations of such comparisons where statistical significance was reached (for example, a within-group comparison only). We provided a narrative exploration of the extent to which included studies demonstrated that their rehabilitative interventions were of benefit to the participants, and we discussed the nature and sustainability of any benefits. Some trials selected extremely frail individuals, and we considered this when assessing these interventions, as preventing or slowing decline may be the treatment goal in this situation.

Subgroup analysis and investigation of heterogeneity

For all outcome measures, potential sources of heterogeneity decided a priori were risk of bias (see Risk of bias in included studies); duration of intervention: for the BI, FIM, death and walking speed less than three months compared with three or more months, and for the TUG test and RMI less than six months compared with six or more months; mode of delivery (group, individual or group and individual); mean age of participants (less than 85 years compared with 85 years or more); and the percentage of participants in the study who are female (less than 80% compared with 80% or more). For ADL outcome measures, we also specified the level of function at baseline as measured by the relevant outcome measure (above or below the median function). For walking speed, we also included the fixed distance walked (less than six metres compared with six metres or more), in case this was a source of heterogeneity. We investigated these through subgroup analysis.

Our original intention, if sufficient data existed, was to conduct analyses on the basis of methodological quality and the effect of dropouts, but this was replaced by risk of bias. We also specified age, pathology-specific interventions, mode of delivery, and residential category. However, we neither conducted analyses based on pathology-specific interventions, because insufficient data exists, nor conducted analyses based on residential category, because we replaced this with measured function at baseline (see Differences between protocol and review).

We wanted to consider type of intervention as a potential source of heterogeneity, e.g. physiotherapy, strength training, mobility training, balance training, occupational therapy, but the interventions were often complex, containing many combinations of the above, and with great variation within each broad type. Given the small number of studies available for each meta-analysis, there were insufficient studies of each type to explore this interesting aspect further.

Sensitivity analysis

For all outcomes included in a meta-analysis, we presented a fixed-effect sensitivity analysis. For dichotomous outcomes, we also calculated odds ratios and risk differences. Where a meta-analysis included studies that were cluster-randomised, we presented a sensitivity analysis excluding such studies.

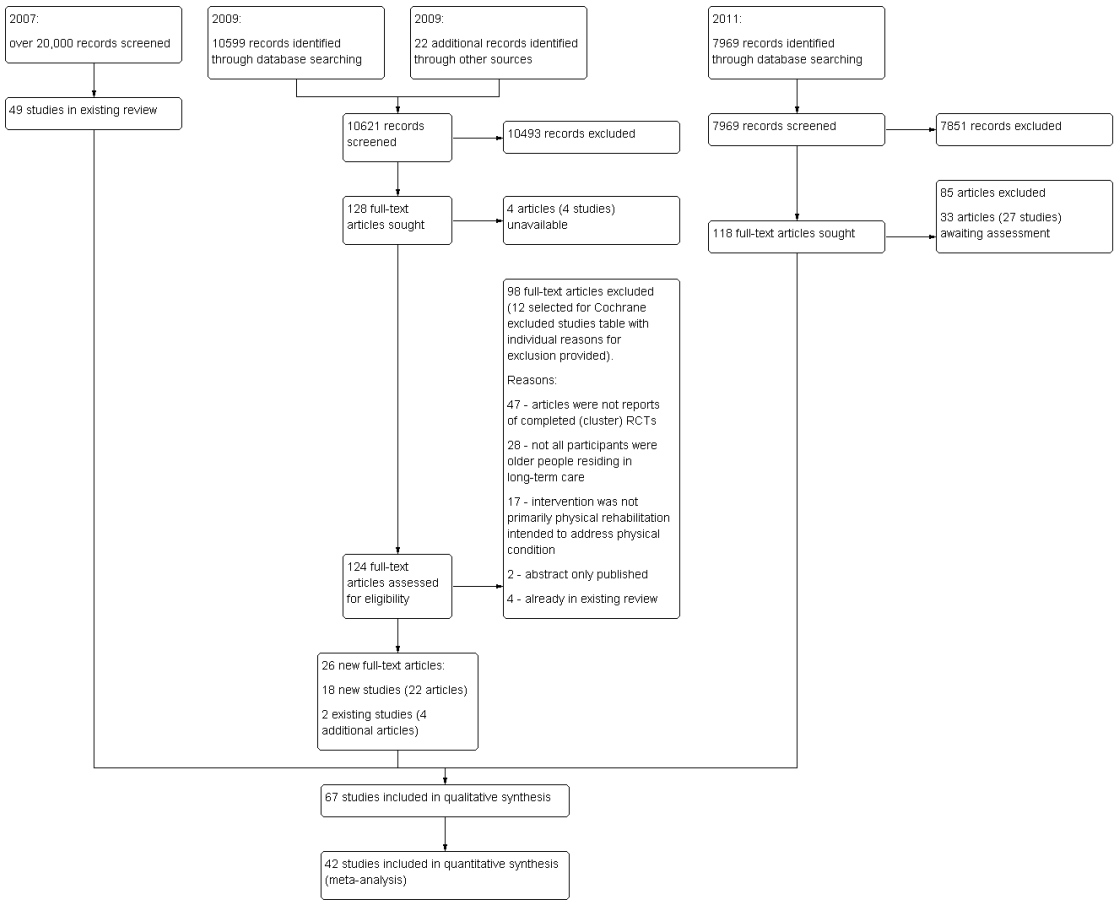
RESULTS

Description of studies

Results of the search

Several searches contributed to this review. The results of the searches are outlined in a PRISMA diagram in Figure 1. Searches from the original review in 2007 and searches from December 2009 produced approximately 30,000 references, from which 67 studies fulfilled the eligibility criteria and were included in this review. An additional search (August 2011) produced 7969 references, from which there are 27 potentially eligible studies awaiting classification.

Figure 1. Review update flow diagram



The original review included 49 studies from a search that produced over 20,000 references. The search from December 2009 produced 10,621 references, from which 26 new articles fulfilled the eligibility criteria and were included in this update. This represented 18 new studies (22 articles) and an additional four articles that report on two existing studies. Four studies remain awaiting classification from this search because the articles were unavailable. The characteristics of Included studies and Excluded studies are discussed below. We conducted an additional search in August 2011. Because of the scale of this review and updates to the methods (introduction of an electronic database and meta-analyses), we did not fully assess the results of these searches (i.e. we did not include any new studies). Of the 7969 references, an additional

25 new studies (28 references) and five new references across two existing studies (Resnick 2009; Rosendahl 2006) are awaiting classification (see the 'Characteristics of studies awaiting classification' tables). These studies awaiting classification are likely to be classified as included or ongoing in future updates of the review.

Included studies

Across 67 studies, the included studies randomised a total of 6300 participants, prior to any attrition. We give a general overview below; further details can be found in the 'Characteristics of included studies' tables.

Design

Forty-eight studies randomised individuals into experimental groups; the remaining 19 used cluster designs, when they randomised facilities, not individuals (Brittle 2009; Brown 2004; Choi 2005; Faber 2006; Gillies 1999; Kerse 2008; Lee 2009; McMurdo 1993; McMurdo 1994; Mihalko 1996; Morris 1999; Peri 2008; Resnick 2009; Rosendahl 2006; Sackley 2006; Sackley 2008; Sackley 2009; Sung 2009; Taboonpong 2008). One study followed cluster randomisation of exercise type with randomisation of individual participants to exercise or control conditions (Faber 2006). Nine studies stratified participants before randomisation to ensure even distribution of certain participant characteristics between groups, for example, older, more sick, or less mobile individuals (Baum 2003; Bautmans 2005; Lazowski 1999; MacRitchie 2001; Makita 2006; Mulrow 1994; Przybylski 1996; Santana-Sosa 2008; Sihvonen 2004). Five studies used a 'matched pairs' design, where participants were systematically matched on characteristics of interest and then randomly allocated into intervention groups (Au-Yeung 2002; de Bruin 2007; Dorner 2007; Schoenfelder 2000; Schoenfelder 2004). Of the cluster randomised trials, two studies stratified facilities (Rosendahl 2006; Sackley 2006), and two matched facilities (Morris 1999; Peri 2008) prior to randomisation.

Five trials used a counterbalanced cross-over design, where all participants received all conditions, but the order in which they were received was randomised. In three of these, the outcome measures were measures of performance during single-session interventions, such as number of repetitions (DeKuiper 1993; Lang 1992; Riccio 1990), while in two they followed long-term interventions that risked carry-over of treatment effects between periods (Ouslander 2005; Pomeroy 1993). Four trials also used a semi-cross-over design (Baum 2003; Brown 2004; Kinion 1993; Sauvage 1992) where participants allocated to the control group also received the intervention. However, in Sauvage 1992 this was a post-hoc design following attrition from the intervention group. Of the cluster trials, six (Brittle 2009; Kerse 2008; Peri 2008; Resnick 2009; Sackley 2006; Sackley 2009) explicitly reported statistical analyses that were adjusted for the effect of clustering.

Eligibility criteria

All of the studies except Przybylski 1996 stated some eligibility criteria, which on average limited eligibility to half of all residents. This often related to the safety and feasibility of including such participants in the planned intervention or the likelihood of it showing an effect, and in 27 studies, it limited the focus to populations with specific functional limitations.

General eligibility criteria

Thirty studies had a minimum age limit (typically 65 years). Thirteen studies excluded participants that were engaged in physical therapy or activity. Six studies required participants to have been a resident for a minimum time that varied between one and four months; seven studies specified an expected duration of stay for at least as long as the intervention. Six studies excluded those with challenging behaviours, including abusive and aggressive behaviour.

Physical functioning or disorders

Overall, 45 studies excluded residents with insufficient physical function or physical disorders. The ability to walk or be mobile was a requirement of 22 studies, of which two disallowed the use of walking aids; one allowed one carer to assist; five specified at least six metres and two at least five metres; one, 250 feet; and one, five minutes. Alternative requirements included the ability to independently stand (three studies), stand or transfer with assistance (five studies), or to be independent in all but one basic activity of daily living (ADL) (one study). Thirteen studies excluded participants on the basis of musculoskeletal disorders or other physical impairments, including paralysis and amputation.

Cognitive functioning and communication

In total, 39 studies only included participants with a minimum level of cognitive function, often citing the ability to follow simple instructions; an additional four studies excluded participants because of communication-specific difficulties. Exclusion criteria were often stated as severe dementia or severe cognitive impairment, but where specific measures were given, these varied widely. Nine studies excluded participants on the basis of their Mini-Mental State Examination (MMSE) score: Five required a minimum score between 20 and 23, indicating participants were cognitively intact or had mild dementia; one excluded those scoring less than 50% (typically 15); and three excluded those scoring less than 10 or 11, indicating severe dementia. Four studies excluded those with very low communication and physical skills using the Parachek Geriatric Rating Scale.

Other health conditions

A variety of other health-related criteria were reasons for exclusion. Sixteen studies ruled out participants on the broad grounds of medical contraindications or at the discretion of a physician. Twenty-two studies excluded individuals with acute or unstable conditions, while 19 studies excluded those with a terminal condition or short life expectancy. Eight studies excluded individuals on the basis of recent medical events, for example, a fracture within the past six months. Twenty-seven studies identified a variety of specific diseases as reasons for exclusion, often including cardiac disorders (14 studies). Medical implants, including pacemakers and hip replacements, or specific medications were exclusion criteria in six studies. Seven studies excluded those with significant visual impairments. Four studies excluded individuals with psychological or psychiatric disorders.

Focus on specific conditions

While most studies required participants to have some minimum level of physical or mental functioning, 27 studies only examined participants with some form of impairment or limitation. These included a degree of dependence in ADL (Brittle 2009; Karl 1982; Meuleman 2000; Mulrow 1994; Rosendahl 2006; Sackley 2009), stroke-related dependence in ADL (Sackley 2006), dementia and dependence in ADL (Christofoletti 2008; Pomeroy 1993), dementia (Buettner 1997; Stevens 2006; Tappen 1994), Alzheimer's disease (Cott 2002; Rolland 2007; Santana-Sosa 2008; Tappen 2000), mental illness (Stamford 1972), those who were physically restrained (Schnelle 1996), incontinence (Alessi 1999; Ouslander 2005; Schnelle 1995; Schnelle 2002), visual impairment (Cheung 2008), those at a risk of falling (Choi 2005; Donat 2007), and those with poor balance and weak muscles (Sauvage 1992). Finally, in the feasibility study of Sackley 2008, staff purposively selected residents with a range of functional, cognitive, and continence impairments prior to randomisation.

Representativeness of participants

Approximately half of the population of participating facilities were eligible for entry into the trials, but only one quarter participated. Twenty-two studies reported the total population of the participating facilities, and the number of those who were eligible for participation. Across these, the total population included 14,384 (median = 423) individuals, 6853 (47.6%, median = 204) were eligible, but only 3426 (23.8%, median = 104) of whom were allocated to groups in the trials; 1618 (11.2%, median = 63) did not consent to participate, and in 14 trials, residents were excluded for other reasons, including insufficient capacity within the trial or individuals becoming unavailable (e.g. illness) before the trial began (total = 1849 (12.9%), median = 7).

Sample size

Included studies randomised a median of 56 participants into their trial prior to any attrition. This ranged from just 12 participants (Sauvage 1992) to 682 (Kerse 2008) (lower quartile = 28, upper quartile = 107). Only 18 studies included 100 or more participants (Chin A Paw 2004; Faber 2006; Fiatarone 1994; Kerse 2008; Lee 2009; Makita 2006; Morris 1999; Mulrow 1994; Ouslander 2005; Peri 2008; Przybylski 1996; Resnick 2009; Rolland 2007; Rosendahl 2006; Sackley 2006; Sackley 2009; Schnelle 2002; Stevens 2006). Twenty-four studies randomised fewer than 35 participants; of these, eleven studies were particularly small with 20 or fewer participants (Baum 2003; Brill 1998; Gillies 1999; Karl 1982; Lang 1992; Naso 1990; Santana-Sosa 2008; Sauvage 1992; Schoenfelder 2000; Stamford 1972; Urbscheit 2001). One study (Sauvage 1992) was especially problematic, reporting data from just 10 individuals. Starting with 12 participants, they allocated 6 each to the intervention and control groups. On losing two intervention participants, they allowed four control participants to complete the intervention. Therefore, they reported data for eight intervention participants and six control participants. Sample size calculations were performed for 17 studies (25%), although recruitment did not always achieve the target.

Setting

Studies were undertaken in various countries and long-term care settings.

Location

Most studies were conducted in North America: 31 took place in the USA and five in Canada. Within Europe, eight were conducted in the UK, two each in Belgium and The Netherlands, and one each in Austria, Denmark, Finland, France, Spain, Sweden, Switzerland, and Turkey. Throughout the rest of the world, there were three studies from Hong Kong, and two studies each from New Zealand and South Korea, with single studies from Australia, Brazil, Japan, and Thailand.

Care setting

Most often, studies were undertaken in nursing and residential care homes, with 45 studies and 25 studies including facilities from these categories, respectively. In addition, four studies were undertaken exclusively in hospitals where participants were long-term residents (Clark 1975; Dorner 2007; Pomeroy 1993; Stamford 1972).

Participants

We present a brief synopsis of the characteristics of participants here. We give further in the 'Characteristics of included studies' tables. See also Eligibility criteria.

Sex

Overall, 76% of participants were women. Seven studies only had female participants (Cheung 2008; Crilly 1989; Makita 2006; Riccio 1990; Sihvonen 2004; Sung 2009; Yoder 1989), while two studies had exclusively male participants (Sauvage 1992; Stamford 1972).

Age

Data indicated that in each study the mean age was greater than 65 years. The grand mean (composite standard deviation (SD)) participant age was 83 (8) years across studies reporting such data. Reported means ranged from 69 years (Clark 1975; Stamford 1972) to 90 years (Bruunsgaard 2004). Only six studies reported a mean age of under 75 years, five of which were small (less than 25 participants) (Clark 1975; Karl 1982; Santana-Sosa 2008; Sauvage 1992; Stamford 1972), and one was of average size (54 participants) (Christofoletti 2008). Three studies did not report mean age, two of which reported age range (Naso 1990; Pomeroy 1993). In total, 36 studies reported age range, and among these, the total range was from one participant aged 44 (Sackley 2006) to a participant aged 105 (Tappen 2000). Only five of these studies included any participants aged less than 60, and all but one included participants aged over 90 (Clark 1975), with 13 of the 36 studies including centenarians.

Physical status

The physical status of participants varied widely within and between studies that reported this. Eight studies reported the Barthel Index (BI) mean (SD) at baseline as 49.1 (27.5) (Sackley 2006), 51.5 (24) (Sackley 2008), 55.5 (21) (Brittle 2009), 58.8 (13) (Dorner 2007), 58.8 (21.1) (Sackley 2009), 58.9 (29.5) (Resnick 2009), 65.6 (21) (Rosendahl 2006), 71 (10) (Santana-Sosa 2008), and 88 (12.5) (Peri 2008) out of 100, where 100 indicates independence in 10 basic ADLs. Four studies reported the Katz ADL index, with mean (SD) values of 1.9 (1.3) (Fiatarone 1994), 3.1 (1.3) (Rolland 2007), 4.7 (0.5) (Christofoletti 2008), and 5.8 (0.4) (Bautmans 2005) out of 6, where 6 indicates independence in six basic ADLs. Five studies reported the proportion of participants who used mobility assistance devices (e.g. cane, wheelchair) as 10% (Chin A Paw 2004), 19% (Donat 2007), 45% (Mihalko 1996), 60% (Sihvonen 2004), and 83% (Fiatarone 1994); as reported above, three studies had excluded such participants, and one study only included participants requiring assistance to stand.

Cognitive status

The cognitive status of participants varied widely within and between studies that reported this. Twenty-one studies provided mean MMSE scores at baseline, four of which had a mean score less than 10, indicative of severe dementia (Buettner 1997; Cott 2002; Schoenfelder 2000; Tappen 1994); nine studies' participants had a mean score between 10 and 20, indicative of moderate dementia (Alessi 1999; Christofoletti 2008; Ouslander 2005; Rosendahl 2006; Santana-Sosa 2008; Schnelle 1995; Schnelle 1996; Schnelle 2002; Tappen 2000); five studies' participants had a mean score between 20 and 25, indicative of mild dementia (Baum 2003; Dorner 2007; Fiatarone 1994; Mulrow 1994; Resnick 2009); while three studies' participants' mean score was in the cognitively intact range (25 to 30) (de Bruin 2007; Faber 2006; Schoenfelder 2000). Overall, mean MMSE scores ranged from 6 (Cott 2002) to 26.9 (de Bruin 2007), while for individual participants they ranged from 0 to 30.

Chronic comorbidities

The majority of participants had at least one significant comorbidity, with many having multiple comorbidities based on the 29 studies that reported on this. Commonly reported comorbidities included arthritis, osteoporosis, Alzheimer's disease, stroke, cardiovascular disease, respiratory disease, incontinence, and depression. Three studies reported the mean (SD) number of comorbidities that participants had as 2.9 (3.1) (Lee 2009), 4.9 (2.2) (Kerse 2008), and 5.6 (3.6) (Tappen 2000), while the similar Charlson Comorbidity Index was reported to average 3.8 (2.2) in Ouslander 2005.

Interventions

To provide a convenient overview, we categorised interventions according to key components. We describe individual programmes in the 'Characteristics of included studies' tables. Details of the groups that experimental interventions were compared with in all studies are provided in the below 'Comparison conditions' section. While most studies featured only one experimental intervention, two studies featured two different experimental physical interventions. Faber 2006 compared 'functional walking' and 'in-balance' exercise interventions, while Morris 1999 compared the 'fit for your life' exercise regime and the 'self-care for seniors' nursing rehabilitation programme. Therefore, 69 interventions are described across the 67 studies.

Physical components

The most common physical components were strength training and walking. Forty-nine interventions included exercises targeted at basic components of physical fitness, such as strength or flexibility (rote exercise), while 40 interventions included practice of basic ADLs, such as walking or transfers, and 21 interventions featured other recreation or leisure activities, such as ball games or dancing.

Rote exercise

Strength training, for example, using elastic resistance bands or weights, featured in 42 interventions. Balance (motor skill) exercises, such as tandem stands, were features of 21 interventions; flexibility (range of motion) exercises featured in 17 interventions; and endurance training featured in seven. Other less common features include relaxation and breathing exercises (three interventions) and posture training (two interventions).

Basic ADL practice

Mobility training (walking or wheeling) featured in 37 interventions; transfer practice featured in 21 interventions; and 10 interventions included practice of other basic ADLs, such as washing, dressing, eating, or grooming.

Recreation and leisure-like activities

Other recreation or leisure-like physical activities included kicking or throwing and catching balls, balloons or bean bags (10 interventions), rhythmic movement to music or dancing (5 interventions), Tai Chi (4 interventions), arts and crafts activities (1 intervention), meal preparation activities (2 interventions), and indoor gardening (1 intervention).

Combinations of physical components

Seventeen interventions only featured rote exercises; thirteen, basic ADL practice; and five, recreational activities. Eighteen combined basic ADL practice with rote exercises, seven combined recreational activities with rote exercises; and two combined basic ADL practice with recreational activities. In total, seven interventions included examples of all three of these types of component.

Components supplementary to physical activity

In addition to physical activity, 23 interventions contained other components. Among these were a social or communication element, for example, 'walking and talking' (Brittle 2009; Buettner 1997; Cott 2002; MacRitchie 2001; Tappen 2000). Twelve studies included music alongside the exercise (Chin A Paw 2004; Choi 2005; MacRitchie 2001; McMurdo 1993; McMurdo 1994; Pomeroy 1993; Rolland 2007; Sackley 2008; Santana-Sosa 2008; Stevens 2006; Sung 2009; Taboonpong 2008). Interventions to improve continence, for example, prompted voiding (Alessi 1999; Ouslander 2005; Sackley 2008; Schnelle 1995; Schnelle 2002), nutritional supplementation (Fiatarone 1994; Rosendahl 2006), and environmental adaptations designed to improve sleep (Alessi 1999). Sung 2009 included a health education programme, while Brown 2004 included a video on gardening.

Distinctive interventions

Four trials explored the potential of imagery or purposefulness for enhancing exercise participation (DeKuiper 1993; Lang 1992; Riccio 1990; Yoder 1989). Imagery (e.g. pretending to pick apples) or 'added purpose' exercise (e.g. rotary arm exercise in the form of making biscuits) were compared with rote exercise. Two studies explored 'Whole body vibration', where exercises are performed on an oscillating platform (Bautmans 2005; Bruyere 2005). One study (Sihvonen 2004) compared dynamic balance exercise visual feedback sessions on a 'Good Balance' force platform with an unspecified control activity. Przybylski 1996 did not specify particular physical components, but examined the effect of a four-fold increase in occupational therapy and physiotherapy staffing, comparing a 1:200 (standard) and 1:50 (enhanced) staff to participant ratio.

Format of intervention

Interventions were most often delivered as supervised 45-minute group sessions three times weekly. Forty-one interventions included a group component, two of which were provided in pairs and three of which also had an individually delivered component. Another 18 individual interventions were described, with 10 not specifying whether they were provided on a group or individual basis. Despite the predominance of group-based interventions, some degree of tailoring to the ability or needs of the participant was a feature of 43 interventions. In 11 trials, participants carried out the intervention seated (e.g. McMurdo 1993), and in five further studies, this was optional (e.g. Karl 1982). Sessions were time-limited in 47 interventions, ranging from nine minutes to two and a half hours, with a median and mode of 45 minutes (10 studies). In most cases, sessions occurred on a routine basis, varying from weekly to four times daily, but most often three times weekly (median and mode, N = 30). In other cases, the intervention was continuous in nature or only administered once where the exercise rate or duration, rather than the effect of exercise on health were being evaluated. In the 32 interventions for which a total time per week could be calculated, this varied widely from 20 to 750 minutes per week, with a median of 120 minutes per week.

Fifty-six interventions involved specific sessions primarily designed to deliver physical rehabilitation (Au-Yeung 2002; Baum 2003; Bautmans 2005; Brill 1998; Brittle 2009; Brown 2004; Bruunsgaard 2004; Bruyere 2005; Cheung 2008; Chin A Paw 2004; Choi 2005; Christofoletti 2008; Clark 1975; Cott 2002; Crilly 1989; de Bruin 2007; DeKuiper 1993; Donat 2007; Dorner 2007; Faber 2006 (both interventions); Fiatarone 1994; Gillies 1999; Hruda 2003; Karl 1982; Kinion 1993; Lang 1992; Lazowski 1999; Lee 2009; MacRitchie 2001; Makita 2006; McMurdo 1993; McMurdo 1994; Meuleman 2000; Mihalko 1996; Morris 1999 (fit for your life); Mulrow 1994; Naso 1990; Pomeroy 1993; Przybylski 1996; Riccio 1990; Rolland 2007; Sackley 2006; Sackley 2008; Santana-Sosa 2008; Sauvage 1992; Schnelle 1996;

Schoenfelder 2000; Schoenfelder 2004; Sihvonen 2004; Stamford 1972; Stevens 2006; Sung 2009; Taboonpong 2008; Urbscheit 2001; Yoder 1989). Ten interventions involved rehabilitation that was embedded within, or incidental to, resident care (Alessi 1999; Buettner 1997; Kerse 2008; Morris 1999 (self care for seniors); Ouslander 2005; Peri 2008; Resnick 2009; Schnelle 1995; Schnelle 2002; Tappen 2000). Three interventions combined specific sessions and incidental rehabilitation (Rosendahl 2006; Sackley 2009; Tappen 1994). Examples of specific sessions include an interactive group exercise class with warm-up and cool-down periods, flexibility, balance, strengthening and endurance exercises (Brittle 2009) or client-centred occupational therapy (Sackley 2006). Examples of incidental rehabilitation include the Functional Incidental Training (FIT) and 'Promoting Independence' interventions described below.

Three studies evaluated FIT (Alessi 1999; Ouslander 2005; Schnelle 1995). Here, exercises targeting specific individual needs, such as standing up, were provided throughout the day, incidental to daily nursing care routines, such as toileting. The therapeutic recreation nursing team intervention (Buettner 1997) is comparable to these. Here, the nursing-home environment was enhanced, with every aspect of daily life regarded as part of the intervention. A range of activities were provided, including cardiovascular exercise, cooking, gardening, cognitive therapy, and sensory stimulation activities. Nursing staff were involved in provision, and ADLs such as dressing were targeted. Kerse 2008 and Peri 2008 evaluated variations of a 'Promoting Independence' plan, where a functional physical goal was set with the resident, an activity plan based on ADLs was devised, and a healthcare assistant encouraged the resident to perform these.

Delivery of intervention

It appeared that all interventions involved supervised delivery, as opposed to wholly self-directed interventions with a worksheet or video, for example. The majority were delivered by staff external to the home (54 interventions), using rehabilitation professionals (e.g. physiotherapists, occupational therapists, sports scientists, activities staff; 30 interventions), researchers (22 interventions), or a combination of these (2 interventions). Care facility staff delivered five interventions (Kinion 1993; Lazowski 1999; MacRitchie 2001; Morris 1999 (both interventions)). All of these included the healthcare staff, while two included activities staff, and two included other staff (e.g. domestic staff). In two of these studies, volunteers (e.g. family members) participated in the delivery. Ten interventions involved both internal and external staff (Baum 2003; Buettner 1997; Kerse 2008; Lee 2009; Makita 2006; Peri 2008; Przybylski 1996; Resnick 2009; Rosendahl 2006; Sackley 2009): In six, staff were external rehabilitation professionals and internal healthcare staff; in three, internal and external healthcare staff; and in one, internal and external rehabilitation professionals. Among the 10 interventions that were incidental to the resident's care (see the above 'Format of intervention' section), research staff provided the care and rehabilitation in five interventions (Alessi 1999; Ouslander 2005; Schnelle 1995; Schnelle 2002; Tappen 2000); in four delivery was provided by a combination of internal and external staff (Buettner 1997; Kerse 2008; Peri 2008; Resnick 2009), and in one delivery was provided wholly by internal staff (Morris 1999 (self care for seniors)).

Duration of intervention

The interventions lasted between four weeks (Karl 1982; Sackley 2008; Sihvonen 2004) and a year (Naso 1990; Resnick 2009; Rolland 2007), with the exception of the four interventions that examined imagery or purposefulness and were only administered once (DeKuiper 1993; Lang 1992; Riccio 1990; Yoder 1989). Most typically, interventions were twelve weeks in duration (median and mode, N = 12), with 10 interventions lasting eight to nine weeks and 7 lasting six months. Total exposure to the intervention (total time per week multiplied by the duration of the intervention) ranged very widely from 240 minutes (four hours) (Karl 1982) to 15,653 minutes (approximately one and a half weeks delivered in two-hour sessions, five times per week for six months) (Christofoletti 2008), with a median of 1440 minutes (24 hours) in the 32 interventions where this could be calculated.

Comparison conditions

Most studies compared two groups: the intervention of interest and some sort of control. However, 10 studies compared three groups (Christofoletti 2008; Clark 1975; Cott 2002; Faber 2006; Gillies 1999; Lang 1992; Morris 1999; Schnelle 1995; Stevens 2006; Tappen 1994), and 4 studies compared four groups (Chin A Paw 2004; Faber 2006; Fiatarone 1994; Rosendahl 2006).

Thirty-five studies compared their intervention(s) to a 'usual care' control group, allowing examination of whether an intervention was better or worse than their usual situation. The remaining studies supplemented 'usual care' in some way, for example, with a social meeting or different exercise. A social or recreational activity control session, for example, talking, playing cards, or reminiscing, featured in 18 studies (e.g. Baum 2003; Brown 2004). Nineteen studies compared different exercise programmes, usually a novel approach with a traditional type (Au-Yeung 2002; Bautmans 2005; Brill 1998; Bruyere 2005; Cheung 2008; de Bruin 2007; Donat 2007; Dorner 2007; Gillies 1999; Lazowski 1999; Mihalko 1996; Riccio 1990; Urbscheit 2001; Yoder 1989). Two studies compared three exercise types (DeKuiper 1993; Lang 1992). Four studies compared four groups. Two studies crossed an exercise and a social activity control with a nutritional supplement and a placebo control to examine whether exercise alone was better than the social activity control, and whether benefit from exercise was enhanced by nutritional supplementation (Fiatarone 1994; Rosendahl 2006). For the purposes of this review, we ignored the impact of supplementation, and where possible, we combined nutrition and

placebo variants of exercise and control groups for meta-analyses. One study compared two different exercise programmes, each with their own control group (Faber 2006: controls were located in the same facilities as the relevant exercise programme). Finally, one study compared the effects of strength training and functional skills training, with the effect of both interventions combined and with an educational control group (Chin A Paw 2004).

Outcome measures

As a consequence of the considerable variation in the purpose and content of the interventions outlined above, the studies used many outcome measures (327 in total). Frequently, these were study-specific, with 59 studies including a unique measure and 258 of the 327 measures used being unique. The studies reported only 13 measures five or more times (Timed Up and Go (TUG) test, six-metre walk time, BI, Berg Balance Scale, Tinetti Mobility Scale, 'sit-and-reach' test, average number of sit-to-stands in 30 seconds, hand grip strength, Geriatric Depression Scale, MMSE, falls (number of falls and any per participant), and attendance). In total, 51 trials reported an outcome measure related to ADL, our primary outcome. Other common outcomes addressed by the studies included balance (29 studies), muscle power (25 studies), flexibility (16 studies), exercise tolerance (7 studies), physical activity (7 studies), mood (15 studies), cognitive performance (11 studies), quality of life (7 studies), fear of falling (6 studies), and perceived health status (6 studies). The studies also recorded morbidity, mortality, adverse events, and attendance. We report details of the methods used by individual studies to assess these outcomes in the 'Characteristics of included studies' tables.

Follow up

All studies except Brittle 2009 assessed participants immediately after intervention completion; follow up of participants after this was rare, undertaken by just 14 studies. In these, follow-up was most frequently at three months after the end of the intervention (Au-Yeung 2002; Rosendahl 2006; Sackley 2006; Sackley 2009; Schoenfelder 2000; Schoenfelder 2004). The other follow-up periods were two weeks (Sackley 2008), one month (Clark 1975; Sihvonen 2004), two and five months (Brittle 2009), six months (Kerse 2008), and one year (Faber 2006; Meuleman 2000; Urbscheit 2001).

Excluded studies

We excluded 52 studies that may, on the surface, appear to meet the inclusion criteria, but do not: individual reasons are provided in the 'Characteristics of excluded studies' tables. We excluded these studies because the purpose was not to improve residents' physical condition (N = 14); assignment to groups was not random (N = 12); participants included those who were not residents of long-term care, and they did not report the results separately (N = 10); they evaluated a multi-faceted falls prevention intervention (N = 7); the aspect of the intervention that varied between groups was not physical rehabilitation (N = 4); they targeted contractures (N = 3); or there was insufficient information to include them (N = 2).

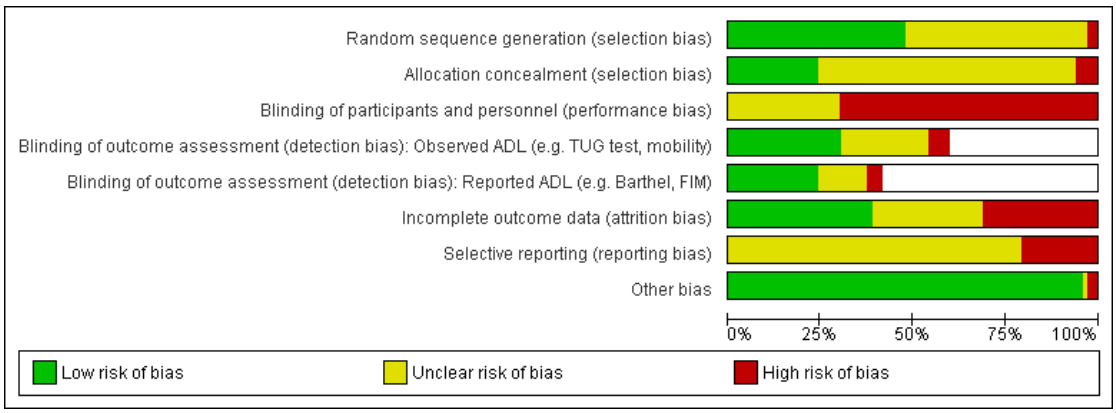
New studies found at this update

We included an additional 18 studies in this update. Half of the new studies have used a cluster-randomised design, previously only used by 20% of the included studies. Similarly, eight new studies had over 100 participants compared to 10 of the 49 studies in the previous version of the review. In total, the number of participants has almost doubled from 3611 to 6300. It was notable that only one new study came from North America, which had previously supplied 35 studies (71%) and that nine additional countries are represented in this review, including the first South American country (Brazil).

Risk of bias in included studies

We present our 'Risk of bias' judgements, made according to The Cochrane Collaboration's tool, in the 'Characteristics of included studies' tables and summarise them here in the text, in Figure 2, and in Appendix 7. We did not judge any studies to have low risk of bias across all categories, with no studies judged to have a low risk of performance bias or reporting bias. To enable an analysis of the best available evidence, we selected the seven studies judged to have low risk of bias in all other categories (selection, detection, attrition, and other sources of bias) as a subgroup named 'lower risk of bias' for meta-analysis (Brittle 2009; Chin A Paw 2004; Kerse 2008; McMurdo 1994; Sackley 2006; Sackley 2008; Sackley 2009) to be contrasted with all other studies (higher risk of bias).

Figure 2. 'Risk of bias' graph: review authors' judgements about each 'Risk of bias' item presented as percentages across all included studies



Several studies caused particular concern. Karl 1982 did not report baseline or follow-up data or randomisation procedure. Brill 1998 had only one room and time slot to conduct their weight-training intervention, which meant both groups received their intervention at the same time. It is unclear how far this deviates from the intended design. In Sauvage 1992, the study began with 12 individuals, and following the loss of two of the six intervention participants, crossed over four participants from the control group, whose results were reported in each group. They did not account for this in their statistical analysis (samples were treated as independent), nor did they discuss temporal differences or report results separately. The design used in one study (Przybylski 1996) also raised potential problems. Their intervention was implemented over two years, with 29 new participants recruited throughout to replace those who died or were discharged. The researchers had no control over who entered and left the groups and made the assumption that this was a random process.

Allocation

We judged the risk of selection bias to be unclear in the majority of studies because they reported insufficient information. We judged the risk in both categories to be low for 13 studies and high for 2 studies, where after the initial randomisation, these studies allocated further participants without stating that this was performed randomly. We judged risk of bias due to random sequence generation to be low for 32 studies, unclear for 33 studies, and high for 2 studies. We judged concealment of the allocation sequence to pose low risk of bias for 16 studies and high risk of bias for 4 studies; it was unclear for 47 studies.

Blinding

We did not judge blinding to pose low risk of bias in any of the studies, because none of them were able to achieve low risk with respect to blinding of participants and personnel (performance bias). We judged 47 studies to be at high risk of performance bias, usually because the control would have been obvious, while for 20 studies the risk of performance bias was judged unclear, typically where such blinding was feasible, using strategies including cluster randomisation and alternative interventions for the control groups, but not specifically reported. By contrast, blinding of outcomes assessors was often sufficient to judge a low risk of detection bias for the outcome measures entered into meta-analyses (for observed outcomes, 20 studies were at low risk, 16 studies were at unclear risk, and four studies were at high risk; for reported outcomes, 16 studies were at low risk, 9 studies were at unclear risk, and 3 studies were at high risk). Thirty-five of the 67 studies attempted blinding of some of their outcome assessments.

Incomplete outcome data

We judged incomplete outcome data to pose low risk of bias in 26 studies, high risk of bias in 21 studies, and it was unclear in 20 studies. Typically, high risk of bias related to differential attrition rates between study groups, but also high overall attrition, inability to get measurements for a significant proportion of participants, or post-randomisation exclusions. Overall attrition rates were reported by 59 of the 67 studies, among which the grand mean rate was 21.4% (N = 1300 of 6083). Five studies had no attrition, three of which were studies of single-session interventions (DeKuiper 1993; Lang 1992; Yoder 1989), the other two (Cheung 2008; Kinion 1993) lasting for 12 and 8 weeks, respectively. Attrition in 29 other studies was less than 20%, between 20% and 30% in 18 studies (Buettner 1997 (21%); Chin A Paw 2004 (28%); Christofoletti 2008; de Bruin 2007 (22%); Donat 2007 (24%); Dorner 2007 (29%); Gillies 1999 (25%); Lazowski 1999 (29%); Lee 2009 (21%); Meuleman 2000 (26%);

Naso 1990 (27%); Ouslander 2005 (27%); Sackley 2006 (25%); Sackley 2009 (25%); Schnelle 1996 (26%); Schnelle 2002 (22%); Schoenfelder 2004 (28%); Taboonpong 2008 (29%)), between 30% and 40% in four studies (Kerse 2008 (31%); Pomeroy 1993 (33%); Resnick 2009 (33%); Stevens 2006 (38%)), and over 40% in three studies (Au-Yeung 2002 (42%); Bruunsgaard 2004 (46%); Przybylski 1996 (45%)). The eight studies that did not provide data on overall attrition were Brill 1998; Brown 2004; Karl 1982; Mihalko 1996; Santana-Sosa 2008; Sauvage 1992; Stamford 1972, and Urbscheit 2001, only two of which had more than 20 participants.

Selective reporting

We did not judge selective reporting to pose low risk of bias in any studies, often because a pre-study protocol was not available, and because of the wide range of outcomes measured across studies, a complete range could not be considered to have been assessed. We judged 53 studies to have an unclear risk of reporting bias, while we judged 14 studies to have a high risk of reporting bias, usually because they did not report (or did so insufficiently) outcomes specified in the methods section. It should be noted that many of the studies judged to have unclear risk of reporting bias reported a number of outcomes that did not reach (or even come close to) statistical significance, suggesting that these studies may have reported all outcomes.

Other potential sources of bias

In three studies, we identified a potential risk of bias due to contamination (control participants receiving the intervention). We judged this to pose an unclear risk of bias in Buettner 1997, where the review authors suspected contamination, and a high risk of bias in Peri 2008 and Baum 2003, where the study authors reported contamination.

Effects of interventions

Primary outcomes: function in activities of daily living

In total, 51 studies conducted a measure of our primary outcome, function in activities of daily living (ADL). However, only 33 studies measured an outcome that was included in one of our meta-analyses, nine of which were excluded from the analysis, either because they provided insufficient information to be included (N = 8) or had a substantial baseline imbalance in the specific measure (N = 1, sensitivity analysis presented). Therefore, we included the results of 24 studies in the meta-analyses (Au-Yeung 2002; Baum 2003; Bautmans 2005; Brill 1998; Brittle 2009; Bruyere 2005; Cheung 2008; Chin A Paw 2004; Dorner 2007; Hruda 2003; Kerse 2008; Lazowski 1999; MacRitchie 2001; Makita 2006; McMurdo 1993; Peri 2008; Przybylski 1996; Resnick 2009; Rolland 2007; Rosendahl 2006; Sackley 2006; Sackley 2009; Santana-Sosa 2008; Schoenfelder 2004). These studies initially randomised a total of 3139 participants into them. The other studies used ADL measures that they reported too infrequently for inclusion in meta-analyses. We provide details in the 'Characteristics of included studies' tables, but they are not synthesised here.

Independence in activities of daily living

Barthel Index

The Barthel Index (BI) assesses independence in physical ADL across 10 items, rated in increments of 5, e.g. scores of 0, 5, 10, with a maximum total score of 100 (best function). Some studies scaled this to increments of 1, e.g. scores of 0, 1, 2, with a maximum total score of 20. In this case, scores were multiplied by 5 to allow comparison with the original scaling.

Seven studies used the BI and contributed information to the meta-analysis (Dorner 2007; McMurdo 1993; Resnick 2009; Rosendahl 2006; Sackley 2006; Sackley 2009; Santana-Sosa 2008). Where the rules of the residential home restricted the total score, e.g. participants not being allowed to go to the toilet alone, reducing the maximum score to 95/100, we ignored this in pooling studies. In McMurdo 1993, it was unclear which scale had been used, so we assumed use of the 0 to 20 scale, because this is most common in the UK, and the standard errors would have been unfeasibly tight for such a small study if the alternative had been used. In Santana-Sosa 2008, the BI score was derived from the graphs presented in the publication. Five of these studies were cluster trials (McMurdo 1993; Resnick 2009; Rosendahl 2006; Sackley 2006; Sackley 2009), although two only reported unadjusted results (McMurdo 1993; Rosendahl 2006). We were able to adjust these results using an estimated intra-cluster correlation coefficient (ICC) of 0.38 based on Sackley 2006 and Sackley 2009.

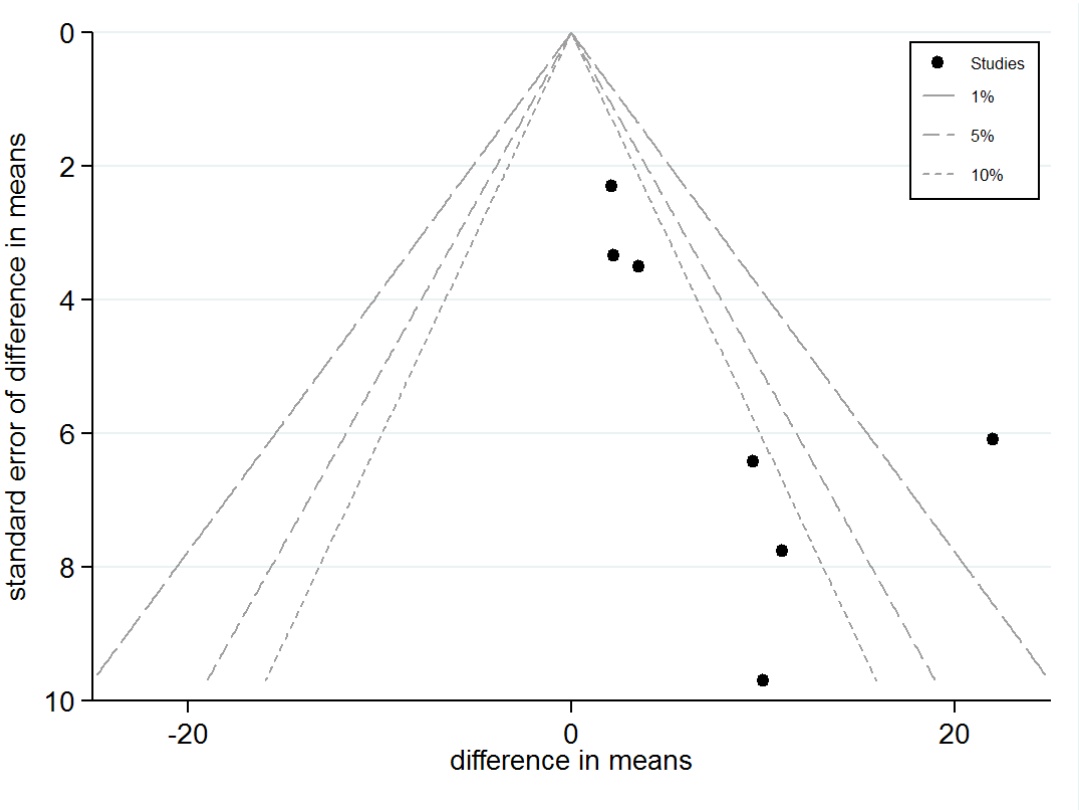
The rehabilitation group had a BI on average six points higher than controls (95% CI 2 to 11, P = 0.008) when analysed with the random-effects method (Analysis 1.1). We found similar results for the fixed-effect pooled estimate, with a BI five points higher (95% CI 2 to 7, P = 0.003) at follow-up than controls (Analysis 1.43). There was substantial between-study heterogeneity (I^2 statistic = 48%, Q = 12 on 6 degrees of freedom (df), P = 0.07). Excluding cluster studies resulted in a much larger effect estimate of 18 points difference, with wide confidence intervals (95% CI 7 to 28, P = 0.001) (Analysis 1.44), although this was based on two small studies.

The small number of studies limited the exploration of the potential sources of heterogeneity. There was no evidence that studies with a higher risk of bias had different measures of effect than those with a lower risk of bias (Analysis 1.7) (P = 0.3). There was some evidence that studies with shorter interventions had larger effects than those with longer interventions (Analysis 1.8) (P =

0.01). There was no evidence of differential effects on BI based on mode of delivery (Analysis 1.9) (P = 0.3), baseline function (Analysis 1.10) (P = 0.5), age (Analysis 1.11) (P = 0.4), or gender (Analysis 1.12) (P = 0.5).

There was some evidence of asymmetry in the contour-enhanced funnel plot (Figure 3) (Egger's test P = 0.05), with larger studies indicating less benefit of rehabilitation. However, six of the seven studies were not statistically significant, suggesting that this asymmetry may not be due to publication bias. However, with only seven studies contributing, this should be interpreted with caution.

Figure 3. Funnel plot of comparison: 1 Rehabilitation versus control, outcome: 1.1 Barthel Index.



Functional Independence Measure

The Functional Independence Measure (FIM) assesses a participant's degree of independence in self care, toileting, mobility, communication, and social cognition functions. It consists of 18 items rated on a 7-point scale, with higher scores indicating greater independence.

Four studies used the FIM and contributed information to the meta-analysis (Dorner 2007; Lazowski 1999; Makita 2006; Przybylski 1996). Przybylski 1996 did not present the numbers in each intervention group at follow-up, but did present total numbers, balanced numbers in each group at baseline, and report that attrition was similar. We therefore assumed an equal dropout rate

in each group and similar numbers in each group at follow-up. All of these studies were randomised at the level of the individual.

The rehabilitation group had a FIM on average 5.0 points higher than controls (95% CI -1.6 to 11.5, P = 0.1) when analysed with the random-effects method (Analysis 1.2). The fixed-effect pooled estimate was lower, but with narrower confidence intervals, with a FIM on average 1.5 points higher (95% CI -0.4 to 3.3, P = 0.1) at follow-up than controls (Analysis 1.45). There was substantial between-study heterogeneity (I^2 statistic = 71%, Q = 10 on 3df, P = 0.02).

The small number of studies limited the exploration of the potential sources of heterogeneity. All studies were categorised as higher risk of bias, so it was not possible to assess this as a source of heterogeneity (Analysis 1.13). There was no evidence of differential effects on FIM based on duration of intervention (Analysis 1.14) (P = 0.6) or mode of delivery (Analysis 1.15) (P = 0.3). Comparing studies with differing mean functional independence at baseline (Analysis 1.16) suggested that participants with greater functional independence benefited more from intervention than those with less function at baseline (P = 0.03). There was evidence that younger participants (less than 85 years) benefited more from rehabilitation in terms of functional independence than older participants (85 years and older) (Analysis 1.17) (P = 0.001). This also reduced the excess heterogeneity in both groups (from I^2 statistic = 71% to I^2 statistic = 0% in each group separately). There was no evidence of differential effects on FIM due to gender (Analysis 1.18) (P = 0.8).

There were too few studies to explore asymmetry in the contour-enhanced funnel plot (Egger's test P = 0.3).

Rivermead Mobility Index

The Rivermead Mobility Index (RMI) assesses mobility independence and performance across 15 items, with a score ranging from 0 to 15, with 15 being the best outcome.

Three studies contributed information to the meta-analysis (Brittle 2009; Sackley 2006; Sackley 2009); four studies used the RMI, but Sackley 2008 did not present results as it was a feasibility study. All of these studies were cluster trials, and all presented appropriately adjusted analyses.

Rehabilitation groups had a RMI on average 0.7 points higher at follow-up than controls (95% CI 0.04 to 1.3, P = 0.04) when analysed with the random-effects method (Analysis 1.3). There was almost no excess between-study heterogeneity (I^2 statistic = 0%, Q = 0.02 on 2df, P = 0.99). Therefore, the fixed-effect pooled estimate (Analysis 1.46) was identical to the random-effects model.

The small number of studies limited the exploration of the potential sources of heterogeneity. We had categorised all of these studies as lower risk of bias, so we were not able to assess risk of bias as a source of heterogeneity (Analysis 1.19). There was no evidence of differential effects on RMI based on duration of intervention (Analysis 1.20) (P = 0.9), mode of delivery (Analysis 1.21) (P = 0.9), baseline function (Analysis 1.22) (P = 0.9), age (Analysis 1.23) (P = 0.9), or gender (Analysis 1.24) (P = 0.9).

There were too few studies to explore asymmetry in the contour-enhanced funnel plot (Egger's test P = 0.09).

Tests of ability in specific activities of daily living

Timed Up and Go test

The Timed Up and Go (TUG) test assesses participant mobility, measuring the time in seconds for a participant to rise from sitting in a standard armchair, then walk three metres, turn around, walk back to the chair, and sit down again. Therefore, a lower score indicates better performance. Two studies modified the distance for the TUG test (Hruda 2003; Santana-Sosa 2008), and one counted the number of steps taken in addition to the time taken (Christofoletti 2008). To reduce heterogeneity, the modified outcomes were not included in the meta-analyses.

Seven studies contributed to the rehabilitation versus control meta-analysis, and two studies contributed to the meta-analysis of rehabilitation (experimental) versus rehabilitation (control). Twelve studies used the standard TUG test (Au-Yeung 2002; Baum 2003; Bautmans 2005; Bruyere 2005; Cheung 2008; Christofoletti 2008; Donat 2007; Kerse 2008; Lazowski 1999; MacRitchie 2001; Peri 2008; Sackley 2009). However, we could not include Sackley 2009 in the meta-analyses because the authors did not present TUG test results on the grounds of extensive missing data and substantial variation in individual results. We could not include Donat 2007 in the meta-analyses because the study did not present a measure of variation in the outcome (e.g. standard error, standard deviation, or confidence interval). We excluded Christofoletti 2008 because of substantial baseline imbalance that persisted throughout the duration of the trial, with the control group taking more than twice as long to complete the TUG test before any intervention. We present below an analysis that re-includes these data. We analysed two studies in a separate meta-analysis because they compared exercise plus whole body vibration with exercise alone, so both groups contained a rehabilitative intervention (Bautmans 2005; Bruyere 2005). Kerse 2008 and Peri 2008 were cluster randomised trials and presented appropriately adjusted analyses.

The rehabilitation group was five seconds quicker on average at follow-up than controls (95% CI -9 to 0, P = 0.05) when analysed with the random-effects method (Analysis 1.4). We observed substantial excess heterogeneity (I^2 statistic = 65%, Q = 17 on 6df, P = 0.009). The fixed-effect pooled estimate was similar: Rehabilitation groups had TUG test results four seconds quicker than controls (95% CI -6 to -1), and this was statistically significant (P = 0.001) (Analysis 1.47). The sensitivity analysis excluding cluster trials (Analysis 1.48) was significant (P = 0.02) and estimated a larger effect, with rehabilitation groups an average eight seconds faster, but with wide confidence intervals (95% CI -14 to -2). The

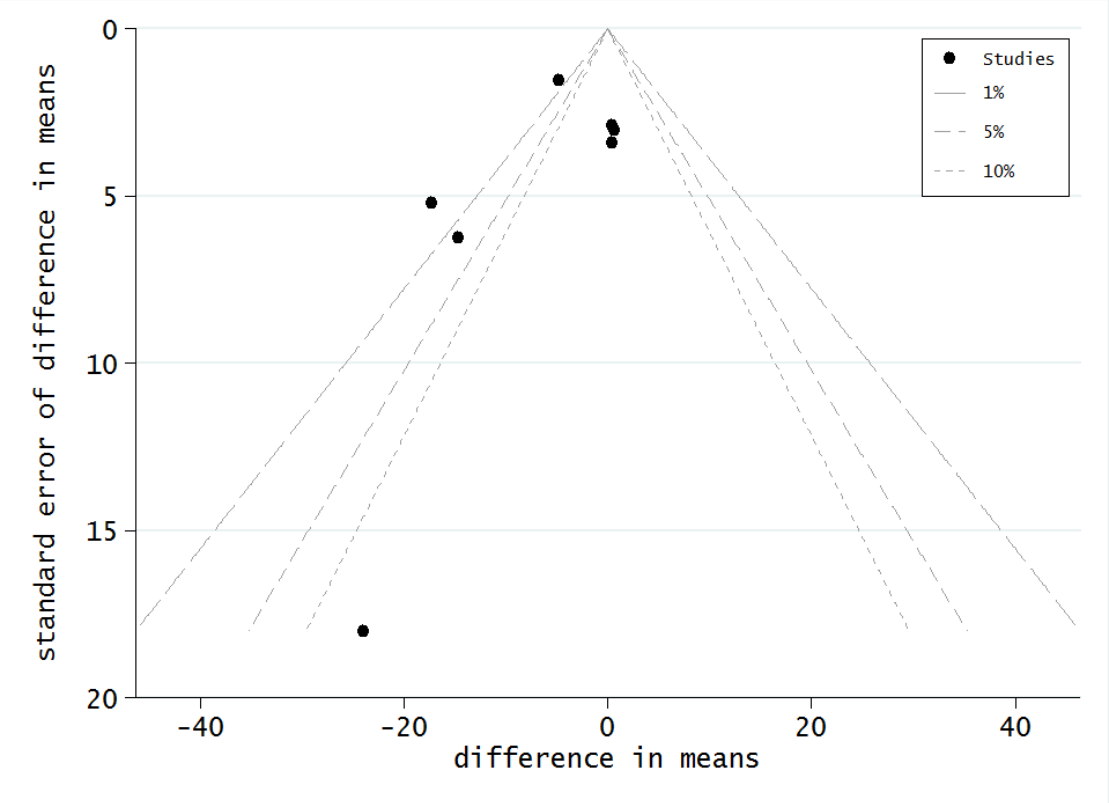
sensitivity analysis including the study with substantial baseline imbalance (Christofoletti 2008) (Analysis 1.49) was significant (P = 0.02) and estimated a larger effect, with rehabilitation groups an average eight seconds faster, but wide confidence intervals (95% CI -16 to -1) and further increased heterogeneity (I^2 statistic = 89%, Q = 65 on 7df, P < 0.00001).

Exploring the heterogeneity, we categorised only one study as lower risk of bias, and there was no evidence that this study had different measures of effect on TUG test scores than those with a higher risk of bias (Analysis 1.25) (P = 0.1). There was some evidence that studies with shorter interventions had larger effects than those with longer interventions (Analysis 1.26) (P = 0.06), though numbers of studies were small, and there was still substantial heterogeneity between studies with less than six months' intervention. There was no evidence that group interventions differed in effect from individual interventions (Analysis 1.27) (P = 0.9).

There was some evidence that participants with greater mobility benefited more from rehabilitation than those with less mobility at baseline (Analysis 1.28) (P = 0.06). However, the numbers of studies in each subgroup were small, and substantial heterogeneity remained between studies with lower TUG test scores. A post-hoc analysis, moving the median study from the more mobile group to the less mobile group, found no evidence of this difference (P = 0.8). There was no evidence of difference in pooled estimates due to age (Analysis 1.29) (P = 1.0). There was some evidence that participants in studies with a higher proportion of women (more than 80% compared with 80% or less) had lower (better) TUG test scores than those with a lower proportion of women (Analysis 1.30) (P = 0.05).

There was no evidence of asymmetry in the contour-enhanced funnel plot (Figure 4) (Egger's test P = 0.4).

Figure 4. Funnel plot of comparison: 1 Rehabilitation versus control, outcome: 1.4 TUG test



The whole body vibration plus exercise (experimental rehabilitation) group was eight seconds quicker on average at follow-up than exercise alone (control rehabilitation) (95% CI -19 to 3, P = 0.2) when analysed with the random-effects method (Analysis 2.1). The fixed-effect pooled estimate was similar, with the experimental group seven seconds quicker (Analysis 2.3) (95% CI -11 to -3, P = 0.0002). We observed substantial excess heterogeneity (I^2 statistic = 89%, Q = 9 on 1df, P = 0.003). However, because there were only two studies, we did not conduct subgroup analyses.

Walking time and speed over fixed distance

To investigate walking as a functional ability, we combined measures of time to walk a fixed distance with measures of speed over a fixed distance, converting these into speed in metres per second (m/s). We anticipated that varied distances may impact on speed to walk that distance. Therefore, to reduce heterogeneity, we decided a priori to only combine studies over a fixed distance (i.e. excluding studies of maximum distance walked in a fixed time) and for that fixed distance to be less than 10 metres. Where measures of 'fast' walking and 'normal' walking were available, we selected normal walking speed, again to reduce heterogeneity.

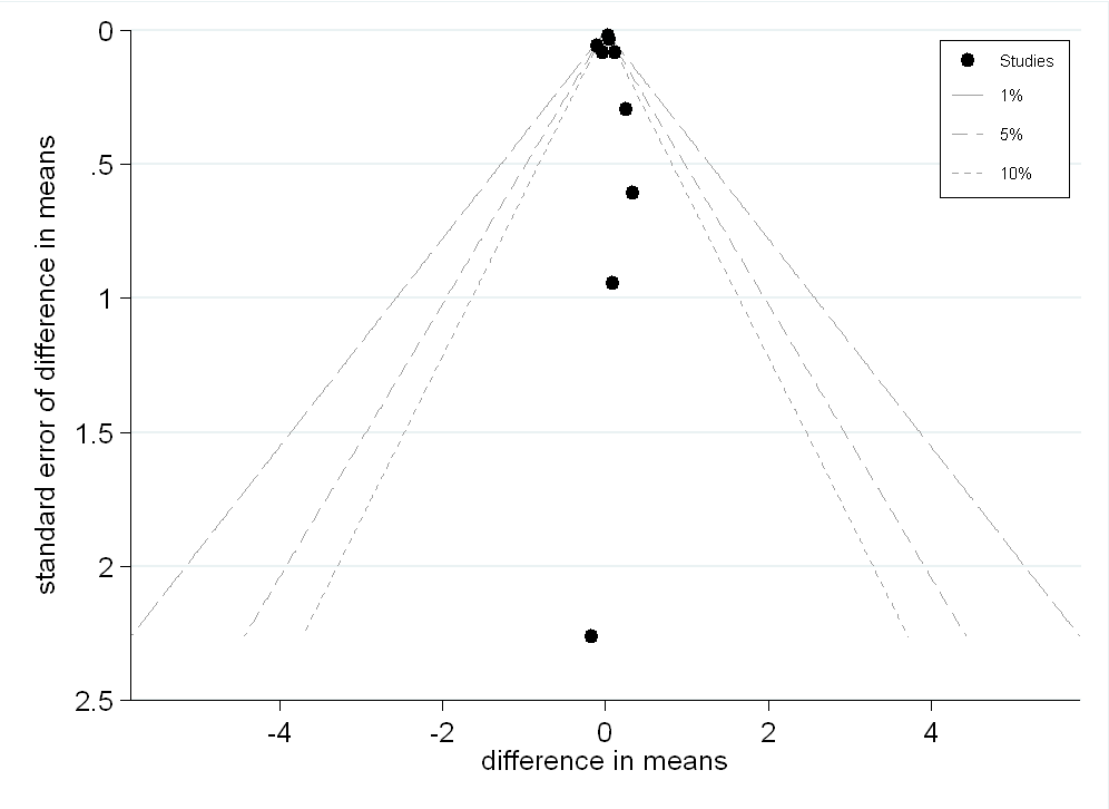
Fifteen studies met these criteria, but only nine studies contributed information to the meta-analysis (Au-Yeung 2002; Brill 1998; Chin A Paw 2004; Hruda 2003; Lazowski 1999; MacRitchie 2001; Rolland 2007; Rosendahl 2006; Schoenfelder 2004). One study did not report numeric results for the walking outcome (Schnelle 1996); two studies did not present any measure of variation in the outcome (Schnelle 1995; Schoenfelder 2000); and three studies only presented results as change in time, which we were unable to convert into change in speed (Choi 2005; Fiatarone 1994; Meuleman 2000). Rosendahl 2006 was a cluster randomised trial, but did not present correctly adjusted results, although they claimed results were similar. Because other trials were not cluster trials, we could not estimate an ICC from them. We were also unable to identify a suitable ICC estimate from external sources. Therefore, we presented the unadjusted results.

The rehabilitation group were on average 0.03 m/s (95% CI -0.01 to 0.07, P = 0.1) faster at walking a fixed distance less than 10 metres than controls when analysed with the random-effects method (Analysis 1.5). There was very little between-study heterogeneity (I^2 statistic = 9%, Q = 9 on 8df, P = 0.4). Therefore, the fixed-effect pooled estimate was similar, also estimating that rehabilitation groups had a walking speed of on average 0.03 m/s faster over a fixed distance (95% CI 0.00 to 0.06, P = 0.02) at follow-up than controls (Analysis 1.50). While statistically significant, this is a small effect and was not significant in the random-effects analysis. The sensitivity analysis excluding the one cluster trial (Analysis 1.51) further reduced the estimated effect to an increase of 0.01 m/s (95% CI -0.05 to 0.08, P = 0.7) and slightly increased between-study heterogeneity (I^2 statistic = 16%, Q = 8 on 7df, P = 0.3).

We categorised only Chin A Paw 2004 as lower risk of bias, which appeared to be significantly different from the other studies, which were higher risk of bias (Analysis 1.31) (P = 0.01), implying that studies with lower risk of bias recorded less impact of the rehabilitation. However, this was based on only one lower risk study, which differed in other ways, e.g. type of intervention, duration of intervention, and distance walked to measure speed. There was no evidence of differential effects due to duration of interventions (Analysis 1.32) (P = 0.7), mode of delivery (Analysis 1.33) (P = 0.6), or baseline walking speeds (Analysis 1.34) (P = 0.6). All these studies had mean participant ages less than our predetermined threshold (less than 85 years), so we could not assess age as a potential source of heterogeneity in this outcome (Analysis 1.35). There was no evidence of differential effects due to gender (Analysis 1.36) (P = 0.2). There was no evidence that studies testing walking speeds over shorter distances measured different responses to rehabilitation than those testing over longer distances (Analysis 1.37) (P = 0.5).

There was no evidence of any asymmetry in the contour-enhanced funnel plot (Figure 5) (Egger's test P = 1.0).

Figure 5. Funnel plot of comparison: 1 Rehabilitation versus control, outcome: 1.5 Walking speed



Secondary outcomes

Strength

Twenty-five studies reported strength as an outcome, seven of which reported no significant effect at the end of the intervention. Five studies assessed upper body strength (excluding grip), three of which found significant differences between groups (Mihalko 1996; Ouslander 2005; Schnelle 2002), while two did not (Chin A Paw 2004; Lazowski 1999). However, in the case of Mihalko 1996, this was based on an unadjusted analysis of a cluster study. Seven studies assessed hand grip strength, four of which found significant differences (Brill 1998; Buettner 1997; McMurdo 1993; Schnelle 1996), although in two of these strength was assessed separately in each hand, and differences were only significant in one hand (Brill 1998; Schnelle 1996), while McMurdo 1993 presented an unadjusted analysis of a cluster study. Three studies found no significant difference in grip strength (Bautmans 2005; Lazowski 1999; Resnick 2009). Sixteen studies assessed lower body strength, with 11 finding significant differences favouring rehabilitation at the end of the intervention (Brill 1998; Bruunsgaard 2004; Choi 2005; de Bruin 2007; Donat 2007; Fiatarone 1994; Hruda 2003; Lazowski 1999; McMurdo 1994; Ouslander 2005; Sauvage 1992) and five finding no significant difference (Bautmans 2005; Chin A Paw 2004; Rosendahl 2006; Schoenfelder 2000; Schoenfelder 2004). However, among those finding in favour of rehabilitation, one study had a significant baseline imbalance (Choi 2005); this study and McMurdo 1994 were cluster trials that did not adjust their analysis for the design; one did not find significant differences in all types of strength measure (Hruda 2003); and three were limited to within-group improvements only (de Bruin 2007; Donat 2007; Sauvage 1992). Three studies assessed a global measure, combining measures of upper and lower body strength, with one finding significant difference in some measures (isometric and isokinetic concentric, not isokinetic eccentric) after training (Meuleman 2000), one finding significant difference in changes in strength, but with a large baseline imbalance likely to have produced a regression to the mean (Dorner 2007), and one finding no significant difference (Mulrow 1994).

Five studies addressed improvement sustainability (Buettner

1997; Meuleman 2000; Rosendahl 2006; Schoenfelder 2000; Schoenfelder 2004), although only two had found significant differences at the end of the intervention (Buettner 1997; Meuleman 2000). Buettner 1997 observed significant strength gains in very frail participants during the first 20 weeks of the intervention, while strength deteriorated among controls. However, during the final 10 weeks of the intervention, strength deteriorated among all participants, although the intervention group remained significantly stronger than at baseline and than the control group. The participants in Meuleman 2000 did not sustain the significant differences seen after four to eight weeks training at 6 or 12 months. Of the other studies, Schoenfelder 2000 and Schoenfelder 2004 still found no significant difference, while in Rosendahl 2006, improvement in the intervention group and deterioration in the control group led to a significant difference at six months not seen at the end of the intervention. This was in an unadjusted analysis of a cluster study.

Flexibility

Components targeting flexibility featured in 17 interventions, and 16 studies assessed it as an outcome measure (Bautmans 2005; Buettner 1997; Chin A Paw 2004; Choi 2005; Donat 2007; Kinion 1993; Lazowski 1999; Lee 2009; Makita 2006; McMurdo 1993; Mulrow 1994; Resnick 2009; Santana-Sosa 2008; Schnelle 1996; Sung 2009; Taboonpong 2008). Ten reported significant benefits to their participants at the end of the intervention (at $P < 0.05$) (Buettner 1997; Choi 2005; Donat 2007; Kinion 1993; Lazowski 1999; Makita 2006; McMurdo 1993; Santana-Sosa 2008; Schnelle 1996; Sung 2009), although three studies were cluster trials that did not adjust their analysis for the design (Choi 2005; McMurdo 1993; Sung 2009); in two studies, this was limited to within-group assessments (Donat 2007; Lazowski 1999); and in three studies, only some joints showed significant benefit (spine but not knees McMurdo 1993; shoulders and knees but not ankles Makita 2006; shoulders, hips, and elbows but not knees Kinion 1993). The within-group assessments of Donat 2007 found significant increases in flexibility in both the supervised and unsupervised exercise groups, but there was no usual care control group for comparison. Five other studies found no evidence of significant benefit to flexibility from their interventions (Bautmans 2005; Chin A Paw 2004; Mulrow 1994; Resnick 2009; Taboonpong 2008). Successful interventions included rowing by participants with advanced dementia and frailty (Schnelle 1996); a combination of walking, joint mobility, resistance and coordination exercises (Santana-Sosa 2008); Tai Chi (Choi 2005); a programme to increase the practice of sensorimotor activities (Buettner 1997); strengthening exercises with dancing to music and health education (Sung 2009); and exercise to music related to improvement in spinal flexion, which deteriorated in the control group (McMurdo 1993). Only Lazowski 1999 compared the effect of two types of physical rehabilitation on flexibility. They found their 'functional fitness' intervention significantly ($P < 0.05$) outperformed 'range of motion' exercises on several indices of flexibility. Studies rarely systematically assessed flexibility, and it was not clearly linked with overall activity restriction. Lee 2009 did not report results. None of the studies examined long-term effects.

Balance

Twenty-nine trials assessed balance as an outcome measure (Au-Yeung 2002; Baum 2003; Bautmans 2005; Brill 1998; Bruyere 2005; Cheung 2008; Choi 2005; Christofoletti 2008; Clark 1975; Crilly 1989; de Bruin 2007; Dorner 2007; Donat 2007; Kerse 2008; Lazowski 1999; Lee 2009; MacRitchie 2001; McMurdo 1993; Morris 1999; Mulrow 1994; Resnick 2009; Rolland 2007; Rosendahl 2006; Sauvage 1992; Schoenfelder 2000; Schoenfelder 2004; Sihvonen 2004; Sung 2009; Urbscheit 2001). Thirteen trials reported significantly benefiting their participants' balance at the end of the intervention (at $P < 0.05$) (Bautmans 2005; Bruyere 2005; Cheung 2008; Choi 2005; Christofoletti 2008; de Bruin 2007; Donat 2007; Lazowski 1999; MacRitchie 2001; Resnick 2009; Schoenfelder 2004; Sihvonen 2004; Sung 2009). However, Choi 2005 and Sung 2009 based this on an unadjusted analysis of a cluster study; Donat 2007 only reported within-group comparisons; in three studies, benefit was only significant for some of their measures of balance (Choi 2005; Schoenfelder 2004; Sihvonen 2004); and in one study (Resnick 2009), there was a significant baseline imbalance with possible regression to the mean. The within-group assessments of Donat 2007 found significant increases in balance in both the supervised and unsupervised exercise groups, but there was no usual care control group for comparison. Successful interventions included a combination of strength and balance exercises (Cheung 2008; Christofoletti 2008; de Bruin 2007; Lazowski 1999), strengthening exercises with dancing to music and health education (Sung 2009), and standing and walking activities performed to music (MacRitchie 2001). However, 14 studies were unable to demonstrate any effect of their programme on balance at the end of the intervention (Au-Yeung 2002; Baum 2003; Clark 1975; Crilly 1989; Dorner 2007; Kerse 2008; McMurdo 1993; Morris 1999; Mulrow 1994; Rolland 2007; Rosendahl 2006; Sauvage 1992; Schoenfelder 2000; Urbscheit 2001). Urbscheit 2001 suggested this was due to initial balance ability, with participants in poorer health unable to improve. Morris 1999 suggested some rehabilitation interventions may cause harm to the balance of elderly residents of long-term care: They found their nursing rehabilitation intervention group's balance deteriorated significantly compared to their control and 'fit for your life' groups. Two studies did not report the results of their balance assessments (Brill 1998; Lee 2009).

Eight studies conducted long-term follow up of balance (Au-Yeung 2002; Clark 1975; Kerse 2008; Rosendahl 2006; Schoenfelder 2000; Schoenfelder 2004; Sihvonen 2004; Urbscheit 2001). Re-

sults at follow-up were typically similar to those at the end of the intervention, with significant differences for some measures of balance found by Schoenfelder 2004 and Sihvonen 2004, and no evidence of effect in five studies (Au-Yeung 2002; Clark 1975; Kerse 2008; Schoenfelder 2000; Urbscheit 2001). Only Rosendahl 2006 found a different result at follow-up: While differences in balance were not significant at the end of the intervention, there was significant improvement in their experimental group's balance at follow-up. This was in an unadjusted analysis of a cluster study.

Mood

Fifteen studies assessed mood (Brill 1998; Brittle 2009; Brown 2004; Buettner 1997; Chin A Paw 2004; Dorner 2007; Kerse 2008; MacRitchie 2001; McMurdo 1993; Meuleman 2000; Mihalko 1996; Morris 1999; Mulrow 1994; Rolland 2007; Sung 2009). Five studies reported significant differences in mood at the end of the intervention, favouring the experimental group ($P < 0.05$), for depression (Brill 1998; Buettner 1997; McMurdo 1993), anxiety (Brill 1998), self-esteem (Sung 2009), and loneliness (Brown 2004), although two of these studies limited these conclusions to within-group comparisons (Brill 1998; Brown 2004), while two studies were cluster trials that did not adjust their analysis for the design (McMurdo 1993; Sung 2009). By contrast, Kerse 2008 found participants became significantly more depressed during the course of the intervention, while the control group did not: this increase was concentrated among cognitively-impaired participants. Ten studies found no significant difference in depression (Brittle 2009; Chin A Paw 2004; Dorner 2007; MacRitchie 2001; Meuleman 2000; Morris 1999; Mulrow 1994; Rolland 2007; Sung 2009) or positive and negative affect (Mihalko 1996).

Three studies conducted long-term follow up of mood (Brittle 2009; Kerse 2008; Meuleman 2000). Results were the same as at the end of the intervention, with no significant improvement in mood, while Kerse 2008 found intervention participants became significantly more depressed.

Cognitive status

Eleven studies assessed cognitive performance (Baum 2003; Buettner 1997; Christofoletti 2008; Dorner 2007; McMurdo 1993; McMurdo 1994; Mulrow 1994; Pomeroy 1993; Schoenfelder 2000; Schoenfelder 2004; Stevens 2006), nine of which used the Mini-Mental State Examination (MMSE). Three studies, at the end of the intervention, identified significant differences in cognitive performance (at $P < 0.05$) (Buettner 1997; Christofoletti 2008; Stevens 2006), although these results should be interpreted with caution. In Buettner 1997, the control group's cognition declined consistently, in contrast to the experimental group, but there was significant baseline imbalance, and at no point did the experimental group score higher than the control, suggesting regression to the mean. In Christofoletti 2008, the significant difference was only for two of the eight subscales of the Brief Cognitive Screening Battery, not its overall measure or for the MMSE, and it was described by the authors as probably fortuitous. In Stevens 2006, a comparison of their experimental group with their social-visit control group was significant, but comparison of the experimental group with the no-intervention control group was not. Within-group comparisons revealed statistically significant changes in the social-visit group only (significant decline). Five studies found no significant difference in cognition at the end of the intervention (Dorner 2007; McMurdo 1993; McMurdo 1994; Mulrow 1994; Schoenfelder 2004). Schoenfelder 2000 did not report results. Baum 2003 assessed cognition, but only tested significance in combination with three other outcomes to avoid multiple hypothesis testing. They reported an effect size of 0.54 (3.1 points better on the MMSE; 90% CI 0.15 to 0.92). Pomeroy 1993 did not analyse possible effect on cognition.

Two studies conducted long-term follow up of cognitive status (Schoenfelder 2000; Schoenfelder 2004), although only Schoenfelder 2004 reported results, finding no significant difference, as at the end of the intervention.

Exercise tolerance

Three studies examined the effect of interventions on exercise tolerance (Naso 1990; Sauvage 1992; Schnelle 1996); four other studies examined the effect of interventions on the quantity of exercise conducted (see the section below, 'Approaches to increase intervention compliance or quantity') (DeKuiper 1993; Lang 1992; Riccio 1990; Yoder 1989). The intervention condition had significantly greater exercise tolerance than the control group in one study (Schnelle 1996). In two studies, there was no significant difference between groups (Naso 1990; Sauvage 1992). None of the studies examined long-term effects.

Perceived health status

Six studies examined perceived health status (Bruyere 2005; Chin A Paw 2004; Kerse 2008; Lee 2009; Mulrow 1994; Peri 2008). The rehabilitation group had significantly greater perceived health ($P < 0.05$) than the control group at the end of the intervention in three studies (Bruyere 2005; Lee 2009; Peri 2008). However, in Bruyere 2005, there was significant difference for eight subscales of the Short Form-36 (SF-36), but not health change; while in Peri 2008, it was limited to the physical, but not mental, component; and in Lee 2009, it was only after adjustment for resident satisfaction, in a cluster trial that did not adjust the analysis to account for the design. Two studies showed no significant difference between groups (Kerse 2008; Mulrow 1994). In Chin A Paw 2004, there was a significant decline in perceived health among the intervention group, although this was not significant among regular attenders to the exercise sessions. Kerse 2008 and Peri 2008

examined long-term effects following the withdrawal of external nursing support; neither found a significant difference.

Fear of falling

Six studies measured fear of falling (Brill 1998; Choi 2005; Donat 2007; Kerse 2008; Schoenfelder 2000; Schoenfelder 2004). In Choi 2005, there was a significant difference between the groups in favour of the experimental group at the end of the intervention, but this was a cluster trial that did not adjust the analysis to account for the design. Three studies reported no significant difference (Donat 2007; Schoenfelder 2000; Schoenfelder 2004). Two studies did not report a statistical comparison (Brill 1998; Kerse 2008), which was explained by Kerse 2008 as being due to significant missing data because participants found it difficult to assign a number to their fear of falling. Three studies conducted long-term follow up (Kerse 2008; Schoenfelder 2000; Schoenfelder 2004), but as at the end of the intervention, it was not significant for two (Schoenfelder 2000; Schoenfelder 2004) and not analysed in Kerse 2008, as described above.

Economics

No study performed a full cost-benefit analysis, but three studies assessed costs (Mulrow 1994; Przybylski 1996; Schnelle 2002). Mulrow 1994 compared average costs of their one-to-one physical therapy intervention (USD 1220, 95% CI USD 412 to USD 1832) and their control, friendly visits, (USD 189, 95% CI USD 80 to USD 298) over four months. They also found that other healthcare charges did not differ significantly between the groups (average USD 11,398), the majority of which (81%) were nursing-home charges. Przybylski 1996 calculated the cost of providing their enhanced level physiotherapy and occupational therapy service as well as direct-care nursing costs from case-mix measures and found that reductions in nursing costs outweighed the cost of their service by USD 283 per bed per year. However, they did not test significance or perform sensitivity analyses. Schnelle 2002 compared the costs of evaluating and treating acute events between groups and found no significant difference as a result of their intervention. They also calculated that there would be insufficient staff resources to implement their FIT intervention at a ratio of 10 residents to one nursing aide.

Intervention compliance and feasibility

Many studies failed to report either intervention or control session attendance. Twenty-four studies reported experimental intervention session attendance, with a mean of 83% and only Cheung 2008 reporting 100%. Twelve studies reported control session attendance, with a mean of 82%; only Fiatarone 1994 reported 100% attendance. Varying attendance levels may enhance the apparent treatment effect in favour of the experimental intervention. Session attendance was irrelevant where interventions were not provided in discreet sessions, for example, the FIT studies, repeated measures designs, or for control groups that used 'usual care'. Resnick 2009 suggested additional measures of treatment fidelity for future studies and at each stage in the process, for example, training of providers and delivery as well as receipt.

Taboonpong 2008 reported that 4 of the 35 participants in the exercise group could not maintain the Tai Chi schedule. Similarly, Chin A Paw 2004 reported that 8 of 173 participants found the intervention "too intensive" and discontinued it. Brittle 2009 reported that cognitive impairment in 9 of 28 participants either rendered them unable to follow the instructions or disruptive. Peri 2008 reported that varying adherence across sites, in a programme implemented by care-home staff, appeared to be related to resource.

Approaches to increase intervention compliance or quantity

Four trials investigated different ways of maximising compliance, the amount of exercise a participant took, or both. Two studies (Riccio 1990; Yoder 1989) found verbally elicited imagery of purposeful activity resulted in more exercise than rote repetitions ($P < 0.05$). Two studies (DeKuiper 1993; Lang 1992) found that participants exercised more when engaged in activity with a real object compared to an imaginary one. This suggests that adding purpose and asking participants to work with an actual object is an effective way of increasing exercise quantity. Similarly, including conversation during walking exercises improved compliance (Tappen 1994; Tappen 2000), preventing the physical decline observed in the conversation-only and walk-only groups. Donat 2007 compared supervised and unsupervised exercise, with four unsupervised and two supervised participants giving up (21 in each group). Karl 1982 argued that perceived irrelevance of the intervention to participants' lives was the main cause of lack of success, and proposed that individualised interventions might have been more effective.

Adverse events

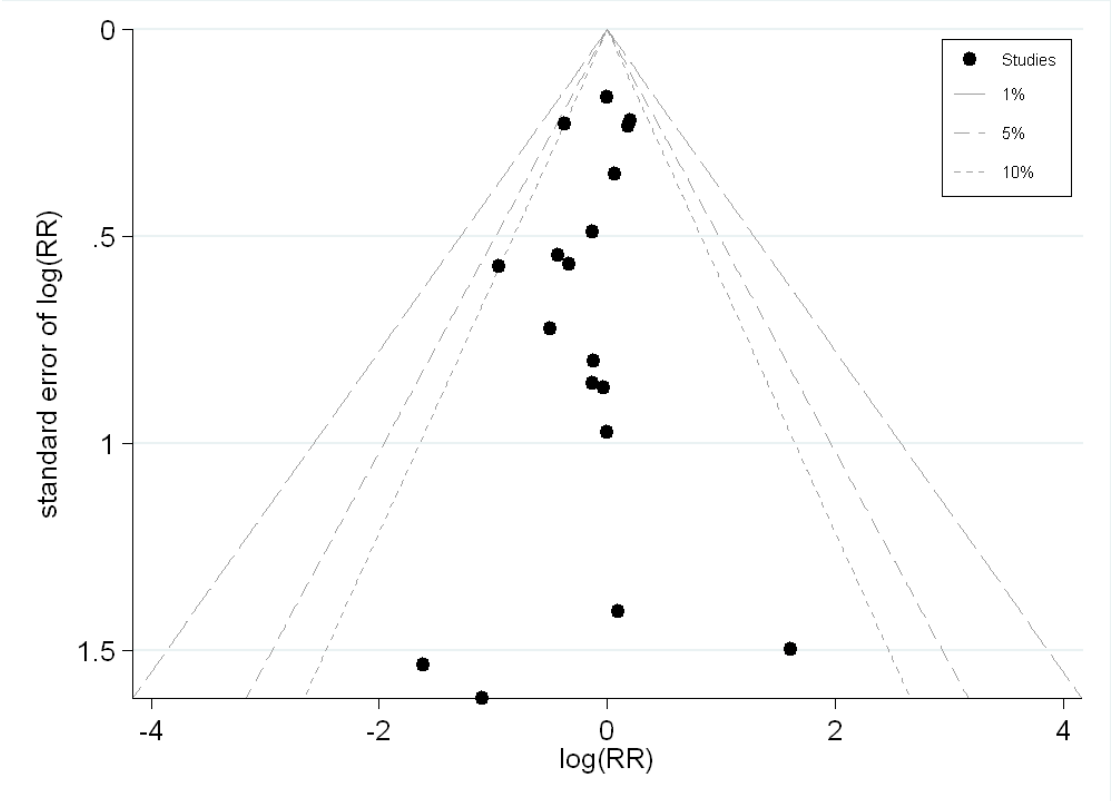
Few studies reported adverse events that were directly attributable to their intervention. Many reported morbidity and mortality for their participants during the trial period. However, morbidity and mortality should be expected among this population because of their age and often poor physical condition, making causality difficult to establish. The studies assessing whole body vibration reported some adverse events. Bautmans 2005 reports one participant developing a phobia of the treatment room. Other adverse events included the following: one case of groin pain (Bautmans 2005) and two cases of lower limb tingling (Bruyere 2005). Among other intervention types, few reported any problems. One of the only other studies to report adverse events was in the study by Rosendahl, et al (191 participants) of high intensity functional exercise and nutritional supplementation (Rosendahl 2006). They

reported that adverse events occurred in 9% of 1906 sessions. Of these, they classified only two as major: one case of chest pain and another of loss of balance, neither of which led to manifest injury or disease. Mulrow 1994 found the intervention group suffered more, and more serious, falls, although this was not statistically significant. Rolland 2007 reported five falls occurring during the exercise sessions, one causing a head injury, although there was no significant difference in the number of falls between the groups over the 12-month programme. Six other studies found no significant difference in the number of falls between groups (Cheung 2008; Choi 2005; Faber 2006; Kerse 2008; MacRitchie 2001; Peri 2008).

Morbidity and mortality

Twenty-nine studies reported mortality within each group at the end of the intervention period, or we inferred it from reports of attrition. Fourteen of these studies were cluster trials, and we did not identify a suitable ICC by which to adjust the results; therefore, we presented unadjusted counts and events. Brittle 2009 reported mortality per group, but we did not include this in the meta-analysis because reports were at three and six months post-baseline, rather than at the end of the five-week intervention period. The meta-analysis for the 25 rehabilitation studies versus the control studies showed no evidence of an effect from a physical rehabilitation intervention (Analysis 1.6) (P = 0.5), with the risk ratio slightly favouring the rehabilitation group (0.95, 95% CI 0.8 to 1.1). There was almost no excess between-study heterogeneity (I^2 = 0%, Q = 11 on 17df, P = 0.9). There is little evidence of asymmetry in the funnel plot (Figure 6). Prespecified sensitivity analyses also yielded no evidence of an effect with alternative methods (odds ratio (OR), Analysis 1.52; risk difference, Analysis 1.53; fixed-effect, Analysis 1.54; and Peto odds ratio, Analysis 1.55). Excluding cluster trials resulted in a similar risk ratio, but with wider confidence intervals (0.93, 95% CI 0.60 to 1.44, P = 0.8) (Analysis 1.56). Results of a post-hoc sensitivity analysis including Brittle 2009 were very similar to the primary analysis (Analysis 1.57) (P = 0.5). None of the prespecified subgroup analyses suggested differential mortality between studies based on risk of bias (Analysis 1.38) (P = 0.4), duration of intervention (Analysis 1.39) (P = 0.5), mode of delivery (Analysis 1.40) (P = 0.6), age (Analysis 1.41) (P = 0.4), or gender (Analysis 1.42) (P = 0.9). Four studies contributed to the meta-analysis of rehabilitation (experimental) versus rehabilitation (control), but only one death was reported across these studies, leading to no evidence of an effect (Analysis 2.2) (risk ratio = 2.7, 95% CI 0.1 to 61, P = 0.5).

Figure 6. Funnel plot of comparison: 1 Rehabilitation versus control, outcome: 1.6 Death



Several studies reported hospitalisations. Rolland 2007 reported a significantly increased number of hospitalisations per participant within the exercise group (at 12 months, 0.6 (1.3) versus 0.2 (0.6), P = 0.04). Meuleman 2000 found significantly fewer hospitalisations and significantly fewer days admitted to hospital among the intervention group compared to the control group (at 12 months, 0.2 versus 0.7, P = 0.005; and 2.3 versus 7.6, P = 0.005, respectively). Kerse 2008 and Schnelle 2002 found no significant difference.

DISCUSSION

Summary of main results

The present studies provide preliminary evidence that physical rehabilitation interventions may be associated with significant improvements across various measures of physical and mental functioning, without increasing the mortality risk in elderly care-home residents. This is traditionally regarded as a group that is hard to research, but this review has found a substantial body of evidence. Many studies concluded that their intervention was both successful and safe, achieving their study goals. However, these are mostly explanatory trials that require replication in routine care and direct comparison between different interventions. At present, there is no clear indication of the optimum type of intervention.

Activities of daily living

There is some evidence that activities of daily living (ADL) independence and performance in this population are enhanced, or decline less, through physical rehabilitation interventions when compared with usual care. All of the point estimates for measures of ADL for which we performed meta-analyses favour rehabilitation, and two have statistically significant random-effects estimates (Barthel Index (BI), Rivermead Mobility Index (RMI)). The fixed-effect models are significant for all measures except the Functional Independence Measure (FIM), although the heterogeneity expected and observed in many of the analyses suggest we should consider fixed-effect estimates with caution. The RMI estimate, which is significant in both models, is of note for only pooling studies of lower risk of bias. In each of the analyses of independence scales, the point estimates of the effect were approximately 5% of the scale total. For the Timed Up and Go (TUG) test, the point estimate was approximately 15% of the mean baseline time, while for walking speed, the point estimate was approximately 5% of the mean baseline speed. While these are not large effects, they at least imply a stabilisation of function. It should be remembered that these are estimates of the average intervention effect, which may vary widely with some interventions resulting in smaller or larger effects. Of interest is the large difference between TUG test estimate and walking speed estimate, which could conceivably suggest a greater effect of rehabilitation on standing up, sitting down, or turning around than walking speed. Alternatively, it may relate to differences in the participants, interventions, or other study features.

The subgroup analyses did not provide clear evidence across measures of sources of heterogeneity in effects, although the small number of studies in each subgroup hampered this. For all but one of the measures, there were greater estimates of effect in studies with participants with better baseline function, but this was only significant in one analysis (FIM). There was some evidence that shorter interventions had larger effects than longer interventions based on the BI and TUG test, but not other outcome measures. We did not perform subgroup analyses of interventions, which varied widely. It is plausible that some of the heterogeneity observed is related to differences in effect between interventions.

Secondary outcomes

Many of the studies measuring strength, flexibility, and balance found significant differences favouring the intervention. There was little evidence about the effect on exercise tolerance and perceived health status. There was some evidence of effect on mood and little evidence of effect on cognition and fear of falling. However, it should be noted that we excluded interventions primarily targeting improvements in cognitive, psychological, or psychosocial outcomes and multi-faceted falls interventions from this review. Therefore, it is possible that physical interventions other than those in the included studies would show greater evidence of effect on these outcomes or outcomes such as quality of life. There was very limited economic evidence and no cost-benefit analyses among the trials. Evidence from several trials suggests that ensuring an intervention is perceived as relevant and important by participants may be crucial to its success.

Adverse outcomes

The meta-analysis of mortality provides good evidence that rehabilitation does not increase mortality risk. Subgroup analyses also suggested there were not different effects among different types of participant (age or gender). There was relatively little evidence about other adverse outcomes. Most trials included very frail elderly individuals, among whom relatively high rates of morbidity

and mortality would be expected, and high morbidity was often reported at baseline.

Overall completeness and applicability of evidence

Dominance of North American research

Of the 67 included studies, 36 took place in North America. This may be problematic if there are large differences in the nature of long-term care in North America or in the characteristics, such as age and physical condition, of the people who receive the intervention, when compared with Europe or the rest of the world. As a consequence, the present findings may be difficult to apply to long-term care settings elsewhere. However, the increase in nationalities represented in this update is welcome. We have described the characteristics of the participants and the interventions. The interventions may be effective in this frail elderly client group regardless of location of care, but this hypothesis remains to be tested.

Participant representativeness

The extent to which participants in the included studies are representative of the wider population residing in long-term care is unclear. This may present more of a problem where sample sizes were small, participant attrition was high, or both. It is notable that where studies did report the number of eligible individuals within the facility, on average they excluded more than half of its residents and less than one quarter of residents ultimately participated. This might suggest that the participant sample is not representative of the wider long-term care population. However, some studies included participants with multiple comorbidities and severe physical and cognitive disabilities.

Participant variation

There is substantial variation in the physical condition and mental health of people aged over 65 years in long-term care. It is improbable that the same intervention will be appropriate for all people. However, the subgroup analyses failed to identify clear differences in effect between different studies based on participant characteristics.

Economics

A convincing economic case for rehabilitation has yet to be made. Conceptually, it seems reasonable: improving physical condition should reduce ill health, reducing the burden of the individual on health care, the need for hospital treatment, and intensive personal care. Evidence for this would have to demonstrate that the absolute cost of the intervention is less than the amount the individual would cost if they remained in the same condition or deteriorated. A further effect to consider in an economic analysis is the additional cost of increased length of stay in long-term care that may result from a rehabilitative intervention increasing life expectancy. Consideration would also have to be given to the variety of funding models. Because of the variation between individuals in resource use, we will require large trials to evaluate economic arguments. Widespread provision of interventions, however effective they are in practical terms, are only likely to occur once a viable financial case has been demonstrated. However, benefits may go beyond reductions in healthcare costs to improvements in quality of life; these should be quantified and accounted for in future economic analysis.

Research conducted among the long-term care population may also be informative and applicable to similarly frail elderly people residing in the community. While none of the present trials investigated this adequately, it is reasonable to include it in future research.

Quality of the evidence

Overall, we included 67 studies, featuring 6300 participants, in this review. Within the analyses of specific outcomes, these numbers were reduced as each study only contributed data to some comparisons. Between three and nine studies contributed to each meta-analysis of ADL outcome measures. The direction of the effect estimates in these meta-analyses was consistently in favour of rehabilitation, though not always statistically significant. Twenty-five studies contributed to the meta-analysis of mortality where rehabilitation was compared with control.

Risk of bias

It is possible that biases have resulted in overestimation of the effects. Most of the included studies had unclear or high risk of bias across most categories. Blinding of participants and personnel was particularly problematic, a common limitation of trials of rehabilitative interventions. The risk of selective reporting was also often unclear, in part due to the range of different outcomes measured. A large number of studies also had substantially incomplete outcome data, often due to high and differential rates of attrition. However, there was evidence of an effect on the RMI among studies with the lowest risk of bias in this review. Yet, for the three measures where lower and higher risk of bias studies could be compared (BI, TUG test, and walking speed), lower estimates of effect were found in studies with lower risk of bias. However, this was only significant for one analysis (walking speed), and each comparison included only one or two lower risk studies. Based on funnel plots and Egger's test, there was little evidence of small studies effects.

Trial diversity

It was disappointing that the huge variety of outcome measures used precluded a comprehensive meta-analysis. While creative variation in interventions is desirable for promoting innovation, the extent of the diversity among these trials, in both interventions and in the extensive number of outcome measures used, is highly problematic. A particular obstacle was the small number of trials replicating previous work. Where replications occurred, most often the same research group within the same location undertook them.

Intervention fidelity

High levels of participant attrition and poor compliance with the intervention's demands were a fairly frequent problem among these trials. This is understandable; many participants would have been unused to activity and physically frail, making them vulnerable to illness and limiting their life expectancy. Many researchers reported reluctance to comply with intervention demands and felt this apathy adversely affected the trial. While it is impossible to prevent attrition through illness and death, it should be possible to improve motivation and compliance with interventions; enjoyment of, and satisfaction with, the intervention among participants should be a priority, especially if long-term and widespread provision is ultimately intended. Ways of achieving this might include ensuring that participants perceive the intervention to be both relevant and beneficial to their lives. Many trials included social elements in both the intervention and the control group; the relationship between use of such methods and compliance requires further exploration. Incorporating the therapy into daily activities as opposed to discreet sessions also warrants closer attention.

Long-term follow up

The lack of postintervention follow up is problematic. Among the trials that did follow participants after the intervention (for a maximum of one year, most often three months), there was frequently no finding of intervention benefits. However, this was also often the case in these studies at the end of the intervention. It is hard to justify provision of any short-term rehabilitation intervention if any benefits the individual gains dissipate as soon as it ends. However, if benefits are sustained while the intervention remains in place, the economic and practical viability of long-term or indefinite provision need to be assessed. Moreover, some studies addressed interventions that were designed to become self-sustaining, delivered by care-home staff after an initial training and support period. Future research should follow participants for a reasonable period postintervention to clarify the durability of improvements and whether some participants require some type of long-term maintenance. If this is the case, interventions should be designed with long-term provision as a clear consideration and sustainability of the programmes evaluated.

Cluster trials

While 19 of the studies used cluster randomisation, only six of the studies adjusted for this in their analysis. Where we have been unable to adjust these estimates (walking speed and mortality outcomes), the cluster studies are likely to have overly narrow confidence intervals and receive excess weight in the meta-analyses. Excluding cluster trials from the meta-analyses typically resulted in an increase in effect size, although for walking speed the estimated difference decreased. The use of cluster randomisation for this type of intervention and setting will often be appropriate, as the approach can help researchers to guard against contamination and identification of the experimental intervention by staff and residents. It is also possible that some interventions may have an effect at the group level, perhaps acting through culture or opportunities to socialise, although there was no evidence of this in the sensitivity analyses conducted.

Potential biases in the review process

We identified a considerable amount of literature for this systematic review, providing confidence in our search strategy and indicating the wealth of innovative research. The 67 included studies included 6300 participants. We have not included possible evidence from two studies in this review because they are awaiting translation (de Greef 2006; Sung 2007). A further 29 studies are awaiting assessment, and the additional information contained could have an important impact on the conclusions of the review. Identification of this volume of literature created its own problems. The included studies present an almost overwhelming number of different interventions, ranging from traditional exercise programmes to those requiring access to machinery, and the huge variety of outcome measures used hampered our ability to synthesise the evidence and compare the effectiveness of different interventions in different types of participant and in different circumstances. Two authors extracted all data, and this was combined automatically for numerical data where there was consensus and manually for qualitative data and conflicting results, giving confidence in its quality. We performed a variety of sensitivity analyses to evaluate the robustness of the outcomes of meta-analyses. A relatively low number of studies contributed to our analysis of ADL outcomes because many studies reported a measure that could not be quantitatively combined with others. However, we do not believe this has biased results. We included five of the seven lower risk of bias studies. The 24 studies represented almost half of the participants from the 67 included studies (3139/6300). The new analyses provided an estimate of the effect size, reducing our optimism about the effectiveness of physical rehabilitation in this population expressed in the original version of this review.

Agreements and disagreements with other studies or reviews

Two other systematic reviews (Rydwik 2004a; Weening-Dijksterhuis 2011) evaluated the effects of physical rehabilitation on elderly residents in long-term care. Both suggest there is moderate to good evidence of effects on strength, mobility, and flexibility. Weening-Dijksterhuis 2011 also concluded there were significant positive effects on balance and ADL, while Rydwik 2004a found contradictory evidence for these outcomes. The current review, including more studies overall and excluding multi-faceted falls interventions, finds significant positive effects on all of these outcomes, although the effect size appears small. The current review also synthesises data on adverse outcomes and reports the results of meta-analyses, which were not included in those reviews.

AUTHORS' CONCLUSIONS

Implications for practice

The included studies provide evidence that physical rehabilitation interventions for elderly people residing in long-term care may be both safe and effective, improving physical and possibly mental state. However, the size and duration of the effects of physical rehabilitation interventions are unclear. Although physical rehabilitation may be beneficial for care-home residents, the specific type(s) with most benefit, and how these relate to resident characteristics, is unclear.

Implications for research

Current research suggests rehabilitation improves short-term function in ADL and is safe among elderly residents of long-term care, but the evidence for this is limited by plausible risk of bias, inconsistency, and incompleteness in the outcomes reported. Further research is needed to establish the sustainability of any improvements, to demonstrate the effect of interventions on quality of life and caregiver satisfaction, to optimise interventions, to establish how individual differences (for example, age, gender, frailty, mental state) may affect treatment outcomes, and whether different interventions should be applied to disability-based subgroups. The provision of rehabilitation services to this client group requires robust health economic evaluation. Of the ongoing studies and those awaiting assessment, a variety of measures of well-being, life satisfaction, and perceived health status are in use and one is conducting a cost-effectiveness evaluation (Gerritsen 2011). We described the characteristics of the participants and the interventions. The interventions may be applicable to this frail elderly client group regardless of location of care, but this hypothesis requires testing in future research. Future research should utilise mechanisms such as cluster randomisation and placebo interventions as part of an explicit strategy to blind participants and personnel to the experimental intervention. Publication of pre-study protocols for analysis and reporting of all outcome measures is particularly important given the wide variety of outcome measures used in these studies. Outcome measures should be chosen with care, for their relevance, sensitivity, feasibility, validity, and reliability and to allow comparison between studies. Future research should report outcomes per group for mortality, fall incidence, number of participants who fell at least once, hospitalisation incidence, number of participants hospitalised at least once, and incidence of minor injuries.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

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

Alessi 1999

Methods	Design: RCT Duration: 14 weeks Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: none
Participants	Country: USA Setting: community nursing home Randomised: 29 % women = 90 Age: mean = 88.3 ± 5.7 years; range = not reported Consent: assent accepted Inclusion criteria: urinary incontinence Exclusion criteria: cognitive = comatose, severe physical aggression; medical = life expectancy < 3 months, length of stay < 3 months % Eligible within home: 49.6 % Eligible that participate: 45.3 Intervention: N = 15; % women = 92.9; age (mean) = 88.6 years ± 10.4 Control: N = 14; % women = 92.9; age (mean) = 88.3 years ± 5.7
Interventions	Study aim or objective: to test whether an intervention combining increased daytime physical activity with improvement in the night-time environment improves sleep and decreases agitation in nursing-home residents Intervention group: FIT programme, individualised intervention, session duration = n/a, number of sessions per week = maximum of 20 Exercise features: upper limb and lower limb exercises, walking/wheelchair propulsion delivered by research personnel twice hourly up to a maximum of 4 sessions per day, 5 days a week for 14 weeks Nonexercise features: night-time program commenced in 14th week for 5 nights, reduction of noise, reducing sleep-disruptive nursing care practices, night-time incontinence care Control group: usual care for 14 weeks, then 1 week of night-time programme
Outcomes	Physical function in ADL: 10-minute walk/wheel (time), 10-minute walk/wheel (average distance) Agitation: agitation (daytime behavioural observation) Physical activity: in-bed time (% of daytime behavioural observations) Energy expenditure: physical activity (kCal/hr) Sleeping: sleep episodes (maximum duration), sleep episodes (average duration), sleep (night-time) %, sleeping (daytime behavioural observation, % of observations asleep) Environment (physical): night-time noise (> 60 dB in 2-minute period), night-time light

Notes	Funding: not reported	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "Randomization occurred after baseline assessment" No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Quote: "Randomization occurred after baseline assessment" Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Study was performed in a single home with an observable intervention
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	Quote: "...performed by independent evaluators..." Details of blinding or likelihood of it being broken not reported
Incomplete outcome data (attrition bias) All outcomes	High risk	25 participants lost prior to baseline assessment because of time taken for parent study. 4 further participants lost to follow up, but unclear if already randomised and if so from which group
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable. Some baseline assessments could have been outcome measures (e.g. OSAI)
Other bias	Low risk	No other apparent risks of bias

Au-Yeung 2002

Methods	Design: randomised, assessor-blind trial, matched pairs Duration: 18 sessions over 2 months, 3-month follow-up Method of randomisation: drawing lots - matched according to age, sex, ambulatory status, medical history, length in home; each pair randomly allocated to control or intervention by physiotherapist not involved in the exercise programme by drawing lots Concealment of allocation: assessors blinded to allocation of participants Intra and interrater reliability established before study Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: 31 consented; 13 dropped out because of lack of interest, medical problems, or personal reasons
Participants	Country: Hong Kong Setting: 3 private old-age homes Randomised: 31 % women = 78 Age: mean = approximately 80 years; range = not reported Consent: fully-informed consent Inclusion criteria: able to understand and follow verbal instructions, ambulate independently (with or without aids), tolerate standing, and walking for at least 5 minutes Exclusion criteria: medical= acute musculoskeletal pain, neurological signs and symptoms not under medication control, unstable medical conditions, complaint of dizziness and blurred vision leading to difficulty walking, medical conditions contraindicative to physical activity % Eligible within home: not reported % Eligible that participate: not reported Intervention: N = baseline not reported; % women = not reported; age (mean) = 79.1 years ± 8.41 Control: N = baseline not reported; % women = not reported; age (mean) = 81.0 years ± 7.45
Interventions	Study aim or objective: to examine the effects of a short-term mobility programme on the balance and mobility of elderly residents in private old-age homes in Hong Kong Number of experimental groups: 2 Groups: 2 exercise programmes Group intervention delivery Session duration: 45 minutes Number of sessions per week: 3 (18 sessions over 2 months conducted in the home by qualified physiotherapist or 2 students) Intervention: M programme (N = 10) = lower limb strengthening and balance training based on the overloading principle for strengthening and specificity for challenging balance in the upright position Control: C programme (N = 8) = general light exercises performed while sitting without progression Training session adherence: 98% Mobility: 17.2 ± 1.4 Control: 18 ± 1.07 of 18 sessions
Outcomes	Physical function in ADL: TUG test (seconds) (Podsiadlo 1991), 4 metre walk (time seconds) Balance: BBS

Notes	Funding: not reported Pilot study

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Subjects of each matched pair were randomly allocated...by drawing of lots"
Allocation concealment (selection bias)	Unclear risk	Quote: "...by drawing of lots..." Unclear if concealed
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not mentioned. Both participant groups received exercise interventions
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "They were blinded to the allocation of subjects to the exercise programmes"
Incomplete outcome data (attrition bias) All outcomes	High risk	31 participants consented; 13 dropped out (unclear numbers per group). Analysed as treated
Selective reporting (reporting bias)	Unclear risk	The three measures were appropriate. However, may not have been exclusive. Protocol not available
Other bias	Low risk	No other apparent risks of bias

Baum 2003

Methods	Design: randomised controlled semi-cross-over trial Duration: 12 months (control group joined exercise group at 6 months) Method of randomisation: after baseline assessments, randomisation was determined by computer-generated algorithm stratified by place of residence (nursing home or assisted-living) Concealment of allocation: unclear - all participants had been promised they would receive the intervention eventually Outcome assessor blinding: yes - all performance tests carried out by occupational therapists and physiotherapists blinded to allocation Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: 2 participants non-compliant with their assignment - 1 switched to exercise immediately and another assigned to exercise refused to attend -; some analyses included them; 13% missing measurements
Participants	Country: USA Setting: 50-bed long-term care facility comprising 32 nursing-home beds and 18 assisted-living beds Randomised: 21 21 met criteria, and 20 consented (5 from nursing home; 15 from assisted-living) % women = 75 Age: mean = 88 years; range = 75 to 99 years Consent: not specified Inclusion criteria: age > 65, residence at facility > 3 months, ability to ambulate alone (included with assistive devices or carer) Exclusion criteria: cognitive = inability to follow 2-step command; medical = acute unstable illness (e.g. pneumonia),chronic illness (e.g. uncompensated congestive heart failure); functional = assaultive behaviour pattern, unwillingness to discontinue current physical therapy % Eligible within home: 42 % Eligible that participate: 95.2 Intervention: N = 11; % women = 82; age (mean) = 88 years, range = 75 to 96 years Control: N = 9; % women = 67; age (mean) = 88 years, range = 78 to 99 years
Interventions	Study aim or objective: to determine whether a strength and flexibility programme in frail long-term care facility residents would result in improved function Number of experimental groups: 2 Group intervention delivery Session duration: 60 minutes Number of sessions per week: 3 Seated: yes Attendance records kept Intervention: conducted by exercise physiologist in the lounge, exercises done in seated position (frailty), warm-up; upper body strengthening; lower-body strengthening; cool down, soft ankle and wrist weights (2 to 4 lbs), Thera-Bands® (resistance 2.5 to 9 lbs) , weighted hand-sized balls, beach balls for kicking and throwing, weekly evaluations of progress Control: art therapist or social worker; sessions of drawing, painting, puzzles, or cards; encouraged to continue normal activities; discouraged from joining exercise regime during the intervention

Baum 2003 (*Continued*)

Outcomes	Physical function in ADL: Physical Performance Test, TUG test (seconds) (Podsiadlo 1991) Balance: BBS Cognition: MMSE	
Notes	Funding: not reported	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation was determined by a computer-generated algorithm (permuted blocks) stratified by place of residence within the LTC facility"
Allocation concealment (selection bias)	Low risk	Quote: "Assignment to the study group was done by opening sealed envelopes with the random numbers supplied in sequence by the study coordinator"
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants were not blinded
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "All the performance tests were administered by physical and occupational therapists who were blinded to the group assignments. The MMSE was administered by two trained medical students and research nurses also blinded to group membership" FIM not administered after baseline because could not be blinded
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	13% of total repeated measures after baseline missing because of death or acute illness, but not reported which groups. ITT analysis performed
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	High risk	Quote: "Two patients were non-compliant with their assignment; one switched to exercise immediately...results...included these patients as they were assigned...When they were eliminated from analysis, the results were slightly more positive in favour

Baum 2003 (*Continued*)

		of the exercise intervention" Evidence of contamination reported

Bautmans 2005

Methods	Design: RCT Duration: 6-week intervention Follow up: none Method of randomisation: done by lottery at the same time; stratification was applied for gender, ADL dependence, and age Concealment of allocation: yes - participants in the control group thought they were also receiving the vibration treatment Outcome assessor blinding: yes - all functional assessments done by assessors blind to allocation Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: 3 (13%)
Participants	Country: Belgium Setting: nursing home with capacity for 102 beds Randomised: 24 % women = 63 Age (mean) = 77.5 years ± 11.0; range = not given Consent: informed consent Inclusion criteria: dependent in no more than 2 of 6 ADL categories (Katz Scale) Exclusion criteria: cognitive = cognitive dysfunction interfering with test and training procedures; medical = presence of infectious disease, insulin-dependent diabetes mellitus, endogenous osteosynthetic material, knee or hip prosthesis, pacemaker, epilepsy, musculoskeletal disorders % Eligible within home: 33.7 % Eligible that participate: 72.7 Intervention: N = 13; men:women ratio = 5:8; age (mean) = 76.6 years ± 11.8 Control: N = 11; men:women ratio = 4:7; age (mean) = 78.6 years ± 10.4
Interventions	Study aim or objective: to investigate the feasibility of whole body vibration in the institutionalised elderly and its impact on functional capacity and muscle performance Number of experimental groups: 2 Individualised intervention delivery Session duration: not reported Number of sessions per week: 3 Seated: no Both groups attended "two-weekly seated gymnastic sessions together with other residents of the nursing home" organised by independent physical therapists unaware of the participant's group Targeted social interaction Intervention: used Power Plate vibration platform, sessions 3 times a week with at least 1 day of rest between; 6 static exercises targeting lower limb muscles, exercise volume, and intensity gradually increased Control: the same exercise regimen on the same vibration platform but machine switched

	off and sound produced by tape recorder
Outcomes	Physical function in ADL: TUG test (seconds) (Podsiadlo 1991) Physical function (other): Tinetti Mobility Scale (gait and balance) (Tinetti 1986), Tinetti Test (gait) Muscle power (anaerobic): leg extension (60 cm/second) - work, leg extension (40 cm/second) - maximal explosivity, leg extension (40 cm/second) - maximal force, leg extension (40 cm/second) - work, leg extension (60 cm/second) - maximal force, leg extension (60 cm/second) - maximal explosivity, hand grip strength (maximal), leg extension (40 cm/second) - maximal power, leg extension (60 cm/second) - maximal power Balance: Tinetti Test - Body Balance Flexibility: 'Sit-and-reach' test, Back Scratch test (Rikli 1999) Adverse events (other): occurrence of complications Feasibility and acceptability: attendance
Notes	Funding: not reported, were given the loan of the vibration platform by 'Power Plate Belgium'

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation was done for all 24 participants together at the same moment by lottery" Cards representing participants (stratified) assigned to intervention or control by means of lottery. Starting sequence determined by tossing a coin
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants attempted - reproduced sound of vibration platform to convince control group that it was working, but participants may have felt that it was not working
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "Functional performance assessment was done by a physical therapist who was unaware of group assignment of the participants"
Incomplete outcome data (attrition bias) All outcomes	High risk	Three dropouts in whole body vibration group compared with no dropouts in control group - two dropouts likely to be related to whole body vibration program

Bautmans 2005 (*Continued*)

Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Brill 1998

Methods	Design: RCT Duration: 8 weeks Follow up: none Method of randomisation: random numbers table Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: none
Participants	Country: USA Setting: integrated health services of Dallas multi-level assisted-living facility Randomised: 16 % women = 87 Age: 25% older than 90 years, mean = approximately 82 years; range = 69 to 96 Consent: fully-informed consent Inclusion criteria: residential status, > 65 years old, ambulatory (± assistive device) Exclusion criteria: history of heart attack/stroke within previous 6 months, unstable angina, any condition that the physician felt might be worsened by exercise % Eligible within home: not reported % Eligible that participate: not reported Training group 1: N = 8; mean age = 84 years ± 9.6; range = 71 to 96 years; 6 women, 2 men Training group 2: N = 8; mean age = 80 years ± 6.6; range = 69 to 90 years; all women
Interventions	Study aim or objective: to evaluate the effect of a 8-week progressive functional fitness strength programme using dumbbells and ankle weights on strength, functional capability, balance, and selected psychological variables in residents in an assisted-living facility Number of experimental groups: 2 Group intervention delivery Session duration: 30 minutes Number of sessions per week: 3 Seated: unclear Intervention: both groups followed the same exercise routine, only the weights varied (see Notes), the exercise routine comprised 5 upper and 5 lower body strengthening exercises targeting the major muscle groups, using different weights of dumbbells as resistance, cadence exercises wearing ankle weights were also performed, a gerontologist specialising in exercise training for older adults led the exercise sessions, which included all of the participants in 1 large group (see Notes) Training group 1: the dumbbell and ankle weights and number of exercise repetitions were gradually increased over the course of the study (Control) Training group 2: Used 1 lb dumbbells throughout the study, and cadence exercises were performed wearing ankle straps without the addition of weights

Brill 1998 (*Continued*)

Outcomes	Falls: number of falls Fear of falling: fear of falling (single item 4-point scale) (Tinetti 1990) Physical function in ADL: steps required to walk 6 metres, Stair Climb test (1 flight of 7 steps), ADL score (Brill 1998), six-metre walk (time) Physical function (other): sit-to-stand (fastest time to stand up) Muscle power (anaerobic): hand grip strength, upper body strength (chest press), lower body strength (leg extension) Balance: balance (Brill 1998) Mood related: trait anxiety (State-Trait Anxiety Inventory), depression (Beck Depression Inventory) Pain: ADL level of pain (Brill 1998)
Notes	Funding: University of North Texas Research and Professional Development Grant An issue arose when the participants refused to serve as controls; all wanted to participate in the strength-training programme. In addition to this, the facility would only permit use of 1 time period and 1 room. The investigators resolved these issues by combining the 2 treatment groups together. Cross-over was prevented by the exercise leader handing out the appropriate weights to each participant

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Subjects were entered into training group 1 or training group 2 through random assignment by a random number table"
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	The two treatment groups trained together - participants may have noticed that different groups were receiving different weighted dumbbells and wearing different ankle weights
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	No report of blinding of assessors
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Unclear risk	Interviewer not described
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No report of missing data. No reports of attrition and exclusions

Brill 1998 (*Continued*)

Selective reporting (reporting bias)	High risk	Prespecified measures 'balance' and 'number of falls' not reported at 8 weeks
Other bias	Low risk	No other apparent risks of bias

Brittle 2009

Methods	Design: cluster RCT Clustering accounted for Details: exploratory cluster RCT Duration: 5 weeks Follow up: yes
Participants	Characterisation: residents with self-care dependency needs Country: UK Setting: nursing and residential homes Randomised: 56 % women = 71% Age details: mean (SD) for control = 82 (9.98); mean (SD) for exercise = 87 (6.99) Statistically significant difference between groups Inclusion criteria: Nursing and residential homes: +5 beds with residents > 65 years with self-care dependency needs Residents: expected to survive for more than 9 months, had reduced mobility indicated by a Barthel Activities of Daily Living Index score of 17, less than or equal to 16 Exclusion criteria: none stated ADL status details: mean (SD) BI Score for control = 11.0 (4.19); mean (SD) BI Score for exercise = 11.1 (4.20) Cognitive status details: MMSE, n (%): < 21: 39 (70%); 21 to 23: 9 (16%); > 24: 8 (14%) Significant comorbidities: at least 1 confirmed stroke, n (%): 13 (23%) Assessed: not reported Excluded: not reported
Interventions	Study aim or objective: to investigate the feasibility, acceptability, and potential efficacy of group exercise for residents in care homes 2 groups: Intervention: exercise group (N = 28) Format: group, delivered by 2 physiotherapists in lounge area Session length: 40 to 60 minutes, twice weekly Interactive group exercise class including: - warm-up and cool-down period - flexibility: range of movement and stretching - sitting balance: postures that progressively reduce the base of support and dynamic movements, such as reaching and throwing that perturb the body's centre of gravity - Posture: education and practice of good posture during exercises - Co-ordination: reaching targets and dual tasking - Strengthening of the clinically major muscle groups

	- Cardiovascular, e.g. marching on the spot (in sitting or standing) Feedback to participants: group cohesion, peer reinforcement, social support Control: control group (N = 28) Usual care (no provision of regular physiotherapy or exercise training)
Outcomes	Physical function in ADL: RMI (Collen 1991) Mood related: depression subscore, (HADS-D) (Zigmond 1983)
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Randomization was performed.. .using computer-generated random numbers"
Allocation concealment (selection bias)	Low risk	Quote: "Randomization was performed by an independent principal statistician from Birmingham Clinical Trials Unit"
Blinding of participants and personnel (performance bias) All outcomes	High risk	Personnel designed and delivered the intervention to exercise, but control received usual care, so personnel knew. No report of blinding of participants - although, intervention and control groups were in separate homes, so may not have been aware of which group they were in
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	Quote: "Assessments were conducted...by one of two research staff... masked to group allocation"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Same number of losses to follow up in each group
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Brown 2004

Methods	Design: Cluster RCT Duration: 9 weeks; 2-week baseline, 5-week intervention for experimental group 1 followed by 2-week intervention for experimental group 2 Follow up: none Method of randomisation: coin toss Concealment of allocation: unclear Outcome assessor blinding: unclear - pre-test and post-test data collected by the same person for consistency Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: none reported for phase 1; of group B, 21 did not enter the second phase
Participants	Country: USA Setting: 2 rural public nursing homes; home A had 98 beds; home B had 100 Randomised: 66 % women = 82 Age: mean = approximately 82 years; range = 60 to 96 years Consent: assent accepted Inclusion criteria: their current health status did not preclude participation, aged = 60, could speak and understand English, cognitively comprehend and answer questions, communicate verbally or in writing, were willing to participate in indoor gardening activities for 6 weeks Exclusion criteria: see inclusion criteria % Eligible within home: not reported % Eligible that participate: not reported Experimental group 1: N = 33, men = 6 Experimental group 2: N = 33, men = 6 Experimental group 3: N = 12, men = 6
Interventions	Study aim or objective: the effects of indoor gardening on socialisation, activities of daily living, and perceptions of loneliness Number of experimental groups: 3 Group intervention delivery Session duration: 20 minutes Number of sessions per week: 2 Seated: yes Phase 1: residents in home A comprised experimental group 1 and participated in an indoor gardening project once a week for 5 weeks; home B, the control group, received 20-minute visits over the same 5-week period Phase 2: residents of home B became experimental group 2 and participated in indoor gardening twice a week for 2 weeks Intervention: decorating flowerpots and planting bulbs of their choice, choosing and transplanting colourful flowering plants, discussing proper care of plants, viewing video on gardening, arranging plants in a hanging basket, arranging fresh cut flowers and greenery Control: 20-minute visits during the 5-week intervention period to control for social interaction and changes due to the presence of experimenters; control group then invited to participate in the gardening (phase 2)

Brown 2004 (*Continued*)

Outcomes	Physical function in ADL: MDS: transfer item (Brown 2004), MDS: eating item (Brown 2004), MDS: locomotion item (Brown 2004), MDS: grooming item (Brown 2004), MDS: dressing item (Brown 2004), MDS: bathing item (Brown 2004), MDS: Physical Functioning scale (6 items, Brown 2004) Mood related: UCLA Loneliness Scale (version 3) Social support: Revised Social Provisions Scale
Notes	Funding: not reported

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "A coin toss was used to determine the assignment of each nursing home"
Allocation concealment (selection bias)	High risk	Coin toss - allocation could have been foreseen by researchers
Blinding of participants and personnel (performance bias) All outcomes	High risk	Unblinded participants and personnel
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Unclear risk	Outcome assessor unreported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No report of loss to follow up or otherwise
Selective reporting (reporting bias)	High risk	Only some sub-scales reported for some comparisons
Other bias	Low risk	No other apparent risks of bias

Bruunsgaard 2004

Methods	Design: RCT Duration: 12 weeks Follow up: none Method of randomisation: not specified Concealment of allocation: not specified Outcome assessor blinding: not specified Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: 18 (46%)

Bruunsgaard 2004 (*Continued*)

Participants	Country: Denmark Setting: nursing homes Randomised: 39 % women = 99 Age: mean = approximately 89 years; range = 85 to 95 years Consent: not specified Inclusion criteria: see exclusion criteria Exclusion criteria: cognitive = moderate/severe cognitive impairment; medical = acute illness, hypertension, severe cardiovascular disease, severe impairment of motor function, neurological disorder % Eligible within home: not reported % Eligible that participate: 53.8 Intervention: N = 10; men:women ratio = 1:9; age = 88.6 years (86 to 95 years) Control: N = 11; men:women ratio = 1:10; age = 90.6 years (86 to 95 years)
Interventions	Study aim or objective: to test the hypothesis that physical exercise induces an anti-inflammatory response that is associated with reduced chronic activation of the tumour necrosis factor (TNF)-alpha system in frail elders and that the increase in muscle strength after resistance training is limited by systemic low-grade inflammation Number of experimental groups: 2 Unclear whether intervention delivery was group or individual Session duration: 45 minutes Number of sessions per week: 3 Seated: yes Exercise features: training protocol from Harridge 1999. 3 exercise sessions a week for 12 weeks, low repetitions with high weight resistance, seated upright in training chair. 3 sets of 8 knee extensions Non-exercise features: subgroup of participants gave blood samples for examining inflammatory marker Control: occupational therapist supervised social activities twice a week for 12 weeks; no physical training
Outcomes	Muscle power (anaerobic): knee flexor muscle strength, knee extensor muscle strength Physiology: plasma levels of cytokines
Notes	Funding: Danish Medical Research Council NOVO Foundation

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "Participants were randomly assigned..." No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided

Bruunsgaard 2004 (*Continued*)

Blinding of participants and personnel (performance bias) All outcomes	High risk	No report of blinding of participants, but social control intervention with physical outcome measures, so intervention would have been obvious
Incomplete outcome data (attrition bias) All outcomes	High risk	Excluded results of the two men from the analysis
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Bruyere 2005

Methods	Design: RCT Duration: 6 weeks Follow up: none Method of randomisation: not specified Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: no, significant group differences, P < 0.05 Treatment group significantly older than control group (P = 0.03) Treatment group had significantly better TUG scores at baseline (P = 0.04) Losses to follow up: 6 (14%)
Participants	Country: Belgium Setting: nursing home in Liège, Belgium Randomised: 42 % women = 73 Age: mean = 81.9 ± 6.9 years; range= 63 to 98 years Consent: not specified Inclusion criteria: ambulatory, no major cognitive disorders that would effect their ability to complete questionnaires Exclusion criteria: medical = people with a high risk or thromboembolism, history of hip or knee replacement % Eligible within home: not reported % Eligible that participated: 87.5 Intervention (vibration therapy plus physiotherapy): N = 22; % women = 81; age: mean: 83.6 years ± 4.8 years Control (physiotherapy alone): N = 20; % women = 65; age(mean) = 78.9 years ± 6.9 years
Interventions	Study aim or objective: to investigate the effects of whole body vibration in the elderly Number of experimental groups: 2 Individual intervention delivery Session duration: 10 minutes Number of sessions per week: 3 Seated: no

	Groups: randomised to receive vibration intervention plus a standard physical training regimen or physical training alone Exercise features: Intervention - controlled whole body vibration: at each session stood on vertical vibrating platform for 4 series of 1 minute of vibration alternating with 90 seconds of rest, vibration set at 10 Hz for the first and third series with peak to peak amplitude of 3 mm; for second and fourth series, vibration set at 26 Hz with peak to peak 7 mm, blood pressure and pulse were taken before the first series, immediately after the second and fourth series, and 2 minutes after the fourth series in each session Physical therapy: standard exercise programme, gait and balance exercises, training in transfer skill, strengthening exercises with resistive mobilisation of lower limbs, 3 times weekly for 10 minutes during the 6-week study, provided by only 1 physical therapist
Outcomes	Physical function in ADL: TUG test (seconds) (Podsiadlo 1991) Physical function (other): Tinetti Mobility Scale (gait and balance) (Tinetti 1986), Tinetti Test (gait), SF-36 physical function Balance: Tinetti Test - Body Balance Perceived health status: SF-36 vitality, SF-36 social function, SF-36 Role-physical, SF-36 Role-emotional, SF-36 mental health, SF-36 health change, SF-36 general health Pain: SF-36 pain
Notes	Funding: not reported; no commercial party had any financial interests

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	No evidence of blinding. The potential influence of the additional treatment in the intervention group, and outcome expectations of the intervention provider could have influenced participant response
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	No information provided
Incomplete outcome data (attrition bias) All outcomes	High risk	Lost to follow up from intervention (27%) ; none lost from control. ITT analysis undertaken utilising last available data
Selective reporting (reporting bias)	High risk	Some results were reported as ITT analysis, others as per-protocol (possible selective re-

Bruyere 2005 (*Continued*)

		porting)
Other bias	Low risk	No other apparent risks of bias

Buettner 1997

Methods	Design: RCT Duration: 30 weeks Method of randomisation: name draw Concealment of allocation: unclear Outcome assessor blinding: yes - evaluators blind to participant assignment Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: N = 14 (21%); 12 deaths - 2 became unstable on their medications, does not report which group(s) they were from
Participants	Country: USA Setting: nursing home Randomised: N = 66 % women = 88 Age: mean = 86.2 years; range = 54 to 100 years MMSE score: range = 0 to 19; mean score = 7.5 Consent: assent accepted Inclusion criteria: diagnosis of dementia, family consent, stable on medications, resident in the home for 3 months Exclusion criteria: medical: use of tacrine, a drug used in the treatment of Alzheimer's disease (centrally acting anticholinesterase) % Eligible within home: not reported % Eligible that participate: not reported
Interventions	Study aim or objective: to assess the impact of a highly structured interdisciplinary programme of sensorimotor activities on the function and behaviour of nursing-home residents with dementia Number of experimental groups: 2 Both small groups and personalised interventions Session duration: n/a Number of sessions per week: n/a Seated: unclear Intervention: first 10-week period: Intervention provided by certified therapeutic recreation specialists in collaboration with the unit managers; design based on level of functioning, personal care schedule, and interests; small group activities among people of similar functioning; co-ordinated schedule of care established for the treatment group including all aspects of care and therapeutic programming; staff were encouraged to walk with residents, interact socially, and promote functional independence during activities; intervention participants received therapeutic programming and diversional stimulatory activities throughout the day and evening; every aspect of the day considered programming and outcome-based - all sensory motor activities, no matter how mundane (e.g. hand washing, waking to meals); cooking, herb gardening, group cognitive therapy, fitness sessions, various sensory (water, relaxation activities); second 10-week period: home

	staff took over 50% of the programming; third 10-week period: nursing-home staff took over all aspects of the programming Control: usual care: same schedule of regular nursing-home activities and standard nursing care
Outcomes	Physical function in ADL: timed walk over 50 feet Physical function (other): Timed Manual Performance (TMP) test Muscle power (anaerobic): grip strength (lbs) Mood related: GDS Agitation: Cohen-Mansfield Agitation Inventory Cognition: MMSE Flexibility: 'Sit-and-Reach' test (Modified Wells) Psychosocial and physical functioning: Multidimensional Observation Scale for Elderly Subjects (MOSES)
Notes	Funding: National Alzheimer's Association Evaluators were unit managers; participants came from the same home, and as a result, were probably aware of group allocation during the 30-week period

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "...by name draw without replacement" Comment: N = 33 in each group. Assume drawn names were allocated alternately to each group
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding of participants
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	All evaluators blind to group assignment
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	All evaluators blind to group assignment
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	12 participants died, and 2 were not stable on medications - data from these 14 eliminated from final data analysis
Selective reporting (reporting bias)	High risk	MOSES outcomes not reported

Buettner 1997 (*Continued*)

Other bias	Unclear risk	Risk of contamination: randomisation of individual residents, but intervention involved some staff training, so possibility of confounding

Cheung 2008

Methods	Design: RCT Duration: 12 weeks Follow up: no
Participants	Characterisation: visually-impaired elderly Country: Hong Kong Setting: care and attention homes Randomised: 50 % women = 100% Age details (mean (SD)): experimental group = 83 (4.7) years; control group = 84.4 (6.5) years Inclusion criteria: visually-impaired people (people with no light perception or with visual acuity of 6/120 or worse on the better eye with corrective device), aged 65 years or older. All participants were independently mobile Exclusion criteria: those who suffered from painful conditions that affected their mobility or balance, neurological disorders, musculoskeletal problems, cardiovascular disease, unstable blood pressure associated with posture or mental conditions, which limited them from following the exercise instructions ADL status details: There were no significant differences between the training and control groups in age (P = 0.377) and pre-training scores of the BBS, CST, and TUG Cognitive status details: excluded neurological disorders that limited following instructions Significant comorbidities: not reported Assessed: not reported Excluded: not reported
Interventions	Study aim or objective: to examine the effects of an exercise programme, which focused on improvement of the functional balance of visually-impaired elderly people 2 groups: Intervention: exercise training (experimental) (N = 27) Format: group; delivered by: designed and conducted by 2 physiotherapists Session length: 45 minutes, 3 times weekly Protocol included: (1) warm up - range of motion and stretching exercises for the upper limbs in a sitting position, lower limb warm-up exercise including quadriceps and calf stretching, and ankle circumduction in a standing position (2) lower limbs strengthening exercises - chair stand exercise (sets of 5 repetitions progressing to 10 repetitions), quadriceps strengthening in a sitting position, strengthening of hip extensors and abductors in a standing position, with cuff weights in 3 sets of 10 repetitions with progressive weights (e.g. 10 repetitions with 3 lbs, then 5 lbs, followed by 7 lbs, based on the capacity of the individual participant)

	(3) balance exercises - supervised stool-stepping exercise, tandem standing, and single-leg standing (4) cool down exercises - general stretching and mobility exercise Balance exercise was progressed based on the participant's needs and according to the ability of the participant Control: control (N = 23) General exercise (upper limb and lower limb mobilization exercises using shoulder pulley and floor bike/static bike) per week
Outcomes	Physical function in ADL: TUG (Timed Up and Go) test (seconds) (Podsiadlo 1991) Physical function (other): sit-to-stand (up and down 5 times) Balance: BBS Falls, risk and fear of falling: falls (any episodes for participant)
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided on random sequence generation
Allocation concealment (selection bias)	Low risk	Quote: "Participants were randomly assigned...by drawing from a sealed opaque envelope that contained the number that determined the allocation"
Blinding of participants and personnel (performance bias) All outcomes	High risk	Both control and experimental exercise programmes were designed and conducted by two physiotherapists
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "Assessment of the functional status of the subjects was conducted by a third physiotherapist who was blinded to the grouping of the subjects"
Incomplete outcome data (attrition bias) All outcomes	Low risk	No losses to follow up in either group
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Chin A Paw 2004

Methods	Design: RCT Duration: 6 months Follow up: no
Participants	Characterisation: older adults Country: Netherlands Setting: long-term care facilities, i.e. homes for the aged with services ranging from independent living to skilled nursing Randomised: 224 % women = 80% Age details: mean (SD) = 81.7(5.4); range = 64 to 94 years Inclusion criteria: 1. aged 65 or older 2. living in a nursing home or residential care facility 3. able to walk six metres or more (with or without a walking aid) 4. able to comprehend the study procedures 5. no medical contraindication for study participation 6. no rapidly progressive or terminal illness 7. not moving away from the home within the 6-month intervention period (5 and 6 were evaluated by their general practitioner) Exclusion criteria: ADL status details: number of participants with ADL disability: 27 Number of participants using a walking aid indoors: 23 Cognitive status details: not reported Significant comorbidities: not reported Assessed: not reported Excluded: 17 on eligibility criteria, 5 other
Interventions	Study aim or objective: to examine the effect of different training protocols on quality of life, vitality, and depression of older adults living in long-term care facilities 4 groups: Intervention: combined training (N = 56) Format: group; delivered by: trained physical therapist and assistant Session length: 40 to 60 minutes, twice weekly A complete strength training session (2 x 12 reps of 5 exercises, once weekly) and a complete functional training session (once weekly) Strength: resistance increased until 2 sets of 8 to 12 reps possible. Progressively increased when 2 x 12 reps achieved at 2 sessions. Warm-up of 10 to 20 reps at minimal resistance. The 5 exercises were leg press; latissimus pull down; biceps curl and triceps press on TechnoGym equipment; and heel raises with dumbbells (1 to 5 kg each), or ankle or wrist weights (1 and 2 kg per pair), or some combination of these. For the heel raises, the number of repetitions were increased if the participants could lift the maximum weight (2 × 5 kg dumbbells + 2 × 2 kg ankle weights) Functional: warm-up of walking and movement to music, followed by 30 to 35 minutes of skills training in game-like and co-operative activities, such as throwing and catching a ball while standing up and sitting down on a chair, musical chairs, and team pursuit races

	Control 1 (of 3): functional-skills training (N = 60) Program designed to improve muscle strength, speed, endurance, co-ordination and flexibility to improve functional performance of common daily activities. An emphasis was placed on skills training, meaning that the specific activities required for independence in daily activities were practiced. Classes started with 5 to 10 minutes of warm-up activities: walking (whenever possible), exercise-to-music routines, becoming familiar with the equipment, followed by 30 to 35 minutes of skills training in game-like and co-operative activities, such as throwing and catching a ball while standing up and sitting down on a chair, musical chairs, and team pursuit races. The cool-down period (5 to 10 minutes) consisted of stretching and relaxation activities (e.g. finger and wrist rolls, shoulder rolls, reaching, leg stretches). Exercises adjusted to individual mobility level. The intensity was gradually increased: the number of repetitions increased, exercises were performed more often standing up straight, and the use of wrist and ankle weights (1 and 2 kg per pair) was stimulated Control 2 (of 3): strength training (N = 57) Program designed to improve muscle strength of major muscle groups of both upper and lower body, important for functional performance on common daily activities. 5 exercises: leg press, latissimus pull down, biceps curl and triceps press on TechnoGym equipment, and heel raises with dumbbells (1 to 5 kg each); ankle or wrist weights, or both (1 and 2 kg per pair). In the first 2 weeks, participants were familiarised with the equipment and the technique of the exercises by exercising with minimal resistance. The following weeks, resistance increased until 2 sets of 8 to 12 repetitions were possible. Resistance was to be increased after the participant could complete 2 sets of 12 repetitions for 2 consecutive sessions. As a warm-up, each exercise was first performed 10 to 20 repetitions with minimal resistance. Progression was monitored with exercise logs filled out by the supervising physical therapist and assistant. Sessions closed with stretching exercises Control 3 (of 3): control (educational) (N = 51) An 'educational' program designed to provide attention and social interaction (i.e. group discussions about topics of interest to older people, such as history of the 20th century, music, relaxation, etc)
Outcomes	Physical function in ADL: walking speed over 8 metres, disability in 17 ADLs (Chin A Paw 2006), putting on and off a coat, picking up a pen from the floor while standing Physical function (other): eye-hand co-ordination (block-transfer test for measuring manual dexterity), reaction time, sit-to-stand (up and down 5 times) Muscle power (anaerobic): ankle dorsiflexor strength, elbow extensor strength Mood related: GDS Flexibility: 'Sit-and-Reach' test Physical activity: physical activity (accelerometer data), LASA Physical Activity Questionnaire (Stel 2004) Quality of life: Dementia Quality of Life Instrument (Brod 1999) Perceived health status: Vitality Plus Scale, VPS (Myers 1999) Continence: laxatives (number of participants using), constipation (number of participants with) Anthropometry: body fat (%), BMI
Notes	-

Chin A Paw 2004 (*Continued*)

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "The random allocation sequence was generated by computer"
Allocation concealment (selection bias)	Low risk	Two independent students assigned participants to their group - implies allocation was concealed
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No mention of blinding of participants, but there were four different groups so participants may not have been aware which ones were experimental and which was the control
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "Data were collected at baseline and after 6 months intervention by three trained research assistants who were blinded to group assignment"
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	Quote: "Data were collected at baseline and after 6 months intervention by three trained research assistants who were blinded to group assignment"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Dropout of participants was not significantly different among the four groups" Similar reasons for dropout between groups
Selective reporting (reporting bias)	Unclear risk	Stated that they were going to report body composition measurements - only referred to in text in associated paper (Chin A Paw 2006)
Other bias	Low risk	No other apparent risks of bias

Choi 2005

Methods	Design: Cluster RCT Duration: 12 weeks Follow up: none Method of randomisation: randomly assigned to either the experimental or control group by coin tossing, cluster allocation of the 2 homes Concealment of allocation: no Outcome assessor blinding: not possible because of the non-random participant assignment (homes were allocated) Group comparability at entry: no, significant differences, P < 0.05 Strength of ankle dorsiflexors (control group stronger) Balance (control group had better balance both with eyes open and eyes closed) Mobility (control group more mobile) Losses to follow up: 9 (13.2%)
Participants	Country: South Korea Setting: unclear - based on the number of residents, location, and facilities; 2 facilities with similar characteristics were selected from list provided by Korean Council on social welfare Randomised: 68 % women = 75 Age: mean = 77.86 years; range = 61 to 91 years 61% fall in the previous year Consent: assent accepted Inclusion criteria: ambulatory adults aged over 60 with at least 1 of the following: impaired gait (score of < 10 on gait sub-scale (maximum score of 12) of the Performance Orientated Assessment of Mobility (POAM)), impaired balance (score of < 14 on POAM balance sub-scale (maximum 16), history of falling in the previous year, postural hypotension (drop in systolic blood pressure of 20 mmHg from lying to standing, use of 4 or more prescription medications that may affect balance Exclusion criteria: cognitive = severe dementia (score < 20 on Folstein MMSE); medical = inability to complete 12 weeks of exercise because of physical illness; functional = current involvement in any type of regular exercise % Eligible within home: not reported % Eligible that participate: not reported Intervention: N = 29; % women = 79; age (mean) = 76.96 years ± 7.7 years Control: N = 30; % women = 70; age (mean) = 78.73 years ± 6.9 years
Interventions	Study aim or objective: to determine changes in physical fitness (knee and ankle muscle strength, balance, flexibility, and mobility), fall avoidance efficacy, and fall episodes of institutionalised adults after participating in a 12-week Sun-style Tai Chi exercise programme Number of experimental groups: 2 Group intervention delivery Session duration: 35 minutes Number of sessions per week: 3 Seated: unclear Exercise features: Sun style Tai Chi, 10 minutes warming up, 20 minutes of 12 Tai Chi movements, 5 minutes of cooling down, done to music for soothing effect Control: maintained routine activities; did not participate in any regular exercise classes

Choi 2005 (*Continued*)

Outcomes	Falls: falls (any episodes for participant) Fear of falling: Falls Efficacy Scale (Tinetti 1990) (10 item fear of falling) Physical function in ADL: 6-metre walk (time) Muscle power (anaerobic): ankle plantar/flexor strength, ankle dorsiflexor strength, knee extensor muscle strength, knee flexor muscle strength Balance: balance: time standing on 1 leg (eyes open), balance: time standing on 1 leg (eyes closed) Flexibility: flexibility (touch toes) (Choi 2005)
Notes	Funding: not reported

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Selected two facilities (based on number of residents, location, and facilities) and randomly assigned them to either the experimental or control group by coin tossing
Allocation concealment (selection bias)	High risk	Coin toss - allocation could have been foreseen by researchers
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "Participants were aware of their group assignment"
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	Quote: "Professional team rather than the research team measured physical fitness" No report of blinding of assessors, although hinted at. Because of cluster assignment and non-blinding of participants, all allocations could have been revealed by 1 participant
Incomplete outcome data (attrition bias) All outcomes	Low risk	'As treated' analysis done - measures not reported for all participants initially included, but only two departed from allocation
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Christofoletti 2008

Methods	Design: RCT Duration: 6 months Follow up: no
Participants	Characterisation: institutionalised elderly people with mixed dementia Country: Brazil Setting: residential care Randomised: 54 % women = 69% Age details (mean (SD)): 74.3 (1.4) Inclusion criteria: (a) a primary diagnosis of dementia, based on ICD-1011 Classification of Mental and Behavioral Disorders, and confirmed by the participant's performance on the MMSE and on Katz Activities Daily Living Scale; (b) no other neurological diagnosis or neuropsychiatric conditions associated to cognitive impairment; (c) medically fit in order to participate in therapy; (d) no prescriptions of antidepressant medications with central anticholinergic or sedation actions; (e) no drug-related impairment of cognition or balance; (f) residing in a long-term psychiatric institution Exclusion criteria: included above ADL status details: Katz ADL means (SD), N = 5.0 (0.3), N = 17 4.6 (0.5), N = 17 4.5 (0.5), N = 20 Cognitive status details: MMSE means (SD), N = 18.7 (1.7), N = 17 12.7 (2.1), N = 17 14.6 (1.2), N = 20 Significant comorbidities: not reported Assessed: not reported Excluded: 8 on criteria, 1 other
Interventions	Study aim or objective: to analyse the effects of multidisciplinary or physiotherapeutic rehabilitation interventions on the cognition and balance of institutionalised elderly people with mixed dementia 3 groups: Intervention: Group 1 (physiotherapy + occupational therapy + physical exercise) (N = 17) Format: group; delivered by: physiotherapy, occupational therapy, and physical exercise professionals Session length: 120 minutes, 5 times per week An interdisciplinary programme that consisted of physiotherapy, occupational therapy, and physical exercise Physiotherapy: individualised kinesiotherapeutic exercises that stimulated strength, balance, and cognition using bars, Bobath balls, elastic ribbons, and proprioceptive stimulation plates Occupational therapy: arts and crafts activities (pictures, paintings, drawings, and embroidering) Physical exercise: walking and upper and lower limb exercises

	Control 1 (of 2): Group 2 (physiotherapy) (N = 17) Physiotherapy sessions involving the same kinesiotherapeutic exercises as detailed for group 1 Control 2 (of 2): Group 3 (control) (N = 20) Control without motor intervention
Outcomes	Physical function in ADL: TUG test (steps) (Christofoletti 2008), TUG test (seconds) (Podsiadlo 1991) Balance: BBS Cognition: Brief Cognitive Screening Battery (BCSB: includes Identification/nomination, incidental memory, immediate memory, learning memory, delayed memory, clock drawing test, verbal fluency test, recognition), MMSE
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "A sealed envelope with an identification number was assigned to each subject, each one filled with a slip giving the group. When a patient was registered and given a number, the appropriate envelope was opened"
Allocation concealment (selection bias)	Low risk	Quote: "A sealed envelope with an identification number was assigned to each subject, each one filled with a slip giving the group. When a patient was registered and given a number, the appropriate envelope was opened"
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "As a common bias presented on most rehabilitation trials, it was not possible to 'blind' the subjects regarding the treatments"
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "Assessors were 'masked' with respect to the data collected and to those patients that were included or not in this trial"
Incomplete outcome data (attrition bias) All outcomes	High risk	Because of small initial group sizes (mean = 18), the loss of 5 from each intervention group compared with the loss of 3 from the control group may present potential bias
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable

Christofoletti 2008 (*Continued*)

Other bias	Low risk	No other apparent risks of bias

Clark 1975

Methods	Design: RCT Duration: 12 weeks Follow up: 4 weeks Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: not described Group comparability at entry: unclear Losses to follow up: 2 participants (8.7%) failed to complete the study; both in the social activity group
Participants	Country: USA Setting: 4 long-stay psychiatric wards, of which 3 were secure Randomised: 23 % women = 52 Age: mean = 69 years; range = 50 to 77 years Consent: assent accepted Inclusion criteria: capable of communicating and following simple instructions Exclusion criteria: hypertension, debilitating arthritic impairment, requiring cardiac medication % Eligible within home: not reported % Eligible that participate: not reported Activity group: N = 10; 5 women Social group: N = 6; 4 women Control group: N = 7; 3 women
Interventions	Study aim or objective: hypothesised that 12-week physical activity programme would (1) increase total daily activity level, (2) upgrade participant self care, and (3) increase activity tolerance levels Number of experimental groups: 3 Group intervention delivery Session duration: 60 minutes Number of sessions per week: 5 Seated: no Activity group: stretching and postural exercise, modified weight and circuit training, dancing and walking; led by a therapist trained in physical education instruction and an assistant, for 1 hour, 5 sessions per week for 12 weeks Social group: recreational activities involving no physical exertion, e.g. board games, arts and crafts; led by a recreational therapist and an assistant, for 1 hour, 5 sessions per week for 12 weeks Control group: usual care
Outcomes	Physical function in ADL: self-care personal neatness evaluation (NOSIE-30) Balance: balance (beam stand), balance (one foot stand), balance (toe stand) Endurance (physical other): heart rate

Clark 1975 (*Continued*)

	Physical activity: Total Daily Activity Level Assessment (TDAL)
Notes	Funding: National Institute of Mental Health (NIMH) U.S. Department of Health, Education, and Welfare (DHEW) Hospital improvement grant Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) grant

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "Subjects were assigned randomly to one of three groups" No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	RCT with obvious control
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	No information reported
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Unclear risk	No information reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Quote: "Only two subjects failed to complete the 12-week experimental period, both in the social activity group"
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Cott 2002

Methods	Design: RCT Duration: 16 weeks Follow up: none Method of randomisation: randomly assigned to 1 of 3 groups using a table of random numbers Concealment of allocation: yes Outcome assessor blinding: yes, maintained Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: N = 12 (8.7%), 5 lost from talk-only group and 7 lost from control group Reasons stated: death and surgery; no separate data reported
Participants	Country: Canada Setting: 3 long-term care facilities Randomised: 86 % women = 53 Age: mean = 82 years ± 8 years; range = not reported Consent: assent accepted Inclusion criteria: diagnosis of Alzheimer's disease, MMSE less than 20, MMSE item 8 score of less than 3, ability to walk 5 metres with or without walking aid or supervision Exclusion criteria: medical: cardiac conditions precluding ambulation % Eligible within home: not reported % Eligible that participate: 81.5 Walk and talk group: N = 30; mean age = 83.23 years (SD 8.34); 16 women Talk-only group: N = 30; mean age = 81.68 years (SD 7.36); 15 women Control group: N = 26; mean age = 79.78 years (SD 8.30); 8 women
Interventions	Study aim or objective: to investigate the effects of a walking/talking programme on communication, ambulation, and level of function on people with Alzheimer's disease Number of experimental groups: 3 Group intervention delivery Session duration: 30 minutes Number of sessions per week: 5 Seated: no Exercise features: walking Non-exercise features: talking Walk-and-talk group: to walk and talk as much as possible with rest as necessary (guided conversation), 30-minute sessions, 5 sessions per week for 16 weeks, led by a research assistant Talk-only group: guided conversation only, 30 minutes, 5 sessions per week for 16 weeks, led by a research assistant Control group: usual care
Outcomes	Physical function in ADL: 2-minute walk test (Cooper 1968; Cooper 1970) Communication: Functional Assessment of Communication Skills for Adults (Frattali 2003) Psychosocial and physical functioning: London Psychogeriatric Rating Scale (LPRS) (Hersch 1978)

Cott 2002 (*Continued*)

Notes	Funding: Alzheimer's Society of Canada

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Residents were assigned within each site to one of three groups using a table of random numbers"
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Research assistants were blind to the group membership of the residents when completing the measures, but not to the study design No report of blinding of participants, but usual care so intervention would have been obvious
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Does not specifically report blinded assessment for this measurement. However, it does report 1 measure where they were not used, so assume blinded RAs used for measurement
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	High risk	The nurses caring for the residents completed the LPRS. They were not blind to group membership
Incomplete outcome data (attrition bias) All outcomes	High risk	Losses from each group significantly different P = 0.01 (talk-only = 5, control = 7, and talk-and-walk = 0)
Selective reporting (reporting bias)	High risk	Not all observed ADL measures (i.e. LPRS in this study) were reported
Other bias	Low risk	No other apparent risks of bias

Crilly 1989

Methods	Design: RCT Duration: 12 weeks Follow up: none Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: not described Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: N = 3 (6%)
Participants	Country: Canada Setting: sheltered apartments, rest homes, and nursing homes Randomised: 50 % women = 100 Age: mean = 82.2 years; range = 71 to 91 years Consent: fully-informed consent Inclusion criteria: ability to ambulate independently without walking aid, eyesight sufficiently good to read large new print, hearing sufficiently good to hear instructions in normal speaking voice, ability to understand instructions, and ability to participate in exercise programme Exclusion criteria: see inclusion criteria % Eligible within home: 69 % Eligible that participate: 43 Intervention: N = 25 Control: N = 25
Interventions	Study aim or objective: to test the hypothesis that increase in postural sway is due to nervous system deterioration, and as a consequence, no improvement is possible - irreversible loss of function Number of experimental groups: 2 Group intervention delivery Session duration: 25 minutes Number of sessions per week: 3 Seated: no Exercise features: exercise class delivered by physiotherapists, activities conducted aim to improve breathing, single and double limb balance, co-ordination, flexibility, antigravity strength, trunk and ankle strength, and promote general relaxation Control: usual care
Outcomes	Balance: postural sway (measured on a force platform; lateral and anteroposterior sway measured with eyes open and eyes closed)
Notes	Funding: Canadian Geriatrics Society

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Subjects were randomized into an exercise or control group using the Rand

Crilly 1989 (*Continued*)

		Corporation random tables"
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	No mention of blinding of participants, but usual care in same setting, so intervention would have been obvious
Incomplete outcome data (attrition bias) All outcomes	Low risk	2 participants dropped out of the exercise group - may be related to intervention, but less than 10% of group
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

de Bruin 2007

Methods	Design: RCT Details: participants were matched in pairs of 2 and then randomised because participants were expected to train with a regular partner (participants were allowed to choose their preferred training partner) Duration: 12 weeks Follow up: no
Participants	Characterisation: senior hostel residents Country: Switzerland Setting: senior residents hostel Randomised: 32 % women = 64% Age details: mean (SD) Strength group: 86.5 (4.9) Strength and balance group: 85.39 (5.4) Inclusion criteria: residential status, age over 70 years, signed informed consent statement, ability to walk 6 metres Exclusion criteria: severe cognitive impairment, rapidly progressive or terminal illness, acute illness or unstable chronic illness, myocardial infarction, fracture of a lower extremity within 6 months prior to study beginning, insulin-dependent diabetes mellitus, undergoing resistance training at the time of enrolment, musculoskeletal or cardiovascular abnormalities (revealed by muscle strength test) ADL status details: not reported Cognitive status details: MMSE, mean (SD) Strength group: 26.5 (3.8) Strength and balance group: 27.3 (2.2) Significant comorbidities: not reported Assessed: not reported Excluded: 6 on eligibility criteria, 0 other

Interventions	Study aim or objective: to evaluate the additional effect of functional exercises on balance and lower extremity function among hostel-dwelling elderly people partaking in strength training 2 groups Intervention: strength and balance group (N = 16) Format: group, delivered by: physical therapist and exercise trainer Session length: 45 minutes strength exercises twice a week plus half-hour balance training on same day as second weekly strength training. Twice weekly strength exercises as reported in strength group, plus an additional half-hour of balance training on the same day as the second weekly strength training. Classes started with 5 to 10 minutes of warm-up activities, followed by 20 to 25 minutes of skills training in game activities, such as throwing and catching a ball while standing on a foam surface. All exercise adjusted to individual mobility level. The intensity was gradually increased and previously formulated recommendations were applied with progressive difficulty as tolerated Control: Strength group (N = 16) A regimen of progressive resistance training of the hip and knee extensors, the hip abductors, and the foot plantar flexors. The total training period was divided into 2 phases of 6 weeks each. In phase 1, participants performed progressive resistance. The first set performed with no weight or with 50% of maximal exercise weight and 15 repetitions. In the 2nd set, 100% of the maximal exercise weight was taken with the aim of 8 to 12 repetitions. In the 2nd training phase, participants trained in high-intensity progressive resistance training
Outcomes	Physical function (other): functional test for physical performance (Guralnik 1994), Tinetti Mobility Scale (gait and balance) (Tinetti 1986) Muscle power (anaerobic): isometric knee extensor muscle force (maximal) Balance: dynamic postural stability
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Stated used random number table
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Stated that all exercise sessions were undertaken by a single exercise trainer. As a result he/she would have been aware of group status
Incomplete outcome data (attrition bias) All outcomes	Low risk	Similar numbers lost for similar reasons
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable

de Bruin 2007 (*Continued*)

Other bias	Low risk	No other apparent risks of bias

DeKuiper 1993

Methods	Design: RCT, repeated measures cross-over design Duration: n/a, one-off intervention Follow up: n/a Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: no Group comparability at entry: n/a Losses to follow up: none
Participants	Country: USA Setting: nursing home and retirement home Randomised: 28 % women: not reported Age: mean = 84.86 years ± 6.08 years; range = 76 to 98 years Consent: unspecified Inclusion criteria: score of 25 to 40 points on the Paracheck Geriatric rating scale Exclusion criteria: see inclusion criteria % Eligible within home: not reported % Eligible that participate: not reported Group 1: N = 10 Group 2: N = 8 Group 3: N = 10
Interventions	Study aim or objective: (1) materials-based intervention would elicit more repetitions and greater distance of movement than imagery-based occupation and rote exercise; (2) imagery-based occupation would elicit more repetitions and greater distance of movement during physical activity than rote exercise Number of experimental groups: 3 Single, individual session Session duration: not reported Number of sessions per week: n/a Seated: yes Exercise features: materials-based occupation involved kicking a balloon; imagery-based occupation involved kicking an imaginary balloon; rote exercise involved being asked to kick your foot as in a demonstration; participants were asked to kick with the same foot as many times as possible before becoming tired Group 1: materials-based occupation, followed by imagery-based occupation, followed by rote exercise Group 2: imagery-based occupation, followed by rote exercise, followed by materials-based occupation Group 3: rote exercise, followed by materials-based occupation, followed by imagery-based occupation

DeKuiper 1993 (*Continued*)

Outcomes	Physical function (other): vertical kicking speed, vertical kicking distance Endurance (physical other): kicking repetitions
Notes	Funding: not reported Replication and extension of Lang 1992

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Subjects were randomly assigned to three groups" No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Cross-over design - all participants received all interventions - it is likely that participants would have been able to tell which was the intervention under experiment and which was the control
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing outcome data
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	Cross-over design, but intervention unlikely to produce a carry-over effect

Donat 2007

Methods	Design: RCT Duration: 8 weeks Follow up: no
Participants	Characterisation: ambulatory independent Country: Turkey Setting: nursing home Randomised: 42 % women = 68% Age details: median years (range): UHE group = 79 (21) SGE group = 81 (19) Drop-outs = 79 (20) Inclusion criteria: > 65 years and being non-obese (i.e. BMI B/30), increased risk of

	falling. Exclusion criteria: psychological disease Score of > 52 on the BBS or if they had attended an exercise programme regularly in the 2 months prior to the study, not recently suffered a stroke or recovery from an acute illness, no unstable or uncontrolled medical conditions (e.g. diabetes mellitus, hypertension) , no resting angina, no recurrent heart failure or arrhythmias, no uncontrolled seizure disorder, no progressive neurological disease, no blindness or deafness, and no severe osteoporosis with 2 or more fractures ADL status details: assistive device: cane inside (N = 1); cane outside (N = 3); 2 unilateral crutches, 2 canes outside (N = 4) Cognitive status details: not reported. Significant comorbidities: number of chronic diseases: 0 to 3 (N = 27), 4 to 6 (n = 15) Assessed: 535 Excluded: overall = 493, 272 on criteria, 112 declined, 109 other
Interventions	Study aim or objective: to compare the effectiveness of unsupervised home and supervised group exercise on parameters related to risk of falling among older adults 2 groups Intervention: Supervised group exercise (SGE) group (N = 21) Format: group; delivered by: physiotherapist in exercise class Session length: 45 minutes, 3 times per week Exercise programme based on balance training, strengthening and stretching of the lower limbs, increasing flexibility, posture exercises, and functional activities Sessions consisted of warm-up, posture exercises, balance and lower limb co-ordination exercises, sit-to-stands, walking training, stretching, strengthening, and cool down (details in Table 1) Body weight was used for strengthening of the lower limbs. Balance exercises progressed from being undertaken with eyes open to eyes closed and from undertaken with a support to without a support. For each exercise, the duration and number of repetitions increased as the participants' tolerance increased and as time progressed Control: Unsupervised home exercise (UHE) group (N = 21) Same exercise programme as SGE group The physiotherapist demonstrated the exercises to the participants and then observed them practising the exercises once to ensure they understood how to do them properly. Participants were given a written exercise programme with a weekly chart to help them keep a record of what they had accomplished. On this chart the participants marked the exercises they completed on the various days. Furthermore, they were asked to come to meet the physiotherapist at the end of the second and fourth weeks in order to ensure the exercise programme was being performed properly and to discuss any problems encountered. At these meetings, the participants were also instructed on how to make the appropriate progressions to higher level exercises
Outcomes	Physical function in ADL: TUG test (seconds) (Podsiadlo 1991) Muscle power (anaerobic): leg strength (leg dynamometer) Balance: balance: time standing on 1 leg (eyes open), balance: time standing on 1 leg (eyes closed), balance: tandem stance (up to 30 seconds, eyes open), balance: tandem stance (up to 30 seconds, eyes closed), BBS Flexibility: 'Sit-and-Reach' test

Donat 2007 (*Continued*)

	Falls, risk and fear of falling: fear of falling (VAS) (Wolf 2001a) Proprioception: lower limb matching task (position sense of knee joint)
Notes	-

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "...code number of each subject was written on a card and placed in an envelope, and the envelopes were then put in two groups by a person with no knowledge of the codes" No report of shuffling of envelopes; therefore, unclear risk of bias
Allocation concealment (selection bias)	Low risk	Quote: "...code number of each subject was written on a card and placed in an envelope, and the envelopes were then put into two groups by a person with no knowledge of the codes"
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants were in the same home; 1 group supervised, and 1 unsupervised so knowledge of allocation likely
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "The physiotherapist, who carried out all measurements, both at baseline and after the exercises, was also unaware of the group the subjects were in"
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Slight imbalance in number of participants lost to follow up between groups (more in UHE group than in SGE group), although similar reasons across groups
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Dorner 2007

Methods	Design: RCT Details: to achieve statistically-similar groups, participants of the same sex, similar age, and comparable MMSE scores and degree of muscle strength were sorted in pairs. Then each pair was divided randomly; 1 participant assigned to training group and other to control group Duration: 10 weeks Follow up: no
Participants	Characterisation: frail, long-term care facility residents, aged 75 years or older Country: Austria Setting: geriatric long-term care facility Randomised: 42 % women = 77% Age details: mean (SD) = 86.8 (5.8); range = 77 to 98 Inclusion criteria: > 75 years, physical ability to take part in strength and balance training (assessed as the ability to walk 5 metres or more, with or without the assistance of walking aids) Exclusion criteria: high degree of dementia (MMSE score < 10), severe acute diseases ADL status details: not reported Cognitive status details: MMSE score, mean (SD): 20.9 (5.2) Range: 11 to 28 Significant comorbidities: most participants were multi-morbid people with several diagnosed illnesses: osteoporosis: 52%, dementia: 45%, depression: 42%, history of stroke: 39%, coronary heart disease: 29% Assessed: not reported Excluded: not reported
Interventions	Study aim or objective: to examine the effects of structured strength and balance training in frail, elderly long-term care residents 2 groups Intervention: Training group (N = 21) Format: group; delivered by: sports scientist Session length: 50 minutes 3 times weekly Structured strength and balance training: warm up (10 minutes), strength training (25 minutes), performed with elastic resistance bands and soft weights, 1 set per muscle group, 10 to 15 repetitions Balance training (10 minutes): exercise balls, balance discs and blocks (20 cm high) used Cool down (5 minutes) Control: Control group (N = 21) At baseline, according to their skills and deficits, some participants received rehabilitative physical, occupational, psychotherapy, speech therapy, or both (possible contamination)
Outcomes	Physical function in ADL: BI (0 to 100 scale), FIM Physical function (other): Tinetti Mobility Scale (gait and balance) (Tinetti 1986) Muscle power (anaerobic): muscle function (upper and lower extremity) Mood related: GDS Cognition: MMSE Anthropometry: lean body mass (kg), lean body mass (%), BMI

Notes	-

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Matched pairs "divided randomly" No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	No mention of blinding of participants, but RCT in same home and usual care as alternative
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Unclear risk	Neither the psychologist nor the physiotherapist, who tested muscle function, were informed by the study organisers to which group participants were assigned. Unclear who assessed BI and FIM and if assessors were blinded to allocation
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Same number of losses to follow-up in each group, but unclear if reasons for losses to follow-up were different between groups
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Faber 2006

Methods	Design: cluster RCT Duration: 20 weeks Follow up: 52 weeks Method of randomisation: participating homes allocated to 1 of 2 exercise interventions using sealed envelopes. Participants in those homes were then randomly assigned to exercise programme or control using computer-generated random numbers. Maximum size of exercise group at each home is 12 and control at least 5 Concealment of allocation: yes Outcome assessor blinding: not specified Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: recruited 278 participants; 40 (14.4%) dropped out immediately after randomisation (equally distributed across both groups), 6 excluded from fall analyses because no reliable data, 30 excluded from physical function and disability analyses because they did not come to the post-intervention assessment, 4 perceived their health to be too poor, 4 lost interest, 1 suffered fracture, 5 hospitalised > 2 weeks; 4 died, and 6 were ill
Participants	Country: the Netherlands Setting: 15 homes for the elderly Randomised: 278 % women = 79 Age: mean = 84.9 years; range = 63 to 98 years Consent: fully-informed Inclusion criteria: see exclusion criteria Exclusion criteria: cognitive: impaired cognition to the extent that they could not process information provided during the testing and exercising; medical = GP judged whether there was a medical contraindication to exercising; functional = unable to walk more than 6 metres independently (aids allowed) % Eligible within home: not reported % Eligible that participate: not reported Functional walking: N = 130 (7 residences); 80 allocated intervention, 50 allocated control In balance: N = 148 (8 residences); 94 allocated intervention, 54 allocated control
Interventions	Study aim or objective: to determine the effects of moderate intensity group-exercise programme on falls, functional performance, and disability in older adults, and to investigate the effect of frailty on outcome Number of experimental groups: 4 Group intervention delivery Session duration: 90 minutes Number of sessions per week: 2 Seated: no All participants (including control) required to report levels of physical activity to monitor and control contamination from the intervention Interventions: 2 exercise programmes, both with evidence that they were effective in preventing falls, 1 session per week for 4 weeks followed by bi-weekly sessions for 16 weeks, 90-minute sessions including 30-minute social element intended to increase motivation; all groups had their own instructor and assistant Functional walking: 10 exercises: balance, mobility, and transfer training In balance: (derived from Tai Chi) elements of Tai Chi most beneficial to elderly people

Faber 2006 (*Continued*)

	Control: there was a control group for each exercise type; details not reported
Outcomes	Risk of falling: time to first fall Falls: falls (any episodes for participant), fall rate (falls per person years), number of falls Physical function in ADL: GARS (Groningen Activity Restriction Scale) Physical function (other): Physical Performance Score (PPS) (Faber 2006), Performance Orientated Mobility Assessment (POMA)
Notes	Funding: not reported; no commercial party had any financial interests

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "The participating homes were randomly assigned to one of the two exercise intervention programs, using sealed envelopes. Participants in each of the homes were then randomly distributed across an intervention and a control group, using computer-generated random numbers. The maximum size of the exercise group in each home was set at 12, with the provision that the control group should contain at least 5 participants" Unclear whether size of participant groups was constrained using a truly random process
Allocation concealment (selection bias)	Unclear risk	Quote: "The participating homes were randomly assigned to one of the two exercise intervention programs, using sealed envelopes" Unclear if second allocation of participants was concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "The outcome of the randomization was notified to the participants in a letter after baseline assessment"
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	Insufficient information - no information included about who undertook the outcome measures
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Unclear risk	Insufficient information - no information included about who undertook the outcome measures

Faber 2006 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes	Unclear risk	ITT analysis stated. However, baseline figures do not match number of participants initially randomised. 6 participants excluded from analyses of fall data because there was no reliable data available; 30 participants excluded from analyses of physical function and disability data because of missing post-intervention assessment (24 of whom had dropped out of the study). Reasons not given per group and unclear impact on outcomes
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Fiatarone 1994

Methods	Design: RCT Duration: 10 weeks Follow up: none Method of randomisation: unclear Concealment of allocation: unclear Outcome assessor blinding: partial - measurements of muscle function were made by a single observer who was aware of group assignments, but not involved in training. CT evaluation of the mid-thigh was conducted by a single investigator in a blinded fashion; no details of blinding were described for the other outcomes Group comparability at entry: no, significant differences, P < 0.05 Baseline difference in strength: exercise + nutrition participants significantly weaker than exercise-alone participants Losses to follow up: 3 lost from exercise-only group (1 lack of interest, 1 musculoskeletal pain, 1 pneumonia), 2 from supplement-only group (1 death, 1 lack of interest), and 1 lost from control group because of death
Participants	Country: USA Setting: elderly long-term care facility Randomised: 100 % women = 63 Age: 38% older than 90 years; mean = 87.1 years ± 0.6 years; range = not reported Consent: not specified Inclusion criteria: aged over 70 years, residential status, ability to walk 6 metres Exclusion criteria: cognitive = severe cognitive impairment; medical = rapidly progressive or terminal illness, acute illness, unstable chronic illness, myocardial infarction, fracture of a lower extremity within 6 months before the study, insulin-dependent diabetes mellitus, if they were on a weight loss diet or undergoing resistance training at the time of enrolment, if test of muscle strength revealed a musculoskeletal or cardiovascular abnormality % Eligible within home: 26.7

Fiatarone 1994 (*Continued*)

	% Eligible that participate: 28.7 Exercise-only group: N = 25; mean age = 86.2 years ± 1.0 mean SE; range = 72 to 95 years; 64% women Supplement-only group: N = 24; mean age = 85.7 years ± 1.2 mean SE; range = 75 to 97 years; 71% women Exercise and supplement group: N = 25; mean age = 87.2 years ± 1.2 mean SE; range = 76 to 98 years; 64% women Control group: N = 26; mean age = 89.2 years ± 0.8 mean SE; range = 78 to 98 years; 54% women
Interventions	Study aim or objective: hypothesis: physical frailty is partially mediated by skeletal-muscle disuse and marginal nutritional intake, and should therefore be reduced by interventions designed to reverse those deficits Number of experimental groups: 4 Individualised intervention Session duration: 45 minutes Number of sessions per week: 3 Seated: no A therapeutic recreation specialist delivered the exercise components Exercise-only group: high-intensity progressive resistance training of the hip and knee extensors, commencing at 80% of 1 repetition max and progressing as able Supplement-only group: 240 ml Exceed micronutrient supplement drink daily, representing 360 kilocalories, delivered in an unmarked container Exercise and supplement group: comprised both interventions Control group: 240 ml of a minimally nutritive liquid delivered in the same way, plus 3 activities of the participants' choice offered by the same service, but excluding resistance training
Outcomes	Physical function in ADL: gait velocity over a 6.1 metre course (Fiatarone 1994) Physical function (other): Stair Climbing Power (Bassey 1992) Muscle power (anaerobic): leg press (Fiatarone 1994), hip extensor muscle strength, knee extensor muscle strength Physical activity: physical activity (GMM activity monitor) Anthropometry: thigh-muscle area (Fiatarone 1994), weight Physiology: whole body potassium (Cohn 1980) Energy consumption: energy intake (kCal/day)
Notes	Funding: National institute of Ageing Agricultural Research Service Public Health Service of Hebrew Rehabilitation Centre, Massachusetts Brookdale Foundation

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided on randomisation procedure

Fiatarone 1994 (*Continued*)

Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Study performed in one home. As a result, it would have been difficult to blind participants and would have been obvious which groups they were assigned to
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	Not clear who performed mobility outcome assessments
Incomplete outcome data (attrition bias) All outcomes	High risk	Outcome data missing for some participants because of technical problems or illness at time of testing
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Gillies 1999

Methods	Design: cluster RCT Duration: 12 weeks Follow up: none Method of randomisation: by residential home Concealment of allocation: unclear Outcome assessor blinding: no Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: N = 5 (25%) Intervention group: N = 4 (2 due to illness, 1 loss of interest, 1 out with relatives on day of classes) Control group: N = 1 (refused test)
Participants	Country: UK Setting: 2 residential homes Randomised: 20 % women = 95 (only data from women analysed) Age: mean = approximately 88 years; range = not reported Consent: fully-informed Inclusion criteria: > 70 years, mobile, able to participate in test battery, no medical conditions that would interfere with safety regarding training program Exclusion criteria: 6 participants were excluded, but no reasons given % Eligible within home: 76.9 % Eligible that participate: not reported Intervention group: N = 10; mean age = 88 ± 5 years; all women Control group: N = 10; mean age = 87 years ± 4 years; 9 women

Gillies 1999 (*Continued*)

Interventions	Study aim or objective: study question: is it possible to improve functional ability in older people by getting them to practise the functional tasks themselves? Number of experimental groups: 3 Group intervention delivery Session duration: unclear Number of sessions per week: 2 Seated: unclear Exercise features: circuit of 8 functional exercises for 30 seconds initially progressing to a maximum of 1 minute, then increasing difficulty of task Control: reminiscence and recreational sessions; gentle, seated range of movement exercises (trunk and upper limbs only) Personnel delivering interventions not specified
Outcomes	Physical function in ADL: stair ascent/descent, walking distance in 15 seconds Physical function (other): sit-to-stand (fastest time to stand up) Anthropometry: weight
Notes	Funding: not reported

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	This was a cluster randomised trial. No evidence as to how randomisation was determined
Allocation concealment (selection bias)	Unclear risk	No evidence to demonstrate if individuals were recruited into the trial before/after the homes had been randomised to intervention or control
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No evidence of blinding
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	No evidence of blinding
Incomplete outcome data (attrition bias) All outcomes	High risk	Missing outcome data (5 dropouts; 4 from intervention)
Selective reporting (reporting bias)	Unclear risk	In the results, confidence intervals are only reported for some results (not clear why)
Other bias	Low risk	No other apparent risks of bias

Hruda 2003

Methods	Design: RCT Duration: 10 weeks Follow up: none Method of randomisation: randomly assigned using a 1:2 ratio in a lottery format to control group or exercise group Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: N = 5 (17%), dropped out because of health reasons (exercise = 2, control = 3)
Participants	Country: Canada Setting: long-term care facility Randomised: 30 % women = 80 Age: mean = approximately 83 years; range = 75 to 94 years Consent: assent accepted No participants were currently involved in any physical exercise programme or had any recent exercise history Inclusion criteria: ability to follow directions; ability to walk across a room (with or without assistive device); no recent history of cardiovascular, cerebral vascular, respiratory, systemic, muscular, or uncontrolled metabolic disease Exclusion criteria: see inclusion criteria % Eligible within home: not reported % Eligible that participate: not reported Control: N = 10; 75 to 87 years Exercise: N = 20; 76 to 94 years
Interventions	Study aim or objective: examine the effect of an onsite and simple progressive lower body training programme designed to improve muscle power on functional abilities in frail older adults Number of experimental groups: 2 Group intervention delivery Session duration: 20 to 60 minutes Number of sessions per week: 3 Seated: If necessary Exercise features: 10-minute warm-up and stretch, strengthening components utilised seated and standing components focusing in lower-body muscle groups, Thera-Bands® gradually introduced to increase resistance, number of exercise repetitions were gradually increased and a speed element introduced, 10-minute cool-down, personnel delivering interventions not specified Control: no active or placebo intervention, asked to perform no more or no less activity than normal on a daily basis
Outcomes	Physical function in ADL: six-metre walk (time), TUG test (modified to 8 feet) (Bassey 1992; Rikli 1999) Physical function (other): sit-to-stand (average number in 30 seconds) Muscle power (anaerobic): knee extensor muscle strength

Hruda 2003 (*Continued*)

Notes	Funding: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Subjects were randomly assigned in a lottery format"
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	RCT with usual care control, so obvious group assignment
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	No report of blinding
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Differential loss to follow up but seems unlikely to be related to intervention
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Karl 1982

Methods	Design: RCT Duration: 4 weeks Follow up: none Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: unclear Losses to follow up: none stated
Participants	Country: USA Setting: long-term residents of an intermediate care facility Randomised: 19 % women = 16 Age: mean = not reported; median = 73 years; range = 62 to 95 years Consent: assent accepted Inclusion criteria: > 65 years old, some deficits in self care - requiring assistance with dressing, grooming, and feeding Exclusion criteria: see inclusion criteria % Eligible within home: not reported

Karl 1982 (*Continued*)

	% Eligible that participate: 47.5
Interventions	Study aim or objective: to test the assumption that elderly individuals participating in a range of motion exercise programme will show more of an increase in self care in hygiene and eating than those who do not Number of experimental groups: 2 Group intervention sessions Session duration: 30 minutes Number of sessions per week: 2 Seated: If necessary Exercise features: upper limb and lower limb range of movement exercises; personnel delivering the intervention were not described Control: movies only
Outcomes	Physical function in ADL: Performance Test of Activities of Daily Living (PADL)
Notes	Funding: not reported

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	No mention of blinding of participants, but control group watched movies, and outcome measure was physical so intervention would have been obvious
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Unclear risk	No details provided
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No information about losses to follow up
Selective reporting (reporting bias)	High risk	Results for pre and post PADL not reported
Other bias	Low risk	No other apparent risks of bias

Kerse 2008

Methods	Design: cluster RCT Clustering accounted for Duration: 6 months Follow up: yes
Participants	Characterisation: elderly care-home residents Country: New Zealand Setting: low-level dependency residential care homes Randomised: 682 % women = 74% Age details: mean (SD) = 84.3 (7.2) Inclusion criteria: residents aged 65 years and over, able to engage in a conversation about a goal, remember the goal, and participate in a programme to achieve the goal (a proxy for cognitive state) Exclusion criteria: residents unable to communicate to complete the study measures, anxiety as their main diagnosis, were acutely unwell, or in a terminal state ADL status details: Late Life Function and Disability Instrument (LLFDI) total disability score, mean (SD) = 37.7 (6.3) Cognitive status details: Abbreviated Mental Test Score (AMTS), mean (SD) = 7.2 (2.4) Significant comorbidities: total number of diagnoses, mean (SD) = 4.9 (2.2) No (%) Depression (GDS > 4): 215/614 (35%) Assessed: 1584 Excluded: overall = 902; 762 on criteria, 140 declined, 0 other
Interventions	Study aim or objective: to assess the effectiveness of an activity programme in improving function, quality of life, and falls in older people in residential care 2 groups Intervention: activity group (N = 330) Format: individual, delivered by gerontology nurses and healthcare assistants Session length: not reported. Daily Trained nurses delivered the promoting independence in residential care (PIRC) intervention. The resident set a goal to promote physical activity. The nurse then designed an individualised programme of physical activities based on ADLs (daily or several times a day). The gerontology nurse trained healthcare assistants in implementing the plan and provided ongoing support. Exercise activities were undertaken several times daily Control: social group (N = 352) Received usual care and were offered 2 social visits by a social science researcher to control for the attention received by the resident from the gerontology nurse visits
Outcomes	Physical function in ADL: Late Life Function and Disability Instument (LLFDI) (Sayers 2004), TUG test (seconds) (Podsiadlo 1991), Elderly Mobility Scale (EMS) (Smith 1994) Balance: FICSIT-4 balance test Mood related: GDS Quality of life: Life Satisfaction Index (Neugarten 1961) Perceived health status: EuroQoL (Brooks 1996) Falls, risk and fear of falling: fear of falling (modified) (Hill 1996), falls (any episodes

Kerse 2008 (*Continued*)

	for participant) Acute health events: adverse effects, hospitalisations	
Notes	-	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Randomised homes to the intervention or control group using computer generated random numbers
Allocation concealment (selection bias)	Low risk	Quote: "...a biostatistician not involved in recruitment randomized homes to the intervention or control group..."
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Cluster design so potential for blinding, but not specifically reported
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "...research nurses blinded to the group allocation of the homes used standardised methods to assess outcomes..."
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	Quote: "...research nurses blinded to the group allocation of the homes used standardised methods to assess outcomes..."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Large losses, but balanced and similar reasons
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Kinion 1993

Methods	Design: RCT Duration: 8 weeks Follow up: none Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: unclear Losses to follow up: none

Kinion 1993 (*Continued*)

Participants	Country: USA Setting: assisted-living home for the aged Randomised: 24 % women = 75 Age: mean = approximately 85 years; range = 72 to 101 years Consent: fully-informed consent Inclusion criteria: permission of participants' physicians was sought; no participants had any acute illness Exclusion criteria: see inclusion criteria % Eligible within home: not reported % Eligible that participate: not reported Intervention group: N = 12; mean age = 87 year; range = 72 to 101 years; 9 women Control group: N = 12; mean age = 82 years; range = 74 to 100 years; 9 women
Interventions	Study aim or objective: the programme addressed physical activity and psychosocial needs, such as learned helplessness and sadness, without placing additional strain on the hectic schedules of staff Number of experimental groups: 2 Group session delivery Session duration: 30 minutes Number of sessions per week: 3 Seated: yes Exercise features: Sit-and-get-fit group: performed seated range of movement exercises, included measures to promote psychosocial well-being; programme was delivered by a paraprofessional Control: participated in usual home activities, with opportunity to participate in sit and get fit programme after the study period
Outcomes	Flexibility: ankle dorsiflexion and plantarflexion (range of motion), shoulder abduction, hip flexion and extension, elbow flexion and extension, shoulder anterior flexion, knee flexion (range of movement) Feasibility and acceptability: subjective experience data
Notes	Funding: not reported

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	No information provided, but RCT with obvious intervention/control

Kinion 1993 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes	Low risk	No attrition
Selective reporting (reporting bias)	High risk	Pre and post data not reported in an appropriate format (only reported as percentage change; no absolute figures)
Other bias	Low risk	No other apparent risks of bias

Lang 1992

Methods	Design: RCT Duration: n/a (one-off intervention) Follow up: n/a Method of randomisation: unclear - according to a counter-balanced design Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: n/a Losses to follow up: none
Participants	Country: USA Setting: 2 nursing homes Randomised: 15 % women = not reported Age: mean = 76.3 ± 9.95 years; range = 56 to 93 years Consent: not specified Inclusion criteria: Parachek score > 25 Exclusion criteria: see inclusion criteria % Eligible within home: not reported % Eligible that participate: not reported
Interventions	Study aim or objective: tested the hypothesis that materials-based occupation elicits a greater number of repetitions during physical activity in elderly persons than rote exercise Number of experimental groups: 3 Delivered to groups of participants Session duration: n/a Number of sessions per week: n/a Exercise features: materials-based occupation (kicking balloon); imagery-based occupation (kicking imaginary balloon); rote exercise (kicking foot as demonstrated) Group 1: materials-based occupation, then imagery-based occupation, then rote exercise Group 2: imagery-based occupation, then rote exercise, then materials-based occupation Group 3: rote exercise, then materials-based occupation, then imagery-based occupation Participants were instructed to kick as many times as possible and stop when too tired to continue All interventions were supervised by a research assistant, conducted in one-off sessions, with 3 days in between each 1
Outcomes	Endurance (physical other): kicking repetitions

Lang 1992 (*Continued*)

Notes	Funding: not reported	
Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "Subjects were randomly assigned. .." No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not addressed; all three groups received each intervention in different orders
Incomplete outcome data (attrition bias) All outcomes	Low risk	No incomplete outcome data
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	Cross-over design, but intervention unlikely to produce a carry-over effect

Lazowski 1999

Methods	Design: RCT Duration: 4 months Follow up: none Method of randomisation: table of random numbers; participants were stratified into 2 levels of mobility, based on their scores and the Timed Up and Go test. Within each mobility category at each site, residents were randomly assigned to either the functional fitness for long-term care (FFLTC) or range of motion (ROM) condition Concealment of allocation: yes - maintained Outcome assessor blinding: yes - maintained Group comparability at entry: unclear Losses to follow up: N = 28 (29%): FFLTC group N = 19, ROM group N = 9 Similar reasons for both groups: too busy N = 15, medical reasons N = 8, unable to follow exercise N = 3, moved away N = 2
Participants	Country: Canada Setting: long-term care institution Randomised: 96 % women = 84 Age: mean = 80 years ± 0.9 years; range = not reported Consent: assent accepted Inclusion criteria: able to stand with minimal assistance, ability to follow simple instruc-

	tions Exclusion criteria: medical = recent cardiovascular event, vestibular disorder, uncontrolled hypertension, uncontrolled epilepsy, fracture within 4 months, total blindness/deafness, surgery planned for within the next 4 months; functional = holidays planned for within the next 4 months, recent admission (less than 3 months) % Eligible within home: not reported % Eligible that participate: not reported FFLTC (functional fitness for long-term care) group: N = 55; mean age = 79.7 years; 29 women ROM (range of motion) group: N = 41; mean age = 80.4 years; 30 women
Interventions	Study aim or objective: this study compared traditional range of motion to a 'functional fitness for long-term care' programme designed to improve strength, balance, flexibility, gait, functional capacity, and strength Number of experimental groups: 2 Group intervention delivery Session duration: 45 minutes Number of sessions per week: 3 Seated: not specified Exercise features: FFLTC group: comprised walking, strengthening and balance exercises, tailored to meet each of the 2 groups (high mobility/low mobility), conducted by recreation staff ROM group: comprised seated exercise to improve range of movement (fingers, hands, arms, knees, ankles), relaxation, vocal exercise, and word/memory games Groups were of mixed ability, supervised by recreation staff
Outcomes	Physical function in ADL: gait speed over 7 metres (self-selected normal pace), gait speed over 7 metres (fast pace), TUG test (seconds) (Podsiadlo 1991), FIM Physical function (other): stair climbing power (Bassey 1992) Muscle power (anaerobic): lower extremity strength, total hip strength, upper extremity strength, isometric strength (elbow flexion; shoulder abduction; knee extension; hip ab/adduction, flexion/extension), hand grip strength, isotonic strength of knee extensors (Connelly 1995) Balance: BBS Flexibility: 'Sit-and-reach' test (modified) (Lazowski 1997), upper body flexibility (Leighton flexometer)
Notes	Funding: grants from the Canadian Fitness and Lifestyle Research Institute, The Walter J. Blackburn Family Foundation, The Richard Ivey Foundation, and the Ontario Ministry of Health Long-term Care

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Stated used a random number table
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided

Lazowski 1999 (*Continued*)

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding attempted, but potential that blinding was broken as participants were from the same setting However, ROM and FFLTC groups, so questionable whether it was important
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	TUG: stated research assistant blind to study condition
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	FIM: stated research assistant blind to study condition
Incomplete outcome data (attrition bias) All outcomes	High risk	Much higher attrition rate in FFLTC than ROM, 19/55 (35%) versus 9/41 (22%), and large numbers
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Lee 2009

Methods	Design: cluster RCT Clustering not accounted for Details: a non-equivalent pre-test-post-test control-group design Duration: 26 weeks Follow up: no
Participants	Characterisation: nursing-home residents Country: Hong Kong Setting: nursing homes Randomised: 175 % women = 68% Age details: mean (SD) = 82.7 (7.1); range = 66 to 101 years Inclusion criteria: (a) Chinese, (b) > 65 years of age, (c) intact cognitive function (Abbreviated Mental Test score > 6/10), (d) able to walk independently, (e) able to communicate in Cantonese Exclusion criteria: (a) experiencing acute symptoms of medical problems, (b) having a pre-existing psychological disorder, (c) having previous Tai Chi training ADL status details: not reported Cognitive status details: not reported Significant comorbidities: mean (SD) number of comorbidities = 2.9 (3.1) Assessed: not reported Excluded: not reported

Lee 2009 (*Continued*)

Interventions	Study aim or objective: to examine the effect of Tai Chi on health-related quality of life in nursing-home residents 2 groups Intervention: Tai Chi group Format: group, delivered by: Tai Chi instructor Session length: 8 to 10 minutes to perform entire sequence, 3 times weekly Chen-style Tai Chi was taught. This short-form incorporated essential elements of Tai Chi and was relatively gentle During the sessions, the instructor demonstrated the Tai Chi movements, and participants imitated the motions and postures. New Tai Chi movements were introduced each session, and participants learned the sequence at the end of 26 weeks Control: Control group Usual daily activities
Outcomes	Balance: balance (Single Limb Stand Timed test) Flexibility: 'Sit-and-reach' test Perceived health status: SF-12 health-related quality of life (mental component), SF-12 health-related quality of life (physical component) Energy expenditure: Physical Activity Questionnaire (PAQ) (Liu 2001) Other: satisfaction with Nursing Home Instrument Chinese version (Lee 2006)
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Author reports homes as randomised, but no information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Stated that the instructor was blind to outcome measures. However, participants could not have been
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Figures not provided for loss to follow up (hospitalisation, death, or move to other home) for intervention or control group (presented as combined data only)
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

MacRitchie 2001

Methods	Design: RCT Duration: 54 weeks Follow up: none Method of randomisation: participants were stratified by every 5 years of age and then randomly assigned by computer Concealment of allocation: unclear Outcome assessor blinding: no, but objective assessments were performed (assessors were unaware of pre-test scores when collecting post-test data) Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: N = 6 (7%)
Participants	Country: USA Setting: 2 nursing homes Randomised: 88 % women = 80.7 Age: mean = 84.1 years ± 6.9 years; range = 65 to 98 years Consent: informed consent from participant or relative and from their doctor Inclusion criteria: nursing home long-term care resident, physically capable of safe bilateral lower extremity weight-bearing with supervision or minimal assistance, cognitively able to follow simple directions Exclusion criteria: cognitive = unable or generally unwilling to follow simple directions; medical = inability or medical restriction to bear weight on both lower extremities, less than 65 years of age; functional = participating in skilled rehabilitation (physical therapy or occupational therapy) immediately prior to study % Eligible within home: unclear % Eligible that participate: unclear, possibly N = 88 of 294 residents (30%) Group breakdown: not given, 29 to 30 participants in each group
Interventions	Study aim or objective: investigation of the effect of a standing exercise programme on the number of falls and the severity of intrinsic fall risk factors (functional losses of strength, balance and endurance, depression and number of infections) Number of experimental groups: 3 one-to-one sessions with each participant being supervised by a care assistant 'buddy' Session duration: 20 minutes Number of sessions per week: 5 - both interventions were conducted daily Monday to Friday, for 54 weeks Seated: no Intervention group: (group 1): comprised exercises in standing and walking activities, triggered when energetic music was played over intercom Control group (group 2): consisted of talking and listening to music only Control group (group 3): listened to the music alone
Outcomes	Falls: number of falls Physical function in ADL: 30-feet walk (time s), TUG test (seconds) (Podsiadlo 1991) Balance: Duncan Functional Reach (DFR) test Mood related: GDS Acute health events: infections (average number per month)

MacRitchie 2001 (*Continued*)

Notes	Funding: unclear Unpublished PhD thesis

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Assignment to specific activities will be randomized by computer" Comment: assume this means a computer random-number generator was used
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding of participants would not have been possible - participants would have been aware of which group they were in
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	Unclear if assessor was blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	Author states that the 6 participants who were unable to complete the post-tests were "dispersed among the groups, with reasons for dropping out unrelated to the intervention"
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Makita 2006

Methods	Design: RCT Details: stratified by care level (determined on base of total time required for assistance with ADLs, instrumental ADLs, functional training, and medical services) Duration: 3 months Follow up: no
Participants	Characterisation: frail elderly women Country: Japan Setting: special nursing homes for the elderly Randomised: 149 % women = 100% Age details: mean (SD): Exercise group: 84.85 (7.3)

	Control group: 86.25 (6.59) Inclusion criteria: women and stable health Exclusion criteria: not reported ADL status details: length of time of care per day (number of participants): 30 to 50 minutes: 9 50 to 70 minutes: 19 70 to 90 minutes: 36 90 to 110 minutes: 33 110 minutes or longer: 48 Cognitive status details: not reported Significant comorbidities: not reported Assessed: 226 Excluded: Overall = 77
Interventions	Study aim or objective: to evaluate the effects of exercise therapy using the Takizawa Program 2 groups Intervention: Exercise group (N = 74) Format: group, delivered by nurses and care workers as physical exercise instructors Session length: not reported, 3 times weekly Takizawa program: following exercises performed while sitting or standing: 1. upper limb range of motion exercise using a movable pulley 2. trunk flexion and twisting exercise with abdominal breathing 3. ankle plantar-dorsal flexion exercise using the instrument 'PATA' 4. knee flexion-extension exercise using the instrument 'KORO' 5. shoulder and elbow flexion-extension exercise 6. knee extension exercise 7. hip flexion exercise
Outcomes	Physical function in ADL: FIM Flexibility: range of motion (shoulder flexion; knee extension; ankle dorsal flexion/plantar flexion)
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	No report of blinding of participants, but usual care so intervention would have been obvious

Makita 2006 (*Continued*)

Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	Quote: "The evaluators of FIM in this study were the care workers who provided daily care to the patients, and were blind to the patient's assignments to the Ex or Co group"
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Slightly more losses to follow up in exercise group than in control group, although same reason provided across groups
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

McMurdo 1993

Methods	Design: cluster RCT Duration: 7 months Follow up: none Method of randomisation: sealed envelopes supplied in sequence by the study co-ordinator and prepared from a computer-generated random numbers table Concealment of allocation: yes - maintained Outcome assessor blinding: no Group comparability at entry: unclear Losses to follow up: N = 8 (16.3%): intervention group: N = 5 (3 deaths, 2 loss of interest), control group: N = 3 (3 deaths)
Participants	Country: Scotland, UK Setting: 4 residential homes Randomised: 49 % women = 80 (of completers) Age: mean = 81 years; range = 64 to 91 years Consent: assent accepted Inclusion criteria: see exclusion criteria Exclusion criteria: cognitive: severe communication difficulties Residential homes all had identical entrance criteria, namely that residents should be able to toilet, dress, and walk independently % Eligible within home: not reported % Eligible that participate: not reported Intervention group: N = 20; mean age = 82.3 years (SD 6.9); 12 women Control group: N = 29; mean age = 79.3 years (SD 6.2); 21 women
Interventions	Study aim or objective: to evaluate whether participation in regular exercise was acceptable to residents of old people's homes, and whether it produced significant improvements in balance, flexibility, strength, or functional capacity compared with a control group who participated in reminiscence sessions Number of experimental groups: 2 Group intervention delivery

McMurdo 1993 (*Continued*)

	Session duration: 45 minutes Number of sessions per week: 2 Seated: yes Personnel delivering the interventions were not described Exercise features: full upper limb and lower limb range of movement; seated exercises to music, intended to promote strengthening; exercise groups lasted for 45 minutes, and were conducted twice weekly for 7 months Control: music and reminiscence therapy designed to prompt social interaction
Outcomes	Physical function in ADL: BI (0 to 20) Physical function (other): sit-to-stand (fastest time to stand up) Muscle power (anaerobic): hand grip strength Balance: postural sway (using Wright's ataxiameter) (Wright 1971) Mood related: GDS Cognition: MMSE Flexibility: spinal flexion (American Academy of Orthopaedic Surgeons 1965), knee extension (range of movement), knee flexion (range of movement) Quality of life: Life Satisfaction Index (Neugarten 1961) Anthropometry: BMI
Notes	Funding: The Mathew Trust The ICL Discretionary Trust All of the residential homes exhibited identical admission criteria

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation...prepared from a computer-generated random numbers table"
Allocation concealment (selection bias)	Low risk	Quote: "Randomisation was by opening sealed envelopes supplied in sequence by the study co-ordinator"
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No report of blinding of participants - although exercise groups and reminiscence groups were in different homes, so participants possibly weren't aware if they were intervention or control
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	High risk	All measurements made by the same observer that provided the interventions

McMurdo 1993 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes	High risk	More losses to follow up in exercise group (25%) than in control group (10%), and losses from exercise group include lack of interest
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

McMurdo 1994

Methods	Design: cluster RCT Duration: 6 months Follow up: none Method of randomisation: sealed envelopes supplied in sequence by the study co-ordinator, prepared from a computer-generated random number table Concealment of allocation: yes - maintained Outcome assessor blinding: partial Group comparability at entry: yes, no significant differences, P > 0.05 Losses to follow up: N = 10 (15.4%): intervention group: N = 4 (3 deaths, 1 fractured neck of femur); control group N = 6 (4 deaths, 2 hospital admissions)
Participants	Country: Scotland, UK Setting: 4 residential homes Randomised: 65 % women = 83% Age: mean = 83 years; range = 67 to 98 years Consent: assent accepted Inclusion criteria: volunteers were not excluded on the basis of any medical condition Exclusion criteria: cognitive = severe communication difficulties % Eligible within home: not reported % Eligible that participate: not reported Intervention group: N = 36; mean age = 83.7 years (6.6); 29 women Control group: N = 29; mean age = 82.0 years (9.6); 25 women Residential homes all had identical entrance criteria, namely that residents should be able to toilet, dress, and walk independently
Interventions	Study aim or objective: (1) what are the mechanisms of improvement seen in McMurdo 1993?, (2) in the institutionalised elderly, does participation in regular seated exercise strengthen the quadriceps muscles?, (3) is participation in such exercise associated with improved psychomotor or cognitive function? Number of experimental groups: 2 Group intervention sessions Session duration: 45 minutes Number of sessions per week: 2 Seated: yes Exercise features: performed seated exercise to music, number of repetitions and gravity-resisted exercises were increased during the course of the study, group format, supervised

McMurdo 1994 (*Continued*)

	by research physiotherapist Control group: reminiscence therapy designed to prompt social interaction and group discussion, 45 minutes in duration, conducted twice weekly for 6 months, facilitated by research physiotherapist
Outcomes	Physical function in ADL: step test Physical function (other): reaction Time Muscle power (anaerobic): quadriceps muscle strength Cognition: MMSE
Notes	Funding: not reported

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Randomization...prepared from a computer-generated random table"
Allocation concealment (selection bias)	Low risk	Quote: "Randomization was by opening sealed envelopes supplied in sequence by the study coordinator"
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Quote: "Pre-study measurements were undertaken by the research physiotherapist at the same time of day in both groups. Post-study measurements were undertaken by an independent, blinded observer who was not otherwise involved in the project" No information about blinding of participants and personnel involved in recording outcome measures
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "Done by an independent, blinded observer who was not otherwise involved in the project"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing outcome data relatively balanced across the groups (all participants accounted for)
Selective reporting (reporting bias)	High risk	Only Quadriceps, MMSE and reaction time data reported
Other bias	Low risk	No other apparent risks of bias

Meuleman 2000

Methods	Design: RCT Duration: 4 to 8 weeks Follow up: 1 year Method of randomisation: groups were determined by computer algorithm stratified by site of care (GEM or nursing home); assignments were in sealed envelopes that were opened after the pre-test was completed (see notes) Concealment of allocation: yes - maintained Outcome assessor blinding: yes Group comparability at entry: no significant differences, P < 0.05 Significantly more training participants had their primary medical problem disability from cerebrovascular accident Losses to follow up: N = 20 (25.6%) (at initial post-test): training group N = 13 (6 discharged home, 4 due to illness, 2 deaths, 1 withdrew because of shoulder strain); control group N = 7 (4 discharged home, 1 because of illness, 2 deaths)
Participants	Country: USA Setting: 1 Veteran's Affairs nursing home and geriatric evaluation and management unit, and 1 community nursing home Randomised: 78 % women = 12 Age: mean = 75 years; range = 60 to 97 years Consent: assent accepted Inclusion criteria: > 60 years, impaired functional status (requiring assistance with 1 or more physical activities of daily living) with potential for improvement, able to follow simple commands, wheelchair participants must be able to transfer with modest assistance at most, Veteran's Affairs participants must have an expected length of stay > 4 weeks Exclusion criteria: severe dementia, uncontrolled hypertension, unstable angina, medical condition that would interfere with safety of training protocol, stroke in previous 3 weeks, pacemaker, chronic atrial fibrillation % Eligible within home: not reported % Eligible that participate: not reported Training group: N = 39; mean age = 74.1 years; range = 60 to 90 years; 2 women (7.7%) Control group: N = 39; mean age = 76.9 years; range = 60 to 97 years; 7 women (21.9%)
Interventions	Study aim or objective: to establish whether moderate-intensity endurance training results in short-term improvements in strength, endurance, and function Number of experimental groups: 2 Group intervention delivery Session duration: 30 Number of sessions per week: 2 Seated: no All participants participated in training for 4 to 8 weeks, and a minimum of 10 resistance sessions in the 4-week period were ensured The interventions were delivered in-group format and led by a physiotherapist and an aide Exercise features: Training group: progressive resistance and endurance training regime, comprised a minimum of 10 minutes of endurance training, up to a maximum of 30 minutes before resistance was increased, endurance training took place on a Tuesday and Thursday, resistance

	training occurred on Monday, Wednesday, and Friday, and comprised 15 repetitions for each muscle group Control group: usual care
Outcomes	Physical function in ADL: walking speed over 20-foot, self-selected (Friedman 1988), Performance Test of Activities of Daily Living (PADL), Instrumental Activities of Daily Living (IADL, 7 items) Muscle power (anaerobic): isokinetic eccentric strength (knee extension/flexion; shoulder extension/flexion; elbow extension/flexion; ankle dorsi/plantarflexion), isokinetic concentric strength (knee extension/flexion; shoulder extension/flexion; elbow extension/flexion; ankle dorsi/plantarflexion), isometric strength (knee extension/flexion; shoulder extension/flexion; elbow extension/flexion; ankle dorsi/plantarflexion) Mood related: GDS Endurance (physical other): heart rate after 6 minutes of endurance testing (using either an upper extremity ergometer, a stationary cycle, or a recumbent stepper) Acute health events: hospitalisations
Notes	Funding: Veterans affairs health services research and development service Transportation logistics precluded more than 2 participants from the community nursing home from training at any given time. As a result, the randomisation scheme for these participants was done using a flip coin every time 2 participants had completed the pretest. Though the assessor was blinded to the participants' group assignment, the assessor was not questioned to ascertain the success of blinding

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "The randomization scheme for the VA participants was determined by a computer algorithm stratified by site of care"
Allocation concealment (selection bias)	Low risk	Quote: "Assignments to the study groups were concealed in sealed envelopes that were opened after the pretest was completed"
Blinding of participants and personnel (performance bias) All outcomes	High risk	RCT in same setting with usual care, so intervention would be obvious
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	Regarding strength tests: "The assessor was blinded to the subjects' group assignments (training or control)" No information on blinding of mobility tests

Meuleman 2000 (*Continued*)

Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Unclear risk	Quote: "Whenever possible, the subject's primary nurse was interviewed to provide information for the PADL and IADL scale. " No mention of blinding
Incomplete outcome data (attrition bias) All outcomes	High risk	Almost double the attrition rate in the training group. 25% overall
Selective reporting (reporting bias)	High risk	Quote "When post-hoc we stratified the subjects into most dysfunctional score..." (re: ADL)
Other bias	Low risk	No other apparent risks of bias

Mihalko 1996

Methods	Design: cluster RCT Duration: 8 weeks Follow up: 1 week Method of randomisation: randomised by residence - no further details given Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: no, significant differences, P < 0.05 Participants in the strength training programme had significantly greater strength and ADL scores Losses to follow up: none
Participants	Country: USA Setting: senior citizen or residential nursing home Randomised: 58 % women = 83% Age: mean = 82.67 years ± 7.72 years; range = 71 to 101 years Consent: not specified Inclusion criteria: sedentary for at least 6 months prior to commencing programme Exclusion criteria: none stated % Eligible within home: not reported % Eligible that participate: not reported Experimental group: N = 29 Control group: N = 29
Interventions	Study aim or objective: (1) effects of upper body high-intensity training on muscular strength, ADLs, and subjective well-being; (2) whether changes in strength were related to subsequent changes in subjective well-being and ADLs Number of experimental groups: 2 Group intervention delivery Session duration: 30 minutes Number of sessions per week: 3

Mihalko 1996 (*Continued*)

	Seated: yes Exercise features: Experimental group: progressive resistance exercise regime targeting 5 upper body muscle groups, led by an exercise specialist Control group: comprised fluid movements that incorporated non-stress exercise and mild stretching activities Groups were led by the same exercise specialist
Outcomes	Physical function in ADL: Instrumental Activities of Daily Living Scale (modified) (Mihalko 1996) Muscle power (anaerobic): upper body strength (for each of pectorals, shoulders, back, biceps, triceps), upper body power (sum of strength scores for 5 muscle groups: pectorals, shoulders, back, biceps, triceps) Mood related:Positive and Negative Affect Schedule (PANAS) (Watson 1988) Quality of life: Satisfaction with Life Scale (SWLS) (Diener 1985) Feasibility and acceptability: Subjective Exercise Experiences Scale (SEES) (McAuley 1994)
Notes	Funding: not reported

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Stated "subjects were assigned by residence"
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided.
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No information provided
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	No information provided
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Unclear risk	No information provided
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	The number of participants who completed intervention/control not reported
Selective reporting (reporting bias)	High risk	Subjective Exercise Experiences Scale not presented. Comparative statistics for IADL not presented

Mihalko 1996 (*Continued*)

Other bias	Low risk	No other apparent risks of bias

Morris 1999

Methods	Design: cluster RCT Duration: 10 months Follow up: 40 weeks Method of randomisation: 2 nursing homes were randomly assigned to be control sites, 4 as experimental sites. Homes were matched into sets of triplets, from which sites were randomised to the 3 study conditions. Randomisation procedure not detailed Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: yes Losses to follow up: 76 (16.2%): Fit for your life group N = 18 (12 deaths, 6 refusals), Self care for seniors group N = 27 (deaths), Control group N = 31 (28 deaths, 3 refused)
Participants	Country: USA Setting: 6 nursing homes Randomised: 468 % women = 79 Age: mean = 84.7 years; range = not reported Consent: assent accepted Inclusion criteria: see exclusion criteria Exclusion criteria: cognitive = severe cognitive disability (Cognitive Performance Scale < 5); medical = unstable cardiac condition (excluded from exercise component only), terminal prognosis, length of stay < 90 days, health complications that prohibited contact % Eligible within home: 55.1 % Eligible that participate: not reported Fit for your life group: N = 142 Self-care for seniors group: N = 171 Control group: N = 155
Interventions	Study aim or objective: to evaluate how weight training or nursing-based rehabilitation programmes in nursing homes impact on resident performance of ADLs and objective tests of physical performance Number of experimental groups: 3 Individualised intervention delivery Session duration: 20 minutes Number of sessions per week: 3 Seated: unclear Fit for your life group: progressive resistance training of major muscle groups related to function and mobility; led by staff, family, and volunteers; walking for 1 to 5 minutes initially, up to a maximum of 20 minutes continuous walking; resistance training comprised 2 sets of 8 repetitions, with progressively heavier weights; resistance training was conducted 3 times per week, non-consecutive days, with walking on alternate days, for a minimum of 4 months over a 10-month study period Self-care for seniors group: Nursing rehabilitation intervention tailored to individual, with aim of maintaining function or preventing decline

Morris 1999 (*Continued*)

	Control group: usual care
Outcomes	Physical function in ADL: number of feet walked in 6 minutes - scale score (Morris 1999), MDS: Locomotion (on and off unit items) (Morris 1999), MDS: Late loss ADL (transfer, toilet use, bed mobility, and eating) (Morris 1999), MDS:early loss ADL (dressing and personal hygiene) (Morris 1999), MDS: ADL summary (8 items) (Morris 1999) Physical function (other): sit-to-stand (scale based on time required to stand up 5 times in a row) (Morris 1999) Balance: balance (time able to stand normally in 5-feet positions) (Morris 1999) Mood related: GDS
Notes	Funding: Grant from National Institute of Health, National Institute on Ageing

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Facilities were "randomly designated" to be control or experimental sites No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Not mentioned (although, different homes were assigned to different interventions, so participants would not have been aware of which group they were in)
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	Not clear who performed observed ADL outcome assessments
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	ADL summary: "Assessments were completed by trained research staff, all of whom were blinded to the intervention status of the study subjects"
Incomplete outcome data (attrition bias) All outcomes	High risk	Performance - large number of residents were unable to start to initiate these activities
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Mulrow 1994

Methods	Design: RCT Duration: 1 year Follow up: none Method of randomisation: performed by calling a central number, randomisation was blocked into groups of 4, and stratified by nursing-homes site Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: yes Losses to follow up: N = 14 (7.2%): Intervention group N = 5 (deaths); control group: N = 9 (7 deaths)
Participants	Country: USA Setting: 1 academic nursing home and 8 community nursing homes Randomised: 194 % women = 71 Age: mean = approximately 80 years; range = not reported Consent: not specified Inclusion criteria: > 60 years of age, residence in nursing home > 3 months, dependent in 2 or more activities of daily living Exclusion criteria: cognitive = severe dementia, inability to follow 2-step command; medical = terminal illness/acute medical condition; functional = assaultive behaviour, receiving physiotherapy currently, or within last 2 months % Eligible within home: 7.3 % Eligible that participate: 77 Intervention group: N = 97; mean age = 79.7 years (8.5); 70% women Control group: N = 97; mean age = 81.4 years (7.9); 71 % women
Interventions	Study aim or objective: to assess whether a physical therapy programme tailored to long-stay residents' disabilities improved their physical function and long-term health Number of experimental groups: 2 Individualised intervention delivery Session duration: 30 minutes Number of sessions per week: 3 Seated: unclear Exercise features: Intervention group: physical therapy tailored to the individual, incremental programme, used algorithm for treatment priorities, a specific number of repetitions were performed for each exercise category, sessions conducted on an individual basis, in either Spanish or English, by a physiotherapist Control group: friendly visits, reading to participants in language of their choice, activities avoided exercise and psychosocial interventions, personnel not described
Outcomes	Falls: number of falls Physical function in ADL: Physical Disability Index (Mobility Score) (Gerety 1993), Katz ADL Scale (Katz 1963) Physical function (other): Physical Disability Index (Summary Score) (Gerety 1993) Muscle power (anaerobic): Physical Disability Index (Strength Score) (Gerety 1993) Balance: Physical Disability Index (Balance Score) (Gerety 1993) Mood related: GDS (short version) (Sheikh 1986) Cognition: MMSE

	Flexibility: Physical Disability Index (Range of Motion Score) (Gerety 1993) Perceived health status: Sickness Impact Profile (Total Score) (Bergner 1981), Sickness Impact Profile (Psychosocial Score) (Bergner 1981), Sickness Impact Profile (Physical Score) (Bergner 1981) Medications: medications (number) Acute health events: adverse effects, emergency department and physician visits, hospitalisations Feasibility and acceptability: compliance Cost: cost
Notes	Funding: grants from the National Institute on Ageing and Veterans Affairs Health Services Research and Development San Antonio nursing-home policy routinely prohibits independent bathing, which results in de facto classification of all residents as dependent in at least 1 ADL

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided on random sequence generation procedure
Allocation concealment (selection bias)	Low risk	Quote: "Randomization was performed after baseline assessments by calling a central number" - central allocation
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No report of blinding of participants. RCT in same setting, but friendly visits could have blinded intervention/control
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Unclear risk	Unclear if Katz ADL scale was performed by a blinded assessor
Incomplete outcome data (attrition bias) All outcomes	Low risk	More losses to follow up in control group (N = 9) than in intervention group (N = 5) but all for same reason (death). Total = 194 participants
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Naso 1990

Methods	Design: RCT Duration: 1 year Follow up: none Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: unclear Losses to follow up: N = 4 (26.7%)
Participants	Country: USA Setting: nursing home Randomised: 15 % women: not reported Age: mean = not reported; range = 64 to 97 Consent: fully-informed Inclusion criteria: see exclusion criteria Exclusion criteria: cognitive = mental impairment (unable to understand programme description); medical = serious cardiac disease (CCF, angina), other active illness, significant % Eligible within home: 10 % Eligible that participate: 100 Intervention group: N = 8; age range = 66 to 97 years Control group: N = 7; age range = 64 to 87 years
Interventions	Study aim or objective: to examine the effectiveness of an upper extremity and lower extremity exercise programme on endurance Number of experimental groups: 2 Individual session delivery Session duration: 15 minutes Number of sessions per week: 3 Seated: unclear Exercise features: Intervention group: upper and lower body endurance programme based on target heart rates; personnel not described Control group: usual care
Outcomes	Endurance (physical other): heart rate after 2 minutes of exercise, duration of exercise
Notes	Funding: not reported

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided

Naso 1990 (*Continued*)

Blinding of participants and personnel (performance bias) All outcomes	High risk	No mention of blinding of participants, but usual care so intervention would have been obvious
Incomplete outcome data (attrition bias) All outcomes	Low risk	Moderate loss to follow up, but balanced across groups with similar reasons
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Ouslander 2005

Methods	Design: randomised controlled cross-over trial 4 phases: (1) participant screening and enrolment; (2) baseline assessment and randomisation by computer-generated random numbers into immediate intervention (group 1) or delayed intervention (group 2); (3) immediate intervention phase for which group 2 acted as group 1's control; (4) delayed intervention phase - group 2 receive the intervention and group 1 cross over to no intervention to assess the durability of the intervention's effects Duration: 16 weeks - after 8 weeks the groups switched Method of randomisation: computer-generated random numbers Outcome assessor blinding: assessor masked to treatment group, but at some treatment sites, the group assignment became apparent in a small number of participants Group comparability at entry: yes Losses to follow up: (N = 29, 27%) 61 of 107 allocated, and 178 eligible completed all assessments
Participants	Country: USA Setting: 4 Veterans Affairs medical-centre nursing homes in the South-East of the USA (Atlanta, Georgia; Durham, North California; Salisbury, North Carolina; West Palm Beach, Florida) selected because of their proximity to the researcher's home institution in Atlanta, willingness to participate, and size of potential population All residents at each facility screened Randomised: 107 % women = 10 Age: mean = approximately 78 years; range = not reported 75% white More than three-quarters of participants had at least 1 psychiatric diagnosis Consent: informed consent from participant where capable, if not, from facility staff or from a responsible party - assent Inclusion criteria: long-stay resident (at least 30 days and not initially admitted for short-term care), able to state their name, or in the presence of aphasia, capable of reliably pointing to 2 objects, required assistance by 2 or fewer people for transfer from bed to chair, incontinent of urine or stool, or would be without assistance from staff, not severely behaviourally disturbed, not known to be terminally ill, life expectancy of at least 6 months, not receiving active physical therapy, aged 60 and older Exclusion criteria: see inclusion criteria

	% Eligible within home: 44 % Eligible that participate: 60 Intervention: N = 52; % women = 53; age: mean = 77.8 years ± 7.6 years Control: N = 55; % women = 50; age: mean = 78.8 years ± 6.3 years N = 528 assessed for eligibility N = 350 did not meet criteria Unable to obtain consent for: N = 21 Attrition before assessment complete: N = 50 N = 107 randomised Allocated to intervention (group 1): N = 52 Allocated to delayed intervention (group 2): N = 55
Interventions	Study aim or objective: to test the effects of a rehabilitative intervention directed at continence, mobility, endurance, and strength (FIT) in older people living in nursing homes Number of experimental groups: 2 Individualised intervention delivery Session duration: n/a Number of sessions per week: n/a Seated: yes Functional incidental training intervention: trained research aides provided opportunities to participate in FIT for 4 to 5 participants every 2 hours between 8am and 4pm Monday to Friday for 8 weeks, so each participant could participate in 4 FIT sessions a day; the intervention included prompted voiding and functionally-orientated endurance and strengthening exercises; individualised exercise programmes created from baseline data and modified every 2 weeks; goal for 3 sessions of FIT to involve endurance exercise (sit-to-stands, walking or wheelchair mobility to a goal time) and 4 sessions to involve strengthening exercises (bicep curls, straight arm exercises, knee extensions, and hip abductions and flexions); daily adherence recorded; supervisors conducted periodic process observations and provided additional training and reinforcement on the protocol where needed to endure quality and consistency Control: usual care
Outcomes	Physical function in ADL: transfer time (seconds; chair to chair and back), FIM (toileting score), FIM (locomotion score), Walk or Wheel Total Time (seconds) during a 10 minute trial, Walk or Wheel (time over 6 metres), Walk or Wheel (total distance in up to 10 minutes (feet) Physical function (other): sit-to-stand (time for first, seconds), sit-to-stand (maximum number in 30 seconds), sit-to-stand (average number in 30 seconds) Muscle power (anaerobic): lower body strength (right hip flexion), upper body strength (right biceps curl) Continence: appropriate toileting ratio (urine), appropriate toileting ratio (stool), fecal incontinence frequency, urinary incontinence frequency
Notes	Funding: grant from the Department of Veterans Affairs Rehabilitation Services Research Service Baseline significant difference between the intervention and control group in number of sit-to-stand exercises, with immediate intervention group able to do more

Ouslander 2005 (*Continued*)

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation by computer-generated random numbers"
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Cross-over design, so participants would have been aware of each intervention
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	High risk	Project manager (outcome assessor) was masked, but allocation revealed in some cases
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	High risk	Project manager (outcome assessor) was masked, but allocation revealed in some cases
Incomplete outcome data (attrition bias) All outcomes	High risk	17/35 (49%) in immediate intervention lost versus 12/43 (28%) from control
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	This was a cross-over trial of an intervention likely to have long-term effects. Therefore, high risk of carry-over effects. However, only the first period used in this review; therefore, low risk of bias

Peri 2008

Methods	Design: cluster RCT Clustering accounted for Details: matched wings allocated by coin toss by independent researcher Duration: 6 months Follow up: no
Participants	Characterisation: ambulatory, need minimal assistance with transferring, independent in eating, but dependent in instrumental ADLs Country: New Zealand Setting: residential care homes Randomised: 149 % women = 85% Age details (mean (SD)): Control: 84.7 (6.7)

	Intervention: 86.8 (5.5) Overall mean 85.7 Overall SD 6.2 Calculated from N = 149 Inclusion criteria: none (All other residents regardless of cognitive or physical ability were eligible for participation and were invited to take part by research staff) Exclusion criteria: under the age of 65 years, admission for respite or terminal care, quadriplegia ADL status details: BI Score (mean, SD): Control: 17.5 (2.7) Intervention: 17.8 (2.2) Cognitive status details: Abbreviated Mental Test Score (mean, SD): Control: 7.0 (2.8) Significant comorbidities: not reported Assessed: 208
Interventions	Study aim or objective: to determine whether a repetitive ADL activity programme improves health status, life satisfaction, and mobility for older people living in residential care 2 groups Intervention: intervention group (N = 73) Format: individual, delivered by gerontology nurse; healthcare assistant within the care home and the community Session length: not reported, daily Goal-setting physical activity programme (1) goal setting phase - goal encompassing physical functionality set with the resident (e.g. gardening, attending a community-based senior citizens' club) (2) gerontological nursing assessment (3) development of Promoting Independent Plan (PIP) - using info from assessment, a prescriptive activity programme was developed and tailored to meet the identified goal. Activities designed to increase strength, balance, and endurance through increased ADLs. Repetitive activities included bed mobility, sitting to standing, and transfers. Longer walking routes (5) healthcare assistant training - individualised programme explained to resident and healthcare assistant. Care plan displayed in resident's room and included in medical record. Healthcare assistant responsible on a daily basis for ensuring that residents carried out their activity programme The residents' individualised plan was reviewed monthly at a staff meeting attended by the research staff, healthcare assistants, and nurse manager. Goals were modified or reset by the resident, if requested, following the review meeting Control: control group (N = 76) Usual care, waiting list for goal setting physical activity intervention
Outcomes	Physical function in ADL: TUG test (seconds) (Podsiadlo 1991), Elderly Mobility Scale (EMS) (Smith 1994) Physical function (other): SF-36 Physical Function Quality of life: Life Satisfaction Index (Neugarten 1961)

	Perceived health status: SF-36 Mental Health Falls, risk and fear of falling: falls (any episodes for participant) Acute health events: adverse effects
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Toss of a coin used for allocation (between two wings of a home)
Allocation concealment (selection bias)	Low risk	Coin toss performed by independent researcher - suggests allocation concealment
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Quote: "Care delivery in each wing was administered independently with no crossover of staff or residents during the study period" No report of blinding of participants, although intervention and control groups were in separate wings, so may not have been aware of which group they were in
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "A research nurse blinded to the allocation then collected baseline, 3- and 6-month outcome measures"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Slight imbalance in number of participants lost to follow up between groups (more in control than in intervention), although reasons similar between groups
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	High risk	Contamination: "Observations of research staff indicated that in two homes the control group residents were observed participating in activities with intervention group residents in the lounge or during walking group outings" Quote: "The mobility measures used may not have been sensitive enough to show small but important changes"

Pomeroy 1993

Methods	Design: RCT Duration: 15 weeks Follow up: none Method of randomisation: randomised cross-over design, using a random numbers table; participants were allocated to either group 1 or group 2 until 1 group contained 12 participants; the remaining participants were then allocated to the other group Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: n/a Losses to follow up: N = 8 (33%) Group 1: N = 4 (1 discharged home because of improvement with treatment, 2 deaths, 1 hip fracture during control phase); Group 2: N = 4 (2 general deteriorations, 1 circulation problems, 1 death)
Participants	Country: UK Setting: long-stay psychiatric hospital participants Randomised: 24 % women = 67 Age: mean = not reported; range = 61 to 91 years Consent: not specified Inclusion criteria: diagnosis of dementia, resident of facility, requiring assistance of 1 to 2 persons for transfers, weight-bearing not precluded by hip/knee contractures, < 18 mobility score, unable to stand/mobilise independently, medically fit to participate Exclusion criteria: medical = signs of severe osteoarthritis, cardiovascular disease, alcoholism, neurological pathology % Eligible within home: not reported % Eligible that participate: not reported Group 1: N = 12 Group 2: N = 12
Interventions	Study aim or objective: Does provision of physiotherapy input improve or maintain mobility skills in elderly people with dementing illness? Number of experimental groups: 2 Individual sessions Session duration: 30 minutes Number of sessions per week: 3 Seated: yes Group 1: physiotherapy followed by no intervention Group 2: no intervention followed by physiotherapy Physiotherapy comprised movement, music, body awareness, and individual functional mobility training; sessions were conducted by a physiotherapist in individual format, 3 times per week for 12 weeks, followed by 3 weeks of videoing
Outcomes	Physical function (other): Southampton Assessment of Mobility (Pomeroy 1990) Cognition: CAPE (Clifton Assessment Procedures for the Elderly) information/orientation score (Pattie 1981)
Notes	Funding: Research into Ageing grant Pilot study

Pomeroy 1993 (*Continued*)

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Used a random numbers table
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Cross-over design - all participants experienced the intervention and a control phase. The control phase consisted of no intervention. Therefore, it would have been apparent to the participants what the intervention under study was
Incomplete outcome data (attrition bias) All outcomes	High risk	Missing data for participants who did not complete all phases - "these were equally distributed between groups 1 and 2". However, 8/24 (33%) lost to follow up
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	This was a cross-over trial of an intervention with the potential for carry-over effects. However, only the first period used in this review so low risk of bias

Przybylski 1996

Methods	Design: RCT Duration: 2 years Follow up: none Method of randomisation: not described, but participants were stratified a priori by severity of their condition using the resident classification system (RCS) Concealment of allocation: unclear Outcome assessor blinding: yes - maintained Group comparability at entry: unclear Losses to follow up: N = 52 (45%) (29 deaths/discharges, 3 unable to complete tests, 20 insufficient test results) Individual group data not described
Participants	Country: Canada Setting: nursing Home Randomised: 115 % women = approximately 77 Age: mean = approximately 85 years (for original participants); range = 62 to 101 years Consent: fully-informed consent

	Inclusion and exclusion criteria: not reported % Eligible within home: not reported % Eligible that participate: not reported Intervention group: N = 58; age range = 62 to 97 years; women:men ratio = 3.5:1 Control group: N = 57; age range = 63 to 101; women:men ratio = 3.1:1
Interventions	Study aim or objective: to determine whether there is a difference in functional status among residents receiving 1 full-time physiotherapist and occupational therapist per 50 beds (enhanced) or per 200 beds (control) Number of experimental groups: 2 Individualised intervention delivery Session duration: not reported Number of sessions per week: not reported Seated: n/a Intervention group: enhanced therapy (physiotherapy/occupational therapy), i.e. increased hours of service on a 1.0 FTE/50 bed ratio, therapy tailored to individual, content/frequency not described Control group: usual treatment comprising minimal therapy input on a 1.0 FTE/200 bed ratio; no further details given
Outcomes	Physical function in ADL: FIM, Functional Assessment Measure, Clinical Outcomes Variables Scale Cost: cost
Notes	Funding: not reported; states that no commercial parties had any interest Physical and occupational therapists and their assistants operated conjointly on the programmes. No differentiation between these 2 disciplines was made in this study. Treatment was offered in a restorative, consultative, monitoring, low/high maintenance programme format, as suited each participant's needs

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	No information provided on initial sequence generation. Intervention was implemented over two years, with 29 new participants recruited throughout to replace participants who died or were discharged. The researchers had no control over who died, was discharged, or recruited to the groups, and made the assumption that this was a random process Inadequate as there is a non-random component
Allocation concealment (selection bias)	High risk	No information provided on concealment during initial allocation. The replacement process may have been visible to staff, so

Przybylski 1996 (*Continued*)

		allocation could not have been concealed
Blinding of participants and personnel (performance bias) All outcomes	High risk	Stated that the testers and the staff were all blind to which group residents had been assigned. However, potential contact between residents and the occupational therapy and physiotherapy staff with other staff members means unlikely that blinding was achieved
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	Stated that the testers and the staff were all blind to which group residents had been assigned
Incomplete outcome data (attrition bias) All outcomes	High risk	Large numbers lost including due to non-testing, not clear which groups they came from
Selective reporting (reporting bias)	High risk	Pre-intervention outcome scores were not provided (only 6 months, 12 months, 18 months, and 24 months)
Other bias	Low risk	No other apparent risks of bias

Resnick 2009

Methods	Design: cluster RCT Clustering accounted for Duration: 12 months Follow up: no
Participants	Characterisation: care-home residents Country: USA Setting: 12 nursing homes (8 'for profit' and 4 'not for profit') Randomised: 487 % women = 80% Age details: mean (SD) = 83.8 years (8.2); range = 65 to 102 years Inclusion criteria: residents were eligible to participate if they were aged 65 and older, had a MMSE score of 11 or greater (level II eligibility - criteria applied post-consent), had a life expectancy of longer than 6 months, and were not receiving skilled rehabilitation services ADL status details: not reported Cognitive status details: mean MMSE score: 20.4 +/- 5.3 Significant comorbidities: not reported Assessed: 2058 Excluded: overall = 1571, 1266 on eligibility criteria, 305 declined, 0 other

Interventions	Study aim or objective: to test the effectiveness of a restorative care (Res-Care) intervention on function, muscle strength, contractures, and quality of life of nursing-home residents, with secondary aims focused on strengthening self-efficacy and outcome expectations 2 groups Intervention: Res-Care Intervention group (N = 256) Format: not reported, delivered by nursing assistants Session length: not reported Res-Care was a 2-tiered self-efficacy-based intervention focused on motivating nursing assistants and residents to engage in functional and physical activities. Restorative care is a philosophy of care that focuses on restoring and maintaining, residents to their highest possible functional and physical status, given comorbidities. Examples include using verbal cues during bathing, transfers, mobility, so the resident performs the tasks, rather than the nursing assistant. Homes in the Res-Care intervention group were also provided with a research restorative care nurse as a prompt to nursing assistants and residents to engage in functional physical activities and to develop short- and long-term goals for residents Control: Control group (N = 231) A single in-service program on managing difficult behaviours. The control site did not receive any information about restorative care, and they were not provided with a restorative care nurse
Outcomes	Physical function in ADL: BI (0 to 100 scale) Physical function (other): Tinetti Mobility Scale (gait and balance) (Tinetti 1986), self-efficacy for functional ability (Resnick 1999; Resnick 2003) Muscle power (anaerobic): hand grip strength Flexibility: muscle contractures (upper extremities (fingers, wrist, elbow, and shoulders) and lower extremities (hip, knee, and ankle) Quality of life: Dementia Quality of Life Instrument (Brod 1999) Expectations of effects of exercise: Outcome Expectation for Functional Ability Scale (Resnick 1999; Resnick 2003)
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Staff involved in delivering intervention were not blind to participants in study/not in study

Resnick 2009 (*Continued*)

Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "A team of evaluators who were blinded to randomization and unfamiliar with the details of the Res-Care intervention measured all outcomes"
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	Quote: "A team of evaluators who were blinded to randomization and unfamiliar with the details of the Res-Care intervention measured all outcomes"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Large numbers lost to follow up, but balanced with similar reasons
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Riccio 1990

Methods	Design: RCT Duration: n/a (one-off intervention) Follow up: n/a Method of randomisation: in accordance with a counterbalanced design; no further details given Concealment of allocation: unclear Outcome assessor blinding: no Group comparability at entry: n/a Losses to follow up: none
Participants	Country: USA Setting: nursing home, residential retirement home, foster care home Randomised: 30 % women = 100 Age: mean = 80.9 years ± 9.2 years; range = 62 to 96 years Consent: not specified Inclusion criteria: Parachek score > 25 Exclusion criteria: see inclusion criteria % Eligible within home: not reported % Eligible that participate: not reported
Interventions	Study aim or objective: to examine the effects of verbally-elicited imagery in the encouragement of exercise in elderly women Number of experimental groups: 4 Group intervention delivery Session duration: not reported Number of sessions per week: n/a Seated: yes Exercise features:

Riccio 1990 (*Continued*)

	Order 1: control condition followed by imaging Order 2: imaging followed by control condition Imaging: added-purpose activity, e.g. reach down as if you are picking up something from the floor Control: rote exercise activity, e.g. reach down to the floor with both hands 2 exercises were performed as above - a reaching-up exercise and a reaching-down exercise. Interventions were one-offs, supervised by a researcher
Outcomes	Endurance (physical other): duration of exercise, frequency of repetition
Notes	Funding: not reported

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "...subjects randomly assigned to different orders in accordance with a counterbalanced design" No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No information given. Participants received both interventions
Incomplete outcome data (attrition bias) All outcomes	Low risk	Three lost from group 1; zero from group 2. Reasons unlikely to be related to intervention-conflicting appointments and refused to participate (cross-over)
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	Cross-over design, but intervention unlikely to produce a carry-over effect

Rolland 2007

Methods	Design: RCT Details: multi-centre Duration: 12 months Follow up: no
Participants	Characterisation: ambulatory participant with Alzheimer's disease Country: France Setting: nursing homes

	Randomised: 134 % women = 75% Age details: mean (SD) = 83 years (7.4); range = 62 to 103 years Inclusion criteria: meet the National Institute of Neurological and Communicative Diseases and Stroke/Alzheimer's Disease and Related Disorders Association criteria for probable or possible Alzheimer's disease Resident in the nursing home for at least 2 months Able to transfer from a chair and walk at least 6 metres without human assistance Exclusion criteria: evidence of vascular dementia or Parkinson's disease, planned transfer from the nursing home for surgery in the year to come, a cardiac condition that might deteriorate during exercise, diagnosis of a terminal illness with a life expectancy of less than 6 months ADL status details: Katz ADL mean (SD) = 3.1 (1.3) Cognitive status details: MMSE 8.8 (6.6) Significant comorbidities: comorbidities, N (%) exercise group and routine-care group 1 comorbidity: 9 (13.4) + 16 (23.9) = 25 (18.7%) 2 comorbidities: 21 (31.3) + 15 (22.4) = 36 (26.9%) 3 or more comorbidities: 26 + (38.9) 12 (17.9) = 38 (28.4%) Assessed: 429 Excluded: overall = 295, 187 on eligibility criteria, 65 declined, 43 other
Interventions	Study aim or objective: to investigate the effectiveness of an exercise program in improving ability to perform ADLs, physical performance, and nutritional status and decreasing behavioral disturbance and depression in participants with Alzheimer's disease 2 groups Intervention: Physical exercise program (N = 67) Format: group, delivered by occupational therapist in care home Session length: 60 minutes, twice weekly Personalised walk, strength, balance, and flexibility training to music: A walking route was established around each home passing all participants' rooms. Participants were paired and encouraged to walk fast enough to become somewhat breathless. Around the trail were stations for strength, balance, and flexibility training. Strength training included squats, heel raises and leg lifts; balance training involved 1 or 2 leg balance exercises and a small step test with cones and hoops; flexibility training involved repetition of demonstrated exercises Control: control (N = 67) Usual care
Outcomes	Physical function in ADL: Katz ADL Scale (Katz 1963), Get Up and Gotest (Mathias 1986), six-metre walk (speed m/s) Balance: one-leg balance test (Vellas 1997) Mood related: depression (Montgomery-Assberg Depression Rating Scale; MADRS) Anthropometry: weight Nutrition: Mini-Nutritional Assessment (MNA) Psychiatric status: Neuropsychiatric Inventory (NPI) (Cummings 1994)
Notes	-

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Staff not involved in intervention or assessment performed separate randomization at each site by lottery draw"
Allocation concealment (selection bias)	Unclear risk	Quote: "Staff not involved in intervention or assessment performed separate randomization at each site by lottery draw" However, unclear if drawing was concealed, e.g. open hat
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "...single-blind study..." Residents assigned to exercise or usual care so assignment obvious
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	A single geriatrician who was blinded to the intervention assignment measured outcomes at baseline, 6 months, and 12 months on different days from the intervention
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	A single geriatrician who was blinded to the intervention assignment measured outcomes at baseline, 6 months, and 12 months on different days from the intervention
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing outcome data balanced across groups (13 control, 11 exercise) with similar reasons
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Rosendahl 2006

Methods	Design: cluster RCT Duration: approximately 3 months (13 weeks) - 29 occasions Follow up: 12 weeks Method of randomisation: after inclusion of participants and baseline assessments, 34 clusters of 3 to 9 participants living on the same floor, wing, or unit were randomly assigned to exercise or control activity Randomisation was stratified in order to have both groups in each facility; within each cluster, the nutrition intervention was randomised individually Randomisation using lots in sealed envelopes Concealment of allocation: yes Outcome assessor blinding: yes, checked at 3 months - if they correctly guessed the participant's group, they were replaced - the case for 11% of participants; checked again at 6 months (1%) Group comparability at entry: no, significant differences, P < 0.05 for perception of health and prescriptions for proton pump inhibitors Losses to follow up: 28 (15%)
Participants	Country: Sweden (Umeå) - frail older people - activity and nutrition study (FOPANU study) Setting: 9 residential care facilities Randomised: 191 (of 487 screened) % women = 73 Age: mean = 84.7 years ± 6.5 years; range = 65 to 100 years Consent: assent accepted Inclusion criteria: aged 65 years, dependent on assistance from a person in 1 or more ADL according to the Katz index, able to stand up from a chair with arm rests with help from no more than 1 person, MMSE score of 10 or higher, approval from the resident's physician Exclusion criteria: see inclusion criteria % Eligible within home: 39 % Eligible that participate: not reported Exercise + protein drink: 85.0 years ± 6.7 years; women = 78% Exercise + placebo drink: 85.5 years ± 5.5 years; women = 69% Control + protein drink: 82.9 years ± 6.4 years; women = 70% Control + placebo drink: 85.6 years ± 7.0 years; women = 74%
Interventions	Study aim or objective: to determine whether a high-intensity functional exercise programme improves balance, gait ability, and lower limb strength in activities of daily living, and if an intake of protein-enriched energy supplement immediately after the exercise increases the effects of the training Number of experimental groups: 4 Group intervention delivery Session duration: no longer than 45 minutes Number of sessions per week: 5 Seated: unclear Groups: both an exercise intervention compared with control activity and a nutrition intervention compared with a placebo in a 2 x 2 factorial model Both exercise and control held within the facility; similar distance from where participants stayed; where a participant did not attend the session, individual activity was offered

	where possible Exercise features: groups of 3 to 9 participants, supervised by 2 physiotherapists Exercise intervention: based on the high-intensity functional exercise programme (HIFE programme of Littbrand 2006), functional exercises consisting of everyday tasks challenging leg strength, postural stability, and gait ability; exercises selected for each participant according to their deficits; all performed in weight-bearing positions; encouraged to exercise at high intensity and to increase load and difficulty progressively, considering changes in function and health status; tasks followed up after 3 months by asking staff about compliance during the previous 2 weeks Control: developed by occupational therapists and involved activities while sitting watching films, reading, singing, and conversing; groups of 3 to 9 participants, supervised by 1 occupational therapist; based on themes - the old country shop, famous persons, games from the past; designed to be stimulating, even to people with cognitive impairment Nonexercise features: Nutrition intervention: protein enriched energy supplement, placebo-drink control packaged in the same way as the intervention drink and had similar flavours
Outcomes	Falls: falls (any episodes for participant), fall rate (falls per person years) Physical function in ADL: Modified Chair Stand (Guralnik 1994), BI (0 to 20), gait speed (self paced) 2.4 metres, gait speed (maximum) 2.4 metres Muscle power (anaerobic): lower-limb strength (1 repetition-maximum) Balance: BBS Adverse events (other): adverse event rate (within intervention) Feasibility and acceptability: performance of high-intensity strength training and balance exercises, attendance
Notes	Funding: grants from the City Council of Västerbotten, the Vårdal foundation, the Magnus Bergvalls Foundation, the Äldrecentrum Västerbotten, the Umeå University Foundation for Medical research, the Gun and Bertil Stohne Foundation, Erik and Anne-Marie Detlof's foundation, the Loo and Hans Ostermans Foundation, the Borgerskapet in Unmeå Research foundation, the Swedish Research Council and the Swedish Council for Working Life and Social Research and Norrmejerier

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Stated that researchers not involved in the study performed the randomisation using lots in sealed non-transparent envelopes
Allocation concealment (selection bias)	Low risk	Stated that researchers not involved in the study performed the randomisation using lots in sealed non-transparent envelopes
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Even though the clusters were in separate flats, they were within the same facilities. As a result, there may have been contact between the exercise intervention group and

Rosendahl 2006 (*Continued*)

		the control group
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Trained physiotherapists blind to group allocation undertook assessment for mobility/balance outcome measures
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Stated ITT, but results appear to be 'as treated' (N at 3 months and 6 months is different to N randomised) N lost = 14 in both groups, but twice as many died in the exercise group
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Sackley 2006

Methods	Design: cluster RCT Duration: 12 weeks Follow up: 12 weeks Method of randomisation: carried out independently by a statistician, homes grouped into 4 strata, using combinations of type (residential, nursing, both), funding source (private or local authority), and setting (urban or rural). Within each stratum, pairs of homes were allocated randomly, using computer-generated random numbers Concealment of allocation: yes Outcome assessor blinding: yes Group comparability at entry: yes Losses to follow up: N = 13 (11%)
Participants	Country: UK Setting: 12 care homes, (approached the managers of 14 homes: 1 refused, 1 home used as a pre-pilot) 12 entered into the study in 3 groups of 4 to control therapists' workload Randomised: 118 % women = 82 Age: mean: approximately 87 years; range = 44 to 102 years Consent: not specified Inclusion criteria: residents with stroke, staff asked to screen people with the BI, information on stroke history and cognitive status for the purpose of consent Exclusion criteria: medical = acute illness, terminally ill % Eligible within home: 46 % Eligible that participate: 61.8 Intervention: 88.6 years ± 6.5 years (62 to 102 years); 83% women Control: 86.3 years ± 8.8 years (44 to 99 years); 82% women Intervention: 6 homes; 63 residents, (3 months: 59 assessed, 3 died; before occupational therapy: 1 died during/after treatment; 6 months: 53 assessed, 6 died) lost 10 to follow up. Control: 6 homes; 55 residents (3 months: 46 assessed, 9 died; 6 months: 35 assessed,

	11 died) lost 20 to follow up
Interventions	Study aim or objective: evaluation of occupational therapy intervention to improve self-care independence for residents with stroke related disability living in care homes Number of experimental groups: 2 Individualised intervention delivery Session duration: n/a Number of sessions per week: n/a Seated: n/a Intervention: provided by experienced occupational therapist delivered to the individual, targeted at improving independence in personal activities of daily living, frequency and duration dependent on resident's and therapist's agreed goals, took place over a 3-month period, intervention group given interview of 1 hour to establish functional ability and agree goals Control: usual care
Outcomes	Physical function in ADL: RMI (Collen 1991), BI (0 to 20) Death and physical deterioration (chronic): poor global outcome (deterioration in BI or death)
Notes	The Stroke Association, Health Foundation, Department of Health Research Capacity Development Program Pilot study

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Homes were allocated randomly, using computer-generated random numbers"
Allocation concealment (selection bias)	Low risk	Quote: "Randomisation was carried out independently by a statistician"
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "Allocation was revealed only to the occupational therapist, not to the assessors" Control was usual care, so participants could not be blinded to allocation
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	Quote: "Allocation was revealed only to the occupational therapist, not to the assessors" Quote: "Assessments were completed...by 1 of 4 research staff masked to the trial allocation"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Imbalance in numbers lost to follow up between intervention and control group, but this was largely due to many deaths in the

Sackley 2006 (*Continued*)

		control group, and unlikely to be related to intervention
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Sackley 2008

Methods	Design: cluster RCT Clustering not accounted for. Details: phase II, exploratory randomised controlled trial with cluster randomisation (at the level of care home) Duration: 4 weeks Follow up: yes
Participants	Characterisation: care-home residents with a range of functional, cognitive, and continence impairments Country: UK Setting: 6 care homes (2 provided nursing) Randomised: 34 % women = 88% Age details: mean (SD) = 86 (9); range = 76 to 101 years Inclusion criteria: staff used their knowledge of residents' functional, cognitive, and continence status to select 10 residents with a range of functional, cognitive, and continence impairments Exclusion criteria: none stated ADL status details: BI ADL, mean (SD): Intervention: 10.7 (5.3); Control: 9.8 (4.4) Cognitive status details: Short Orientation-Memory-Concentration test < 22: 23 (70%) Significant comorbidities: incontinent of urine: 21 (64%) Assessed: 211 Excluded: overall = 177, 0 on criteria, 26 declined, 151 other
Interventions	Study aim or objective: to assess feasibility, acceptability and potential efficacy of group exercise and staff education intervention to promote continence in older people residing in care homes. To establish measures and information to inform a larger trial. 2 groups Intervention: Intervention (N = 17) Format: group, delivered by physiotherapist Session length: 60 minutes, twice weekly Mobility training protocol - participants were encouraged to walk or wheel to class. They then practised the task-related training of functional ADLs (e.g. practising standing up from a chair) and strength, balance, endurance, and flexibility exercises. Music played during the class, and exercises were fun, making use of balloons and balls Pre-training and post-training prompted voiding and fluid intake were included to promote continence Residents set their own pace but were encouraged to improve on previously achieved

	goals. Residents' progress was reviewed and their views were gathered The staff education component comprised separate 2-hour workshops on continence care and mobility care. The continence training was delivered by specialist nurses from the local Primary Care Trust Continence Team and the mobility training by a qualified physiotherapist and occupational therapist Control: control (N = 17) Standard care which involved very little expert care
Outcomes	Physical function in ADL: RMI (Collen 1991) Continence: continence (urodynamic questionnaire) (Matharu 2005)
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	An independent statistician randomly allocated three care homes to each study group, using computer-generated random numbers
Allocation concealment (selection bias)	Low risk	An independent statistician randomly allocated three care homes to each study group, using computer-generated random numbers
Blinding of participants and personnel (performance bias) All outcomes	High risk	No report of blinding of participants; those in control group received usual care, so would have been obvious that they weren't receiving an intervention
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	Quote: "Study outcomes were assessed...by an assessor who was masked to allocation"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Imbalance in number of participants lost to follow up between groups (more in control than in intervention - unlikely to be related to the intervention)
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable. Mean mobility scores (RMI) reported without providing SD or CI
Other bias	Low risk	No other apparent risks of bias

Sackley 2009

Methods	Design: cluster RCT Clustering accounted for Duration: 3 months Follow up: yes
Participants	Characterisation: care home residents with mobility limitations and limitations in ADLs Country: UK Setting: care homes providing care for physical disability and older people with more than 5 beds Randomised: 249 % women = 74% Age details: mean = 85, SD = 9 Inclusion criteria: 5 ≤ BI score ≤ 16 Exclusion criteria: admitted to hospital with acute illness Admitted to the care home for end-of-life care ADL status details: none stated Cognitive status details: MMSE scores: < 21: 168 (67%) 21 to 23: 21 (8%) > 24: 60 (24%) Significant comorbidities: 56% with arthritis 23% with cardiovascular problems 40% dementia 36% diabetes 22% with at least 1 confirmed stroke (conservative, also reported as 24% and 46%) Assessed: not reported Excluded: not reported
Interventions	Study aim or objective: to compare effectiveness of physiotherapy and occupational therapy with standard care in care-home residents who have mobility limitations and are dependent in performing ADLs 2 groups Intervention: intervention (physiotherapy + occupational therapy) (N = 128) Format: individual, delivered by 2 qualified physiotherapists, occupational therapists, staff training providers unstated Session length: not reported, but therapy customised to the individual, not reported Physiotherapy and occupational therapy intervention: Physiotherapy aimed at enhancing mobility and ability to perform ADLs independently through practising functional tasks and therapy for components (e.g. flexibility, balance) . Customised to the individual Occupational therapy aimed at increasing independence in ADL through routine assessment, treatment, and reassessment. In addition, staff were trained in promoting independence and use of therapeutic aids Control: control (N = 121) Standard care as before the trial. Occupational therapy not routinely used by any of the homes and physiotherapy only accessed by GP referral

Outcomes	Physical function in ADL: TUG test (seconds) (Podsiadlo 1991), RMI (Collen 1991), BI (0 to 20)
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Randomisation was performed by an independent principal statistician who used a computer-generated randomisation list"
Allocation concealment (selection bias)	Low risk	Quote: "Randomisation was performed by an independent principal statistician who used a computer-generated randomisation list"
Blinding of participants and personnel (performance bias) All outcomes	High risk	Quote: "Treatment arm was revealed to the treating therapists only, thereby ensuring that allocation was concealed from the independent assessors responsible for all subsequent assessments" Control group received usual care
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "Treatment arm was revealed to the treating therapists only, thereby ensuring that allocation was concealed from the independent assessors responsible for all subsequent assessments"
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	Quote: "Treatment arm was revealed to the treating therapists only, thereby ensuring that allocation was concealed from the independent assessors responsible for all subsequent assessments"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing outcome data balanced in numbers across intervention groups, with similar reasons for missing data across groups Note: If TUG had been analysed and reported it probably would have led to an assessment of high risk of bias due to incomplete outcome data (see selective reporting)
Selective reporting (reporting bias)	High risk	HADS-D was described as an outcome measure, but not reported post-interven-

		tion and its exclusion not discussed. TUG was not analysed or reported because so few participants were able to complete it
Other bias	Low risk	No other apparent risks of bias

Santana-Sosa 2008

Methods	Design: RCT Details: blocked randomisation (by gender) Single-blind Duration: 12 weeks Follow up: no
Participants	Characterisation: people with Alzheimer's disease Country: Spain Setting: residential nursing home Randomised: 16 % women = 38% Age details: mean (SD): Training group: 76 (4) Control group: 73 (4) Inclusion criteria: diagnosed by a trained geriatrician; with Alzheimer's disease of low-medium grade, i.e. score ranging between 18 to 23 in the Spanish; validated version for the general geriatric population of the MMSE; to have lived in the nursing home for at least 4 months; free of neurological (other than Alzheimer's disease), vision, muscle, or cardiorespiratory disorders Exclusion criteria: ADL status details: not reported Cognitive status details: mean (SD) MMSE score: Training group: 20.1 (2.3) Control group: 19.9 (1.7) Significant comorbidities: Alzheimer's disease Assessed: not reported Excluded: not reported
Interventions	Study aim or objective: to determine the effects of a 12-week training program for Spanish participants with Alzheimer's disease on their (1) overall functional capacity (muscle strength and flexibility, agility and balance while moving, and endurance fitness), and (2) ability to perform ADLs 2 groups Intervention: training group (N = 8) Format: group, delivered by exercise scientist in a room inside the nursing home Session length: approximately 75 minutes, 3 times weekly 36 programmed training sessions Each session started and ended with a 15-minute warm-up and 15-minute cool-down period, respectively, consisting of walking without reaching breathlessness (on an inside

	walking trail) and "gentle" stretching exercises for all major muscle groups. The core portion of the training session was divided into joint mobility, resistance, and co-ordination exercises. Joint mobility exercises focused on shoulder, wrist, hip, knee, and ankle joints. Resistance training included 9 exercises with elastic medium-resistance bands (3 sets of 15 repetitions each) engaging some of the major muscle groups: chest, biceps, triceps, shoulder, knee extensors, abductor and adductor muscles, and calf muscles. All exercises were performed through the full range of motion normally associated with correct technique for each exercise. Stretching exercises of muscles were performed at the end of each set of resistance exercises. Co-ordination exercises were performed with foam balls of gradually decreasing size over the program, e.g. bouncing a ball with both hands, tossing and catching a ball, etc. Music (from the participants' youth years) accompanied each session Control: Control group (N = 8) Routine nursing/medical care Did not perform any type of programmed physical activity, except those necessary for daily living, i.e. normal ambulation inside the nursing home
Outcomes	Physical function in ADL: TUG test (modified to 8 feet) (Bassey 1992; Rikli 1999), Katz ADL Scale (Katz 1963), BI (0 to 100 scale) Physical function (other): sit-to-stand (average number in 30 seconds), Tinetti Mobility Scale (gait and balance) (Tinetti 1986), 2-minute step in place Muscle power (anaerobic): arm curl Flexibility: Back Scratch test (Rikli 1999), 'Sit-and-reach' test
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Unclear if participants were blinded, but they all came from the same nursing home, and the control group did not receive any intervention so would probably have been obvious which group they were in
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Reported that the study was single-blind, and the exercise scientist performing the evaluations was different to the 1 delivering the intervention, implying that the assessor was blind to allocation

Santana-Sosa 2008 (*Continued*)

Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	Reported that the study was single-blind, and the exercise scientist performing the evaluations was different to the one delivering the intervention, implying that the assessor was blind to allocation
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No losses to follow up reported
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Sauvage 1992

Methods	Design: RCT Duration: 12 weeks Follow up: none Method of randomisation: not specified Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: yes Losses to follow up: N = 2 (16.7%)
Participants	Country: USA Setting: VA Medical Centre nursing unit Randomised: 14 (12 individuals) (reports for I = 8, C = 6, but 2 participants were lost from the initial intervention group; these were later replaced by 4 control participants; therefore, outcome data are only reported for different 10 individuals, with 4 completing both intervention and control conditions) % women = 0 Age: mean = 73 ± 4 years; range = not reported Consent: fully-informed Inclusion criteria: > 60 years, independently mobile without aid, evidence of gait/balance difficulties (Tinetti Score 30 or less), lower limb weakness (quadriceps/hamstrings < 5), isokinetic quadriceps and hamstrings < 80% of age-predicted normal Exclusion criteria: cognitive = moderate-severe dementia (MMSE < 22); medical = asymmetrical focal neurological deficit, lower limb amputation, lower limb discrepancy > 1 inch, significant systematic disease, e.g. cancer; functional = refusal of consent % Eligible within home: 12 % Eligible that participate: 52.2 Intervention group: N = 6; mean age = 73.38 years ± 4.04 years; all male Control group: N = 6; mean age = 73.83 years ± 4.74; all male
Interventions	Study aim or objective: to determine whether a moderate to high intensity strengthening and aerobic exercise programme can improve the strength, exercise capacity, gait, and balance of deconditioned nursing-home residents Number of experimental groups: 2

	Group intervention delivery Session duration: 60 minutes Number of sessions per week: 3 Seated: unclear Intervention group: progressive-resistance lower-limb weight training and aerobic conditioning, group format: 20 minutes of aerobic exercise, 10 repetitions per lower limb exercise, conducted 3 times per week for 12 weeks; personnel not described Control group: usual care with maintenance physiotherapy when indicated
Outcomes	Physical function in ADL: gait speed/velocity (left and right each) Physical function (other): Tinetti Test - gait, stride length, steps per minute (step cadence) , gait duration (step time, seconds) Muscle power (anaerobic): isokinetic strength (quadriceps, hamstrings, knee flexion and extension; each and combined, left, right, and combined; Sauvage et al) Balance: stance time (% of total time), Tinetti Test modified sub-scale (6 items combining strength and balance) (Sauvage 1992), stance time (seconds), Tinetti Test - Body Balance, balance (Sauvage 1992) (eyes open and eyes closed; average distance from centre of pressure and total distance travelled by centre of pressure (mm)) Endurance (physical other): heart rate, VO2 max, knee resistance repetitions (number of reps completed at 180 degrees/second before strength declined to < 50% of peak torque) (Sauvage 1992) Acute health events: adverse effects, hospitalisations Feasibility and acceptability: attendance
Notes	Funding: Department of Veterans Affairs Medical Research Service and Rehabilitation Research and Development Service Because of resource limitations, it was not possible for all outcome measures to be assessed by blinded raters. However, raters who did not know the residents' group assignment did blinded ratings of FIT assessment performance during approximately 10% of the post-intervention assessments in order to help minimise potential bias of un-blinded raters

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Quote: "...were then randomized." No details reported. However, randomisation not specified at all for subsequent reduction to 12 participants or for the 4 control participants crossed over
Allocation concealment (selection bias)	High risk	Quote: "...were then randomized." No details reported. However, randomisation not specified at all for subsequent reduction to 12 participants or for the 4 control participants crossed over

Sauvage 1992 (*Continued*)

Blinding of participants and personnel (performance bias) All outcomes	High risk	Not reported, but control was usual care; therefore, obvious
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	No report of blinding of outcome assessment
Incomplete outcome data (attrition bias) All outcomes	High risk	2 of 6 original exercise-group participants (33%) lost to follow up. No control group participants lost (1st phase). Unknown number lost from original allocation when group reduced to 6
Selective reporting (reporting bias)	High risk	Original protocol not available, but outcomes reported in such a way that they could not be used in a meta-analysis (mixing of related and independent participants)
Other bias	Low risk	No other apparent risks of bias

Schnelle 1995

Methods	Design: RCT Duration: 8 weeks Follow up: none Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: partial (see notes) Group comparability at entry: yes Losses to follow up: intervention group N = 18 (19.1%)
Participants	Country: USA Setting: 5 proprietary nursing facilities Randomised: 94 % women = 78 Age: mean = 85.1 years ± 8.2 years; range = not reported Consent: assent acceptable Inclusion criteria: incontinent of urine, passing basic cognitive screen Exclusion criteria: cognitive = severe cognitive impairment that precluded participation; medical = indwelling catheters; functional = unable to weight bear, unable to propel wheelchairs because of irreversible physical limitations, e.g. paralysis % Eligible within home: 75 % Eligible that participate: 34.6 Intervention group: N = 36 Control group: N = 40

Interventions	Study aim or objective: to determine if an exercise intervention (FIT) results in improvements in mobility, endurance, and physical activity when compared with prompted voiding among cognitively and mobility impaired residents Number of experimental groups: 2 Individualised intervention delivery Session duration: Number of sessions per week: 20 All components were conducted after each of 4 prompted voiding episodes per day, 5 days per week, and progressed over the 8-week study period Seated: unclear Intervention group: prompted voiding and FIT exercise intervention, comprised incontinence care, and social interaction, 1 to 2 stands, 1 transfer, walking/wheeling exercises, and sit-to-stand Intervention group received approximately 2 times greater input than the control group, delivered by research staff on an individual basis over 8 weeks Control group: prompted voiding only, comprised incontinence care and social interaction, 1 to 2 stands, and 1 transfer, conducted every 2 hours, 4 times per day, 5 days a week for the 8-week period, delivered by research staff on an individual basis
Outcomes	Physical function in ADL: wheelchair mobility endurance (wheel as long as he/she could) (Schnelle 1995), walking endurance (walk as long as he/she could (minutes)) (Schnelle 1995), wheelchair speed over maximal wheeling distance, wheelchair speed over 6 metres, walking speed over maximal walking distance, six-metre walk (speed m/s) Physical function (other): sit-to-stand (average number in 30 seconds) Agitation: agitation (daytime behavioural observation) Physical activity: behavioural observations (standing/walking) Energy expenditure: physical activity (kCal/hour) Feasibility and acceptability: adherence (percentage of sessions in which all, part, or none of the exercise goal was achieved), attendance
Notes	National Institute on Aging (NIA) Pepper Centre grant Ratings of FIT assessment performance during approximately 10% of the post-intervention assessments in order to help minimise potential bias of un-blinded raters

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Authors state that the residents were randomised to receive either prompted voiding or prompted voiding plus FIT, but do not specify how random sequence was generated
Allocation concealment (selection bias)	Unclear risk	Authors state that the residents were randomised to receive either prompted voiding or prompted voiding plus FIT, but do not specify if allocation was concealed

Schnelle 1995 (*Continued*)

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding of participants and personnel not reported. Same setting, but two interventions so could have been blinded
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	High risk	Quote: "It was not possible for all outcome measures to be assessed by blinded raters" Did manage to perform blinded ratings of approximately 10% of assessments
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Unclear if there was any missing outcome data - number of residents on which outcome data were assessed was not reported
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Schnelle 1996

Methods	Design: RCT Duration: 9 weeks Follow up: none Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: partial (50% of assessments were blind) Group comparability at entry: yes Losses to follow up: 26 (26.8%): intervention group N = 12 (8 deaths/transfers, 4 refused to comply); control group N = 14
Participants	Country: USA Setting: 5 proprietary nursing facilities Randomised: 97 % women = not reported Age: mean = 84 years; range = not reported Consent: not specified Inclusion criteria: > 65 years of age, medical order for physical restraint or visual documentation of restraint use by research staff, basic cognitive and behavioural responsiveness Exclusion criteria: medical: paralysis, contracture, foot drop, severe arthritic pain % Eligible within home: 94 % Eligible that participate: 80.7 Intervention group: N = 47 Control group: N = 50
Interventions	Study aim or objective: to evaluate an exercise protocol designed to improve strength and mobility and decrease injury risk factors in physically restrained nursing-home residents Number of experimental groups: 2 Individual intervention delivery

	Session duration: not reported Number of sessions per week: 3 Seated: if necessary Intervention group: exercise safety intervention protocol; comprised mobility exercise, safety practice, rowing endurance, and strengthening exercises; targeted pre-set goals and progressed by 10% each week; conducted on an individual basis by a research staff member, 3 times per week for 9 weeks Control group: usual care
Outcomes	Risk of falling: Safety Assessment for the Frail Elderly (SAFE)Transition Score (Schnelle 1994), SAFE Walk Score (Schnelle 1994), SAFE Total Score (Schnelle 1994), SAFE Judgement Score (Schnelle 1994) Physical function in ADL: walk or wheel time per day (estimated from observations), walking endurance (walk as long as he/she could (seconds), Schnelle 1995), wheelchair speed over 6 metres, six-metre walk (speed m/s), wheelchair mobility endurance (wheel as long as he/she could, Schnelle 1995) Physical function (other): sit-to-stand (average number in 30 seconds), sit-to-stand (time for first, seconds) Muscle power (anaerobic): row force (force produced during rowing, Schnelle 1996), hand grip strength Flexibility: row range of motion (Schnelle 1996) Endurance (physical other): row time (row as long as possible) (Schnelle 1996) Other: restraint use Feasibility and acceptability: attendance, adherence (percentage of sessions in which all, part, or none of the exercise goal was achieved)
Notes	NIA Pepper Centre grant Blinded evaluation on all mobility assessments was accomplished in more than 50% of the observations in all homes but the first site; no significant inter-site difference in outcome data was identified as a result of this

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Authors state that residents were randomised into 1 of the 2 groups, but do not indicate how random sequence was generated
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	No report of blinding of participants, but usual care so intervention would have been obvious
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	High risk	Quote: "Blinding was accomplished on only 50% of the observations"

Schnelle 1996 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes	High risk	Missing data - standing and walking outcomes could only be measured in ambulatory residents; SAFE assessment not available for the first nursing home
Selective reporting (reporting bias)	Unclear risk	Figures not reported for all prespecified outcome measures, but commented upon in results section
Other bias	Low risk	No other apparent risks of bias

Schnelle 2002

Methods	Design: RCT Duration: 8 months Follow up: none Method of randomisation: computerised randomisation program Concealment of allocation: unclear Outcome assessor blinding: partial - 1 of 2 observers was blind Group comparability at entry: yes Losses to follow up: at 8 weeks N = 18 (22%)
Participants	Country: USA Setting: 4 nursing homes (long-stay beds) Randomised: 190 N = 330 met inclusion criteria N = 257 gave informed consent N = 190 baseline assessments completed % women = approximately 84 Age: mean = 87 years ± 8 years; range = not reported Consent: assent accepted Inclusion criteria: incontinent of urine (free of a catheter), able to follow a one-step instruction Exclusion criteria: medical: residents of post-acute skilled care units, terminal illness, catheterised % Eligible within home: 73 % Eligible that participate: 57.6 Intervention group: N = 9; age range = 71 to 95 years; 8 women Control group: N = 7; age range = 65 to 70 years, 76 to 95 years; 4 women
Interventions	Study aim or objective: to examine clinical outcomes and describe the staffing requirements of an incontinence and exercise intervention Number of experimental groups: 2 Individualised intervention delivery Session duration: not reported Number of sessions per week: every 2 hours up to a maximum of 4 episodes per day, 5 days per week for 32 weeks Seated: where necessary

	Intervention group: prompted voiding, walking/wheeling, sit-stands, supervised by research staff, once daily upper limb resistance training Control group: usual care
Outcomes	Physical function in ADL: walked maximum 10 minutes, wheeled (metres average) 10 minutes (Schnelle 2002), wheeled maximum 10 minutes, standing test (level of assistance) (Schnelle 2002), walked (metres average) 10 minutes (Schnelle 2002), 10-minute walk/wheel (average distance), walked and wheeled (metres maximum) 10 minutes (Schnelle 2002) Physical function (other): sit-to-stand (maximum number in 30 seconds), sit-to-stand (average number in 30 seconds) Muscle power (anaerobic): arm curl (maximum lift in pounds), arm raise (maximum lift in pounds) Physical activity: behavioural observations (standing/walking) Continence: appropriate toileting ratio (stool), urinary incontinence frequency, appropriate toileting ratio (urine), bowel movement frequency (incontinent and continent), fecal incontinence frequency Anthropometry: weight Energy expenditure: energy expenditure by motion sensor Nutrition: food and fluid intake during meals (average total per cent) Pain: Geriatric Pain Measure (modified 13 items), pain (number of pain reports per metre of mobility), MDS: documentation of pain (Section J, item 2a: frequency) Acute health events: acute healthcare conditions (episodes) (Schnelle 2003) Cost: healthcare cost (Schnelle 2003)
Notes	"Supported by Grant AG13013 from the National Institutes of Health: Mobility and Incontinence Management Effects on Sickness, and Grant AG10415 from the National Institute on Aging: UCLA Claude D. Pepper Older Americans Independence Center"

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Quote: "Residents were randomized into intervention and control groups using a computerized randomization program completed after baseline assessments"
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Likely to have been incomplete blinding. Whilst attempts were made to blind staff involved in the trial "blinding observers to group assignment whenever possible", participants would probably have been aware of treatment allocation

Schnelle 2002 (*Continued*)

Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	High risk	Stated: "...blinding observers to group assignment whenever possible", suggesting this was not accomplished all of the time
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Loss to follow up moderate, but individual groups not reported (*Primarily* because of death or prolonged illness)
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Schoenfelder 2000

Methods	Design: RCT Duration: 12 weeks Follow up: 12 weeks Method of randomisation: participants were matched in pairs, according to their Risk Assessment for Fall Scale II, and then randomly assigned within each pair to the intervention or control group Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: yes Losses to follow up: N = 0 at 12 weeks, at follow up: intervention group N = 2 (illness/death); control group: none
Participants	Country: USA Setting: 2 long-term care facilities Randomised: 16 % women = 75 Age: mean = 82.8 years; range = 65 to 95 years Consent: fully-informed consent Inclusion criteria: > 65 years of age, independently mobile (+/- aid), able to speak/understand English, MMSE score > 20 Exclusion criteria: medical = unstable physical condition, terminal illness; functional = abusive behaviour % Eligible within home: not reported % Eligible that participate: not reported Intervention group: N = 9; age range = 71 to 95 years; 8 women Control group: N = 7; age range = 65 to 95 years; 4 women
Interventions	Study aim or objective: to investigate the role of exercise in preventing falls, specifically assessing the effectiveness of an ankle strengthening and walking programme to improve balance, ankle strength, walking speed, and falls efficacy and to decrease falls and fear of falling Number of experimental groups: 2 Unclear whether intervention delivery is group or individualised Session duration: 20 minutes

Schoenfelder 2000 (*Continued*)

	Number of sessions per week: 3 Seated: no Intervention group: ankle strengthening programme (heel raises), walking programme (increasing speed/distance), intervention delivered by a researcher Control group: usual care
Outcomes	Risk of falling: Fall Risk Assessment (RAFS II) (Ross 1991) Falls: number of falls Fear of falling: fear of falling (single item 4-point scale) (Tinetti 1990), Falls Efficacy Scale (modified) (Schoenfelder 2000) (10 item fear of falling) Physical function in ADL: six-metre walk (time) Muscle power (anaerobic): ankle strength (number of heel raises in 30 seconds) Balance: balance (tandem stance, up to 10 seconds), balance (semi-tandem stance, up to 10 seconds), balance (parallel stance, up to 10 seconds) Cognition: MMSE Physical activity: behavioural observations (standing/walking)
Notes	Funding: Gerontological Nursing Interventions Research Center grant

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "Subjects were matched in pairs and assigned randomly within each pair" No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	No report of blinding of participants, but would probably have been obvious to the participants which group they were in. Control was usual care in same setting
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	No report of blinding of outcome measurement
Incomplete outcome data (attrition bias) All outcomes	High risk	Missing outcome data for 2 (of 9) participants in the intervention group who could not complete 6-month measures
Selective reporting (reporting bias)	High risk	Some outcome measures not reported No results reported for the statistical analysis procedure reported to have been used in Data Analysis section, simply a comment that "statistical significance was not

Schoenfelder 2000 (*Continued*)

		reached"
Other bias	Low risk	No other apparent risks of bias

Schoenfelder 2004

Methods	Design: RCT, matched-pairs design Duration: 3 months Follow up: 3 months Method of randomisation: matched in pairs by Risk Assessment for Falls Scale II scores (RAFS II) Concealment of allocation: yes - where participants were roommates or spouses, they were assigned to the same group to lessen the possibility of contamination Outcome assessor blinding: yes - no contact with participants other than assessments Group comparability at entry: yes Losses to follow up: at 3 months N = 15 (18.5%) Intervention: Baseline N = 42 3 months N = 33 6 months N = 30 (-12) Control: Baseline N = 39 3 months N = 33 6 months N = 28 (-11)
Participants	Country: USA Setting: 10 private urban nursing homes in Eastern Iowa, ranging from 68 beds to 178 beds Randomised: 81 % women = 77 Age: mean = 84.1 years; range = 64 to 100 years Consent: fully-informed Inclusion criteria: = 65 years, able to ambulate independently or with an assistive device (so they could take part in an ankle strengthening and walking programme), could speak English, did not have an unstable physical condition, did not have evidence of an end-stage terminal illness, no history of acting out or abusive behaviour, had score of 20 or above on MMSE, doctor's consent sought Exclusion criteria: see inclusion criteria % Eligible within home: not reported % Eligible that participate: not reported Intervention: N = 42, women N = 30 Control: N = 39, women N = 32
Interventions	Study aim or objective: to test a 3-month ankle strengthening and walking programme designed to improve or maintain fall related outcomes Number of experimental groups: 2 Individualised programme delivery Session duration: 15 to 20 minutes Number of sessions per week: 3

	Seated: no Intervention: 3-month ankle strengthening and walking programme, 3 times weekly, 15 to 20 minutes, programme tailored to individual ability Control: attention placebo to control for effects of attention and motivation, visited weekly by same research team member who conducted the exercise programme, devoted 30 minutes to an activity such as book reading or 'friendly visiting'
Outcomes	Fear of falling: fear of falling (single item 4-point scale) (Tinetti 1990), Falls Efficacy Scale (modified) (Schoenfelder 2000) (10 item fear of falling) Risk of falling: Fall Risk Assessment (RAFS II) (Ross 1991) Physical function in ADL: six-metre walk (time) Muscle power (anaerobic): ankle plantar/flexor strength Balance: balance (tandem stance, up to 10 seconds), balance (semi-tandem stance, up to 10 seconds), balance (parallel stance, up to 10 seconds) Cognition: MMSE
Notes	Funding: NIH grant

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "Subjects...randomly assigned within each pair to intervention or control group" No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Blinding attempted, but may have been broken
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "For all assessments conducted at 3 and 6 months, examiners doing the assessments had no contact with the participants other than the assessments once group assignments were made"
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	Quote: "For all assessments conducted at 3 and 6 months, examiners doing the assessments had no contact with the participants other than the assessments once group assignments were made"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Similar numbers and reasons for loss to follow up between groups

Schoenfelder 2004 (*Continued*)

Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Sihvonen 2004

Methods	Design: RCT Duration: 4 weeks Follow up: 8 weeks Method of randomisation: blocks due to 2 sites, randomised unequally into exercise group and control group in anticipation of greater drop-out from exercise group, done by drawing lots Concealment of allocation: unclear Outcome assessor blinding: not specified Group comparability at entry: yes Losses to follow up: 1 participant at 4 weeks due to illness, 3 participants at 18 weeks (total 18%)
Participants	Country: Finland Setting: 2 care homes for older people with 79 inhabitants (72 women, 7 men) Randomised: 28 % women = 100 Age: mean = approximately 81 years; range = not reported Consent: fully-informed consent Inclusion criteria: = 70, able to stand without a walking aid, able to see visual feedback from a computer screen, able to follow instructions for testing and training Exclusion criteria: see inclusion criteria % Eligible within home: 41% volunteered % Eligible that participate: 88% of volunteers able to participate Exercise group: N = 20; 80.7 years ± 6.1 years Control group: N = 8; 82.9 years ± 4.2 years
Interventions	Study aim or objective: to investigate the effects of a 4-week visual feedback-based balance training on the postural control of frail elderly women living in residential care Number of experimental groups: 2 Individual session delivery Session duration: 20 to 30 minutes Number of sessions per week: 3 Seated: no Exercise features: 20- to 30-minute individualised dynamic balance exercise sessions on a force platform balance measurement and training device (Good Balance), 3 times a week for 4 weeks Goal: teach participants to control the movement of the centre of pressure during dynamic weight shifting, leaning and stepping tasks, and to manage these tasks in different stances, with higher spatial and temporal demands Control: not specified Groups: both groups told to continue their normal daily routines and not to change their physical activity

Sihvonen 2004 (*Continued*)

Outcomes	Balance: Dynamic Balance Test (3 tests), Standing Balance Test (6 tests), BBS
Notes	Funding: Ministry of Education Juhno Vainio Foundation in Finland

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Stated randomisation by the drawing of lots
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	As intervention and control group participants were from the same 2 homes, unlikely they could have been blinded to group allocation
Incomplete outcome data (attrition bias) All outcomes	Low risk	25% (2/8) lost from control. 15% (3/20) lost from exercise. Limited difference unlikely to relate to intervention or lack of it
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	Stated participants were randomised unequally to exercise group in anticipation of greater dropouts. Heavily imbalanced groups not judged to cause systematic risk of bias

Stamford 1972

Methods	Design: RCT Duration: 12 weeks Follow up: none Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: unclear Losses to follow up: none
Participants	Country: USA Setting: 2 ambulatory geriatric mental wards at Woodville State Hospital Randomised: 17 % women = 0 Age: mean = 69 years; range = not reported

Stamford 1972 (*Continued*)

	Consent: assent accepted Inclusion criteria: ambulatory, medical screening prior to inclusion Exclusion criteria: Medical = cardiovascular abnormality - electrocardiograms carried out prior to inclusion % Eligible within home: not reported % Eligible that participate: not reported Experimental group: N = 9; mean age = 71.5 years Control group: N = 8; mean age = 65.2 years
Interventions	Study aim or objective: to investigate the effects of physical training on institutionalised old men Number of experimental groups: 2 Unclear if group or individual intervention delivery Session duration: 9 minutes + Number of sessions per week: 5 Seated: no Experimental group: performed treadmill walking with speed and gradient adjustment to maintain heart rate at 70% of age-adjusted maximum; sessions lasted 9 minutes for the first 3 weeks, and increased by 3 minutes every subsequent 3 weeks; sessions were conducted daily, Monday to Friday for 12 weeks; persons delivering the intervention were not described Control group: usual care
Outcomes	Endurance (physical other): heart rate Physiology: systolic blood pressure, diastolic blood pressure
Notes	Funding: not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Twenty-five male geriatric mental patients were selected... Patients adjudged eligible for participation were randomly placed in either an experimental or control group" No information provided about random sequence generation
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	No report of blinding of participants but usual care so intervention would have been obvious
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No reporting of losses to follow up

Stamford 1972 (*Continued*)

Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Stevens 2006

Methods	Design: RCT Duration: 12 weeks Follow up: 12 weeks Method of randomisation: lottery method Concealment of allocation: unclear Outcome assessor blinding: unclear Group comparability at entry: no Losses to follow up: 75 complete data sets from 120 volunteers (63%) 37% dropout
Participants	Country: Australia Setting: 6 aged-care facilities Randomised: 120 % women = 75 Age: mean 80.5 years; range = not reported Consent: assent accepted Inclusion criteria: mild to moderate dementia, assessments made by local Aged Care Assessment Team, level determined by MMSE < 23, resident in an aged care facility, legally and cognitively capable of providing informed consent to participate, able to respond appropriately to the majority of verbal requests, physically capable of undertaking some form of gentle but regular exercise, efforts to ensure participants were joining of their own free choice (frequent questioning where there were memory problems) Exclusion criteria: cognitive = severe dementia, MMSE of 0 to 9 % Eligible within home: not reported % Eligible that participate: not reported Group 1: N = 30; women = 23; mean age = 81 years Group 2: N = 21; women = 10; mean age = 81.5 years Group 3: N = 24; women = 23; mean age = 79 years
Interventions	Study aim or objective: to measure the effects of exercise on cognitive symptoms related to dementia and disability levels Number of experimental groups: 3 Group intervention delivery Session duration: 30 minutes Number of sessions per week: 3 Seated: if necessary Groups: (1) control group, no intervention (2) control group, social visit from researcher; interactive group discussion on health-related issues, but no exercise; visits of equivalent duration to the exercise (3) 30-minute group exercise programme 3 x week for 12 weeks Intervention: based on joint and large muscle group movement with an intention to create gentle aerobic exertion, designed to include those in wheelchairs or with impaired

Stevens 2006 (*Continued*)

	movement, generation-appropriate music, data only analysed where participant attended = 75% of sessions
Outcomes	Cognition: Clock-drawing Tool (Shulman 1993) Psychosocial and physical functioning: Revised Elderly Persons Disability Scale (Fleming 1993)
Notes	Funding: not reported

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Stated randomised by lottery method
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding reported for participants or personnel. Outcome measurements could have been influenced by lack of blinding
Incomplete outcome data (attrition bias) All outcomes	High risk	Data only provided for 75 participants who completed. Ill health, death, or lack of interest resulted in substantial dropouts (128 agreed to participate), but numbers from each groups not reported
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Sung 2009

Methods	Design: cluster RCT Clustering not accounted for Duration: 16 weeks Follow up: no
Participants	Characterisation: elderly women of care facilities Country: South Korea Setting: long-term assisted-living facilities Randomised: 40 % women = 100% Age details: mean (SD) = 75.8 (5.6) Inclusion criteria: older than 65 years Able to walk alone Not participated in regular exercise programs within the previous 6 months

	No cognitive impairment (cognitive score > 23 on MMSE Korean version) Exclusion criteria: stroke or cardiovascular event within past 6 months Unstable chronic or terminal illness (e.g. diabetes mellitus, hepatic cancer, liver cirrhosis) Severe cognitive impairment (MMSE Korean version < 24) or major depression (GDS > 20) ADL status details: not reported Cognitive status details: not reported Significant comorbidities: 75% had chronic conditions including hypertension, arthritis or diabetes mellitus Assessed: not reported Excluded: not reported
Interventions	Study aim or objective: to compare the effects of a 16 week group exercise program on the physical function and mental health of older elderly women (≥ 75 years) compared with younger elderly women (<75 years) 2 groups Intervention: exercise group (N = 20) Format: group, delivered by: physical therapist supervised, and 2 research assistants led the functional exercise component Session length: functional exercise: 40 minutes; health education: 30 minutes every 2 weeks, 3 times weekly The program comprised of functional exercise and health education. Exercise was of low to moderate intensity. Exercise consisted of 10 minutes of warm up, 10 minutes of muscle strengthening, 20 minutes of exercise performed with music, and 10-minute cool down. Health education was based on social cognitive theory and explained how to acquire and maintain behaviour changes, benefits and barriers to change Control: control group (N = 20) Usual care. Asked not to initiate any exercise or education program during the 16-week period
Outcomes	Physical function (other): sit-to-stand (average number in 30 seconds) Balance: static balance (Vellas 1997) Mood related: GDS, self-esteem (Rosenberg Self Esteem Scale) (Rosenberg 1965) Flexibility: 'Sit-and-reach' test
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	There appears to have been random sequence generation. However, the process is unclear
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided

Blinding of participants and personnel (performance bias) All outcomes	High risk	Cluster, but one group usual care
Incomplete outcome data (attrition bias) All outcomes	Low risk	Three lost from control, none from exercise; reasons not related to intervention
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Taboonpong 2008

Methods	Design: cluster RCT Clustering not accounted for. Details: quasi-experimental design with controlled group Duration: 12 weeks Follow up: no
Participants	Characterisation: elderly residents Country: Thailand Setting: residential care facilities Randomised: 70 % women = 58% Age details: number of participants: 60 to 69 years: 18 (36%) 70 to 79 years: 24 (48%) 80 years and over: 8 (16%) Inclusion criteria: over 60 years old; communicate in Thai language; able to practice Tai Chi; stayed in the residential facilities for at least 1 month; normal orientation to place, time, and person; no illnesses limiting movements, uncontrolled epilepsy and diabetes mellitus; not engaged in Tai Chi or other exercises except stretching exercise; in the past month, had at least 1 of the following common sleep problems, which occurred more than 2 times a week for at least 1 week: (1) shallow sleep, (2) sleep less than 5 hours a night, (3)awake more than twice at night, (4) take more than 30 minutes to fall asleep, (5) can not go back to sleep when awake at night, or (6) wake up too early and not refreshed Exclusion criteria: during the study period, the participants were excluded from the study if they possessed any of the following exclusion criteria: participated in Tai Chi practice less than 3 times a week; felt discomfort or had symptoms such as dizziness, palpitation, dyspnoea, nausea, vomiting, fatigue, or severe muscle and joint pain; their prescription had been changed recently; developed an illness or had an injury that could interfere with sleep; significant change in daily physical activity ADL status details: not reported Cognitive status details: not reported Significant comorbidities: not reported Assessed: not reported Excluded: not reported

Taboonpong 2008 (*Continued*)

Interventions	Study aim or objective: to investigate the effects of low-intensity and short-term Tai Chi practice on sleep quality, general well-being, and physical performance 2 groups Intervention: experimental group (N = 38) Format: group, delivered by researcher (trained in Tai Chi) Session length: 22 minutes, at least 3 times weekly Tai Chi training program requiring the participants in the group to practice Tai Chi exercise at least 3 times a week, 22 minutes each time for 12 weeks starting from the beginning of the 2nd week through the end of the 13th week of the study. This requirement followed a recommended exercise for the elderly. The participants could join the session on any 3 days of their choice Control: Control group (N = 32) The participants in the controlled group were asked to continue their usual activities throughout 14 weeks of the study
Outcomes	Physical function (other): 2-minute step in place Flexibility: 'Sit-and-reach' test Quality of life: General Well-Being Scale Anthropometry: lung capacity Sleeping: Pittsburg Sleep Quality Index (PSQI)
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Two care facilities were selected. Assignment to experiment or control was done by simple drawing
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No report of blinding of participants, although control and experimental groups were in different homes, so participants possibly were not aware if they were intervention or control
Incomplete outcome data (attrition bias) All outcomes	High risk	Imbalance in number of participants lost to follow up between groups (more in intervention than in control)
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Tappen 1994

Methods	Design: RCT Duration: 20 weeks Follow up: none Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: maintained Group comparability at entry: yes Losses to follow up: 9 (12.5%) (4 before pre-testing completed, 1 transfer, 3 hospitalised) ; no individual group data provided
Participants	Country: USA Setting: nursing home Randomised: 72 % women = 75 Age: mean = 84 years ± 8.5 years; range = 59 to 102 years Consent: not specified Inclusion criteria: diagnosis of dementia (on MMSE), 6 or more errors out of 10 on Short Portable Mental Status Questionnaire, ability to stand with assistance of 2 people Exclusion criteria: medical: evidence of stroke, head injury, major psychiatric problem, mental retardation % Eligible within home: 80 % Eligible that participate: 37.5
Interventions	Study aim or objective: to compare the effects of skill training, a traditional stimulation approach, and regular care on the ability to perform basic activities of daily living of nursing-home residents with dementia Number of experimental groups: 3 Group intervention delivery Session duration: 2.5 hours a day Number of sessions per week: 5 Seated: unclear Skill training group: focused on re-gaining function in basic ADL through repeated practice, with graded assistance Stimulation group: recreation-orientated activities, group discussion, music, and relaxation Control group: usual care The interventions were delivered in group format by a clinical specialist in gerontological nursing, assisted by a rehabilitation aide, for 2.5 hours per day, 5 days a week, for 20 weeks
Outcomes	Physical function in ADL: Performance Test of Activities of Daily Living (PADL), Physical Self-Maintenance Scale (Lawton 1969), Feasibility and acceptability: Goal Attainment (Brody 1971)
Notes	Funding: The Robert Wood Johnson Foundation grant

Risk of bias

Bias	Authors' judgement	Support for judgement

Tappen 1994 (*Continued*)

Random sequence generation (selection bias)	Unclear risk	Stated "randomly assigned", but no information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	No evidence that participants or people delivering the intervention were blinded
Blinding of outcome assessment (detection bias) Reported ADL (e.g. Barthel, FIM)	Low risk	Data collectors were blind to group assignment
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Only 3 were lost to illness/hospitalisation following pre-testing (4 overall). However, it could not be determined if they from intervention or control group
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Tappen 2000

Methods	Design: RCT Duration: 16 weeks Follow up: none Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: yes - maintained Group comparability at entry: no Losses to follow up: N = 6 (8.5%): Walking group N = 3, conversation group N = 2, walk and talk group N = 1, no causes specified
Participants	Country: USA Setting: nursing home Randomised: 71 % women = 84 Age: mean = 87 years; range = 70 to 105 years Consent: assent accepted Inclusion criteria: Alzheimer's disease, MMSE < 23, ability to stand, ability to mobilise with assistance +/- aid Exclusion criteria: medical = vascular dementia, stroke, Parkinson's disease, major depression, schizophrenia % Eligible within home: not reported % Eligible that participate: not reported Walking group: N = 26; mean age = 87.4 years (SD 5.87)

Tappen 2000 (*Continued*)

	Conversation group: N = 24; mean age = 89.6 years (SD 6.53) Walk and talk group: N = 21 Mean age: 84.3 years (SD 7.53)
Interventions	Study aim or objective: to examine the effect of a combination of exercise and conversation with walking-only exercise and conversation-only treatments on the functional mobility of frail nursing-home residents with Alzheimer's disease Number of experimental groups: 3 Individual intervention delivery Session duration: 30 minutes Number of sessions per week: 3 Seated: no Walking group: self-paced with rests as required, and physical assistance, a device or both as required, no conversation initiated, but researcher responded to communication Conversation group: Holland's approach (aphasia) and facilitation for people with Alzheimer's, used in natural conversation Walk and talk group: both interventions simultaneously within a 30-minute session
Outcomes	Physical function in ADL: modified 6-minute walk (Tappen 1997)
Notes	Funding: National Institute for Nursing Research grant

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Quote: "Random assignment to treatment group" No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No information regarding blinding of participants. Control involved an intervention (talking), but the only measure was physical
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Low risk	Quote: "Raters were blinded to treatment group assignment"
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Reasonably balanced losses, but reasons per group not given
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Urbscheit 2001

Methods	Design: RCT Duration: 8 weeks (see notes) Follow up: 1 year Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: yes - maintained Group comparability at entry: no Losses to follow up: none
Participants	Country: USA Setting: long-term care facility Randomised: 13 % women = 92 Age: mean = approximately 86 years; range = 73 to 95 years Consent: fully-informed consent Inclusion criteria: able to walk approximately 250 feet independently with or without aid, Tinetti Score 14 to 24 Exclusion criteria: cognitive = dementia; medical = serious illness requiring medical intervention in previous 6 months % Eligible within home: not reported % Eligible that participate: not reported Intervention group: N = 6; mean age = 89 years (SD 5.1); range = 81 to 95 years Control group: N = 7; mean age = 82.2 years (SD 4.6); range = 73 to 88 years
Interventions	Study aim or objective: to determine the effects of 2 exercise programmes on balance in elderly ambulatory people Number of experimental groups: 2 Group intervention delivery Session duration: not reported Number of sessions per week: 2 Seated: no Exercise group I (control group): traditional exercise incorporating balance and strengthening exercises; no specific equipment used; included weight transference, walking, and lower limb strengthening Exercise group 2 (intervention group): traditional exercise as above, plus Swiss ball exercises to improve dynamic balance and strengthening component Both interventions delivered in group format by a physiotherapy student
Outcomes	Falls: falls (any episodes for participant) Physical function in ADL: ambulatory (capable of walking approximately 250 feet) Physical function (other): Tinetti Test - gait, use of assistive devices (walker/cane), Tinetti Mobility Scale (gait and balance) (Tinetti 1986) Balance: Tinetti Test - Body Balance
Notes	Funding: grants from Kentucky Physical Therapy Association and the University of Louisville Graduate Research fund Tinetti scores were assessed pre- and post-test (8 weeks) for all 13 participants; 8 of the total 13 participants were able to be followed for 1 year post study, although were assessed only in terms of mobility and assistive devices used

Urbscheit 2001 (*Continued*)

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No information provided; both groups received physical interventions
Blinding of outcome assessment (detection bias) Observed ADL (e.g. TUG test, mobility)	Unclear risk	No report of blinding of outcome assessment
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	13 participants completed the intervention phase, but unclear if there were 13 at the onset
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

Yoder 1989

Methods	Design: RCT Duration: n/a (one-off intervention) Follow up: n/a Method of randomisation: not described Concealment of allocation: unclear Outcome assessor blinding: no Group comparability at entry: n/a Losses to Follow up: none
Participants	Country: USA Setting: 2 nursing homes Randomised: 30 % women = 100 Age: mean = 81.5 years ± 7.2 years; range = 70 to 92 years Consent: not specified Inclusion criteria: used the first 30 participants scoring > 25 on Parachek Geriatric Rating Scale, residential status Exclusion criteria: see inclusion criteria % Eligible within home: not reported % Eligible that participate: not reported Intervention:

Yoder 1989 (*Continued*)

	Group A: N = 15 Group B: N = 15
Interventions	Study aim or objective: hypothesised that participants engaged in the added-purpose, occupationally-embedded exercise would engage in more repetitions, and exercise for a longer duration and with fewer stops than the participants engaged in rote exercise Number of experimental groups: 2 Individual session delivery Session duration: 30 minutes Number of sessions per week: 2 to 3 Seated: unclear Added-purpose, occupationally-embedded exercise condition designed, through materials and instructions, to elicit a rotary arm exercise with the added purpose of stirring cookie dough Compared with an occupational form designed to elicit the rotary arm exercise with no added purpose
Outcomes	Endurance (physical other): duration of exercise Feasibility and acceptability: frequency of discontinuities of exercise, frequency of rotations (repetitions of stirring)
Notes	Funding: not reported

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information provided on randomisation procedure
Allocation concealment (selection bias)	Unclear risk	Insufficient information provided
Blinding of participants and personnel (performance bias) All outcomes	High risk	Personnel unblinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	Appears there were no losses to follow up
Selective reporting (reporting bias)	Unclear risk	Protocol unavailable
Other bias	Low risk	No other apparent risks of bias

ADL: activities of daily living
BBS: Berg Balance Scale
BI: Barthel Index
BMI: body mass index
CI: confidence interval

dB: decibels
FIM: Functional Independence Measure
FIT: Functional Incidental Training
GDS: Geriatric Depression Scale
GP: general practitioner
HADS-D: Hospital Anxiety and Depression Scale (depression subscore)
ITT: intention-to-treat
MDS: Minimum Data Set
MMSE: Mini-Mental State Examination
n/a = not applicable
RCT: randomised controlled trial
RMI: Rivermead Mobility Index
OSAI: Obstructive Sleep Apnea Index
SD: standard deviation
TUG test: Timed Up and Go test

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

Study	Reason for exclusion
Alessi 1995b	Not primarily physical outcomes of interest (sleep-orientated)
Alexander 2001	Review team consensus agreed that the study accommodation (congregate housing) was not synonymous with a long-term care environment
Backman 1986	Participants were self-caring within a long-term care environment; interventions were of a psychological, rather than physical, nature
Beck 2009	Focus of study was compliance, rather than improving physical condition
Becker 2003	Multi-faceted intervention included staff and resident education, advice on environmental adaptations, and hip protectors
Binder 1995	Comparison of the same exercise intervention; 1 group was provided with vitamin supplement
Blair 1996	Focus was behavioural management, rather than physical activity
Brill 1999b	Aimed to prevent admission to long-term care
Carmeli 2000	Participants were not randomly allocated to study conditions
Collier 2007	The intervention was not primarily physical rehabilitation
de Carvalho Bastone 2004	Participants were assigned to exercise group or comparative group by personal choice (those who did, or did not, want to attend exercise sessions)
Dyer 2004	Multi-factorial falls prevention programme including medication review, podiatry, and optometry

(*Continued*)

Eggermont 2009	The intervention was not aimed at improving physical condition
Evans 1995	A review paper that described an apparently relevant study, although insufficient information was provided, and no reference cited. The author was contacted for further information; however, we received no reply
Fisher 1991	Not a RCT
Fitzimmons 2001	Evaluated the effect of exercise on depression, rather than physical outcomes
Fox 2000	Review team consensus deemed passive interventions to reduce contractures to be beyond the scope of this review
Friedman 1991	Aimed to improve communication, rather than physical performance measures
Goldberg 1980	No physical outcomes evaluated
Hagen 2003	Participants not randomised
Hara 2007	The participants included visitors to the centre
Hopman-Rock 1999	Interventions targeted cognitive, rather than physical, functioning
Ikezoe 2005	Non-random allocation of participants
Jensen 2002	Multi-faceted intervention to address falls prevention
Jensen 2004	Multi-faceted intervention to address falls prevention
Judge 1993	Communication with the authors identified very few long-term care residents for whom no separate data were available
Kapasi 2007	This was an abstract only for a poster and included no detailed results
Kelly 1983	Interventions were not aimed primarily at improving physical condition
Kerse 2004	Falls risk management programme
Koc 2008	Poster with insufficient data to assess inclusion and included no detailed results
Krishnamurthy 2007	The intervention was not intended to address their physical condition
Light 1984	Review team consensus deemed passive interventions to reduce contractures to be beyond the scope of this review
MacRae 1996	Non-random allocation to the study conditions
McMurdo 2000	Multi-faceted intervention to address falls risk

(*Continued*)

Moye 1996	Review team consensus excluded this paper on the basis that no objective physical outcomes measures were used
Mozley 2007	While the intervention was occupational therapy, the aim was to reduce depression, rather than affect physical condition
Nowalk 2001	Primary focus on reduction of falls
O'Hagan 1994	Non-random allocation to the study conditions
Ray 1997	Multi-facted falls prevention programme
Remsburg 1999	Non-random allocation to the study conditions
Rydwik 2004	Non-random allocation of participants
Sato 2007	Participants were visitors, rather than residents, of care homes
Sherrington 1997	Only a small proportion of participants were residing in institutional care; the majority were independently living in the community. The authors were contacted for separate data, but none were available
Shimada 2003	Participants were from out-patient facilities and nursing homes
Shumway-Cook 1997	Participants were community-dwelling
Stasi 2004	Not a physical rehabilitation intervention
Steffen 1995	Not a RCT
Stones 1993	Focused on memory, rather than physical outcomes of interest
Tan 2004	Non-random allocation of participants
Tseng 2006	Focus on contractures
van Heugten 2000	Particpants recruited from a variety of settings; no separate data available for long-term care residents
Wolf 2001	Included independent living and residential-care participants
Yip 2004	Non-random allocation of participants

RCT: randomised controlled trial

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

Cakar 2010

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Chang 2010

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Chen 2010a

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Ciairano 2010

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

de Greef 2006

Methods	RCT
Participants	N = 36 Frail older nursing-home residents
Interventions	Low-intensity exercise programme
Outcomes	Disability, strength, functional capacity, balance, agility, and walking speed Performance in ADLs significantly improved
Notes	Translation needed

Dechamps 2010

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Dechamps 2010a

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Deschamps 2009

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Fonseca 2010

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Frändin 2009

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Gallon 2011

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Gerritsen 2011

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Holmerová 2010

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Hsu 2011

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Jeon 2009

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Kemoun 2010

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Lee 2007

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed. Unable to get.

Lee 2010

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Montgomery 2010

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Nalbant 2009

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Pan 2011

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Piedras-Jorge 2010

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Resnick 2009 awaiting

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed. Reports associated with Resnick 2009.

Rosendahl 2006 awaiting

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed. Reports associated with Rosendahl 2006.

Sackley 2010

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Serra-Rexach 2011

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Sung 2007

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Translation needed

Swiniarek 2009

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Takeuchi 2011

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

Tse 2010

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Not yet assessed

ż ak 2006

Methods	-
Participants	-
Interventions	-
Outcomes	-
Notes	Unable to get. Request sent to author mzak1@onet.edu - bounced

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

ISRCTN43769277

Trial name or title	Older people's exercise intervention in residential and nursing accommodation
Methods	-
Participants	Residents in nursing home, over 65 years, able to participate in baseline assessment, able to transfer
Interventions	Physical activation and group-based exercise programme
Outcomes	Impact on depression, EQ-5D, mobility, falls, cognitive function, pain, medication use, hospital admissions

ISRCTN43769277 (*Continued*)

Starting date	1 January 2008
Contact information	Martin Underwood m.underwood@qmul.ac.uk
Notes	-

NCT00105807

Trial name or title	The effect of exercise on muscle, function and cost in VA nursing home residents
Methods	-
Participants	Residents in VA nursing home, 65 years or older, able to follow one-step commands
Interventions	Low-intensity exercise
Outcomes	Muscle mass, physical function, cost
Starting date	2002
Contact information	-
Notes	HSRP20071249

NCT00218842

Trial name or title	Physical and daily activity for residents in a nursing home setting - A Nordic multi-centre study
Methods	-
Participants	Residents expected to stay in nursing homes > 3 months
Interventions	Individually-tailored enhanced activities of daily living training
Outcomes	Physical function, well-being, amount of activity, falls
Starting date	August 2005
Contact information	Kerstin Frandin kerstin.frandin@neurotec.ki.se
Notes	-

Serra-Rexach 2009

Trial name or title	Health enhancing strength training in nonagenarians (STRONG)
Methods	RCT
Participants	Sixty residents of a geriatric nursing home (age range = 90 to 102 years)
Interventions	Muscle strengthening and aerobic exercises over 6 months
Outcomes	SF-12, Tinetti mobility scale, BI, 1RM leg press, hand grip strength, 8-metre walk test, 4-step stairs test, BMI, physical activity (Actigraph), MMSE, falls, and other adverse events
Starting date	March 2009
Contact information	Alejandro Lucia alejandro.lucia@uem.es
Notes	-

BI: Barthel Index
BMI: body mass index
MMSE: Mini-Mental State Examinsation
RCT: randomised controlled trial

DATA AND ANALYSES

Comparison 1. Rehabilitation versus control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Barthel Index	7	857	Mean Difference (Random, 95% CI)	6.38 [1.63, 11.12]
2 Functional Independence Measure (FIM)	4	303	Mean Difference (Random, 95% CI)	4.98 [-1.55, 11.51]
3 Rivermead Mobility Index (RMI)	3	323	Mean Difference (Random, 95% CI)	0.69 [0.04, 1.33]
4 Timed Up and Go (TUG) Test	7	885	Mean Difference (Random, 95% CI)	-4.59 [-9.19, 0.01]
5 Walking speed	9	590	Mean Difference (Random, 95% CI)	0.03 [-0.01, 0.07]
6 Death	25	3721	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.80, 1.13]
7 Barthel Index (by risk of bias)	7		Mean Difference (Random, 95% CI)	Subtotals only
7.1 lower risk of bias	2	275	Mean Difference (Random, 95% CI)	3.38 [-2.10, 8.86]
7.2 higher risk of bias	5	582	Mean Difference (Random, 95% CI)	8.25 [1.15, 15.34]
8 Barthel Index (by duration of intervention)	7		Mean Difference (Random, 95% CI)	Subtotals only
8.1 shorter (< 3 months intervention)	2	46	Mean Difference (Random, 95% CI)	17.55 [6.97, 28.13]
8.2 longer (3+ months intervention)	5	811	Mean Difference (Random, 95% CI)	3.08 [-0.03, 6.19]
9 Barthel Index (by mode of delivery)	7		Mean Difference (Random, 95% CI)	Subtotals only
9.1 group	4	256	Mean Difference (Random, 95% CI)	10.99 [1.51, 20.48]
9.2 individual	2	275	Mean Difference (Random, 95% CI)	3.38 [-2.10, 8.86]
9.3 not reported	1	326	Mean Difference (Random, 95% CI)	2.19 [-4.35, 8.73]
10 Barthel Index (by baseline Barthel Index score)	6		Mean Difference (Random, 95% CI)	Subtotals only
10.1 better (baseline Barthel Index score > median)	3	511	Mean Difference (Random, 95% CI)	7.94 [-1.77, 17.64]
10.2 worse (baseline Barthel Index score < median)	3	305	Mean Difference (Random, 95% CI)	3.97 [-0.83, 8.78]
11 Barthel Index (by age)	7		Mean Difference (Random, 95% CI)	Subtotals only
11.1 younger (mean age < 85 years)	4	552	Mean Difference (Random, 95% CI)	8.02 [-0.25, 16.30]
11.2 older (mean age 85+ years)	3	305	Mean Difference (Random, 95% CI)	3.97 [-0.83, 8.78]
12 Barthel Index (by gender)	7		Mean Difference (Random, 95% CI)	Subtotals only
12.1 < 80% female	4	402	Mean Difference (Random, 95% CI)	7.93 [0.18, 15.69]
12.2 80%+ female	3	455	Mean Difference (Random, 95% CI)	4.29 [-1.25, 9.83]
13 Functional Independence Measure (by risk of bias)	4		Mean Difference (Random, 95% CI)	Subtotals only
13.1 lower risk of bias	0	0	Mean Difference (Random, 95% CI)	0.0 [0.0, 0.0]
13.2 higher risk of bias	4	303	Mean Difference (Random, 95% CI)	4.98 [-1.55, 11.51]
14 Functional Independence Measure (by duration of intervention)	4		Mean Difference (Random, 95% CI)	Subtotals only

14.1 shorter (< 3 months intervention)	1	30	Mean Difference (Random, 95% CI)	2.0 [-10.26, 14.26]
14.2 longer (3+ months intervention)	3	273	Mean Difference (Random, 95% CI)	5.85 [-2.22, 13.93]
15 Functional Independence Measure (by mode of delivery)	4		Mean Difference (Random, 95% CI)	Subtotals only
15.1 group	3	240	Mean Difference (Random, 95% CI)	3.90 [-3.08, 10.88]
15.2 individual	1	63	Mean Difference (Random, 95% CI)	11.76 [-2.66, 26.18]
16 Functional Independence Measure (by baseline FIM score)	3		Mean Difference (Random, 95% CI)	Subtotals only
16.1 better (baseline FIM score > median)	2	95	Mean Difference (Random, 95% CI)	7.77 [1.39, 14.14]
16.2 worse (baseline FIM score < median)	1	145	Mean Difference (Random, 95% CI)	0.3 [-1.73, 2.33]
17 Functional Independence Measure (by age)	4		Mean Difference (Random, 95% CI)	Subtotals only
17.1 younger (mean age < 85 years)	2	128	Mean Difference (Random, 95% CI)	9.91 [4.41, 15.42]
17.2 older (mean age 85+ years)	2	175	Mean Difference (Random, 95% CI)	0.35 [-1.65, 2.34]
18 Functional Independence Measure (by gender)	4		Mean Difference (Random, 95% CI)	Subtotals only
18.1 < 80% female	2	93	Mean Difference (Random, 95% CI)	6.11 [-3.33, 15.55]
18.2 80%+ female	2	210	Mean Difference (Random, 95% CI)	4.51 [-4.56, 13.58]
19 Rivermead Mobility Index (by risk of bias)	3		Mean Difference (Random, 95% CI)	Subtotals only
19.1 lower risk of bias	3	323	Mean Difference (Random, 95% CI)	0.69 [0.04, 1.33]
19.2 higher risk of bias	0	0	Mean Difference (Random, 95% CI)	0.0 [0.0, 0.0]
20 Rivermead Mobility Index (by duration of intervention)	3		Mean Difference (Random, 95% CI)	Subtotals only
20.1 shorter (< 3 months intervention)	1	49	Mean Difference (Random, 95% CI)	0.6 [-1.48, 2.68]
20.2 longer (3+ months intervention)	2	274	Mean Difference (Random, 95% CI)	0.69 [0.02, 1.37]
21 Rivermead Mobility Index (by mode of delivery)	3		Mean Difference (Random, 95% CI)	Subtotals only
21.1 group	1	49	Mean Difference (Random, 95% CI)	0.6 [-1.48, 2.68]
21.2 individual	2	274	Mean Difference (Random, 95% CI)	0.69 [0.02, 1.37]
22 Rivermead Mobility Index (by baseline RMI score)	3		Mean Difference (Random, 95% CI)	Subtotals only
22.1 better (baseline RMI score > median)	2	235	Mean Difference (Random, 95% CI)	0.70 [0.01, 1.39]
22.2 worse (baseline RMI score < median)	1	88	Mean Difference (Random, 95% CI)	0.6 [-1.17, 2.37]
23 Rivermead Mobility Index (by age)	3		Mean Difference (Random, 95% CI)	Subtotals only
23.1 younger (mean age < 85 years)	1	49	Mean Difference (Random, 95% CI)	0.6 [-1.48, 2.68]
23.2 older (mean age 85+ years)	2	274	Mean Difference (Random, 95% CI)	0.69 [0.02, 1.37]

24 Rivermead Mobility Index (by gender)	3		Mean Difference (Random, 95% CI)	Subtotals only
24.1 < 80% female	2	235	Mean Difference (Random, 95% CI)	0.70 [0.01, 1.39]
24.2 80%+ female	1	88	Mean Difference (Random, 95% CI)	0.6 [-1.17, 2.37]
25 TUG Test (by risk of bias)	7		Mean Difference (Random, 95% CI)	Subtotals only
25.1 lower risk of bias	1	556	Mean Difference (Random, 95% CI)	0.6 [-5.36, 6.56]
25.2 higher risk of bias	6	329	Mean Difference (Random, 95% CI)	-5.92 [-11.29, -0.54]
26 TUG Test (by duration of intervention)	7		Mean Difference (Random, 95% CI)	Subtotals only
26.1 shorter (< 6 months intervention)	4	185	Mean Difference (Random, 95% CI)	-7.34 [-13.93, -0.75]
26.2 longer (6+ months intervention)	3	700	Mean Difference (Random, 95% CI)	0.13 [-4.28, 4.53]
27 TUG Test (by mode of delivery)	7		Mean Difference (Random, 95% CI)	Subtotals only
27.1 group	4	154	Mean Difference (Random, 95% CI)	-4.98 [-10.74, 0.77]
27.2 individual	3	731	Mean Difference (Random, 95% CI)	-4.56 [-14.02, 4.90]
28 TUG Test (by baseline TUG score)	7		Mean Difference (Random, 95% CI)	Subtotals only
28.1 better (baseline TUG score < median)	4	185	Mean Difference (Random, 95% CI)	-7.34 [-13.93, -0.75]
28.2 worse (baseline TUG score > median)	3	700	Mean Difference (Random, 95% CI)	0.13 [-4.28, 4.53]
29 TUG Test (by age)	7		Mean Difference (Random, 95% CI)	Subtotals only
29.1 younger (mean age < 85 years)	5	741	Mean Difference (Random, 95% CI)	-5.39 [-10.77, -0.00]
29.2 older (mean age 85+ years)	2	144	Mean Difference (Random, 95% CI)	-5.40 [-25.75, 14.96]
30 TUG Test (by gender)	7		Mean Difference (Random, 95% CI)	Subtotals only
30.1 < 80% female	3	594	Mean Difference (Random, 95% CI)	0.17 [-3.90, 4.24]
30.2 80%+ female	4	291	Mean Difference (Random, 95% CI)	-7.55 [-14.28, -0.82]
31 Walking speed (by risk of bias)	9		Mean Difference (Random, 95% CI)	Subtotals only
31.1 lower risk of bias	1	75	Mean Difference (Random, 95% CI)	-0.10 [-0.21, 0.01]
31.2 higher risk of bias	8	515	Mean Difference (Random, 95% CI)	0.04 [0.01, 0.07]
32 Walking speed (by duration of intervention)	9		Mean Difference (Random, 95% CI)	Subtotals only
32.1 shorter (< 3 months intervention)	3	59	Mean Difference (Random, 95% CI)	0.24 [-0.74, 1.22]
32.2 longer (3+ months intervention)	6	531	Mean Difference (Random, 95% CI)	0.02 [-0.03, 0.08]
33 Walking speed (by mode of delivery)	9		Mean Difference (Random, 95% CI)	Subtotals only
33.1 group	7	475	Mean Difference (Random, 95% CI)	0.03 [-0.02, 0.07]
33.2 individual	1	48	Mean Difference (Random, 95% CI)	0.26 [-0.32, 0.83]
33.3 not reported	1	67	Mean Difference (Random, 95% CI)	-0.03 [-0.19, 0.13]
34 Walking speed (by baseline walking speed)	9		Mean Difference (Random, 95% CI)	Subtotals only
34.1 better (baseline walking speed > median)	5	198	Mean Difference (Random, 95% CI)	-0.00 [-0.15, 0.14]
34.2 worse (baseline walking speed < median)	4	392	Mean Difference (Random, 95% CI)	0.04 [0.01, 0.07]

35 Walking speed (by age)	9		Mean Difference (Random, 95% CI)	Subtotals only
35.1 younger (mean age < 85 years)	9	590	Mean Difference (Random, 95% CI)	0.03 [-0.01, 0.07]
35.2 older (mean age 85+ years)	0	0	Mean Difference (Random, 95% CI)	0.0 [0.0, 0.0]
36 Walking speed (by gender)	9		Mean Difference (Random, 95% CI)	Subtotals only
36.1 < 80% female	5	437	Mean Difference (Random, 95% CI)	0.01 [-0.04, 0.07]
36.2 80%+ female	4	153	Mean Difference (Random, 95% CI)	0.13 [-0.02, 0.28]
37 Walking speed (by distance walked)	9		Mean Difference (Random, 95% CI)	Subtotals only
37.1 less far (< 6 metres)	2	185	Mean Difference (Random, 95% CI)	0.04 [0.01, 0.07]
37.2 further (6+ metres)	7	405	Mean Difference (Random, 95% CI)	0.01 [-0.06, 0.09]
38 Death (by risk of bias)	25		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
38.1 lower risk of bias	6	1366	Risk Ratio (M-H, Random, 95% CI)	1.05 [0.76, 1.46]
38.2 higher risk of bias	19	2355	Risk Ratio (M-H, Random, 95% CI)	0.88 [0.71, 1.10]
39 Death (by duration of intervention)	25		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
39.1 shorter intervention (< 3 months)	10	663	Risk Ratio (M-H, Random, 95% CI)	0.64 [0.18, 2.29]
39.2 longer intervention (3+ months)	15	3058	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.80, 1.14]
40 Death (by mode of delivery)	25		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
40.1 group	12	1007	Risk Ratio (M-H, Random, 95% CI)	0.82 [0.46, 1.49]
40.2 individual	9	2172	Risk Ratio (M-H, Random, 95% CI)	0.91 [0.70, 1.19]
40.3 group and individual	1	24	Risk Ratio (M-H, Random, 95% CI)	5.0 [0.27, 94.34]
40.4 not reported	3	518	Risk Ratio (M-H, Random, 95% CI)	1.00 [0.73, 1.36]
41 Death (by age)	25		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
41.1 younger (mean age < 85 years)	16	3001	Risk Ratio (M-H, Random, 95% CI)	0.97 [0.81, 1.17]
41.2 older (mean age 85+ years)	9	720	Risk Ratio (M-H, Random, 95% CI)	0.79 [0.49, 1.27]
42 Death (by gender)	25		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
42.1 < 80% female	12	2366	Risk Ratio (M-H, Random, 95% CI)	0.98 [0.77, 1.25]
42.2 80%+ female	12	1340	Risk Ratio (M-H, Random, 95% CI)	0.91 [0.71, 1.18]
42.3 not reported	1	15	Risk Ratio (M-H, Random, 95% CI)	0.88 [0.16, 4.68]
43 Sensitivity analysis: Barthel Index (fixed-effect)	7	857	Mean Difference (Fixed, 95% CI)	4.54 [1.59, 7.49]
44 Sensitivity analysis: Barthel Index (cluster trials)	7		Mean Difference (Random, 95% CI)	Subtotals only
44.1 cluster (adjusted)	5	811	Mean Difference (Random, 95% CI)	3.08 [-0.03, 6.19]
44.2 individual	2	46	Mean Difference (Random, 95% CI)	17.55 [6.97, 28.13]
45 Sensitivity analysis: Functional Independence Measure (fixed-effect)	4	303	Mean Difference (Fixed, 95% CI)	1.46 [-0.42, 3.34]
46 Sensitivity analysis: Rivermead Mobility Index (fixed-effect)	3	323	Mean Difference (Fixed, 95% CI)	0.69 [0.04, 1.33]
47 Sensitivity analysis: TUG Test (fixed-effect)	7	885	Mean Difference (Fixed, 95% CI)	-3.66 [-5.86, -1.45]
48 Sensitivity anlaysis: TUG Test (cluster trials)	7		Mean Difference (Random, 95% CI)	Subtotals only
48.1 cluster (adjusted)	2		Mean Difference (Random, 95% CI)	0.51 [-3.93, 4.95]

48.2 individual	5		Mean Difference (Random, 95% CI)	-7.85 [-14.34, -1.37]
49 Sensitivity analysis: TUG Test (re-including Christofoletti 2008)	8	914	Mean Difference (Random, 95% CI)	-8.41 [-15.53, -1.29]
50 Sensitivity analysis: Walking speed (fixed-effect)	9	590	Mean Difference (Fixed, 95% CI)	0.03 [0.00, 0.06]
51 Sensitivity analysis: Walking speed (cluster trials)	9		Mean Difference (Random, 95% CI)	Subtotals only
51.1 cluster (unadjusted)	1		Mean Difference (Random, 95% CI)	0.04 [0.01, 0.07]
51.2 individual	8		Mean Difference (Random, 95% CI)	0.01 [-0.05, 0.08]
52 Sensitivity analysis: Death (random-effects: odds ratio)	25	3721	Odds Ratio (M-H, Random, 95% CI)	0.93 [0.75, 1.15]
53 Sensitivity analysis: Death (random-effects: risk difference)	25	3721	Risk Difference (M-H, Random, 95% CI)	-0.01 [-0.02, 0.01]
54 Sensitivity analysis: Death (fixed-effect)	25	3721	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.80, 1.13]
55 Sensitivity analysis: Death (fixed-effect: Peto odds ratio)	25	3721	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.93 [0.75, 1.14]
56 Sensitivity analysis: Death (cluster trials)	25		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
56.1 cluster (unadjusted)	13	2644	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.79, 1.15]
56.2 individual	12	1077	Risk Ratio (M-H, Random, 95% CI)	0.93 [0.60, 1.44]
57 Sensitivity analysis: Death (including Brittle 2009)	26	3777	Risk Ratio (M-H, Random, 95% CI)	0.94 [0.79, 1.11]

Comparison 2. Rehabilitation (experimental) versus rehabilitation (control)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 TUG Test	2	57	Mean Difference (Random, 95% CI)	-7.95 [-19.22, 3.31]
2 Death	4	118	Risk Ratio (M-H, Random, 95% CI)	2.67 [0.12, 60.93]
3 Sensitivity analysis: TUG Test (fixed-effect)	2	57	Mean Difference (Fixed, 95% CI)	-7.19 [-10.92, -3.46]

Analysis 1.1. Comparison 1 Rehabilitation versus control, Outcome 1 Barthel Index.

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 1 Barthel Index

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Dorner 2007	15	15	11 (7.7517)		7.6 %	11.00 [-4.19, 26.19]
McMurdo 1993	15	26	10 (9.5958)		5.3 %	10.00 [-8.81, 28.81]
Resnick 2009	168	158	2.19 (3.335)		20.6 %	2.19 [-4.35, 8.73]
Rosendahl 2006	78	91	3.5 (3.4837)		19.9 %	3.50 [-3.33, 10.33]
Sackley 2006	53	35	9.5 (6.4137)		10.0 %	9.50 [-3.07, 22.07]
Sackley 2009	99	88	2.1 (2.2959)		25.9 %	2.10 [-2.40, 6.60]
Santana-Sosa 2008	8	8	22 (6.0828)		10.8 %	22.00 [10.08, 33.92]
Total (95% CI)	**436**	**421**			**100.0 %**	**6.38 [1.63, 11.12]**

Heterogeneity: Tau^2 = 17.32; Chi^2 = 11.57, df = 6 (P = 0.07); I^2 =48%

Test for overall effect: Z = 2.64 (P = 0.0084)

Test for subgroup differences: Not applicable

Analysis 1.2. Comparison 1 Rehabilitation versus control, Outcome 2 Functional Independence Measure (FIM).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 2 Functional Independence Measure (FIM)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Dorner 2007	15	15	2 (6.2549)		16.7 %	2.00 [-10.26, 14.26]
Lazowski 1999	34	31	9.6 (3.0404)		30.4 %	9.60 [3.64, 15.56]
Makita 2006	71	74	0.3 (1.0334)		39.2 %	0.30 [-1.73, 2.33]
Przybylski 1996	32	31	11.758 (7.3577)		13.6 %	11.76 [-2.66, 26.18]
Total (95% CI)	**152**	**151**			**100.0 %**	**4.98 [-1.55, 11.51]**

Heterogeneity: $Tau^2 = 27.24$; $Chi^2 = 10.39$, df = 3 (P = 0.02); $I^2 = 71\%$

Test for overall effect: Z = 1.49 (P = 0.14)

Test for subgroup differences: Not applicable

Analysis 1.3. Comparison 1 Rehabilitation versus control, Outcome 3 Rivermead Mobility Index (RMI).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 3 Rivermead Mobility Index (RMI)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Brittle 2009	26	23	0.6 (1.0591)		9.6 %	0.60 [-1.48, 2.68]
Sackley 2006	53	35	0.6 (0.9055)		13.1 %	0.60 [-1.17, 2.37]
Sackley 2009	98	88	0.71 (0.372449)		77.3 %	0.71 [-0.02, 1.44]
Total (95% CI)	**177**	**146**			**100.0 %**	**0.69 [0.04, 1.33]**

Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 0.02$, df = 2 (P = 0.99); $I^2 = 0.0\%$

Test for overall effect: Z = 2.09 (P = 0.036)

Test for subgroup differences: Not applicable

Analysis 1.4. Comparison 1 Rehabilitation versus control, Outcome 4 Timed Up and Go (TUG) Test.

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

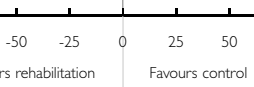
Outcome: 4 Timed Up and Go (TUG) Test

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Au-Yeung 2002	10	8	0.41 (2.8805)		18.9 %	0.41 [-5.24, 6.06]
Baum 2003	11	9	-24 (18)		1.6 %	-24.00 [-59.28, 11.28]
Cheung 2008	27	23	-4.76 (1.56)		23.6 %	-4.76 [-7.82, -1.70]
Kerse 2008	266	290	0.6 (3.0409)		18.3 %	0.60 [-5.36, 6.56]
Lazowski 1999	36	30	-14.7 (6.2328)		9.2 %	-14.70 [-26.92, -2.48]
MacRitchie 2001	24	27	-17.31 (5.22)		11.4 %	-17.31 [-27.54, -7.08]
Peri 2008	63	61	0.4 (3.395)		17.0 %	0.40 [-6.25, 7.05]
Total (95% CI)	**437**	**448**			**100.0 %**	**-4.59 [-9.19, 0.01]**

Heterogeneity: $Tau^2 = 20.88$; $Chi^2 = 17.14$, df = 6 (P = 0.01); $I^2 = 65\%$

Test for overall effect: Z = 1.96 (P = 0.051)

Test for subgroup differences: Not applicable



Analysis 1.5. Comparison 1 Rehabilitation versus control, Outcome 5 Walking speed.

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 5 Walking speed

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Au-Yeung 2002	10	8	0.0935 (0.9456)		0.0 %	0.09 [-1.76, 1.95]
Brill 1998	8	8	-0.1709 (2.2638)		0.0 %	-0.17 [-4.61, 4.27]
Chin A Paw 2004	44	31	-0.1 (0.0552)		10.4 %	-0.10 [-0.21, 0.01]
Hruda 2003	18	7	0.3315 (0.6068)		0.1 %	0.33 [-0.86, 1.52]
Lazowski 1999	35	29	0.12 (0.0806)		5.1 %	0.12 [-0.04, 0.28]
MacRitchie 2001	22	26	0.2551 (0.294)		0.4 %	0.26 [-0.32, 0.83]
Rolland 2007	56	54	0.05 (0.0334)		24.3 %	0.05 [-0.02, 0.12]
Rosendahl 2006	78	89	0.04 (0.0177)		54.9 %	0.04 [0.01, 0.07]
Schoenfelder 2004	33	34	-0.0296 (0.0837)		4.8 %	-0.03 [-0.19, 0.13]
Total (95% CI)	**304**	**286**			**100.0 %**	**0.03 [-0.01, 0.07]**

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 8.77$, df = 8 (P = 0.36); $I^2 = 9\%$

Test for overall effect: Z = 1.59 (P = 0.11)

Test for subgroup differences: Not applicable

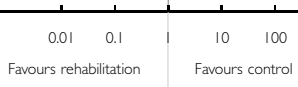
Analysis 1.6. Comparison 1 Rehabilitation versus control, Outcome 6 Death.

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 6 Death

Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Cheung 2008	0/27	0/23			Not estimable
Chin A Paw 2004	6/173	2/51		1.2 %	0.88 [0.18, 4.25]
Choi 2005	0/34	1/34		0.3 %	0.33 [0.01, 7.91]
Fiatarone 1994	0/50	2/50		0.3 %	0.20 [0.01, 4.06]
Gillies 1999	0/10	0/10			Not estimable
Kerse 2008	35/330	31/352		14.3 %	1.20 [0.76, 1.91]
Kinion 1993	0/12	0/12			Not estimable
McMurdo 1993	2/20	3/29		1.1 %	0.97 [0.18, 5.27]
McMurdo 1994	3/36	4/29		1.5 %	0.60 [0.15, 2.49]
Meuleman 2000	2/39	2/39		0.8 %	1.00 [0.15, 6.75]
Morris 1999	39/313	28/155		15.2 %	0.69 [0.44, 1.08]
Mulrow 1994	5/97	7/97		2.4 %	0.71 [0.23, 2.17]
Naso 1990	2/8	2/7		1.1 %	0.88 [0.16, 4.68]
Peri 2008	5/73	8/76		2.6 %	0.65 [0.22, 1.90]
Pomeroy 1993	2/12	0/12		0.4 %	5.00 [0.27, 94.34]
Resnick 2009	61/256	55/231		29.9 %	1.00 [0.73, 1.38]
Rolland 2007	7/67	8/67		3.3 %	0.88 [0.34, 2.28]
Rosendahl 2006	1/91	1/100		0.4 %	1.10 [0.07, 17.31]
Sackley 2006	4/63	9/55		2.4 %	0.39 [0.13, 1.19]
Sackley 2008	0/17	0/17			Not estimable
Sackley 2009	36/127	27/116		16.3 %	1.22 [0.79, 1.87]
Schnelle 2002	14/92	14/98		6.5 %	1.07 [0.54, 2.11]
Schoenfelder 2000	0/9	0/7			Not estimable
Sihvonen 2004	0/20	0/8			Not estimable
Taboonpong 2008	0/38	0/32			Not estimable



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Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Total (95% CI)	**2014**	**1707**		**100.0 %**	**0.95 [0.80, 1.13]**
Total events: 224 (Rehabilitation), 204 (Control)					
Heterogeneity: Tau^2 = 0.0; Chi^2 = 10.82, df = 17 (P = 0.87); I^2 =0.0%					
Test for overall effect: Z = 0.61 (P = 0.54)					
Test for subgroup differences: Not applicable					

0.01 0.1 1 10 100

Favours rehabilitation Favours control

Analysis 1.7. Comparison 1 Rehabilitation versus control, Outcome 7 Barthel Index (by risk of bias).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 7 Barthel Index (by risk of bias)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 lower risk of bias						
Sackley 2006	53	35	9.5 (6.4137)		17.3 %	9.50 [-3.07, 22.07]
Sackley 2009	99	88	2.1 (2.2959)		82.7 %	2.10 [-2.40, 6.60]
Subtotal (95% CI)	**152**	**123**			**100.0 %**	**3.38 [-2.10, 8.86]**
Heterogeneity: Tau^2 = 4.18; Chi^2 = 1.18, df = 1 (P = 0.28); I^2 =15%						
Test for overall effect: Z = 1.21 (P = 0.23)						
2 higher risk of bias						
Dorner 2007	15	15	11 (7.7517)		13.9 %	11.00 [-4.19, 26.19]
McMurdo 1993	15	26	10 (9.5958)		10.4 %	10.00 [-8.81, 28.81]
Resnick 2009	168	158	2.19 (3.335)		29.0 %	2.19 [-4.35, 8.73]
Rosendahl 2006	78	91	3.5 (3.4837)		28.3 %	3.50 [-3.33, 10.33]
Santana-Sosa 2008	8	8	22 (6.0828)		18.4 %	22.00 [10.08, 33.92]
Subtotal (95% CI)	**284**	**298**			**100.0 %**	**8.25 [1.15, 15.34]**
Heterogeneity: Tau^2 = 34.09; Chi^2 = 9.33, df = 4 (P = 0.05); I^2 =57%						
Test for overall effect: Z = 2.28 (P = 0.023)						
Test for subgroup differences: Chi^2 = 1.13, df = 1 (P = 0.29), I^2 =12%						

-100 -50 0 50 100

Favours control Favours rehabilitation

Analysis 1.8. Comparison 1 Rehabilitation versus control, Outcome 8 Barthel Index (by duration of intervention).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 8 Barthel Index (by duration of intervention)

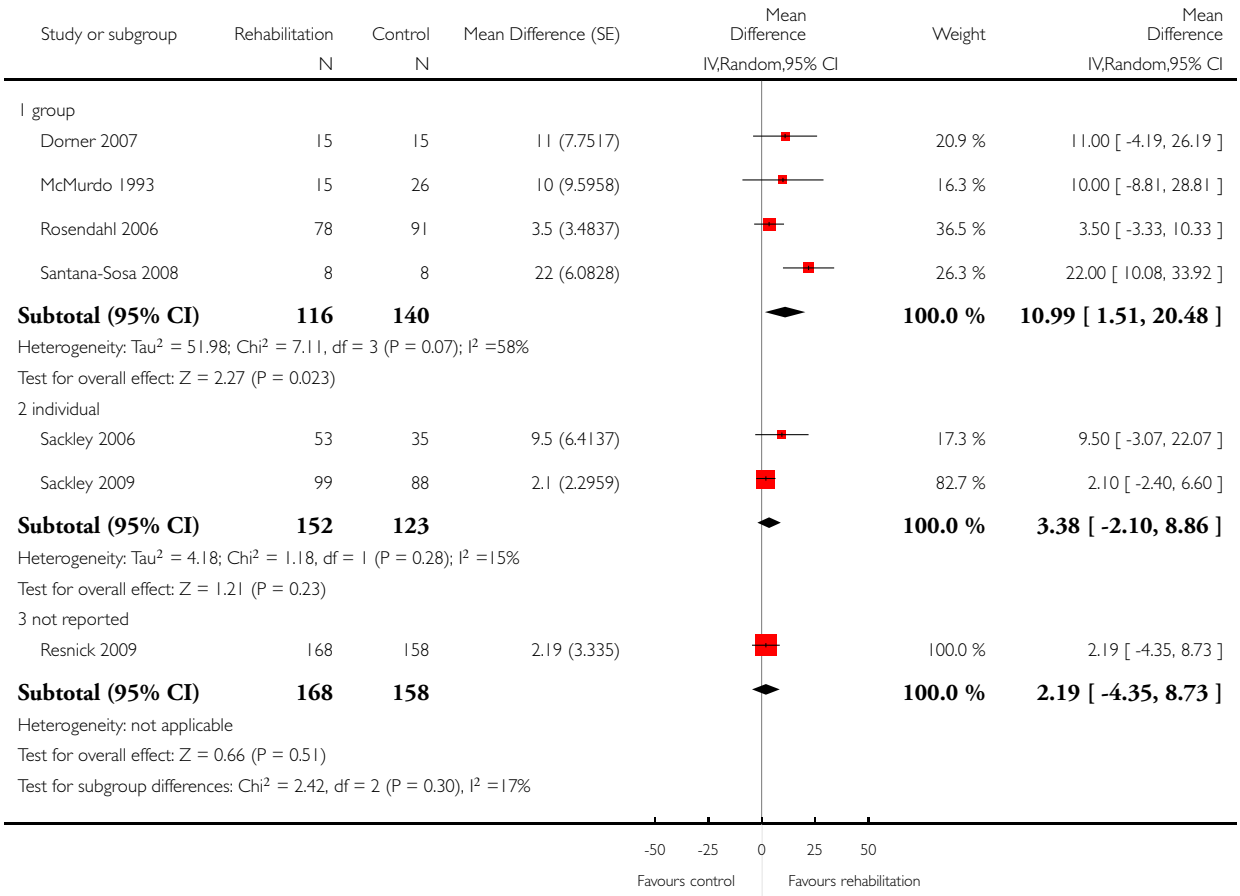
Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 shorter (< 3 months intervention)						
Dorner 2007	15	15	11 (7.7517)		40.5 %	11.00 [-4.19, 26.19]
Santana-Sosa 2008	8	8	22 (6.0828)		59.5 %	22.00 [10.08, 33.92]
Subtotal (95% CI)	**23**	**23**			**100.0 %**	**17.55 [6.97, 28.13]**
Heterogeneity: Tau^2 = 11.96; Chi^2 = 1.25, df = 1 (P = 0.26); I^2 =20%						
Test for overall effect: Z = 3.25 (P = 0.0012)						
2 longer (3+ months intervention)						
McMurdo 1993	15	26	10 (9.5958)		2.7 %	10.00 [-8.81, 28.81]
Resnick 2009	168	158	2.19 (3.335)		22.6 %	2.19 [-4.35, 8.73]
Rosendahl 2006	78	91	3.5 (3.4837)		20.7 %	3.50 [-3.33, 10.33]
Sackley 2006	53	35	9.5 (6.4137)		6.1 %	9.50 [-3.07, 22.07]
Sackley 2009	99	88	2.1 (2.2959)		47.8 %	2.10 [-2.40, 6.60]
Subtotal (95% CI)	**413**	**398**			**100.0 %**	**3.08 [-0.03, 6.19]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 1.79, df = 4 (P = 0.77); I^2 =0.0%						
Test for overall effect: Z = 1.94 (P = 0.052)						
Test for subgroup differences: Chi^2 = 6.61, df = 1 (P = 0.01), I^2 =85%						

Analysis 1.9. Comparison 1 Rehabilitation versus control, Outcome 9 Barthel Index (by mode of delivery).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 9 Barthel Index (by mode of delivery)



Analysis 1.10. Comparison 1 Rehabilitation versus control, Outcome 10 Barthel Index (by baseline Barthel Index score).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 10 Barthel Index (by baseline Barthel Index score)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 better (baseline Barthel Index score > median)						
Resnick 2009	168	158	2.19 (3.335)		37.0 %	2.19 [-4.35, 8.73]
Rosendahl 2006	78	91	3.5 (3.4837)		36.4 %	3.50 [-3.33, 10.33]
Santana-Sosa 2008	8	8	22 (6.0828)		26.6 %	22.00 [10.08, 33.92]
Subtotal (95% CI)	**254**	**257**			**100.0 %**	**7.94 [-1.77, 17.64]**
Heterogeneity: Tau^2 = 55.11; Chi^2 = 8.67, df = 2 (P = 0.01); I^2 =77%						
Test for overall effect: Z = 1.60 (P = 0.11)						
2 worse (baseline Barthel Index score < median)						
Dorner 2007	15	15	11 (7.7517)		9.6 %	11.00 [-4.19, 26.19]
Sackley 2006	53	35	9.5 (6.4137)		13.8 %	9.50 [-3.07, 22.07]
Sackley 2009	99	88	2.1 (2.2959)		76.6 %	2.10 [-2.40, 6.60]
Subtotal (95% CI)	**167**	**138**			**100.0 %**	**3.97 [-0.83, 8.78]**
Heterogeneity: Tau^2 = 2.58; Chi^2 = 2.18, df = 2 (P = 0.34); I^2 =8%						
Test for overall effect: Z = 1.62 (P = 0.11)						
Test for subgroup differences: Chi^2 = 0.51, df = 1 (P = 0.47), I^2 =0.0%						

Analysis 1.11. Comparison 1 Rehabilitation versus control, Outcome 11 Barthel Index (by age).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 11 Barthel Index (by age)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 younger (mean age < 85 years)						
McMurdo 1993	15	26	10 (9.5958)		13.2 %	10.00 [-8.81, 28.81]
Resnick 2009	168	158	2.19 (3.335)		32.6 %	2.19 [-4.35, 8.73]
Rosendahl 2006	78	91	3.5 (3.4837)		32.1 %	3.50 [-3.33, 10.33]
Santana-Sosa 2008	8	8	22 (6.0828)		22.2 %	22.00 [10.08, 33.92]
Subtotal (95% CI)	**269**	**283**			**100.0 %**	**8.02 [-0.25, 16.30]**
Heterogeneity: Tau^2 = 43.48; Chi^2 = 8.89, df = 3 (P = 0.03); I^2 =66%						
Test for overall effect: Z = 1.90 (P = 0.057)						
2 older (mean age 85+ years)						
Dorner 2007	15	15	11 (7.7517)		9.6 %	11.00 [-4.19, 26.19]
Sackley 2006	53	35	9.5 (6.4137)		13.8 %	9.50 [-3.07, 22.07]
Sackley 2009	99	88	2.1 (2.2959)		76.6 %	2.10 [-2.40, 6.60]
Subtotal (95% CI)	**167**	**138**			**100.0 %**	**3.97 [-0.83, 8.78]**
Heterogeneity: Tau^2 = 2.58; Chi^2 = 2.18, df = 2 (P = 0.34); I^2 =8%						
Test for overall effect: Z = 1.62 (P = 0.11)						
Test for subgroup differences: Chi^2 = 0.69, df = 1 (P = 0.41), I^2 =0.0%						

Analysis 1.12. Comparison 1 Rehabilitation versus control, Outcome 12 Barthel Index (by gender).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 12 Barthel Index (by gender)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 < 80% female						
Dorner 2007	15	15	11 (7.7517)		15.6 %	11.00 [-4.19, 26.19]
Rosendahl 2006	78	91	3.5 (3.4837)		29.8 %	3.50 [-3.33, 10.33]
Sackley 2009	99	88	2.1 (2.2959)		34.3 %	2.10 [-2.40, 6.60]
Santana-Sosa 2008	8	8	22 (6.0828)		20.2 %	22.00 [10.08, 33.92]
Subtotal (95% CI)	**200**	**202**			**100.0 %**	**7.93 [0.18, 15.69]**
Heterogeneity: Tau^2 = 40.37; Chi^2 = 10.15, df = 3 (P = 0.02); I^2 =70%						
Test for overall effect: Z = 2.00 (P = 0.045)						
2 80%+ female						
McMurdo 1993	15	26	10 (9.5958)		8.7 %	10.00 [-8.81, 28.81]
Resnick 2009	168	158	2.19 (3.335)		71.9 %	2.19 [-4.35, 8.73]
Sackley 2006	53	35	9.5 (6.4137)		19.4 %	9.50 [-3.07, 22.07]
Subtotal (95% CI)	**236**	**219**			**100.0 %**	**4.29 [-1.25, 9.83]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 1.41, df = 2 (P = 0.49); I^2 =0.0%						
Test for overall effect: Z = 1.52 (P = 0.13)						
Test for subgroup differences: Chi^2 = 0.56, df = 1 (P = 0.45), I^2 =0.0%						

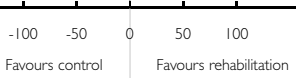
Analysis 1.13. Comparison 1 Rehabilitation versus control, Outcome 13 Functional Independence Measure (by risk of bias).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 13 Functional Independence Measure (by risk of bias)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 lower risk of bias						
Subtotal (95% CI)	**0**	**0**				**Not estimable**
Heterogeneity: not applicable						
Test for overall effect: not applicable						
2 higher risk of bias						
Dorner 2007	15	15	2 (6.2549)		16.7 %	2.00 [-10.26, 14.26]
Lazowski 1999	34	31	9.6 (3.0404)		30.4 %	9.60 [3.64, 15.56]
Makita 2006	71	74	0.3 (1.0334)		39.2 %	0.30 [-1.73, 2.33]
Przybylski 1996	32	31	11.758 (7.3577)		13.6 %	11.76 [-2.66, 26.18]
Subtotal (95% CI)	**152**	**151**			**100.0 %**	**4.98 [-1.55, 11.51]**
Heterogeneity: Tau^2 = 27.24; Chi^2 = 10.39, df = 3 (P = 0.02); I^2 =71%						
Test for overall effect: Z = 1.49 (P = 0.14)						
Test for subgroup differences: Not applicable						



Analysis 1.14. Comparison 1 Rehabilitation versus control, Outcome 14 Functional Independence Measure (by duration of intervention).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 14 Functional Independence Measure (by duration of intervention)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 shorter (< 3 months intervention)						
Dorner 2007	15	15	2 (6.2549)		100.0 %	2.00 [-10.26, 14.26]
Subtotal (95% CI)	**15**	**15**			**100.0 %**	**2.00 [-10.26, 14.26]**
Heterogeneity: not applicable						
Test for overall effect: Z = 0.32 (P = 0.75)						
2 longer (3+ months intervention)						
Lazowski 1999	34	31	9.6 (3.0404)		36.7 %	9.60 [3.64, 15.56]
Makita 2006	71	74	0.3 (1.0334)		44.6 %	0.30 [-1.73, 2.33]
Przybylski 1996	32	31	11.758 (7.3577)		18.6 %	11.76 [-2.66, 26.18]
Subtotal (95% CI)	**137**	**136**			**100.0 %**	**5.85 [-2.22, 13.93]**
Heterogeneity: Tau^2 = 36.96; Chi^2 = 10.39, df = 2 (P = 0.01); I^2 =81%						
Test for overall effect: Z = 1.42 (P = 0.16)						
Test for subgroup differences: Chi^2 = 0.26, df = 1 (P = 0.61), I^2 =0.0%						

Analysis 1.15. Comparison 1 Rehabilitation versus control, Outcome 15 Functional Independence Measure (by mode of delivery).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 15 Functional Independence Measure (by mode of delivery)

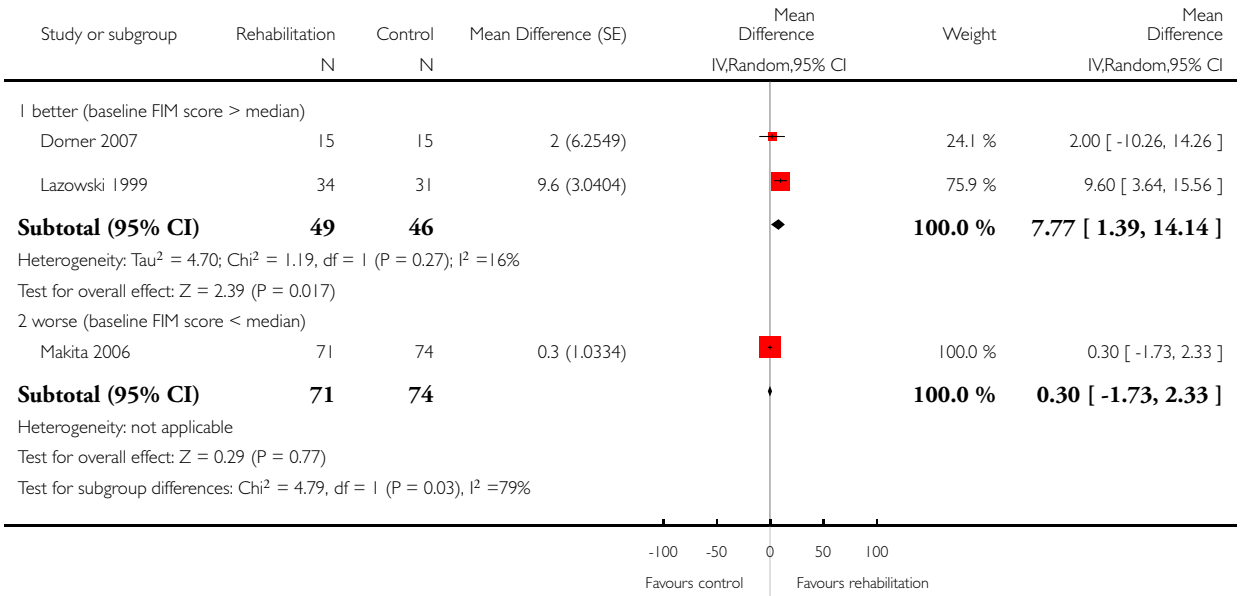
Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 group						
Dorner 2007	15	15	2 (6.2549)		19.2 %	2.00 [-10.26, 14.26]
Lazowski 1999	34	31	9.6 (3.0404)		35.2 %	9.60 [3.64, 15.56]
Makita 2006	71	74	0.3 (1.0334)		45.6 %	0.30 [-1.73, 2.33]
Subtotal (95% CI)	**120**	**120**			**100.0 %**	**3.90 [-3.08, 10.88]**
Heterogeneity: Tau^2 = 26.76; Chi^2 = 8.40, df = 2 (P = 0.01); I^2 =76%						
Test for overall effect: Z = 1.10 (P = 0.27)						
2 individual						
Przybylski 1996	32	31	11.758 (7.3577)		100.0 %	11.76 [-2.66, 26.18]
Subtotal (95% CI)	**32**	**31**			**100.0 %**	**11.76 [-2.66, 26.18]**
Heterogeneity: not applicable						
Test for overall effect: Z = 1.60 (P = 0.11)						
Test for subgroup differences: Chi^2 = 0.92, df = 1 (P = 0.34), I^2 =0.0%						

Analysis 1.16. Comparison 1 Rehabilitation versus control, Outcome 16 Functional Independence Measure (by baseline FIM score).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 16 Functional Independence Measure (by baseline FIM score)



Analysis 1.17. Comparison 1 Rehabilitation versus control, Outcome 17 Functional Independence Measure (by age).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 17 Functional Independence Measure (by age)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 younger (mean age < 85 years)						
Lazowski 1999	34	31	9.6 (3.0404)		85.4 %	9.60 [3.64, 15.56]
Przybylski 1996	32	31	11.758 (7.3577)		14.6 %	11.76 [-2.66, 26.18]
Subtotal (95% CI)	**66**	**62**			**100.0 %**	**9.91 [4.41, 15.42]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.07, df = 1 (P = 0.79); I^2 =0.0%						
Test for overall effect: Z = 3.53 (P = 0.00042)						
2 older (mean age 85+ years)						
Dorner 2007	15	15	2 (6.2549)		2.7 %	2.00 [-10.26, 14.26]
Makita 2006	71	74	0.3 (1.0334)		97.3 %	0.30 [-1.73, 2.33]
Subtotal (95% CI)	**86**	**89**			**100.0 %**	**0.35 [-1.65, 2.34]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.07, df = 1 (P = 0.79); I^2 =0.0%						
Test for overall effect: Z = 0.34 (P = 0.73)						
Test for subgroup differences: Chi^2 = 10.25, df = 1 (P = 0.00), I^2 =90%						

Analysis 1.18. Comparison 1 Rehabilitation versus control, Outcome 18 Functional Independence Measure (by gender).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 18 Functional Independence Measure (by gender)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 < 80% female						
Dorner 2007	15	15	2 (6.2549)		57.9 %	2.00 [-10.26, 14.26]
Przybylski 1996	32	31	11.758 (7.3577)		42.1 %	11.76 [-2.66, 26.18]
Subtotal (95% CI)	**47**	**46**			**100.0 %**	**6.11 [-3.33, 15.55]**
Heterogeneity: Tau^2 = 0.98; Chi^2 = 1.02, df = 1 (P = 0.31); I^2 =2%						
Test for overall effect: Z = 1.27 (P = 0.20)						
2 80%+ female						
Lazowski 1999	34	31	9.6 (3.0404)		45.3 %	9.60 [3.64, 15.56]
Makita 2006	71	74	0.3 (1.0334)		54.7 %	0.30 [-1.73, 2.33]
Subtotal (95% CI)	**105**	**105**			**100.0 %**	**4.51 [-4.56, 13.58]**
Heterogeneity: Tau^2 = 38.09; Chi^2 = 8.39, df = 1 (P = 0.004); I^2 =88%						
Test for overall effect: Z = 0.97 (P = 0.33)						
Test for subgroup differences: Chi^2 = 0.06, df = 1 (P = 0.81), I^2 =0.0%						

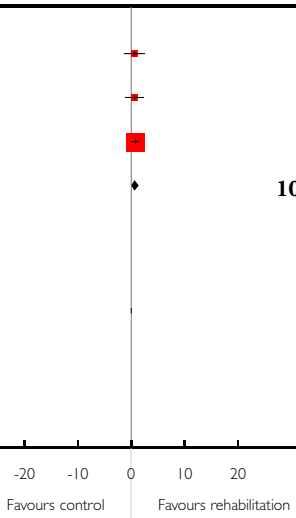
Analysis 1.19. Comparison 1 Rehabilitation versus control, Outcome 19 Rivermead Mobility Index (by risk of bias).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 19 Rivermead Mobility Index (by risk of bias)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 lower risk of bias						
Brittle 2009	26	23	0.6 (1.0591)		9.6 %	0.60 [-1.48, 2.68]
Sackley 2006	53	35	0.6 (0.9055)		13.1 %	0.60 [-1.17, 2.37]
Sackley 2009	98	88	0.71 (0.372449)		77.3 %	0.71 [-0.02, 1.44]
Subtotal (95% CI)	**177**	**146**			**100.0 %**	**0.69 [0.04, 1.33]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.02, df = 2 (P = 0.99); I^2 =0.0%						
Test for overall effect: Z = 2.09 (P = 0.036)						
2 higher risk of bias						
Subtotal (95% CI)	**0**	**0**				**Not estimable**
Heterogeneity: not applicable						
Test for overall effect: not applicable						
Test for subgroup differences: Not applicable						



Analysis 1.20. Comparison 1 Rehabilitation versus control, Outcome 20 Rivermead Mobility Index (by duration of intervention).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 20 Rivermead Mobility Index (by duration of intervention)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 shorter (< 3 months intervention)						
Brittle 2009	26	23	0.6 (1.0591)		100.0 %	0.60 [-1.48, 2.68]
Subtotal (95% CI)	**26**	**23**			**100.0 %**	**0.60 [-1.48, 2.68]**
Heterogeneity: not applicable						
Test for overall effect: Z = 0.57 (P = 0.57)						
2 longer (3+ months intervention)						
Sackley 2006	53	35	0.6 (0.9055)		14.5 %	0.60 [-1.17, 2.37]
Sackley 2009	98	88	0.71 (0.372449)		85.5 %	0.71 [-0.02, 1.44]
Subtotal (95% CI)	**151**	**123**			**100.0 %**	**0.69 [0.02, 1.37]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.01, df = 1 (P = 0.91); I^2 =0.0%						
Test for overall effect: Z = 2.02 (P = 0.044)						
Test for subgroup differences: Chi^2 = 0.01, df = 1 (P = 0.93), I^2 =0.0%						

Analysis 1.21. Comparison 1 Rehabilitation versus control, Outcome 21 Rivermead Mobility Index (by mode of delivery).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 21 Rivermead Mobility Index (by mode of delivery)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 group						
Brittle 2009	26	23	0.6 (1.0591)		100.0 %	0.60 [-1.48, 2.68]
Subtotal (95% CI)	**26**	**23**			**100.0 %**	**0.60 [-1.48, 2.68]**
Heterogeneity: not applicable						
Test for overall effect: Z = 0.57 (P = 0.57)						
2 individual						
Sackley 2006	53	35	0.6 (0.9055)		14.5 %	0.60 [-1.17, 2.37]
Sackley 2009	98	88	0.71 (0.372449)		85.5 %	0.71 [-0.02, 1.44]
Subtotal (95% CI)	**151**	**123**			**100.0 %**	**0.69 [0.02, 1.37]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.01, df = 1 (P = 0.91); I^2 =0.0%						
Test for overall effect: Z = 2.02 (P = 0.044)						
Test for subgroup differences: Chi^2 = 0.01, df = 1 (P = 0.93), I^2 =0.0%						

Analysis 1.22. Comparison 1 Rehabilitation versus control, Outcome 22 Rivermead Mobility Index (by baseline RMI score).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 22 Rivermead Mobility Index (by baseline RMI score)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 better (baseline RMI score > median)						
Brittle 2009	26	23	0.6 (1.0591)		11.0 %	0.60 [-1.48, 2.68]
Sackley 2009	98	88	0.71 (0.372449)		89.0 %	0.71 [-0.02, 1.44]
Subtotal (95% CI)	**124**	**111**			**100.0 %**	**0.70 [0.01, 1.39]**
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 0.01$, df = 1 (P = 0.92); $I^2 = 0.0\%$						
Test for overall effect: Z = 1.99 (P = 0.047)						
2 worse (baseline RMI score < median)						
Sackley 2006	53	35	0.6 (0.9055)		100.0 %	0.60 [-1.17, 2.37]
Subtotal (95% CI)	**53**	**35**			**100.0 %**	**0.60 [-1.17, 2.37]**
Heterogeneity: not applicable						
Test for overall effect: Z = 0.66 (P = 0.51)						
Test for subgroup differences: $Chi^2 = 0.01$, df = 1 (P = 0.92), $I^2 = 0.0\%$						

Analysis 1.23. Comparison 1 Rehabilitation versus control, Outcome 23 Rivermead Mobility Index (by age).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 23 Rivermead Mobility Index (by age)

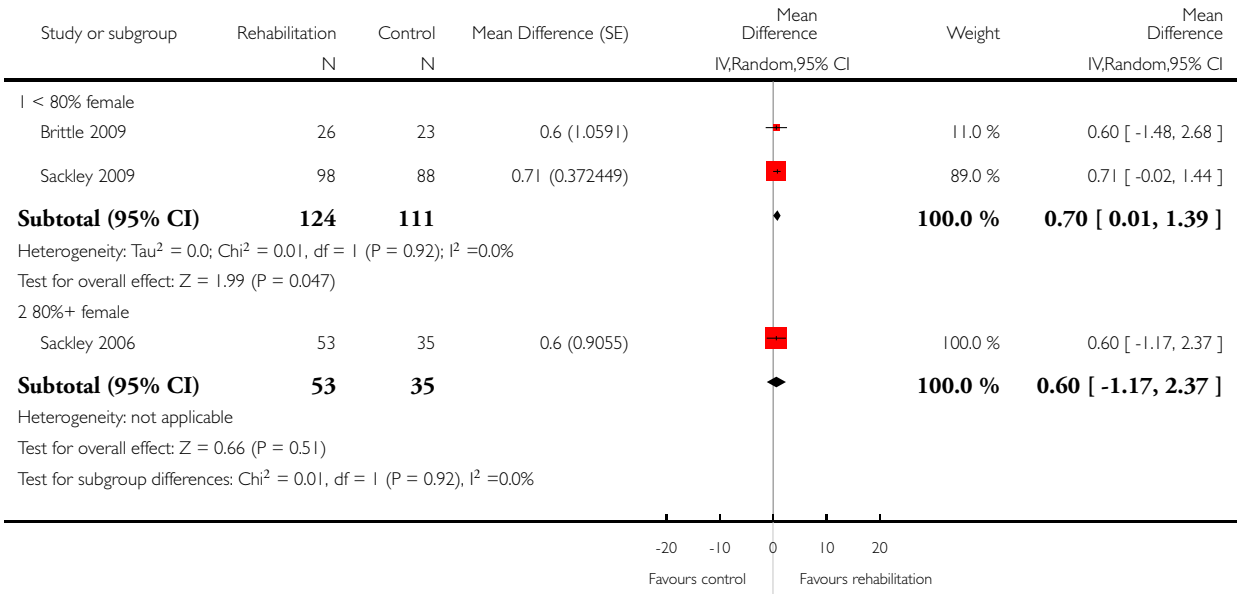
Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 younger (mean age < 85 years)						
Brittle 2009	26	23	0.6 (1.0591)		100.0 %	0.60 [-1.48, 2.68]
Subtotal (95% CI)	**26**	**23**			**100.0 %**	**0.60 [-1.48, 2.68]**
Heterogeneity: not applicable						
Test for overall effect: Z = 0.57 (P = 0.57)						
2 older (mean age 85+ years)						
Sackley 2006	53	35	0.6 (0.9055)		14.5 %	0.60 [-1.17, 2.37]
Sackley 2009	98	88	0.71 (0.372449)		85.5 %	0.71 [-0.02, 1.44]
Subtotal (95% CI)	**151**	**123**			**100.0 %**	**0.69 [0.02, 1.37]**
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 0.01$, df = 1 (P = 0.91); $I^2 = 0.0\%$						
Test for overall effect: Z = 2.02 (P = 0.044)						
Test for subgroup differences: $Chi^2 = 0.01$, df = 1 (P = 0.93), $I^2 = 0.0\%$						

Analysis 1.24. Comparison 1 Rehabilitation versus control, Outcome 24 Rivermead Mobility Index (by gender).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 24 Rivermead Mobility Index (by gender)



Analysis 1.25. Comparison 1 Rehabilitation versus control, Outcome 25 TUG Test (by risk of bias).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 25 TUG Test (by risk of bias)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 lower risk of bias						
Kerse 2008	266	290	0.6 (3.0409)		100.0 %	0.60 [-5.36, 6.56]
Subtotal (95% CI)	**266**	**290**			**100.0 %**	**0.60 [-5.36, 6.56]**
Heterogeneity: not applicable						
Test for overall effect: Z = 0.20 (P = 0.84)						
2 higher risk of bias						
Au-Yeung 2002	10	8	0.41 (2.8805)		22.9 %	0.41 [-5.24, 6.06]
Baum 2003	11	9	-24 (18)		2.2 %	-24.00 [-59.28, 11.28]
Cheung 2008	27	23	-4.76 (1.56)		27.8 %	-4.76 [-7.82, -1.70]
Lazowski 1999	36	30	-14.7 (6.2328)		11.8 %	-14.70 [-26.92, -2.48]
MacRitchie 2001	24	27	-17.31 (5.22)		14.5 %	-17.31 [-27.54, -7.08]
Peri 2008	63	61	0.4 (3.395)		20.8 %	0.40 [-6.25, 7.05]
Subtotal (95% CI)	**171**	**158**			**100.0 %**	**-5.92 [-11.29, -0.54]**
Heterogeneity: Tau^2 = 24.58; Chi^2 = 14.87, df = 5 (P = 0.01); I^2 =66%						
Test for overall effect: Z = 2.16 (P = 0.031)						
Test for subgroup differences: Chi^2 = 2.53, df = 1 (P = 0.11), I^2 =61%						

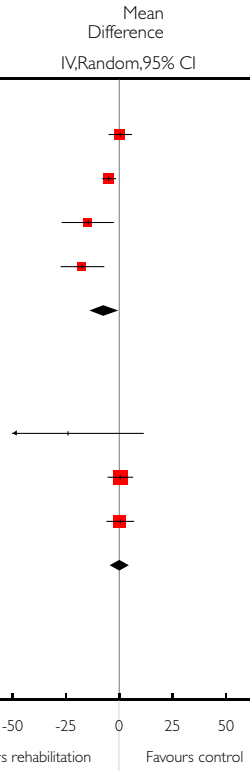
Analysis 1.26. Comparison 1 Rehabilitation versus control, Outcome 26 TUG Test (by duration of intervention).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 26 TUG Test (by duration of intervention)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 shorter (< 6 months intervention)						
Au-Yeung 2002	10	8	0.41 (2.8805)		29.3 %	0.41 [-5.24, 6.06]
Cheung 2008	27	23	-4.76 (1.56)		34.6 %	-4.76 [-7.82, -1.70]
Lazowski 1999	36	30	-14.7 (6.2328)		16.4 %	-14.70 [-26.92, -2.48]
MacRitchie 2001	24	27	-17.31 (5.22)		19.7 %	-17.31 [-27.54, -7.08]
Subtotal (95% CI)	**97**	**88**			**100.0 %**	**-7.34 [-13.93, -0.75]**
Heterogeneity: Tau^2 = 30.28; Chi^2 = 11.53, df = 3 (P = 0.01); I^2 =74%						
Test for overall effect: Z = 2.18 (P = 0.029)						
2 longer (6+ months intervention)						
Baum 2003	11	9	-24 (18)		1.6 %	-24.00 [-59.28, 11.28]
Kerse 2008	266	290	0.6 (3.0409)		54.6 %	0.60 [-5.36, 6.56]
Peri 2008	63	61	0.4 (3.395)		43.8 %	0.40 [-6.25, 7.05]
Subtotal (95% CI)	**340**	**360**			**100.0 %**	**0.13 [-4.28, 4.53]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 1.83, df = 2 (P = 0.40); I^2 =0.0%						
Test for overall effect: Z = 0.06 (P = 0.95)						
Test for subgroup differences: Chi^2 = 3.41, df = 1 (P = 0.06), I^2 =71%						

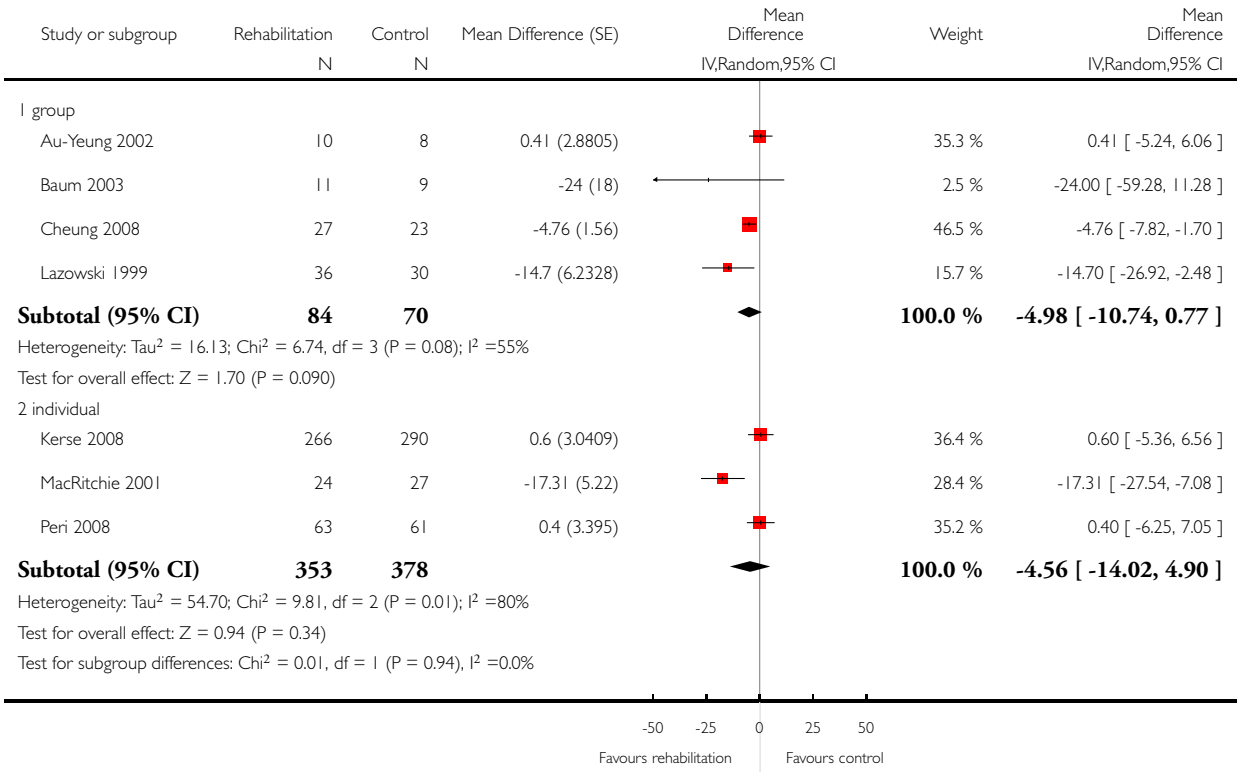


Analysis 1.27. Comparison 1 Rehabilitation versus control, Outcome 27 TUG Test (by mode of delivery).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 27 TUG Test (by mode of delivery)



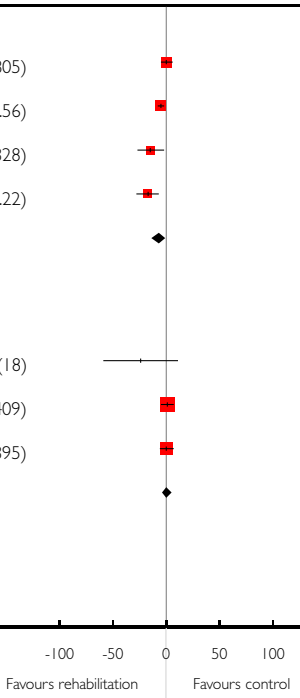
Analysis 1.28. Comparison 1 Rehabilitation versus control, Outcome 28 TUG Test (by baseline TUG score).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 28 TUG Test (by baseline TUG score)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 better (baseline TUG score < median)						
Au-Yeung 2002	10	8	0.41 (2.8805)		29.3 %	0.41 [-5.24, 6.06]
Cheung 2008	27	23	-4.76 (1.56)		34.6 %	-4.76 [-7.82, -1.70]
Lazowski 1999	36	30	-14.7 (6.2328)		16.4 %	-14.70 [-26.92, -2.48]
MacRitchie 2001	24	27	-17.31 (5.22)		19.7 %	-17.31 [-27.54, -7.08]
Subtotal (95% CI)	**97**	**88**			**100.0 %**	**-7.34 [-13.93, -0.75]**
Heterogeneity: Tau^2 = 30.28; Chi^2 = 11.53, df = 3 (P = 0.01); I^2 =74%						
Test for overall effect: Z = 2.18 (P = 0.029)						
2 worse (baseline TUG score > median)						
Baum 2003	11	9	-24 (18)		1.6 %	-24.00 [-59.28, 11.28]
Kerse 2008	266	290	0.6 (3.0409)		54.6 %	0.60 [-5.36, 6.56]
Peri 2008	63	61	0.4 (3.395)		43.8 %	0.40 [-6.25, 7.05]
Subtotal (95% CI)	**340**	**360**			**100.0 %**	**0.13 [-4.28, 4.53]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 1.83, df = 2 (P = 0.40); I^2 =0.0%						
Test for overall effect: Z = 0.06 (P = 0.95)						
Test for subgroup differences: Chi^2 = 3.41, df = 1 (P = 0.06), I^2 =71%						



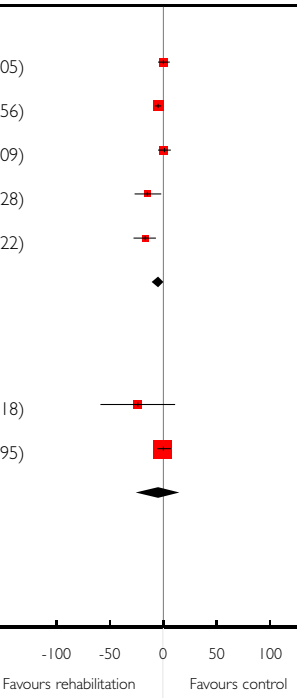
Analysis 1.29. Comparison 1 Rehabilitation versus control, Outcome 29 TUG Test (by age).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 29 TUG Test (by age)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 younger (mean age < 85 years)						
Au-Yeung 2002	10	8	0.41 (2.8805)		23.0 %	0.41 [-5.24, 6.06]
Cheung 2008	27	23	-4.76 (1.56)		28.1 %	-4.76 [-7.82, -1.70]
Kerse 2008	266	290	0.6 (3.0409)		22.4 %	0.60 [-5.36, 6.56]
Lazowski 1999	36	30	-14.7 (6.2328)		11.9 %	-14.70 [-26.92, -2.48]
MacRitchie 2001	24	27	-17.31 (5.22)		14.6 %	-17.31 [-27.54, -7.08]
Subtotal (95% CI)	**363**	**378**			**100.0 %**	**-5.39 [-10.77, 0.00]**
Heterogeneity: Tau^2 = 24.48; Chi^2 = 14.32, df = 4 (P = 0.01); I^2 =72%						
Test for overall effect: Z = 1.96 (P = 0.050)						
2 older (mean age 85+ years)						
Baum 2003	11	9	-24 (18)		23.8 %	-24.00 [-59.28, 11.28]
Peri 2008	63	61	0.4 (3.395)		76.2 %	0.40 [-6.25, 7.05]
Subtotal (95% CI)	**74**	**70**			**100.0 %**	**-5.40 [-25.75, 14.96]**
Heterogeneity: Tau^2 = 129.92; Chi^2 = 1.77, df = 1 (P = 0.18); I^2 =44%						
Test for overall effect: Z = 0.52 (P = 0.60)						
Test for subgroup differences: Chi^2 = 0.00, df = 1 (P = 1.00), I^2 =0.0%						



Analysis 1.30. Comparison 1 Rehabilitation versus control, Outcome 30 TUG Test (by gender).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 30 TUG Test (by gender)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 < 80% female						
Au-Yeung 2002	10	8	0.41 (2.8805)		52.0 %	0.41 [-5.24, 6.06]
Baum 2003	11	9	-24 (18)		1.3 %	-24.00 [-59.28, 11.28]
Kerse 2008	266	290	0.6 (3.0409)		46.7 %	0.60 [-5.36, 6.56]
Subtotal (95% CI)	**287**	**307**			**100.0 %**	**0.17 [-3.90, 4.24]**
Heterogeneity: Tau² = 0.0; Chi² = 1.83, df = 2 (P = 0.40); I² =0.0%						
Test for overall effect: Z = 0.08 (P = 0.93)						
2 80%+ female						
Cheung 2008	27	23	-4.76 (1.56)		35.2 %	-4.76 [-7.82, -1.70]
Lazowski 1999	36	30	-14.7 (6.2328)		16.9 %	-14.70 [-26.92, -2.48]
MacRitchie 2001	24	27	-17.31 (5.22)		20.2 %	-17.31 [-27.54, -7.08]
Peri 2008	63	61	0.4 (3.395)		27.7 %	0.40 [-6.25, 7.05]
Subtotal (95% CI)	**150**	**141**			**100.0 %**	**-7.55 [-14.28, -0.82]**
Heterogeneity: Tau² = 31.06; Chi² = 10.50, df = 3 (P = 0.01); I² =71%						
Test for overall effect: Z = 2.20 (P = 0.028)						
Test for subgroup differences: Chi² = 3.70, df = 1 (P = 0.05), I² =73%						

Analysis 1.31. Comparison 1 Rehabilitation versus control, Outcome 31 Walking speed (by risk of bias).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 31 Walking speed (by risk of bias)

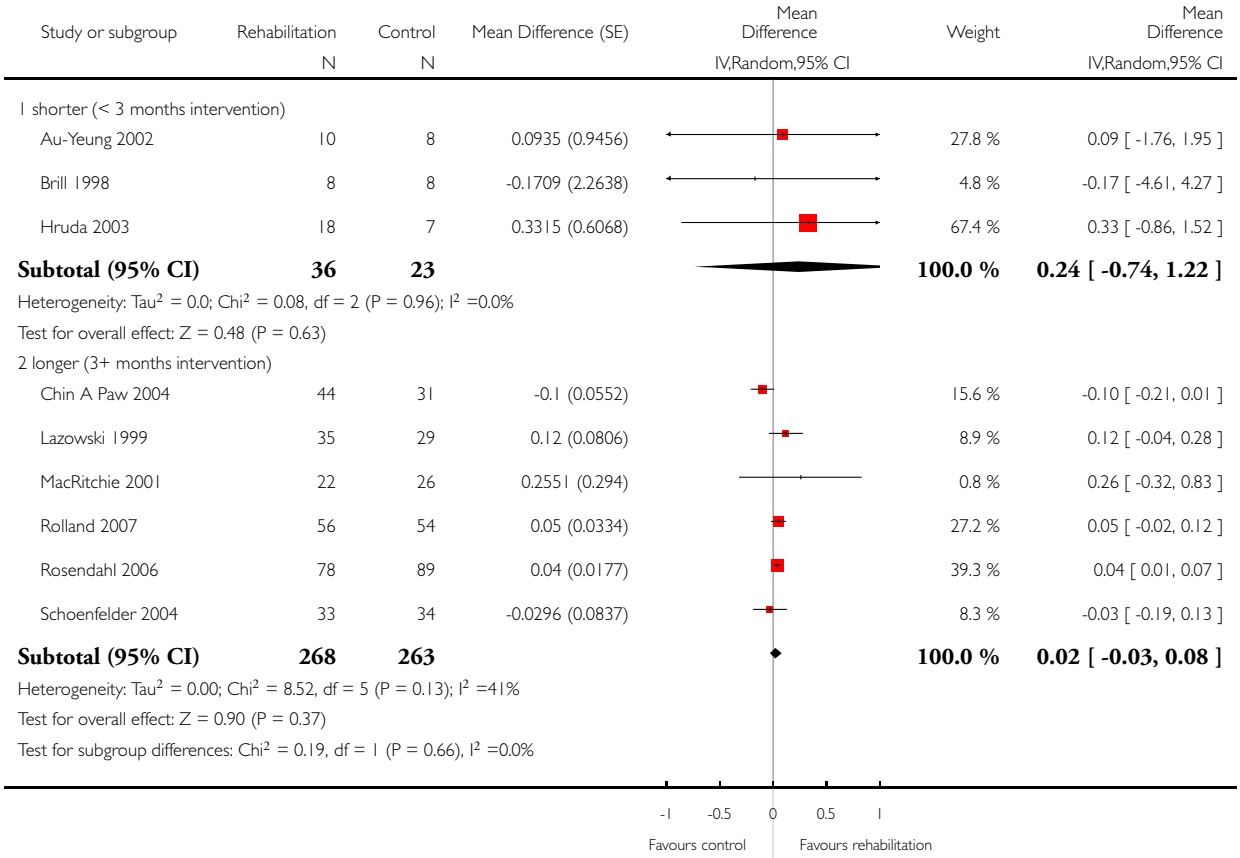
Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Weight	Mean Difference IV,Random,95% CI
1 lower risk of bias					
Chin A Paw 2004	44	31	-0.1 (0.0552)	100.0 %	-0.10 [-0.21, 0.01]
Subtotal (95% CI)	**44**	**31**		**100.0 %**	**-0.10 [-0.21, 0.01]**
Heterogeneity: not applicable					
Test for overall effect: Z = 1.81 (P = 0.070)					
2 higher risk of bias					
Au-Yeung 2002	10	8	0.0935 (0.9456)	0.0 %	0.09 [-1.76, 1.95]
Brill 1998	8	8	-0.1709 (2.2638)	0.0 %	-0.17 [-4.61, 4.27]
Hruda 2003	18	7	0.3315 (0.6068)	0.1 %	0.33 [-0.86, 1.52]
Lazowski 1999	35	29	0.12 (0.0806)	3.5 %	0.12 [-0.04, 0.28]
MacRitchie 2001	22	26	0.2551 (0.294)	0.3 %	0.26 [-0.32, 0.83]
Rolland 2007	56	54	0.05 (0.0334)	20.4 %	0.05 [-0.02, 0.12]
Rosendahl 2006	78	89	0.04 (0.0177)	72.5 %	0.04 [0.01, 0.07]
Schoenfelder 2004	33	34	-0.0296 (0.0837)	3.2 %	-0.03 [-0.19, 0.13]
Subtotal (95% CI)	**260**	**255**		**100.0 %**	**0.04 [0.01, 0.07]**
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 2.50$, df = 7 (P = 0.93); $I^2 = 0.0\%$					
Test for overall effect: Z = 2.87 (P = 0.0041)					
Test for subgroup differences: $Chi^2 = 6.27$, df = 1 (P = 0.01), $I^2 = 84\%$					

Analysis 1.32. Comparison 1 Rehabilitation versus control, Outcome 32 Walking speed (by duration of intervention).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 32 Walking speed (by duration of intervention)



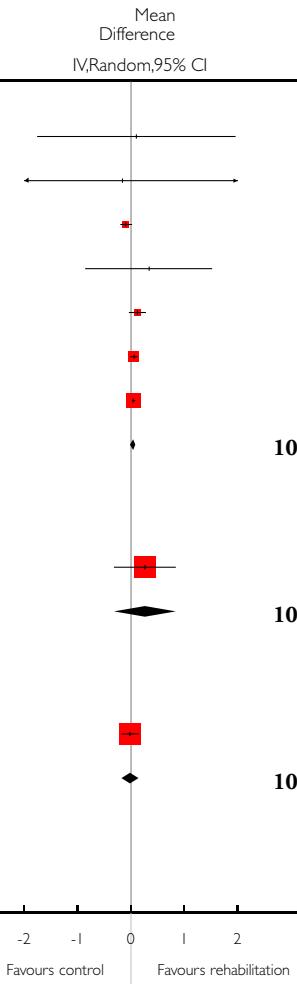
Analysis 1.33. Comparison 1 Rehabilitation versus control, Outcome 33 Walking speed (by mode of delivery).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 33 Walking speed (by mode of delivery)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 group						
Au-Yeung 2002	10	8	0.0935 (0.9456)		0.1 %	0.09 [-1.76, 1.95]
Brill 1998	8	8	-0.1709 (2.2638)		0.0 %	-0.17 [-4.61, 4.27]
Chin A Paw 2004	44	31	-0.1 (0.0552)		14.0 %	-0.10 [-0.21, 0.01]
Hruda 2003	18	7	0.3315 (0.6068)		0.1 %	0.33 [-0.86, 1.52]
Lazowski 1999	35	29	0.12 (0.0806)		7.4 %	0.12 [-0.04, 0.28]
Rolland 2007	56	54	0.05 (0.0334)		28.5 %	0.05 [-0.02, 0.12]
Rosendahl 2006	78	89	0.04 (0.0177)		49.9 %	0.04 [0.01, 0.07]
Subtotal (95% CI)	**249**	**226**			**100.0 %**	**0.03 [-0.02, 0.07]**
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 7.63$, df = 6 (P = 0.27); $I^2 = 21\%$						
Test for overall effect: Z = 1.28 (P = 0.20)						
2 individual						
MacRitchie 2001	22	26	0.2551 (0.294)		100.0 %	0.26 [-0.32, 0.83]
Subtotal (95% CI)	**22**	**26**			**100.0 %**	**0.26 [-0.32, 0.83]**
Heterogeneity: not applicable						
Test for overall effect: Z = 0.87 (P = 0.39)						
3 not reported						
Schoenfelder 2004	33	34	-0.0296 (0.0837)		100.0 %	-0.03 [-0.19, 0.13]
Subtotal (95% CI)	**33**	**34**			**100.0 %**	**-0.03 [-0.19, 0.13]**
Heterogeneity: not applicable						
Test for overall effect: Z = 0.35 (P = 0.72)						
Test for subgroup differences: $Chi^2 = 1.07$, df = 2 (P = 0.59), $I^2 = 0.0\%$						



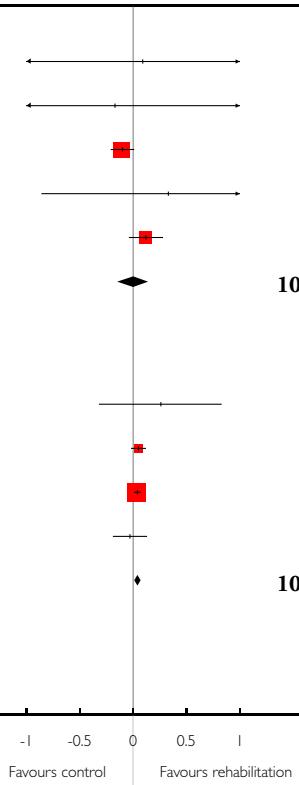
Analysis 1.34. Comparison 1 Rehabilitation versus control, Outcome 34 Walking speed (by baseline walking speed).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 34 Walking speed (by baseline walking speed)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 better (baseline walking speed > median)						
Au-Yeung 2002	10	8	0.0935 (0.9456)		0.6 %	0.09 [-1.76, 1.95]
Brill 1998	8	8	-0.1709 (2.2638)		0.1 %	-0.17 [-4.61, 4.27]
Chin A Paw 2004	44	31	-0.1 (0.0552)		56.3 %	-0.10 [-0.21, 0.01]
Hruda 2003	18	7	0.3315 (0.6068)		1.5 %	0.33 [-0.86, 1.52]
Lazowski 1999	35	29	0.12 (0.0806)		41.6 %	0.12 [-0.04, 0.28]
Subtotal (95% CI)	**115**	**83**			**100.0 %**	**0.00 [-0.15, 0.14]**
Heterogeneity: Tau^2 = 0.01; Chi^2 = 5.44, df = 4 (P = 0.24); I^2 =27%						
Test for overall effect: Z = 0.02 (P = 0.99)						
2 worse (baseline walking speed < median)						
MacRitchie 2001	22	26	0.2551 (0.294)		0.3 %	0.26 [-0.32, 0.83]
Rolland 2007	56	54	0.05 (0.0334)		21.1 %	0.05 [-0.02, 0.12]
Rosendahl 2006	78	89	0.04 (0.0177)		75.2 %	0.04 [0.01, 0.07]
Schoenfelder 2004	33	34	-0.0296 (0.0837)		3.4 %	-0.03 [-0.19, 0.13]
Subtotal (95% CI)	**189**	**203**			**100.0 %**	**0.04 [0.01, 0.07]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 1.32, df = 3 (P = 0.73); I^2 =0.0%						
Test for overall effect: Z = 2.63 (P = 0.0086)						
Test for subgroup differences: Chi^2 = 0.30, df = 1 (P = 0.58), I^2 =0.0%						

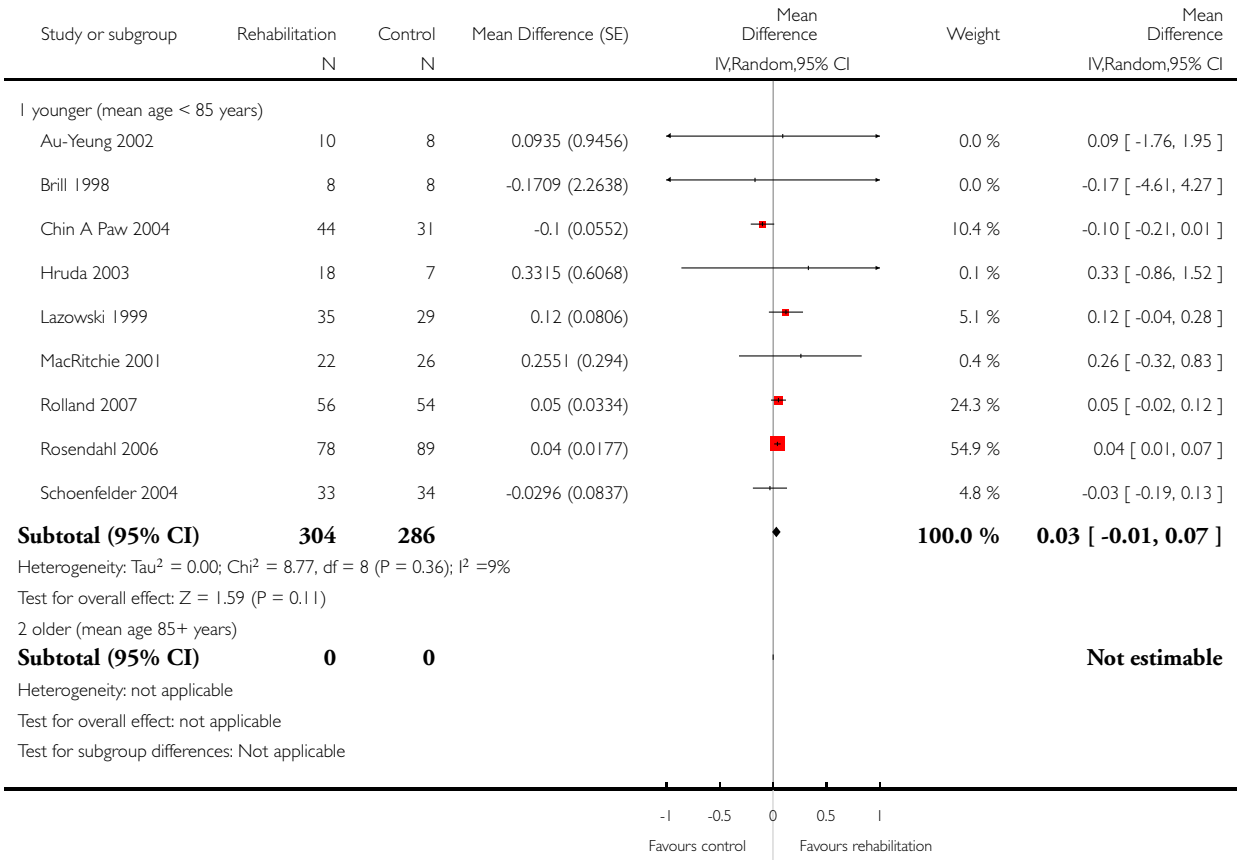


Analysis 1.35. Comparison 1 Rehabilitation versus control, Outcome 35 Walking speed (by age).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 35 Walking speed (by age)

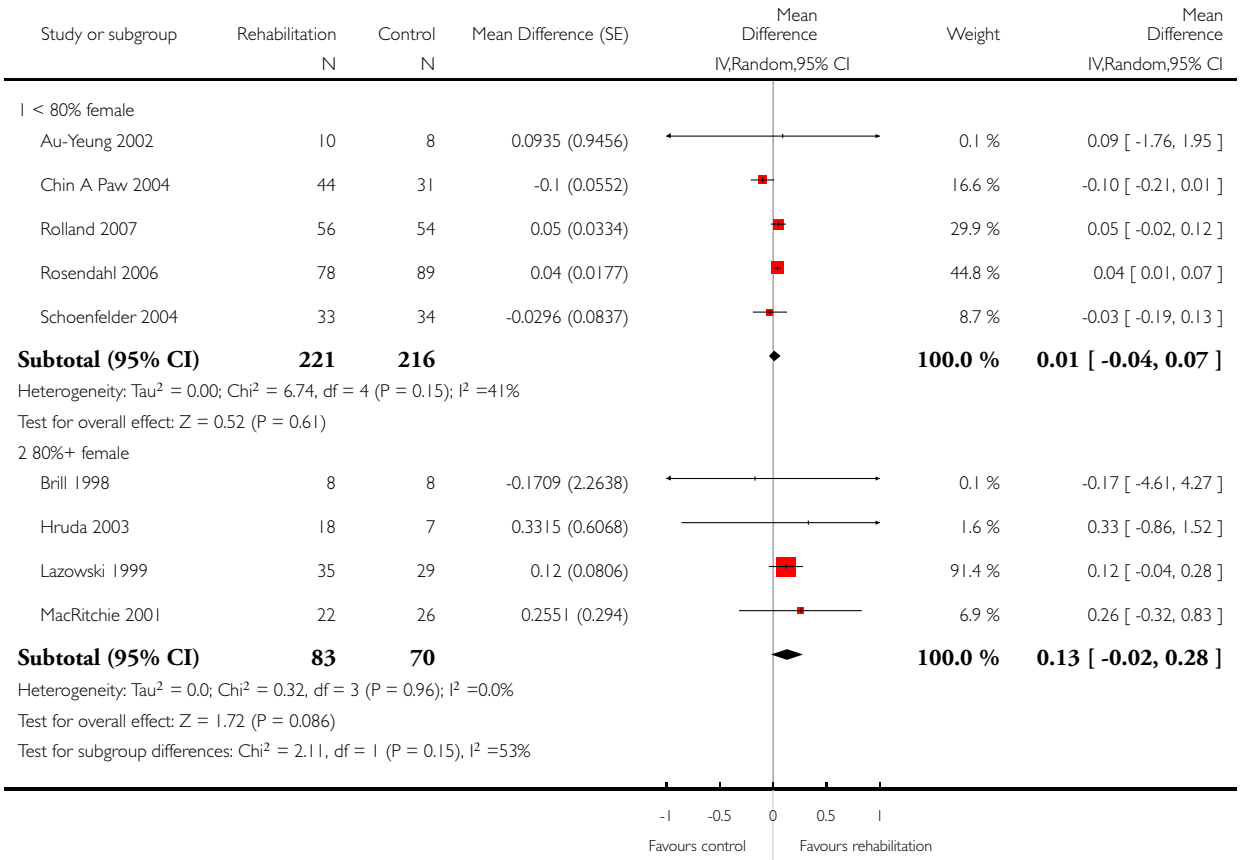


Analysis 1.36. Comparison 1 Rehabilitation versus control, Outcome 36 Walking speed (by gender).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 36 Walking speed (by gender)



Analysis 1.37. Comparison 1 Rehabilitation versus control, Outcome 37 Walking speed (by distance walked).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 37 Walking speed (by distance walked)

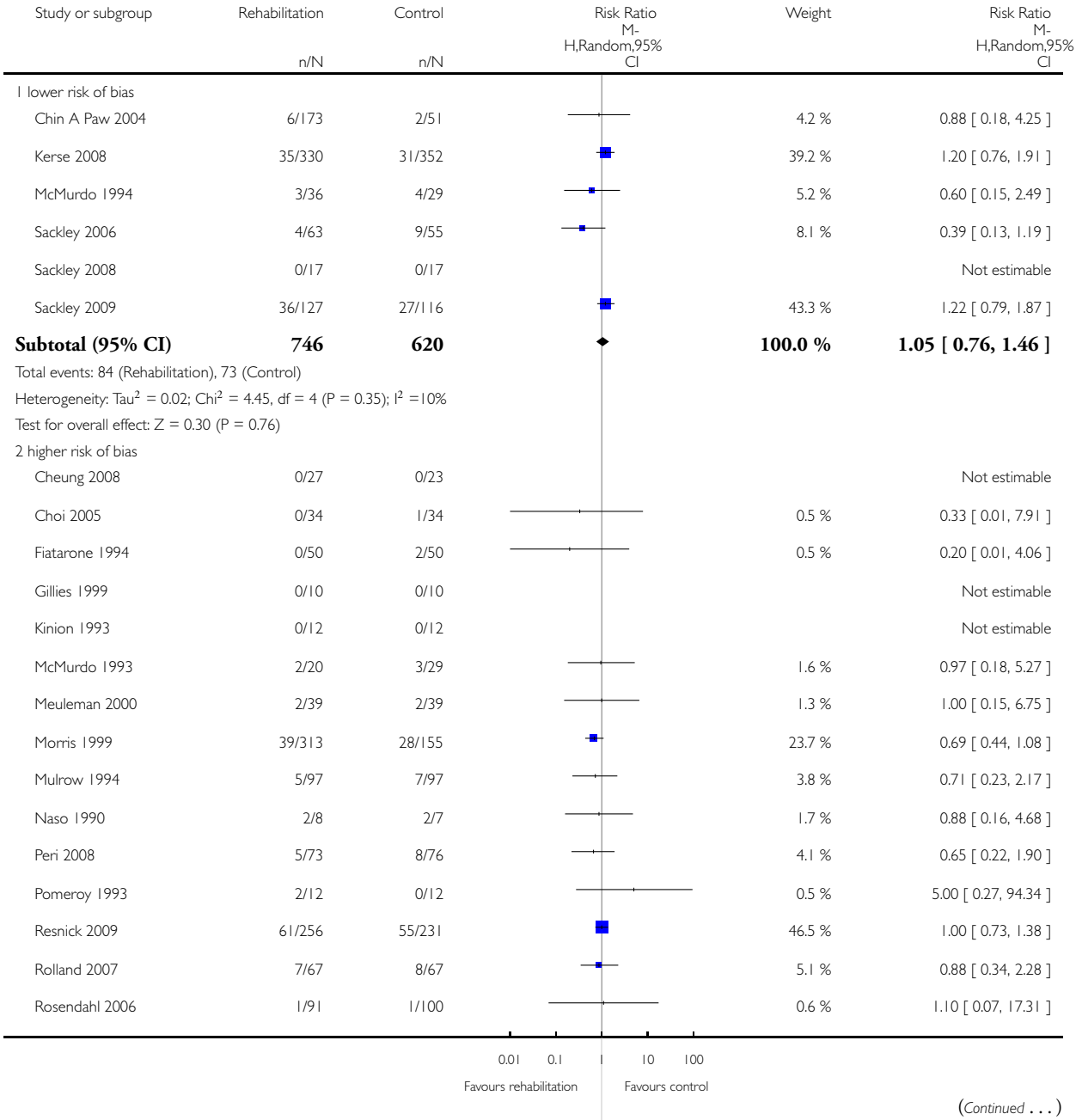
Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Weight	Mean Difference IV,Random,95% CI
1 less far (< 6 metres)					
Au-Yeung 2002	10	8	0.0935 (0.9456)	0.0 %	0.09 [-1.76, 1.95]
Rosendahl 2006	78	89	0.04 (0.0177)	100.0 %	0.04 [0.01, 0.07]
Subtotal (95% CI)	**88**	**97**		**100.0 %**	**0.04 [0.01, 0.07]**
Heterogeneity: Tau^2 = 0.0; Chi^2 = 0.00, df = 1 (P = 0.95); I^2 =0.0%					
Test for overall effect: Z = 2.26 (P = 0.024)					
2 further (6+ metres)					
Brill 1998	8	8	-0.1709 (2.2638)	0.0 %	-0.17 [-4.61, 4.27]
Chin A Paw 2004	44	31	-0.1 (0.0552)	26.2 %	-0.10 [-0.21, 0.01]
Hruda 2003	18	7	0.3315 (0.6068)	0.4 %	0.33 [-0.86, 1.52]
Lazowski 1999	35	29	0.12 (0.0806)	16.2 %	0.12 [-0.04, 0.28]
MacRitchie 2001	22	26	0.2551 (0.294)	1.7 %	0.26 [-0.32, 0.83]
Rolland 2007	56	54	0.05 (0.0334)	40.1 %	0.05 [-0.02, 0.12]
Schoenfelder 2004	33	34	-0.0296 (0.0837)	15.4 %	-0.03 [-0.19, 0.13]
Subtotal (95% CI)	**216**	**189**		**100.0 %**	**0.01 [-0.06, 0.09]**
Heterogeneity: Tau^2 = 0.00; Chi^2 = 8.33, df = 6 (P = 0.21); I^2 =28%					
Test for overall effect: Z = 0.37 (P = 0.71)					
Test for subgroup differences: Chi^2 = 0.37, df = 1 (P = 0.54), I^2 =0.0%					

Analysis 1.38. Comparison 1 Rehabilitation versus control, Outcome 38 Death (by risk of bias).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 38 Death (by risk of bias)



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Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Schnelle 2002	14/92	14/98		10.1 %	1.07 [0.54, 2.11]
Schoenfelder 2000	0/9	0/7			Not estimable
Sihvonen 2004	0/20	0/8			Not estimable
Taboonpong 2008	0/38	0/32			Not estimable
Subtotal (95% CI)	**1268**	**1087**		**100.0 %**	**0.88 [0.71, 1.10]**
Total events: 140 (Rehabilitation), 131 (Control)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 5.21$, df = 12 (P = 0.95); $I^2 = 0.0\%$					
Test for overall effect: Z = 1.13 (P = 0.26)					
Test for subgroup differences: $Chi^2 = 0.77$, df = 1 (P = 0.38), $I^2 = 0.0\%$					

Analysis 1.39. Comparison 1 Rehabilitation versus control, Outcome 39 Death (by duration of intervention).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 39 Death (by duration of intervention)

Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 shorter intervention (< 3 months)					
Cheung 2008	0/27	0/23			Not estimable
Choi 2005	0/34	1/34		16.2 %	0.33 [0.01, 7.91]
Fiatarone 1994	0/50	2/50		17.9 %	0.20 [0.01, 4.06]
Gillies 1999	0/10	0/10			Not estimable
Kinion 1993	0/12	0/12			Not estimable
Meuleman 2000	2/39	2/39		44.5 %	1.00 [0.15, 6.75]
Rosendahl 2006	1/91	1/100		21.4 %	1.10 [0.07, 17.31]

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Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Sackley 2008	0/17	0/17			Not estimable
Sihvonen 2004	0/20	0/8			Not estimable
Taboonpong 2008	0/38	0/32			Not estimable
Subtotal (95% CI)	**338**	**325**		**100.0 %**	**0.64 [0.18, 2.29]**
Total events: 3 (Rehabilitation), 6 (Control)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 1.12$, df = 3 (P = 0.77); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.69 (P = 0.49)					
2 longer intervention (3+ months)					
Chin A Paw 2004	6/173	2/51		1.3 %	0.88 [0.18, 4.25]
Kerse 2008	35/330	31/352		14.6 %	1.20 [0.76, 1.91]
McMurdo 1993	2/20	3/29		1.1 %	0.97 [0.18, 5.27]
McMurdo 1994	3/36	4/29		1.5 %	0.60 [0.15, 2.49]
Morris 1999	39/313	28/155		15.5 %	0.69 [0.44, 1.08]
Mulrow 1994	5/97	7/97		2.5 %	0.71 [0.23, 2.17]
Naso 1990	2/8	2/7		1.1 %	0.88 [0.16, 4.68]
Peri 2008	5/73	8/76		2.7 %	0.65 [0.22, 1.90]
Pomeroy 1993	2/12	0/12		0.4 %	5.00 [0.27, 94.34]
Resnick 2009	61/256	55/231		30.4 %	1.00 [0.73, 1.38]
Rolland 2007	7/67	8/67		3.4 %	0.88 [0.34, 2.28]
Sackley 2006	4/63	9/55		2.5 %	0.39 [0.13, 1.19]
Sackley 2009	36/127	27/116		16.6 %	1.22 [0.79, 1.87]
Schnelle 2002	14/92	14/98		6.6 %	1.07 [0.54, 2.11]
Schoenfelder 2000	0/9	0/7			Not estimable
Subtotal (95% CI)	**1676**	**1382**		**100.0 %**	**0.95 [0.80, 1.14]**
Total events: 221 (Rehabilitation), 198 (Control)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 9.34$, df = 13 (P = 0.75); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.52 (P = 0.60)					
Test for subgroup differences: $Chi^2 = 0.37$, df = 1 (P = 0.54), $I^2 = 0.0\%$					

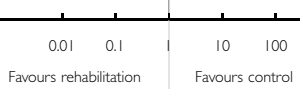
Analysis 1.40. Comparison 1 Rehabilitation versus control, Outcome 40 Death (by mode of delivery).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 40 Death (by mode of delivery)

Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 group					
Cheung 2008	0/27	0/23			Not estimable
Chin A Paw 2004	6/173	2/51		14.2 %	0.88 [0.18, 4.25]
Choi 2005	0/34	1/34		3.5 %	0.33 [0.01, 7.91]
Gillies 1999	0/10	0/10			Not estimable
Kinion 1993	0/12	0/12			Not estimable
McMurdo 1993	2/20	3/29		12.2 %	0.97 [0.18, 5.27]
McMurdo 1994	3/36	4/29		17.5 %	0.60 [0.15, 2.49]
Meuleman 2000	2/39	2/39		9.6 %	1.00 [0.15, 6.75]
Rolland 2007	7/67	8/67		38.3 %	0.88 [0.34, 2.28]
Rosendahl 2006	1/91	1/100		4.6 %	1.10 [0.07, 17.31]
Sackley 2008	0/17	0/17			Not estimable
Taboonpong 2008	0/38	0/32			Not estimable
Subtotal (95% CI)	**564**	**443**		**100.0 %**	**0.82 [0.46, 1.49]**
Total events: 21 (Rehabilitation), 21 (Control)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 0.64$, df = 6 (P = 1.00); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.65 (P = 0.52)					
2 individual					
Fiatarone 1994	0/50	2/50		0.8 %	0.20 [0.01, 4.06]
Kerse 2008	35/330	31/352		22.6 %	1.20 [0.76, 1.91]
Morris 1999	39/313	28/155		23.5 %	0.69 [0.44, 1.08]
Mulrow 1994	5/97	7/97		5.3 %	0.71 [0.23, 2.17]
Peri 2008	5/73	8/76		5.7 %	0.65 [0.22, 1.90]
Sackley 2006	4/63	9/55		5.2 %	0.39 [0.13, 1.19]
Sackley 2009	36/127	27/116		24.6 %	1.22 [0.79, 1.87]
Schnelle 2002	14/92	14/98		12.4 %	1.07 [0.54, 2.11]
Sihvonen 2004	0/20	0/8			Not estimable



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Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Subtotal (95% CI)	**1165**	**1007**		**100.0 %**	**0.91 [0.70, 1.19]**
Total events: 138 (Rehabilitation), 126 (Control)					
Heterogeneity: $Tau^2 = 0.03$; $Chi^2 = 8.60$, df = 7 (P = 0.28); $I^2 = 19\%$					
Test for overall effect: Z = 0.68 (P = 0.49)					
3 group and individual					
Pomeroy 1993	2/12	0/12		100.0 %	5.00 [0.27, 94.34]
Subtotal (95% CI)	**12**	**12**		**100.0 %**	**5.00 [0.27, 94.34]**
Total events: 2 (Rehabilitation), 0 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.07 (P = 0.28)					
4 not reported					
Naso 1990	2/8	2/7		3.5 %	0.88 [0.16, 4.68]
Resnick 2009	61/256	55/231		96.5 %	1.00 [0.73, 1.38]
Schoenfelder 2000	0/9	0/7			Not estimable
Subtotal (95% CI)	**273**	**245**		**100.0 %**	**1.00 [0.73, 1.36]**
Total events: 63 (Rehabilitation), 57 (Control)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 0.02$, df = 1 (P = 0.88); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.02 (P = 0.98)					
Test for subgroup differences: $Chi^2 = 1.62$, df = 3 (P = 0.65), $I^2 = 0.0\%$					

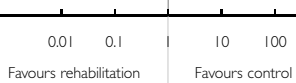
Analysis 1.41. Comparison 1 Rehabilitation versus control, Outcome 41 Death (by age).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 41 Death (by age)

Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 younger (mean age < 85 years)					
Cheung 2008	0/27	0/23			Not estimable
Chin A Paw 2004	6/173	2/51		1.4 %	0.88 [0.18, 4.25]
Choi 2005	0/34	1/34		0.3 %	0.33 [0.01, 7.91]
Kerse 2008	35/330	31/352		16.5 %	1.20 [0.76, 1.91]
Kinion 1993	0/12	0/12			Not estimable
McMurdo 1993	2/20	3/29		1.2 %	0.97 [0.18, 5.27]
McMurdo 1994	3/36	4/29		1.7 %	0.60 [0.15, 2.49]
Meuleman 2000	2/39	2/39		1.0 %	1.00 [0.15, 6.75]
Morris 1999	39/313	28/155		17.5 %	0.69 [0.44, 1.08]
Mulrow 1994	5/97	7/97		2.8 %	0.71 [0.23, 2.17]
Resnick 2009	61/256	55/231		34.4 %	1.00 [0.73, 1.38]
Rolland 2007	7/67	8/67		3.8 %	0.88 [0.34, 2.28]
Rosendahl 2006	1/91	1/100		0.5 %	1.10 [0.07, 17.31]
Sackley 2009	36/127	27/116		18.8 %	1.22 [0.79, 1.87]
Schoenfelder 2000	0/9	0/7			Not estimable
Sihvonen 2004	0/20	0/8			Not estimable
Subtotal (95% CI)	**1651**	**1350**		**100.0 %**	**0.97 [0.81, 1.17]**
Total events: 197 (Rehabilitation), 169 (Control)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 5.43$, df = 11 (P = 0.91); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.27 (P = 0.78)					
2 older (mean age 85+ years)					
Fiatarone 1994	0/50	2/50		2.5 %	0.20 [0.01, 4.06]
Gillies 1999	0/10	0/10			Not estimable
Naso 1990	2/8	2/7		8.1 %	0.88 [0.16, 4.68]
Peri 2008	5/73	8/76		19.9 %	0.65 [0.22, 1.90]
Pomeroy 1993	2/12	0/12		2.6 %	5.00 [0.27, 94.34]



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Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Sackley 2006	4/63	9/55		18.1 %	0.39 [0.13, 1.19]
Sackley 2008	0/17	0/17			Not estimable
Schnelle 2002	14/92	14/98		48.7 %	1.07 [0.54, 2.11]
Taboonpong 2008	0/38	0/32			Not estimable
Subtotal (95% CI)	**363**	**357**		**100.0 %**	**0.79 [0.49, 1.27]**

Total events: 27 (Rehabilitation), 35 (Control)

Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 4.74$, df = 5 (P = 0.45); $I^2 = 0.0\%$

Test for overall effect: Z = 0.97 (P = 0.33)

Test for subgroup differences: $Chi^2 = 0.64$, df = 1 (P = 0.42), $I^2 = 0.0\%$

Analysis 1.42. Comparison 1 Rehabilitation versus control, Outcome 42 Death (by gender).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 42 Death (by gender)

Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 < 80% female					
Chin A Paw 2004	6/173	2/51		2.4 %	0.88 [0.18, 4.25]
Choi 2005	0/34	1/34		0.6 %	0.33 [0.01, 7.91]
Fiatarone 1994	0/50	2/50		0.6 %	0.20 [0.01, 4.06]
Kerse 2008	35/330	31/352		27.7 %	1.20 [0.76, 1.91]
Kinion 1993	0/12	0/12			Not estimable
Meuleman 2000	2/39	2/39		1.6 %	1.00 [0.15, 6.75]
Morris 1999	39/313	28/155		29.4 %	0.69 [0.44, 1.08]

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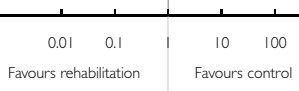
Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Mulrow 1994	5/97	7/97		4.7 %	0.71 [0.23, 2.17]
Pomeroy 1993	2/12	0/12		0.7 %	5.00 [0.27, 94.34]
Rosendahl 2006	1/91	1/100		0.8 %	1.10 [0.07, 17.31]
Sackley 2009	36/127	27/116		31.5 %	1.22 [0.79, 1.87]
Taboonpong 2008	0/38	0/32			Not estimable
Subtotal (95% CI)	**1316**	**1050**		**100.0 %**	**0.98 [0.77, 1.25]**
Total events: 126 (Rehabilitation), 101 (Control)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 7.17$, df = 9 (P = 0.62); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.16 (P = 0.87)					
2 80%+ female					
Cheung 2008	0/27	0/23			Not estimable
Gillies 1999	0/10	0/10			Not estimable
McMurdo 1993	2/20	3/29		2.2 %	0.97 [0.18, 5.27]
McMurdo 1994	3/36	4/29		3.2 %	0.60 [0.15, 2.49]
Peri 2008	5/73	8/76		5.6 %	0.65 [0.22, 1.90]
Resnick 2009	61/256	55/231		63.2 %	1.00 [0.73, 1.38]
Rolland 2007	7/67	8/67		7.0 %	0.88 [0.34, 2.28]
Sackley 2006	4/63	9/55		5.1 %	0.39 [0.13, 1.19]
Sackley 2008	0/17	0/17			Not estimable
Schnelle 2002	14/92	14/98		13.7 %	1.07 [0.54, 2.11]
Schoenfelder 2000	0/9	0/7			Not estimable
Sihvonen 2004	0/20	0/8			Not estimable
Subtotal (95% CI)	**690**	**650**		**100.0 %**	**0.91 [0.71, 1.18]**
Total events: 96 (Rehabilitation), 101 (Control)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 3.50$, df = 6 (P = 0.74); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.69 (P = 0.49)					
3 not reported					
Naso 1990	2/8	2/7		100.0 %	0.88 [0.16, 4.68]
Subtotal (95% CI)	**8**	**7**		**100.0 %**	**0.88 [0.16, 4.68]**
Total events: 2 (Rehabilitation), 2 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.16 (P = 0.88)					
Test for subgroup differences: $Chi^2 = 0.16$, df = 2 (P = 0.92), $I^2 = 0.0\%$					



Analysis 1.43. Comparison 1 Rehabilitation versus control, Outcome 43 Sensitivity analysis: Barthel Index (fixed-effect).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

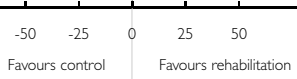
Outcome: 43 Sensitivity analysis: Barthel Index (fixed-effect)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Dorner 2007	15	15	11 (7.7517)		3.8 %	11.00 [-4.19, 26.19]
McMurdo 1993	15	26	10 (9.5958)		2.5 %	10.00 [-8.81, 28.81]
Resnick 2009	168	158	2.19 (3.335)		20.4 %	2.19 [-4.35, 8.73]
Rosendahl 2006	78	91	3.5 (3.4837)		18.7 %	3.50 [-3.33, 10.33]
Sackley 2006	53	35	9.5 (6.4137)		5.5 %	9.50 [-3.07, 22.07]
Sackley 2009	99	88	2.1 (2.2959)		43.0 %	2.10 [-2.40, 6.60]
Santana-Sosa 2008	8	8	22 (6.0828)		6.1 %	22.00 [10.08, 33.92]
Total (95% CI)	**436**	**421**			**100.0 %**	**4.54 [1.59, 7.49]**

Heterogeneity: Chi² = 11.57, df = 6 (P = 0.07); I² =48%

Test for overall effect: Z = 3.01 (P = 0.0026)

Test for subgroup differences: Not applicable



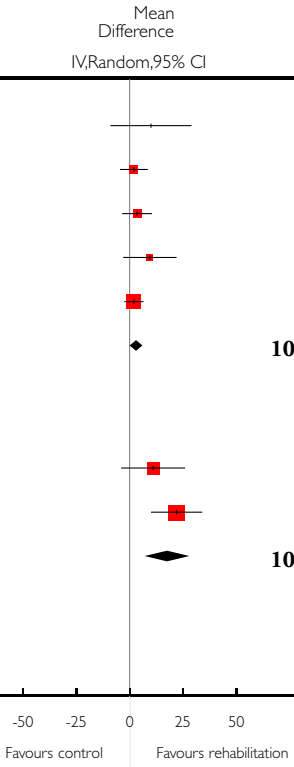
Analysis 1.44. Comparison 1 Rehabilitation versus control, Outcome 44 Sensitivity analysis: Barthel Index (cluster trials).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 44 Sensitivity analysis: Barthel Index (cluster trials)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 cluster (adjusted)						
McMurdo 1993	15	26	10 (9.5958)		2.7 %	10.00 [-8.81, 28.81]
Resnick 2009	168	158	2.19 (3.335)		22.6 %	2.19 [-4.35, 8.73]
Rosendahl 2006	78	91	3.5 (3.4837)		20.7 %	3.50 [-3.33, 10.33]
Sackley 2006	53	35	9.5 (6.4137)		6.1 %	9.50 [-3.07, 22.07]
Sackley 2009	99	88	2.1 (2.2959)		47.8 %	2.10 [-2.40, 6.60]
Subtotal (95% CI)	**413**	**398**			**100.0 %**	**3.08 [-0.03, 6.19]**
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 1.79$, df = 4 (P = 0.77); $I^2 = 0.0\%$						
Test for overall effect: Z = 1.94 (P = 0.052)						
2 individual						
Dorner 2007	15	15	11 (7.7517)		40.5 %	11.00 [-4.19, 26.19]
Santana-Sosa 2008	8	8	22 (6.0828)		59.5 %	22.00 [10.08, 33.92]
Subtotal (95% CI)	**23**	**23**			**100.0 %**	**17.55 [6.97, 28.13]**
Heterogeneity: $Tau^2 = 11.96$; $Chi^2 = 1.25$, df = 1 (P = 0.26); $I^2 = 20\%$						
Test for overall effect: Z = 3.25 (P = 0.0012)						
Test for subgroup differences: $Chi^2 = 6.61$, df = 1 (P = 0.01), $I^2 = 85\%$						



Analysis 1.45. Comparison 1 Rehabilitation versus control, Outcome 45 Sensitivity analysis: Functional Independence Measure (fixed-effect).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 45 Sensitivity analysis: Functional Independence Measure (fixed-effect)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Dorner 2007	15	15	2 (6.2549)		2.3 %	2.00 [-10.26, 14.26]
Lazowski 1999	34	31	9.6 (3.0404)		9.9 %	9.60 [3.64, 15.56]
Makita 2006	71	74	0.3 (1.0334)		86.0 %	0.30 [-1.73, 2.33]
Przybylski 1996	32	31	11.758 (7.3577)		1.7 %	11.76 [-2.66, 26.18]
Total (95% CI)	**152**	**151**			**100.0 %**	**1.46 [-0.42, 3.34]**

Heterogeneity: Chi^2 = 10.39, df = 3 (P = 0.02); I^2 =71%

Test for overall effect: Z = 1.52 (P = 0.13)

Test for subgroup differences: Not applicable

Analysis 1.46. Comparison 1 Rehabilitation versus control, Outcome 46 Sensitivity analysis: Rivermead Mobility Index (fixed-effect).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

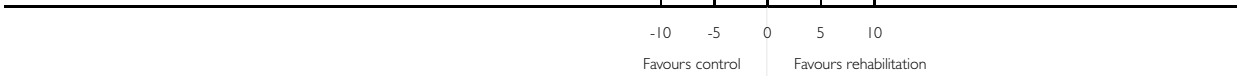
Outcome: 46 Sensitivity analysis: Rivermead Mobility Index (fixed-effect)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Brittle 2009	26	23	0.6 (1.0591)		9.6 %	0.60 [-1.48, 2.68]
Sackley 2006	53	35	0.6 (0.9055)		13.1 %	0.60 [-1.17, 2.37]
Sackley 2009	98	88	0.71 (0.372449)		77.3 %	0.71 [-0.02, 1.44]
Total (95% CI)	**177**	**146**			**100.0 %**	**0.69 [0.04, 1.33]**

Heterogeneity: $Chi^2 = 0.02$, df = 2 (P = 0.99); $I^2 = 0.0\%$

Test for overall effect: Z = 2.09 (P = 0.036)

Test for subgroup differences: Not applicable



Analysis 1.47. Comparison 1 Rehabilitation versus control, Outcome 47 Sensitivity analysis: TUG Test (fixed-effect).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

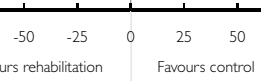
Outcome: 47 Sensitivity analysis: TUG Test (fixed-effect)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Au-Yeung 2002	10	8	0.41 (2.8805)		15.2 %	0.41 [-5.24, 6.06]
Baum 2003	11	9	-24 (18)		0.4 %	-24.00 [-59.28, 11.28]
Cheung 2008	27	23	-4.76 (1.56)		51.9 %	-4.76 [-7.82, -1.70]
Kerse 2008	266	290	0.6 (3.0409)		13.7 %	0.60 [-5.36, 6.56]
Lazowski 1999	36	30	-14.7 (6.2328)		3.3 %	-14.70 [-26.92, -2.48]
MacRitchie 2001	24	27	-17.31 (5.22)		4.6 %	-17.31 [-27.54, -7.08]
Peri 2008	63	61	0.4 (3.395)		11.0 %	0.40 [-6.25, 7.05]
Total (95% CI)	**437**	**448**			**100.0 %**	**-3.66 [-5.86, -1.45]**

Heterogeneity: Chi^2 = 17.14, df = 6 (P = 0.01); I^2 =65%

Test for overall effect: Z = 3.25 (P = 0.0011)

Test for subgroup differences: Not applicable

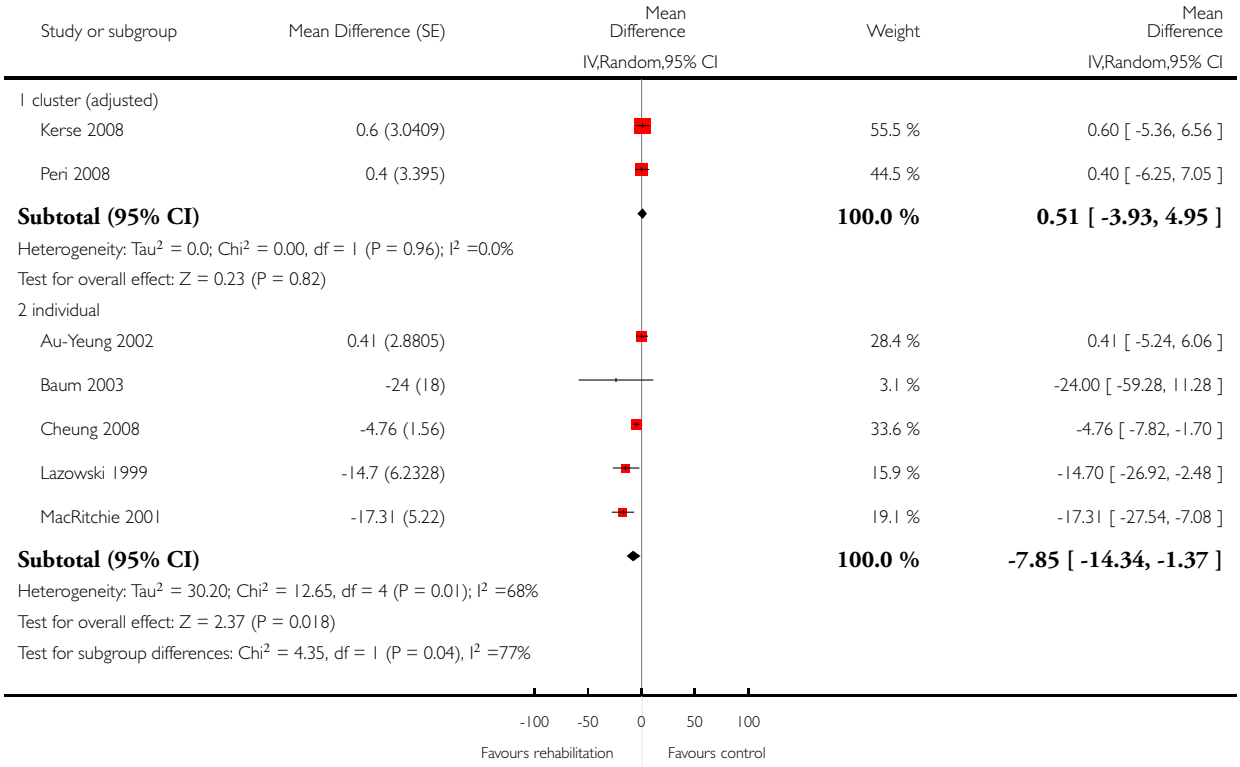


Analysis 1.48. Comparison 1 Rehabilitation versus control, Outcome 48 Sensitivity anlaysis: TUG Test (cluster trials).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 48 Sensitivity anlaysis: TUG Test (cluster trials)



Analysis 1.49. Comparison 1 Rehabilitation versus control, Outcome 49 Sensitivity analysis: TUG Test (re-including Christofoletti 2008).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

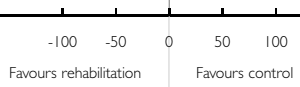
Outcome: 49 Sensitivity analysis: TUG Test (re-including Christofoletti 2008)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Au-Yeung 2002	10	8	0.41 (2.8805)		14.6 %	0.41 [-5.24, 6.06]
Baum 2003	11	9	-24 (18)		3.2 %	-24.00 [-59.28, 11.28]
Cheung 2008	27	23	-4.76 (1.56)		15.6 %	-4.76 [-7.82, -1.70]
Christofoletti 2008	12	17	-22.7 (2.51)		14.9 %	-22.70 [-27.62, -17.78]
Kerse 2008	266	290	0.6 (3.0409)		14.5 %	0.60 [-5.36, 6.56]
Lazowski 1999	36	30	-14.7 (6.2328)		10.9 %	-14.70 [-26.92, -2.48]
MacRitchie 2001	24	27	-17.31 (5.22)		12.1 %	-17.31 [-27.54, -7.08]
Peri 2008	63	61	0.4 (3.395)		14.1 %	0.40 [-6.25, 7.05]
Total (95% CI)	**449**	**465**			**100.0 %**	**-8.41 [-15.53, -1.29]**

Heterogeneity: Tau^2 = 81.96; Chi^2 = 65.09, df = 7 (P<0.00001); I^2 =89%

Test for overall effect: Z = 2.32 (P = 0.021)

Test for subgroup differences: Not applicable



Analysis 1.50. Comparison 1 Rehabilitation versus control, Outcome 50 Sensitivity analysis: Walking speed (fixed-effect).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 50 Sensitivity analysis: Walking speed (fixed-effect)

Study or subgroup	Rehabilitation N	Control N	Mean Difference (SE)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Au-Yeung 2002	10	8	0.0935 (0.9456)		0.0 %	0.09 [-1.76, 1.95]
Brill 1998	8	8	-0.1709 (2.2638)		0.0 %	-0.17 [-4.61, 4.27]
Chin A Paw 2004	44	31	-0.1 (0.0552)		6.9 %	-0.10 [-0.21, 0.01]
Hruda 2003	18	7	0.3315 (0.6068)		0.1 %	0.33 [-0.86, 1.52]
Lazowski 1999	35	29	0.12 (0.0806)		3.3 %	0.12 [-0.04, 0.28]
MacRitchie 2001	22	26	0.2551 (0.294)		0.2 %	0.26 [-0.32, 0.83]
Rolland 2007	56	54	0.05 (0.0334)		19.0 %	0.05 [-0.02, 0.12]
Rosendahl 2006	78	89	0.04 (0.0177)		67.5 %	0.04 [0.01, 0.07]
Schoenfelder 2004	33	34	-0.0296 (0.0837)		3.0 %	-0.03 [-0.19, 0.13]
Total (95% CI)	**304**	**286**			**100.0 %**	**0.03 [0.00, 0.06]**

Heterogeneity: Chi^2 = 8.77, df = 8 (P = 0.36); I^2 =9%

Test for overall effect: Z = 2.30 (P = 0.022)

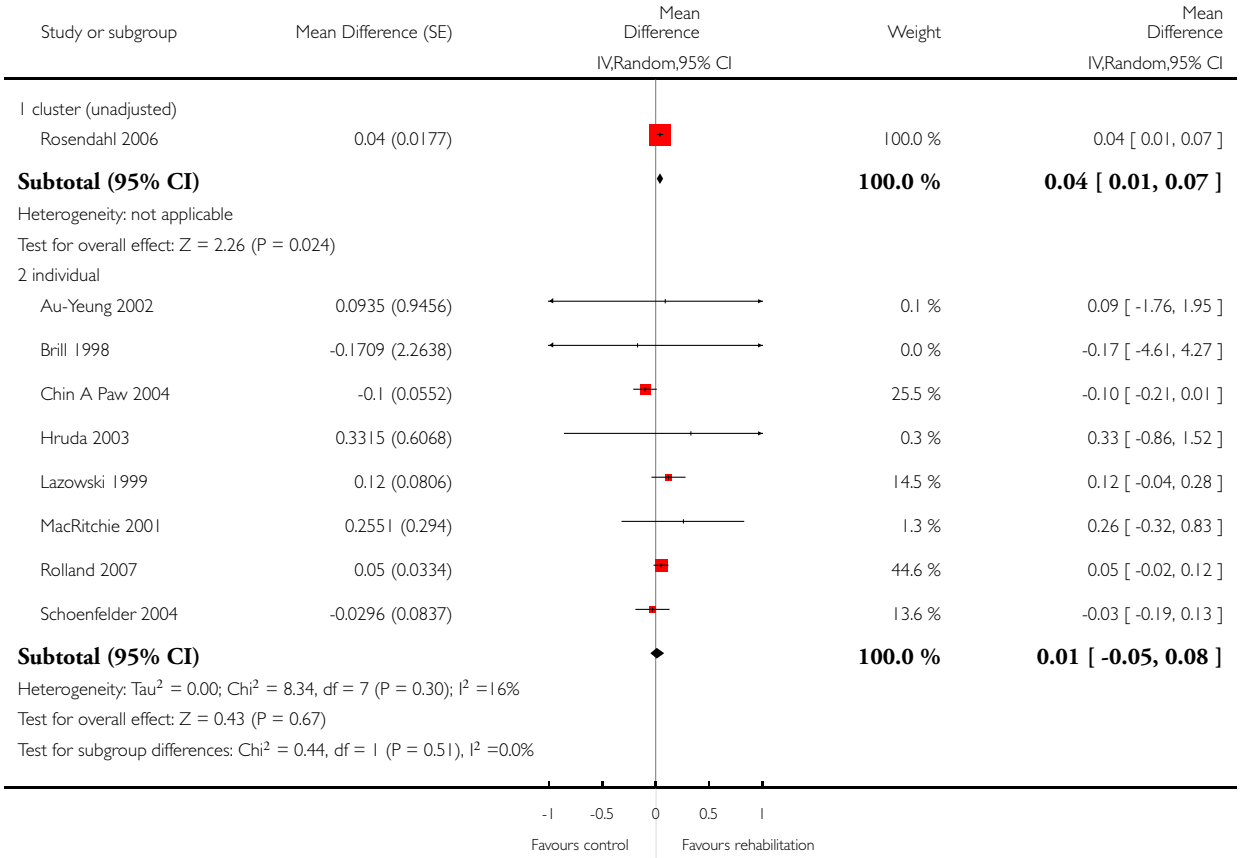
Test for subgroup differences: Not applicable

Analysis 1.51. Comparison 1 Rehabilitation versus control, Outcome 51 Sensitivity analysis: Walking speed (cluster trials).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 51 Sensitivity analysis: Walking speed (cluster trials)



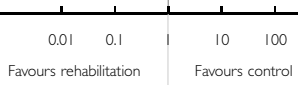
Analysis 1.52. Comparison 1 Rehabilitation versus control, Outcome 52 Sensitivity analysis: Death (random-effects: odds ratio).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 52 Sensitivity analysis: Death (random-effects: odds ratio)

Study or subgroup	Rehabilitation n/N	Control n/N	Odds Ratio M-H,Random,95% CI	Weight	Odds Ratio M-H,Random,95% CI
Cheung 2008	0/27	0/23			Not estimable
Chin A Paw 2004	6/173	2/51		1.7 %	0.88 [0.17, 4.50]
Choi 2005	0/34	1/34		0.4 %	0.32 [0.01, 8.23]
Fiatarone 1994	0/50	2/50		0.5 %	0.19 [0.01, 4.10]
Gillies 1999	0/10	0/10			Not estimable
Kerse 2008	35/330	31/352		17.1 %	1.23 [0.74, 2.04]
Kinion 1993	0/12	0/12			Not estimable
McMurdo 1993	2/20	3/29		1.2 %	0.96 [0.15, 6.36]
McMurdo 1994	3/36	4/29		1.8 %	0.57 [0.12, 2.77]
Meuleman 2000	2/39	2/39		1.1 %	1.00 [0.13, 7.48]
Morris 1999	39/313	28/155		15.8 %	0.65 [0.38, 1.10]
Mulrow 1994	5/97	7/97		3.2 %	0.70 [0.21, 2.28]
Naso 1990	2/8	2/7		0.8 %	0.83 [0.08, 8.24]
Peri 2008	5/73	8/76		3.2 %	0.63 [0.19, 2.01]
Pomeroy 1993	2/12	0/12		0.4 %	5.95 [0.26, 138.25]
Resnick 2009	61/256	55/231		25.4 %	1.00 [0.66, 1.52]
Rolland 2007	7/67	8/67		3.8 %	0.86 [0.29, 2.52]
Rosendahl 2006	1/91	1/100		0.6 %	1.10 [0.07, 17.85]
Sackley 2006	4/63	9/55		2.9 %	0.35 [0.10, 1.20]
Sackley 2008	0/17	0/17			Not estimable
Sackley 2009	36/127	27/116		13.2 %	1.30 [0.73, 2.32]
Schnelle 2002	14/92	14/98		6.9 %	1.08 [0.48, 2.40]
Schoenfelder 2000	0/9	0/7			Not estimable
Sihvonen 2004	0/20	0/8			Not estimable



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Study or subgroup	Rehabilitation n/N	Control n/N	Odds Ratio M-H,Random,95% CI	Weight	Odds Ratio M-H,Random,95% CI
Taboonpong 2008	0/38	0/32			Not estimable
Total (95% CI)	**2014**	**1707**		**100.0 %**	**0.93 [0.75, 1.15]**
Total events: 224 (Rehabilitation), 204 (Control)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 10.84$, df = 17 (P = 0.86); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.69 (P = 0.49)					
Test for subgroup differences: Not applicable					

Analysis 1.53. Comparison 1 Rehabilitation versus control, Outcome 53 Sensitivity analysis: Death (random-effects: risk difference).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 53 Sensitivity analysis: Death (random-effects: risk difference)

Study or subgroup	Rehabilitation n/N	Control n/N	Risk Difference M-H,Random,95% CI	Weight	Risk Difference M-H,Random,95% CI
Cheung 2008	0/27	0/23		4.0 %	0.0 [-0.08, 0.08]
Chin A Paw 2004	6/173	2/51		6.4 %	0.00 [-0.06, 0.06]
Choi 2005	0/34	1/34		3.8 %	-0.03 [-0.11, 0.05]
Fiatarone 1994	0/50	2/50		5.4 %	-0.04 [-0.11, 0.03]
Gillies 1999	0/10	0/10		0.8 %	0.0 [-0.17, 0.17]
Kerse 2008	35/330	31/352		11.5 %	0.02 [-0.03, 0.06]
Kinion 1993	0/12	0/12		1.0 %	0.0 [-0.15, 0.15]
McMurdo 1993	2/20	3/29		0.8 %	0.00 [-0.18, 0.17]
McMurdo 1994	3/36	4/29		1.0 %	-0.05 [-0.21, 0.10]

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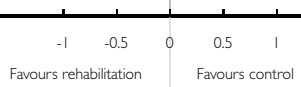
Study or subgroup	Rehabilitation n/N	Control n/N	Risk Difference M-H,Random,95% CI	Weight	Risk Difference M-H,Random,95% CI
Meuleman 2000	2/39	2/39		2.4 %	0.0 [-0.10, 0.10]
Morris 1999	39/313	28/155		4.6 %	-0.06 [-0.13, 0.01]
Mulrow 1994	5/97	7/97		5.0 %	-0.02 [-0.09, 0.05]
Naso 1990	2/8	2/7		0.1 %	-0.04 [-0.49, 0.41]
Peri 2008	5/73	8/76		2.8 %	-0.04 [-0.13, 0.05]
Pomeroy 1993	2/12	0/12		0.4 %	0.17 [-0.07, 0.41]
Resnick 2009	61/256	55/231		4.0 %	0.00 [-0.08, 0.08]
Rolland 2007	7/67	8/67		2.0 %	-0.01 [-0.12, 0.09]
Rosendahl 2006	1/91	1/100		27.2 %	0.00 [-0.03, 0.03]
Sackley 2006	4/63	9/55		1.7 %	-0.10 [-0.21, 0.01]
Sackley 2008	0/17	0/17		2.0 %	0.0 [-0.11, 0.11]
Sackley 2009	36/127	27/116		1.9 %	0.05 [-0.06, 0.16]
Schnelle 2002	14/92	14/98		2.2 %	0.01 [-0.09, 0.11]
Schoenfelder 2000	0/9	0/7		0.5 %	0.0 [-0.22, 0.22]
Sihvonen 2004	0/20	0/8		0.9 %	0.0 [-0.16, 0.16]
Taboonpong 2008	0/38	0/32		7.7 %	0.0 [-0.05, 0.05]
Total (95% CI)	**2014**	**1707**		**100.0 %**	**-0.01 [-0.02, 0.01]**

Total events: 224 (Rehabilitation), 204 (Control)

Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 11.57$, df = 24 (P = 0.98); $I^2 = 0.0\%$

Test for overall effect: Z = 0.86 (P = 0.39)

Test for subgroup differences: Not applicable



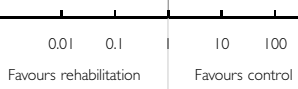
Analysis 1.54. Comparison 1 Rehabilitation versus control, Outcome 54 Sensitivity analysis: Death (fixed-effect).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 54 Sensitivity analysis: Death (fixed-effect)

Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Cheung 2008	0/27	0/23			Not estimable
Chin A Paw 2004	6/173	2/51		1.2 %	0.88 [0.18, 4.25]
Choi 2005	0/34	1/34		0.3 %	0.33 [0.01, 7.91]
Fiatarone 1994	0/50	2/50		0.3 %	0.20 [0.01, 4.06]
Gillies 1999	0/10	0/10			Not estimable
Kerse 2008	35/330	31/352		14.3 %	1.20 [0.76, 1.91]
Kinion 1993	0/12	0/12			Not estimable
McMurdo 1993	2/20	3/29		1.1 %	0.97 [0.18, 5.27]
McMurdo 1994	3/36	4/29		1.5 %	0.60 [0.15, 2.49]
Meuleman 2000	2/39	2/39		0.8 %	1.00 [0.15, 6.75]
Morris 1999	39/313	28/155		15.2 %	0.69 [0.44, 1.08]
Mulrow 1994	5/97	7/97		2.4 %	0.71 [0.23, 2.17]
Naso 1990	2/8	2/7		1.1 %	0.88 [0.16, 4.68]
Peri 2008	5/73	8/76		2.6 %	0.65 [0.22, 1.90]
Pomeroy 1993	2/12	0/12		0.4 %	5.00 [0.27, 94.34]
Resnick 2009	61/256	55/231		29.9 %	1.00 [0.73, 1.38]
Rolland 2007	7/67	8/67		3.3 %	0.88 [0.34, 2.28]
Rosendahl 2006	1/91	1/100		0.4 %	1.10 [0.07, 17.31]
Sackley 2006	4/63	9/55		2.4 %	0.39 [0.13, 1.19]
Sackley 2008	0/17	0/17			Not estimable
Sackley 2009	36/127	27/116		16.3 %	1.22 [0.79, 1.87]
Schnelle 2002	14/92	14/98		6.5 %	1.07 [0.54, 2.11]
Schoenfelder 2000	0/9	0/7			Not estimable
Sihvonen 2004	0/20	0/8			Not estimable



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Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Taboonpong 2008	0/38	0/32			Not estimable
Total (95% CI)	**2014**	**1707**	◆	**100.0 %**	**0.95 [0.80, 1.13]**
Total events: 224 (Rehabilitation), 204 (Control)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 10.82$, df = 17 (P = 0.87); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.61 (P = 0.54)					
Test for subgroup differences: Not applicable					

Analysis 1.55. Comparison 1 Rehabilitation versus control, Outcome 55 Sensitivity analysis: Death (fixed-effect: Peto odds ratio).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 55 Sensitivity analysis: Death (fixed-effect: Peto odds ratio)

Study or subgroup	Rehabilitation n/N	Control n/N	Peto Odds Ratio Peto,Fixed,95% CI	Weight	Peto Odds Ratio Peto,Fixed,95% CI
Cheung 2008	0/27	0/23			Not estimable
Chin A Paw 2004	6/173	2/51		1.6 %	0.88 [0.16, 4.70]
Choi 2005	0/34	1/34		0.3 %	0.14 [0.00, 6.82]
Fiatarone 1994	0/50	2/50		0.6 %	0.13 [0.01, 2.15]
Gillies 1999	0/10	0/10			Not estimable
Kerse 2008	35/330	31/352		17.1 %	1.23 [0.74, 2.04]
Kinion 1993	0/12	0/12			Not estimable
McMurdo 1993	2/20	3/29		1.3 %	0.96 [0.15, 6.21]
McMurdo 1994	3/36	4/29		1.8 %	0.57 [0.12, 2.73]
Meuleman 2000	2/39	2/39		1.1 %	1.00 [0.14, 7.38]

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Study or subgroup	Rehabilitation n/N	Control n/N	Peto Odds Ratio Peto,Fixed,95% CI	Weight	Peto Odds Ratio Peto,Fixed,95% CI
Morris 1999	39/313	28/155		14.6 %	0.63 [0.37, 1.10]
Mulrow 1994	5/97	7/97		3.3 %	0.70 [0.22, 2.25]
Naso 1990	2/8	2/7		0.9 %	0.84 [0.09, 7.73]
Peri 2008	5/73	8/76		3.4 %	0.63 [0.20, 1.97]
Pomeroy 1993	2/12	0/12		0.5 %	8.09 [0.48, 137.69]
Resnick 2009	61/256	55/231		25.4 %	1.00 [0.66, 1.52]
Rolland 2007	7/67	8/67		3.9 %	0.86 [0.30, 2.51]
Rosendahl 2006	1/91	1/100		0.6 %	1.10 [0.07, 17.76]
Sackley 2006	4/63	9/55		3.3 %	0.36 [0.11, 1.15]
Sackley 2008	0/17	0/17			Not estimable
Sackley 2009	36/127	27/116		13.4 %	1.30 [0.73, 2.31]
Schnelle 2002	14/92	14/98		6.9 %	1.08 [0.48, 2.40]
Schoenfelder 2000	0/9	0/7			Not estimable
Sihvonen 2004	0/20	0/8			Not estimable
Taboonpong 2008	0/38	0/32			Not estimable
Total (95% CI)	**2014**	**1707**		**100.0 %**	**0.93 [0.75, 1.14]**

Total events: 224 (Rehabilitation), 204 (Control)

Heterogeneity: Chi^2 = 13.29, df = 17 (P = 0.72); I^2 =0.0%

Test for overall effect: Z = 0.72 (P = 0.47)

Test for subgroup differences: Not applicable

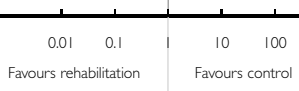
Analysis 1.56. Comparison 1 Rehabilitation versus control, Outcome 56 Sensitivity analysis: Death (cluster trials).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 56 Sensitivity analysis: Death (cluster trials)

Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 cluster (unadjusted)					
Choi 2005	0/34	1/34		0.4 %	0.33 [0.01, 7.91]
Gillies 1999	0/10	0/10			Not estimable
Kerse 2008	35/330	31/352		17.0 %	1.20 [0.76, 1.91]
McMurdo 1993	2/20	3/29		1.3 %	0.97 [0.18, 5.27]
McMurdo 1994	3/36	4/29		1.8 %	0.60 [0.15, 2.49]
Morris 1999	39/313	28/155		18.1 %	0.69 [0.44, 1.08]
Peri 2008	5/73	8/76		3.1 %	0.65 [0.22, 1.90]
Resnick 2009	61/256	55/231		35.6 %	1.00 [0.73, 1.38]
Rosendahl 2006	1/91	1/100		0.5 %	1.10 [0.07, 17.31]
Sackley 2006	4/63	9/55		2.9 %	0.39 [0.13, 1.19]
Sackley 2008	0/17	0/17			Not estimable
Sackley 2009	36/127	27/116		19.4 %	1.22 [0.79, 1.87]
Taboonpong 2008	0/38	0/32			Not estimable
Subtotal (95% CI)	**1408**	**1236**		**100.0 %**	**0.95 [0.79, 1.15]**
Total events: 186 (Rehabilitation), 167 (Control)					
Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 8.15$, df = 9 (P = 0.52); $I^2 = 0.0\%$					
Test for overall effect: Z = 0.52 (P = 0.60)					
2 individual					
Cheung 2008	0/27	0/23			Not estimable
Chin A Paw 2004	6/173	2/51		7.7 %	0.88 [0.18, 4.25]
Fiatarone 1994	0/50	2/50		2.1 %	0.20 [0.01, 4.06]
Kinion 1993	0/12	0/12			Not estimable
Meuleman 2000	2/39	2/39		5.2 %	1.00 [0.15, 6.75]
Mulrow 1994	5/97	7/97		15.2 %	0.71 [0.23, 2.17]
Naso 1990	2/8	2/7		6.7 %	0.88 [0.16, 4.68]



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Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Pomeroy 1993	2/12	0/12		2.2 %	5.00 [0.27, 94.34]
Rolland 2007	7/67	8/67		20.6 %	0.88 [0.34, 2.28]
Schnelle 2002	14/92	14/98		40.3 %	1.07 [0.54, 2.11]
Schoenfelder 2000	0/9	0/7			Not estimable
Sihvonen 2004	0/20	0/8			Not estimable
Subtotal (95% CI)	**606**	**471**		**100.0 %**	**0.93 [0.60, 1.44]**

Total events: 38 (Rehabilitation), 37 (Control)

Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 2.66$, df = 7 (P = 0.91); $I^2 = 0.0\%$

Test for overall effect: Z = 0.32 (P = 0.75)

Test for subgroup differences: $Chi^2 = 0.01$, df = 1 (P = 0.94), $I^2 = 0.0\%$

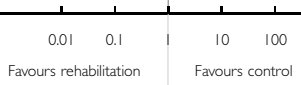
Analysis 1.57. Comparison 1 Rehabilitation versus control, Outcome 57 Sensitivity analysis: Death (including Brittle 2009).

Review: Physical rehabilitation for older people in long-term care

Comparison: 1 Rehabilitation versus control

Outcome: 57 Sensitivity analysis: Death (including Brittle 2009)

Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Brittle 2009	1/28	5/28		0.7 %	0.20 [0.02, 1.60]
Cheung 2008	0/27	0/23			Not estimable
Chin A Paw 2004	6/173	2/51		1.2 %	0.88 [0.18, 4.25]
Choi 2005	0/34	1/34		0.3 %	0.33 [0.01, 7.91]
Fiatarone 1994	0/50	2/50		0.3 %	0.20 [0.01, 4.06]
Gillies 1999	0/10	0/10			Not estimable
Kerse 2008	35/330	31/352		14.2 %	1.20 [0.76, 1.91]
Kinion 1993	0/12	0/12			Not estimable
McMurdo 1993	2/20	3/29		1.0 %	0.97 [0.18, 5.27]
McMurdo 1994	3/36	4/29		1.5 %	0.60 [0.15, 2.49]
Meuleman 2000	2/39	2/39		0.8 %	1.00 [0.15, 6.75]
Morris 1999	39/313	28/155		15.1 %	0.69 [0.44, 1.08]
Mulrow 1994	5/97	7/97		2.4 %	0.71 [0.23, 2.17]
Naso 1990	2/8	2/7		1.1 %	0.88 [0.16, 4.68]
Peri 2008	5/73	8/76		2.6 %	0.65 [0.22, 1.90]
Pomeroy 1993	2/12	0/12		0.3 %	5.00 [0.27, 94.34]
Resnick 2009	61/256	55/231		29.7 %	1.00 [0.73, 1.38]
Rolland 2007	7/67	8/67		3.3 %	0.88 [0.34, 2.28]
Rosendahl 2006	1/91	1/100		0.4 %	1.10 [0.07, 17.31]
Sackley 2006	4/63	9/55		2.4 %	0.39 [0.13, 1.19]
Sackley 2008	0/17	0/17			Not estimable
Sackley 2009	36/127	27/116		16.2 %	1.22 [0.79, 1.87]
Schnelle 2002	14/92	14/98		6.4 %	1.07 [0.54, 2.11]
Schoenfelder 2000	0/9	0/7			Not estimable



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Study or subgroup	Rehabilitation n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Sihvonen 2004	0/20	0/8			Not estimable
Taboonpong 2008	0/38	0/32			Not estimable
Total (95% CI)	**2042**	**1735**		**100.0 %**	**0.94 [0.79, 1.11]**

Total events: 225 (Rehabilitation), 209 (Control)

Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 12.97$, df = 18 (P = 0.79); $I^2 = 0.0\%$

Test for overall effect: Z = 0.73 (P = 0.47)

Test for subgroup differences: Not applicable

Analysis 2.1. Comparison 2 Rehabilitation (experimental) versus rehabilitation (control), Outcome 1 TUG Test.

Review: Physical rehabilitation for older people in long-term care

Comparison: 2 Rehabilitation (experimental) versus rehabilitation (control)

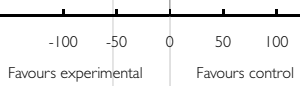
Outcome: 1 TUG Test

Study or subgroup	Experimental N	Control N	Mean Difference (SE)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Bautmans 2005	10	11	-2.3 (2.51)		50.8 %	-2.30 [-7.22, 2.62]
Bruyere 2005	16	20	-13.8 (2.92)		49.2 %	-13.80 [-19.52, -8.08]
Total (95% CI)	**26**	**31**			**100.0 %**	**-7.95 [-19.22, 3.31]**

Heterogeneity: $Tau^2 = 58.71$; $Chi^2 = 8.92$, df = 1 (P = 0.003); $I^2 = 89\%$

Test for overall effect: Z = 1.38 (P = 0.17)

Test for subgroup differences: Not applicable



Analysis 2.2. Comparison 2 Rehabilitation (experimental) versus rehabilitation (control), Outcome 2 Death.

Review: Physical rehabilitation for older people in long-term care

Comparison: 2 Rehabilitation (experimental) versus rehabilitation (control)

Outcome: 2 Death

Study or subgroup	Experimental n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Bautmans 2005	0/13	0/11			Not estimable
de Bruin 2007	0/16	0/16			Not estimable
Donat 2007	1/17	0/15		100.0 %	2.67 [0.12, 60.93]
Yoder 1989	0/15	0/15			Not estimable
Total (95% CI)	**61**	**57**		**100.0 %**	**2.67 [0.12, 60.93]**
Total events: 1 (Experimental), 0 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.61 (P = 0.54)					
Test for subgroup differences: Not applicable					

Analysis 2.3. Comparison 2 Rehabilitation (experimental) versus rehabilitation (control), Outcome 3 Sensitivity analysis: TUG Test (fixed-effect).

Review: Physical rehabilitation for older people in long-term care

Comparison: 2 Rehabilitation (experimental) versus rehabilitation (control)

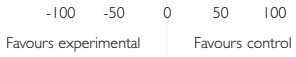
Outcome: 3 Sensitivity analysis: TUG Test (fixed-effect)

Study or subgroup	Experimental N	Control N	Mean Difference (SE)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Bautmans 2005	10	11	-2.3 (2.51)		57.5 %	-2.30 [-7.22, 2.62]
Bruyere 2005	16	20	-13.8 (2.92)		42.5 %	-13.80 [-19.52, -8.08]
Total (95% CI)	**26**	**31**			**100.0 %**	**-7.19 [-10.92, -3.46]**

Heterogeneity: Chi² = 8.92, df = 1 (P = 0.003); I² =89%

Test for overall effect: Z = 3.78 (P = 0.00016)

Test for subgroup differences: Not applicable



APPENDICES

Appendix 1. CENTRAL search strategy

We used the following search strategy for CENTRAL
1 MeSH descriptor Homes for the Aged, this term only
2 MeSH descriptor Nursing Homes, this term only
3 "home* for the aged":ti,ab,kw or (aged NEAR/2 (care or nursing or healthcare or residential) NEAR/2 (facility or facilities or home*)):ti,ab,kw or (geriatric or elderly) NEAR/2 (facility or facilities or care home*):ti,ab,kw
4 (nursing home*):ti,ab,kw
5 MeSH descriptor Hospitals, Veterans, this term only
6 (#1 OR #2 OR #3 OR #4 OR #5)
7 MeSH descriptor Aged explode all trees
8 MeSH descriptor Geriatrics explode all trees
9 (gerontol* or ageing or aging or elder* or geriatric* or seniors or old age or older or late* life):ti,ab,kw
10 (older NEXT (person* or people or adult* or patient* or inpatient* or outpatient*)):ti,ab,kw
11 MeSH descriptor Veterans, this term only
12 (veteran*):ti,ab,kw
13 (#7 OR #8 OR #9 OR #10 OR #11 OR #12)
14 MeSH descriptor Nursing Care, this term only
15 MeSH descriptor Rehabilitation Nursing, this term only
16 MeSH descriptor Community Health Nursing, this term only
17 MeSH descriptor Hospitals, Convalescent, this term only

18 MeSH descriptor Rehabilitation Centers, this term only
19 MeSH descriptor Institutionalization, this term only
20 (#14 OR #15 OR #16 OR #17 OR #18 OR #19)
21 (#13 AND #20)
22 MeSH descriptor Group Homes, this term only
23 MeSH descriptor Assisted Living Facilities, this term only
24 MeSH descriptor Residential Facilities, this term only
25 MeSH descriptor Long-Term Care, this term only
26 MeSH descriptor Halfway Houses, this term only
27 (group or residential) NEXT (home or homes):ti,ab,kw
28 (hous* or residental or residence* or institution* or facility or facilities) NEAR/5 (elder* or geriatric* or seniors or older or aged):ti,ab,kw
29 ((residential or long-term or longterm) NEAR/5 (care or facility or facilities)):ti,ab,kw
30 (sheltered or retirement or residential or halfway or half-way) NEAR/5 (hous* or home* or accommodation):ti,ab,kw
31 (life care cent* or continuing care cent* or extended care facility or extended care facilities):ti,ab,kw
32 (care or convalescent) NEXT (home* or cent* or facility or facilities):ti,ab,kw
33 (skilled or intermediate) NEAR/2 (nursing facility or nursing facilities):ti,ab,kw
34 (healthcare NEAR/2 (facility or facilities)):ti,ab,kw
35 (#32 OR #33 OR #34)
36 (#35 AND #13)
37 (assisted living):ti,ab,kw
38 (#22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #36 OR #37)
39 (#6 OR #21 OR #38)
40 MeSH descriptor Rehabilitation, this term only
41 MeSH descriptor Activities of Daily Living, this term only
42 MeSH descriptor Dance Therapy, this term only
43 MeSH descriptor Early Ambulation, this term only
44 MeSH descriptor Exercise Therapy, this term only
45 MeSH descriptor Muscle Stretching Exercises, this term only
46 MeSH descriptor Resistance Training, this term only
47 MeSH descriptor Occupational Therapy, this term only
48 MeSH descriptor Physical Therapy Modalities, this term only
49 MeSH descriptor Hydrotherapy, this term only
50 MeSH descriptor Musculoskeletal Manipulations, this term only
51 MeSH descriptor Physical Therapy (Specialty), this term only
52 MeSH descriptor Exercise Movement Techniques, this term only
53 MeSH descriptor Exercise, this term only
54 MeSH descriptor Tai Ji, this term only
55 MeSH descriptor Walking, this term only
56 MeSH descriptor Yoga, this term only
57 MeSH descriptor Physical Education and Training, this term only
58 MeSH descriptor Physical Fitness, this term only
59 MeSH descriptor Recovery of Function, this term only
60 MeSH descriptor Residential Treatment, this term only
61 MeSH descriptor Physical Stimulation, this term only
62 MeSH descriptor Health Promotion, this term only
63 MeSH descriptor Leisure Activities, this term only
64 MeSH descriptor Recreation, this term only
65 MeSH descriptor Dancing, this term only
66 MeSH descriptor Health Facility Environment, this term only
67 (rehabilitat* or exercise* or physiotherap* or "keep fit"):ti,ab,kw
68 (physical near/3 (therap* or education or train* or stimulat* or fitness or activit* or function)):ti,ab,kw
69 (exercise or movement or occupational or residential) near/5 (therap* or train* or treatment or program*):ti,ab,kw

70 (strength* or aerobic or resistance) near/3 activit*:ti,ab,kw
71 (improve* near/3 (function or mobil* or recover*)):ti,ab,kw
72 (fitness or health) near/3 promotion:ti,ab,kw
73 (danc* or walk* or yoga or "tai chi" or "tai ji" or "tai chi" or "ji quan" or taiji or taijiquan or "leisure activit*" or recreation* or bicycl* or cycl* or bike* or biking):ti,ab,kw
74 (endurance or balance or strength or flexibility or resistance) near/3 training:ti,ab,kw
75 (#40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52 OR #53 OR #54 OR #55 OR #56 OR #57 OR #58 OR #59 OR #60 OR #61 OR #62 OR #63 OR #64 OR #65 OR #66 OR #67 OR #68 OR #69 OR #70 OR #71 OR #72 OR #73 OR #74)
76 (#39 AND #75), from 2009 to 2011

Appendix 2. MEDLINE search strategy

We used the following search strategy for MEDLINE (Ovid) and adapted it for the other databases
1. Homes for the Aged/ or "homes for the aged".tw.
2. exp Nursing Homes/ or nursing home?.tw.
3. (aged adj2 (care or nursing or healthcare or residential) adj2 (facility or facilites or home?)).ti,ab.
4. ((geriatric or elderly) adj2 (facility or facilities or care home?)).ti,ab.
5. Hospitals, Veterans/
6. Housing for the Elderly/
7. Geriatric Nursing/
8. or/1-7 [care facilities/nursing - aged terms]
9. exp aged/
10. (gerontol* or ageing or aging or elder* or geriatric* or seniors or old age or older or late* life).ti,ab.
11. (older adj (person* or people or adult* or patient* or inpatient* or outpatient*)).ti,ab.
12. veterans/
13. veteran.ti,ab.
14. or/9-13 [elderly terms]
15. Nursing Care/
16. Rehabilitation Nursing/
17. Community Health Nursing/
18. Hospitals, Convalescent/
19. Rehabilitation Centers/
20. Institutionalization/
21. or/15-20 [institutional care terms]
22. 14 and 21 [institutional care terms and elderly terms]
23. Group Homes/
24. Assisted Living Facilities/
25. Residential Facilities/
26. Long-Term Care/
27. Halfway Houses/
28. ((group or residential) adj home?).ti,ab.
29. ((hous$ or residental or residence? or institution$ or facility or facilities) adj5 (elder* or geriatric* or seniors or older or aged)).ti,ab.
30. ((residential or long-term or longterm) adj5 (care or facility or facilities)).ti,ab.
31. ((sheltered or retirement or residential or halfway or half-way) adj5 (hous$ or home? or accommodation)).ti,ab.
32. (life care cent$ or continuing care cent$ or extended care facility or extended care facilities).ti,ab.
33. ((care or convalescent) adj (home? or cent$ or facility or facilities)).ti,ab. and 14
34. ((skilled or intermediate) adj2 (nursing facility or nursing facilities)).ti,ab. and 14
35. (healthcare adj2 (facility or facilities)).ti,ab. and 14
36. assisted living.ti,ab.
37. or/23-35 [other residential are terms]
38. 8 or 22 or 37 [care facilities/nursing -aged or institutional care terms and elder or other residential care terms]

39. rehabilitation/ or "activities of daily living"/
40. dance therapy/ or early ambulation/ or exercise therapy/ or muscle stretching exercises/ or resistance training/ or occupational therapy/
41. physical therapy modalities/ or hydrotherapy/ or musculoskeletal manipulations/
42. "Physical Therapy (Specialty)"/
43. Exercise Movement Techniques/
44. Exercise/
45. Tai Ji/
46. aqua.mp.
47. walking/ or yoga/
48. "Physical Education and Training"/
49. Physical Fitness/
50. "Recovery of Function"/
51. Residential Treatment/
52. Physical Stimulation/
53. Health Promotion/
54. leisure activities/ or recreation/ or dancing/
55. Health Facility Environment/
56. (rehabilitat$ or exercise$ or physiotherap$ or keep fit).tw.
57. (physical adj3 (therap$ or education or train$ or stimulat$ or fitness or activit$ or function)).tw.
58. ((exercise or movement or occupational or residential) adj5 (therap$ or train$ or treatment or program$)).tw.
59. ((strength$ or aerobic or resistance) adj3 activit$).tw.
60. (improve$ adj3 (function or mobil$ or recover$)).tw.
61. ((fitness or health) adj3 promotion).tw.
62. (danc$ or walk$ or yoga or tai chi or tai ji or ji quan or taiji or taijiquan or leisure activit$ or recreation$ or bicycl$ or cycl$ or bike$ or biking).tw.
63. ((endurance or balance or strength or flexibility or resistance) adj3 training).tw.
64. or/39-63 [rehabilitation terms]
65. randomized controlled trials as topic/
66. random allocation/
67. controlled clinical trials as topic/
68. control groups/
69. clinical trials as topic/ or clinical trials, phase i as topic/ or clinical trials, phase ii as topic/ or clinical trials, phase iii as topic/ or clinical trials, phase iv as topic/
70. clinical trials data monitoring committees/
71. double-blind method/
72. single-blind method/
73. placebos/
74. placebo effect/
75. cross-over studies/
76. multicenter studies as topic/
77. therapies, investigational/
78. drug evaluation/
79. research design/
80. program evaluation/
81. evaluation studies as topic/
82. randomized controlled trial.pt.
83. controlled clinical trial.pt.
84. (clinical trial or clinical trial phase i or clinical trial phase ii or clinical trial phase iii or clinical trial phase iv).pt.
85. multicenter study.pt.
86. (evaluation studies or comparative study).pt.
87. meta analysis.pt.
88. meta-analysis as topic/

89. random$.tw.
90. (controlled adj5 (trial$ or stud$)).tw.
91. (clinical$ adj5 trial$).tw.
92. ((control or treatment or experiment$ or intervention) adj5 (group$ or subject$ or patient$)).tw.
93. (surgical adj5 (group$ or subject$ or patient$)).tw.
94. (quasi-random$ or quasi random$ or pseudo-random$ or pseudo random$).tw.
95. ((multicenter or multicentre or therapeutic) adj5 (trial$ or stud$)).tw.
96. ((control or experiment$ or conservative) adj5 (treatment or therapy or procedure or manage$)).tw.
97. ((singl$ or doubl$ or tripl$ or trebl$) adj5 (blind$ or mask$)).tw.
98. (coin adj5 (flip or flipped or toss$)).tw.
99. latin square.tw.
100. versus.tw.
101. (cross-over or cross over or crossover).tw.
102. placebo$.tw.
103. sham.tw.
104. (assign$ or alternate or allocat$ or counterbalance$ or multiple baseline).tw.
105. controls.tw.
106. (treatment$ adj6 order).tw.
107. (meta-analy$ or metaanaly$ or meta analy$ or systematic review or systematic overview).tw.
108. or/65-107
109. exp animals/ not humans.sh.
110. 108 not 109 [RCT Filter - Cochrane Stroke Group]
111. 38 and 64 and 110 [care facilities/nursing -aged or institutional care terms and elder or other residential care and rehabilitation terms and RCT]

Appendix 3. EMBASE search strategy

We used the following search strategy for EMBASE
1. “homes for the aged”.tw.
2. exp nursing home/ or nursing home?.tw.
3. (aged adj2 (care or nursing or healthcare or residential) adj2 (facility or facilites or home?)).ti,ab.
4. ((geriatric or elderly) adj2 (facility or facilities or care home?)).ti,ab.
5. exp elderly care/
6. geriatric hospital/
7. or/1-6 [care facilities - aged terms]
8. aging/
9. gerontology/
10. (gerontol* or ageing or aging or elder* or geriatric* or seniors or old age or older or late* life).ti,ab.
11. (older adj (person* or people or adult* or patient* or inpatient* or outpatient*)).ti,ab.
12. veteran.ti,ab.
13. or/8-12 [elderly terms]
14. nursing care/ or patient care/
15. Rehabilitation Nursing/ or Rehabilitation Center/
16. exp convalescence/
17. exp community health nursing/
18. residential care/
19. or/14-18 [institutional care terms]
20. 19 and 13 [instutional care homes and elderly terms]
21. residential home/
22. assisted living facility/
23. residential home/
24. long term care/

25. Halfway House/
26. ((group or residential) adj home?).ti,ab.
27. ((hous$ or residental or residence? or institution$ or facility or facilities) adj5 (elder* or geriatric* or seniors or older or aged)).ti,ab.
28. ((residential or long-term or longterm) adj5 (care or facility or facilities)).ti,ab.
29. ((sheltered or retirement or residential or halfway or half-way) adj5 (hous$ or home? or accommodation)).ti,ab.
30. (life care cent$ or continuing care cent$ or extended care facility or extended care facilities).ti,ab.
31. ((care or convalescent) adj (home? or cent$ or facility or facilities)).ti,ab. and 13
32. ((skilled or intermediate) adj2 (nursing facility or nursing facilities)).ti,ab. and 13
33. (healthcare adj2 (facility or facilities)).ti,ab. and 13
34. assisted living.ti,ab.
35. or/21-34 [other residential are terms]
36. 7 or 20 or 35 [care facilities/nursing -aged or institutional care terms and elder or other residential care terms]
37. exp rehabilitation/
38. daily life activity/
39. exp Physiotherapy/ or physical activity/ or physical education/
40. exp KINESIOTHERAPY/
41. fitness/ or training/ or sport/
42. hydrotherapy/
43. mobilization/ or stimulation/
44. dancing/
45. health promotion/ or health education/ or health program/
46. recreation/ or leisure/
47. (rehabilitat$ or exercise$ or physiotherap$ or kinesiotherap$ or keep fit).tw.
48. (physical adj3 (therap$ or education or train$ or stimulat$ or fitness or activit$ or function)).tw.
49. ((exercise or movement or occupational or residential) adj5 (therap$ or train$ or treatment or program$)).tw.
50. ((strength$ or aerobic or resistance) adj3 activit$).tw.
51. (improve$ adj3 (function or mobil$ or recover$)).tw.
52. recovery of function/
53. ((fitness or health) adj3 promotion).tw.
54. (danc$ or walk$ or yoga or tai chi or tai ji or ji quan or taiji or taijiquan or leisure activit$ or recreation$ or bicycl$ or cycl$ or bike$ or biking).tw.
55. ((endurance or balance or strength or flexibility or resistance) adj3 training).tw.
56. or/37-55 [rehab terms]
57. randomized controlled trial/
58. randomization/
59. controlled study/
60. control group/
61. clinical trial/ or phase 1 clinical trial/ or phase 2 clinical trial/ or phase 3 clinical trial/ or phase 4 clinical trial/ or controlled clinical trial/
62. crossover procedure/
63. double blind procedure/
64. single blind procedure/ or triple blind procedure/
65. latin square design/
66. parallel design/
67. placebo/
68. multicenter study/
69. experimental design/ or experimental study/ or quasi experimental study/
70. experimental therapy/
71. drug comparison/ or drug dose comparison/
72. drug screening/
73. evaluation/ or "evaluation and follow up"/ or evaluation research/ or clinical evaluation/
74. methodology/
75. "types of study"/

76. research subject/
77. comparative study/
78. "systematic review"/
79. meta analysis/
80. random$.tw.
81. (controlled adj5 (trial$ or stud$)).tw.
82. (clinical$ adj5 trial$).tw.
83. ((control or treatment or experiment$ or intervention) adj5 (group$ or subject$ or patients$)).tw.
84. (surgical adj5 (group$ or subject$ or patient$)).tw.
85. (quasi-random$ or quasirandom$ or pseudo-random$ or pseudorandom$).tw.
86. ((multicenter or multi center or multicentre or multi centre or therapeutic) adj5 (trial$ or stud$)).tw.
87. ((control or experiment$ or conservative) adj5 (treatment or therapy or procedure or manage$)).tw.
88. ((singl$ or doubl$ or tripl$ or trebl$) adj5 (blind$ or mask$)).tw.
89. (coin adj5 (flip or flipped or toss$)).tw.
90. latin square.tw.
91. versus.tw.
92. (cross-over or crossover).tw.
93. placebo$.tw.
94. sham.tw.
95. (assign$ or alternate or allocat$ or counterbalance$ or multiple baseline).tw.
96. controls.tw.
97. (treatment$ adj6 order).tw.
98. (meta-analy$ or metaanaly$ or metanaly$ or systematic review or systematic overview).tw.
99. or/57-98
100. human/
101. nonhuman/
102. 100 and 101
103. 101 not 102
104. 99 not 103 [RCT Filter]
105. 36 and 56 and 104 [care facilities/nursing -aged or institutional care terms and elder or other residential care and rehabilitation terms and RCT]

Appendix 4. CINAHL search strategy

We used the following search strategy for CINAHL

S1	"homes for the aged"
S2	MH Nursing Homes+ or MW Nursing Home OR "nursing home" OR "nursing homes"
S3	TI aged N2 care facilit* or AB aged N2 care facilit* or TI aged N2 care home* or AB aged care home* or TI aged N2 nursing facilit* or AB aged N2 nursing facilit* or TI aged nursing home* or AB aged nursing home* or TI aged N1 healthcare facilit* or AB aged N1 healthcare facilit* or TI resident* N2 care or AB resident* N2 care or TI resident* N2 facilit* or AB resident* N2 facilit*
S4	TI geriatric N2 facility OR AB geriatric N2 facility OR TI elderly N2 facility OR AB elderly N2 facility OR TI geriatric N2 facilities OR AB elderly N2 facilities OR TI geriatric N2 "care home" OR AB elderly N2 "care home" OR TI geriatric N2 "care homes" OR AB elderly N2 "care homes"
S5	MH hospitals, veterans

(*Continued*)

S6	MH housing for the elderly
S7	MH gerontologic nursing
S8	MH gerontologic care or MH rehabilitation, geriatric
S9	(S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8)
S10	(MH "Aged+")
S11	TI ((gerontol* or ageing or aging or elder* or geriatric* or seniors or old age or older or late* life)) OR AB ((gerontol* or ageing or aging or elder* or geriatric* or seniors or old age or older or late* life))
S12	TI ((older N1 person* older N1 people or older N1 adult* or older N1 patient* or older N1 inpatient* or older N1 outpatient*)) OR AB ((older N1 person* older N1 people or older N1 adult* or older N1 patient* or older N1 inpatient* or older N1 outpatient*))
S13	(MH "Veterans")
S14	TI veteran* OR AB veteran*
S15	(S10 or S11 or S12 or S13 or S14)
S16	MH nursing care
S17	MH rehabilitation nursing
S18	MH rehabilitation patients
S19	MH community health nursing
S20	MH rehabilitation centers
S21	MH institutionalization
S22	(S16 or S17 or S18 or S19 or S20 or S21)
S23	S15 and S22
S24	MH Assisted Living
S25	TI (longterm N5 care or longterm N5 facilit*) or AB (longterm N5 care or longterm N5 facilit*) or TI (long-term N5 care or long-term N5 facilit*) or AB (long-term N5 care or long-term N5 facilit*)
S26	(MH "Halfway Houses")
S27	TI (group N1 home* or residential N1 home*) or AB (group N1 home* or residential N1 home*)

(*Continued*)

S28	TI (hous* N5 elder* or residential N5 elder* or residence N5 elder* or residences N5 elder*or institution* N5 elder* or facility N5 elder* or facilities N5 elder*or hous* N5 geriatric* or residential N5 geriatric* or residence N5 geriatric* or residences N5 elder*or institution* N5 geriatric* or facility N5 geriatric* or facilities N5 geriatric*or hous* N5 seniors or residential N5 seniors or residence N5 seniors or residences N5 elder*or institution* N5 seniors or facility N5 seniors or facilities N5 seniors or hous* N5 older or residential N5 older or residence N5 older or residences N5 elder*or institution* N5 older or facility N5 older or facilities N5 older or hous* N5 aged or residential N5 aged or residence N5 aged or residences N5 elder*or institution* N5 aged or facility N5 aged or facilities N5 aged) OR AB (hous* N5 elder* or residential N5 elder* or residence N5 elder* or residences N5 elder*or institution* N5 elder* or facility N5 elder* or facilities N5 elder*or hous* N5 geriatric* or residential N5 geriatric* or residence N5 geriatric* or residences N5 elder*or institution* N5 geriatric* or facility N5 geriatric* or facilities N5 geriatric*or hous* N5 seniors or residential N5 seniors or residence N5 seniors or residences N5 elder*or institution* N5 seniors or facility N5 seniors or facilities N5 seniors or hous* N5 older or residential N5 older or residence N5 older or residences N5 elder*or institution* N5 older or facility N5 older or facilities N5 older or hous* N5 aged or residential N5 aged or residence N5 aged or residences N5 elder*or institution* N5 aged or facility N5 aged or facilities N5 aged)
S29	(TI resident* N2 care or AB resident* N2 care or TI resident* N2 facilit* or AB resident* N2 facilit*) OR (TI (longterm N3 care or longterm N3 facilit*) or AB (longterm N3 care or longterm N3 facilit*) or TI (long-term N3 care or long-term N3 facilit*) or AB (long-term N3 care or long-term N3 facilit*))
S30	TI (sheltered hous* or sheltered home or sheltered homes or sheltered accommodation or retirement hous* or retirement home or retirement homes or retirement accommodation or residential hous* or residential home or residential homes or residential accommodation or Halfway hous* or halfway home or halfway homes or halfway accommodation or Half-way hous* or half-way home or half-way homes or half-way accommodation) OR AB (sheltered hous* or sheltered home or sheltered homes or sheltered accommodation or retirement hous* or retirement home or retirement homes or retirement accommodation or residential hous* or residential home or residential homes or residential accommodation or Halfway hous* or halfway home or halfway homes or halfway accommodation or Half-way hous* or half-way home or half-way homes or half-way accommodation)
S31	TI (life care cent* or continued care cent* or extended care facilit*) or AB (life care cent* or continued care cent* or extended care facilit*)
S32	TI (care W1 home*) or AB (care W1 home*) or TI (care W1 center*) or AB (care W1 center*) or TI (care W1 centre*) or AB (care W1 centre*) or TI (care W1 facilit*) or AB (care W1 facilit*) or TI (convalescent W1 home*) or AB (convalescent W1 home*) or TI (convalescent W1 center*) or AB (convalescent W1 center*) or TI (convalescent W1 centre*) or AB (convalescent W1 centre*) or TI (convalescent W1 facilit*) or AB (convalescent W1 facilit*)
S33	TI skilled W2 nursing facilit* or AB skilled W2 nursing facilit* or TI intermediate W2 nursing facilit* or AB intermediate W2 nursing facilit*
S34	TI (healthcare N2 facilitiy or healthcare N2 facilities) OR AB (healthcare N2 facilitiy or healthcare N2 facilities)
S35	(S32 or S33 or S34)
S36	S15 and S35
S37	TI Assisted Living or AB Assisted Living
S38	(S24 or S25 or S26 or S27 or S28 or S29 or S30 or S31 or S36 or S37)

(*Continued*)

S39	MH rehabilitation
S40	MH occupational therapy
S41	MH physical therapy
S42	MH therapeutic exercise
S43	MH exercise
S44	MH dance therapy
S45	MH early ambulation
S46	MH tai chi
S47	MH walking
S48	MH yoga
S49	MH "physical education and training"
S50	MH physical fitness
S51	MH physical stimulation
S52	MH health promotion
S53	MH leisure activities or MH recreation or MH dancing
S54	MH health facility environment
S55	"activities of daily living"
S56	aqua
S57	rehabilitat* or exercise* or physiotherap* or keep fit
S58	hydrotherap* or musculoskeletal manipulations
S59	physical N3 therap* or physical N3 education or physical N3 train$ or physical N3 stimulat* or fitness or physical N3 activit* or physical N3 function*
S60	movement N5 therap* or movement N5 train* or movement N5 treatment* or movement N5 program*
S61	occupational N5 therap* or occupational N5 train* or occupational N5 treatment* or occupational N5 program*

(*Continued*)

S62	residential N5 therap* or residential N5 train* or residential N5 treatment* or residential N5 program*
S63	dance therapy or early ambulation or exercise* or muscle stretching
S64	strength* N3 activit* or aerobic N3 activit* or resistance N3 activit*
S65	improv* N3 function or improv* N3 mobil* or improv* N3 recover*
S66	fitness promotion or health promotion
S67	danc* or walk* or yoga or tai chi or tai ji or tai chi or ji quan or taiji or taijiquan or leisure activit* or recreation* or bicycl* or cycl* or bike* or biking
S68	endurance N3 training or balance N3 training or strength N3 training or flexibility N3 training or resistance N3 training
S69	recover* N3 function*
S70	health N3 facilit*
S71	(MH "Activities of Daily Living+") or (MH "Activities of Daily Living (Saba CCC)") or (MH "Activities of Daily Living Alteration (Saba CCC)") or (MH "Instrumental Activities of Daily Living (Saba CCC)") or (MH "Instrumental Activities of Daily Living Alteration (Saba CCC)") or (MH "Altered Activities of Daily Living (NANDA) (Non-Cinahl)+") or (MH "Self Care: Activities of Daily Living (Iowa NOC)") or (MH "Self-Care: Instrumental Activities of Daily Living (Iowa NOC)")
S72	MH random assignment
S73	MH random sample+
S74	MH crossover design
S75	MH clinical trials+
S76	MH comparative studies
S77	MH "control (research)"
S78	MH control group
S79	MH factorial design
S80	MH quasi-experimental studies
S81	MH nonrandomized trials
S82	MH placebos
S83	MH meta analysis

(*Continued*)

S84	MH clinical nursing research or MH clinical research
S85	MH community trials or MH experimental studies or MH one-shot case study or MH pre-test-post-test design or MH solomon four-group design or MH static group comparison or MH study design
S86	PT clinical trial or systematic review
S87	random*
S88	singl* N25 blind* or singl* N25 mask*
S89	doubl* N25 blind* or doubl* N25 mask*
S90	tripl* N25 blind* or tripl* N25 mask*
S91	trebl* N25 blind* or trebl* N25 mask*
S92	crossover or cross over or placebo* or control* or factorial
S93	crossover or cross over or placebo* or control* or factorial or sham*
S94	clin* N10 trial* or intervention* N10 trial* or compar* N10 trial* or experiment* N10 trial* or preventive N10 trial* or therapeutic N10 trial*
S95	counterbalance* or multiple baseline* or abab design*
S96	metaanalys* or meta analys* or metanalys* or systematic review*
S97	S72 or S73 or S74 or S75 or S76 or S77 or S78 or S79 or S80 or S81 or S82 or S83 or S84 or S85 or S86 or S87 or S88 or S89 or S90 or S91 or S92 or S93 or S94 or S95 or S96
S98	S39 or S40 or S41 or S42 or S43 or S44 or S45 or S46 or S47 or S48 or S49 or S50 or S51 or S52 or S53 or S54 or S55 or S56 or S57 or S58 or S59 or S60 or S61 or S62 or S63 or S64 or S65 or S66 or S67 or S68 or S69 or S70 or S71
S99	S38 and S97 and S98

Appendix 5. AMED search strategy

We used the following search strategy for AMED
1. “homes for the aged”.tw.
2. nursing home?.tw.
3. (aged adj2 (care or nursing or healthcare or residential) adj2 (facility or facilites or home?)).ti,ab.
4. ((geriatric or elderly) adj2 (facility or facilities or care home?)).ti,ab.
5. exp Geriatric nursing/
6. geriatric assessment/
7. exp health services for the aged/
8. or/1-7 [caring - elderly terms]
9. aged/ or aging/

10. (gerontol* or ageing or aging or elder* or geriatric* or seniors or old age or older or late* life).ti,ab.
11. (older adj (person* or people or adult* or patient* or inpatient* or outpatient*)).ti,ab.
12. veteran.ti,ab.
13. or/9-12 [elderly terms]
14. nursing care/
15. rehabilitation nursing.ti,ab.
16. (rehabilitation center$ or rehabilitation centre$).ti,ab.
17. rehabilitation speciality/
18. exp Institutionalization/
19. exp Community health nursing/
20. or/14-19 [institutional care terms]
21. 13 and 20 [institutional care terms and elderly]
22. residential facilities/
23. exp Long term care/
24. ((group or residential) adj home?).ti,ab.
25. ((hous$ or residental or residence? or institution$ or facility or facilities) adj5 (elder* or geriatric* or seniors or older or aged)).ti,ab.
26. ((residential or long-term or longterm) adj5 (care or facility or facilities)).ti,ab.
27. ((sheltered or retirement or residential or halfway or half-way) adj5 (hous$ or home? or accommodation)).ti,ab.
28. (life care cent$ or continuing care cent$ or extended care facility or extended care facilities).ti,ab.
29. ((care or convalescent) adj (home? or cent$ or facility or facilities)).ti,ab. and 14
30. ((skilled or intermediate) adj2 (nursing facility or nursing facilities)).ti,ab. and 14
31. (healthcare adj2 (facility or facilities)).ti,ab. and 14
32. assisted living.ti,ab.
33. or/22-32 [other residential terms]
34. 8 or 21 or 33 [care facilities/nursing -aged or institutional care terms and elder or other residential care terms]
35. rehabilitation/
36. occupational therapy/
37. physical therapy modalities/
38. exp exercise therapy/
39. exp Hydrotherapy/
40. exp mobilisation/ or exp movement/
41. aqua.mp.
42. muscle strength/ or muscle weakness/ or pliability/
43. exp physical education/
44. exp Physical fitness/
45. recovery of function.ti,ab.
46. exp rehabilitation techniques/
47. exp Residential treatment/
48. "delivery of health care"/
49. (rehabilitat$ or exercise$ or physiotherap$ or keep fit).ti,ab.
50. (physical and (therap$ or education or train$ or stimulat$ or fitness or activit$ or function$)).ti,ab.
51. ((exercise or occupational or residential) and (therap$ or train$ or treatment or program$)).ti,ab.
52. ((strength$ or aerobic or resistance) and activit$).ti,ab.
53. (improve$ and (function or mobil$ or recover$)).ti,ab.
54. ((fitness or health) and promotion).ti,ab.
55. (danc$ or walk$ or yoga or tai chi or tai ji or tai chi or ji quan or taiji or taijiquan or leisure activit$ or recreation$ or bicycl$ or cycl$ or bike$ or biking).ti,ab.
56. ((endurance or balance or strength or flexibility or resistance) and train$).ti,ab.
57. or/35-56 [rehab terms]
58. research design/
59. clinical trials/
60. randomized controlled trials/
61. comparative study/

62. double blind method/
63. meta analysis/
64. random allocation/
65. program evaluation/
66. placebos/
67. (evaluation studies or brief research report or clinical trial or clinical trial phase iii or meta analysis or clinical trialb or clinical trials or multicenter study or multicentre study or comparative studies or comparative study or randomised controlled trial or randomized controlled trial or "review academic" or controlled clinical trial or "review literature" or controlled trial).pt.
68. random$.tw.
69. (controlled adj5 (trial$ or stud$)).tw.
70. (clinical$ adj5 trial$).tw.
71. ((control or treatment or experiment$ or intervention) adj5 (group$ or subject$ or patient$)).tw.
72. (surgical adj5 group$).tw.
73. (quasi-random$ or quasirandom$ or pseudo-random$ or pseudorandom$).tw.
74. ((multicenter or multi center or multicentre or multi centre or therapeutic) adj5 (trial$ or stud$)).tw.
75. ((control or experiment$ or conservative) adj5 (treatment or therapy or procedure or manage$)).tw.
76. ((singl$ or doubl$ or tripl$ or trebl$) adj5 (blind$ or mask$)).tw.
77. (coin adj5 (flip or flipped or toss$)).tw.
78. latin square.tw.
79. versus.tw.
80. (cross-over or crossover).tw.
81. placebo$.tw.
82. sham.tw.
83. (assign$ or alternate or allocat$ or counterbalance$ or multiple baseline).tw.
84. control$.tw.
85. (treatment$ adj6 order).tw.
86. (meta-analy$ or metaanaly$ or metanaly$ or systematic review or systematic overview).tw.
87. or/58-86 [RCT]
88. 35 and 57 and 87 [care facilities/nursing -aged or institutional care terms and elder or other residential care and rehabilitation terms and RCT]

Appendix 6. PsycINFO search strategy

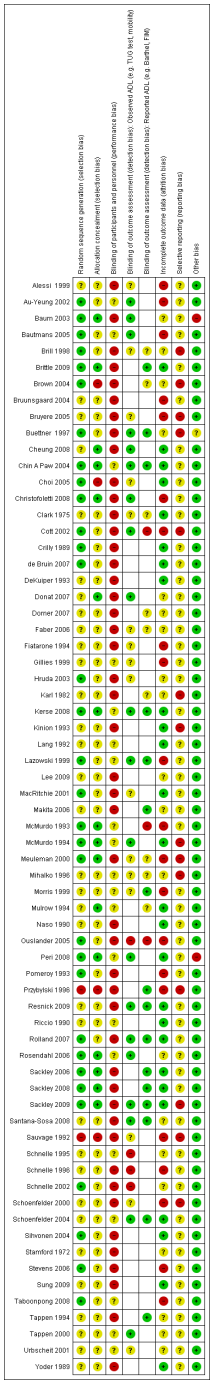
We used the following search strategy for PsycINFO
1. "homes for the aged".tw.
2. nursing home?.tw.
3. (aged adj2 (care or nursing or healthcare or residential) adj2 (facility or facilites or home?)).ti,ab.
4. ((geriatric or elderly) adj2 (facility or facilities or care home?)).ti,ab.
5. exp elder care/
6. or/1-5 [care facilities/nursing - aged terms]
7. exp Geriatric Patients/
8. exp Geriatrics/
9. exp Gerontology/
10. exp Aging/
11. (gerontol* or ageing or aging or elder* or geriatric* or seniors or old age or older or late* life).ti,ab.
12. (older adj (person* or people or adult* or patient* or inpatient* or outpatient*)).ti,ab.
13. veteran.ti,ab.
14. or/7-13 [elderly terms]
15. exp Nursing/
16. exp Rehabilitation Centers/
17. rehabilitation/
18. exp Institutionalization/

19. or/15-18 [institutional care terms]
20. 14 and 19 [elderly and institutional care terms]
21. exp Residential Care Institutions/
22. exp Treatment Facilities/
23. exp Assisted Living/
24. exp Group Homes/
25. exp Long Term Care/
26. ((group or residential) adj home?).tw.
27. ((hous$ or residental or residence? or institution$ or facility or facilities) adj5 (elder* or geriatric* or seniors or older or aged)).ti,ab.
28. ((residential or long-term or longterm) adj5 (care or facility or facilities)).ti,ab.
29. ((sheltered or retirement or residential or halfway or half-way) adj5 (hous$ or home? or accommodation)).ti,ab.
30. (life care cent$ or continuing care cent$ or extended care facility or extended care facilities).ti,ab.
31. ((care or convalescent) adj (home? or cent$ or facility or facilities)).ti,ab. and 14
32. ((skilled or intermediate) adj2 (nursing facility or nursing facilities)).ti,ab. and 14
33. (healthcare adj2 (facility or facilities)).ti,ab. and 14
34. assisted living.ti,ab.
35. or/21-34 [other residential care terms]
36. 6 or 20 or 35 [care facilities/nursing -aged or institutional care terms and elder or other residential care terms]
37. exp REHABILITATION/
38. exp Motor Processes/
39. exp Movement Therapy/
40. exp Physical Fitness/
41. physical strength/
42. exp Therapeutic Environment/
43. exp Physical Endurance/
44. (rehabilitat$ or exercise$ or physiotherap$ or keep fit).tw.
45. (physical adj3 (therap$ or education or train$ or fitness or activit$ or function)).tw.
46. ((exercise or movement or occupational or residential) adj5 (therap$ or train$ or treatment or program$)).tw.
47. ((strength$ or aerobic or resistance) adj3 activit$).tw.
48. (improve$ adj3 (function or mobil$ or recover$)).tw.
49. ((fitness or health) adj3 promotion).tw.
50. (danc$ or walk$ or yoga or tai chi or tai ji or tai chi or ji quan or taiji or taijiquan or leisure activit$ or recreation$ or bicycl$ or cycl$ or bike$ or biking).tw.
51. ((endurance or balance or strength or flexibility or resistance) adj3 training).tw.
52. or/37-51
53. 36 and 52 [care facilities/nursing -aged or institutional care terms and elder or other residential care and rehabilitation terms]

Appendix 7. 'Risk of bias' summary

Figure 7

Figure 7. 'Risk of bias' summary: review authors' judgements about each 'Risk of bias' item for each included study



FEEDBACK

Feedback, 13 November 2009

Summary

During a recent course we gave on Cochrane Reviews, we discussed the topic of how to best make comparisons when a review includes many different kinds of interventions. We used your review as an example of a review that can include many studies but where the authors are then faced with the task of somehow grouping the interventions to produce useful comparisons. In your review you concluded that it was impossible to make comparisons because of the heterogeneity of the included studies. However, we felt that there would be several possibilities of making comparisons that would lead to more informative recommendations for the reader. We also found it difficult to follow how you came to your conclusion that provision of physical rehabilitation interventions to long-term care residents is worthwhile and safe, reducing disability with few adverse events.

We came to the conclusion that it is important to first separate studies that report primary outcomes from those that report secondary outcomes only. In your review, it would mean that you would first report about the studies that used a measure of ADL such as the Barthel Index or the FIM and then you would report on the studies that reported a secondary outcome only. We think that this information is lacking now. In addition, we concluded that it would be helpful to make a classification of the interventions based on their most important features. For your review, we assumed that exercise would be the most important feature of the biggest part of the interventions. Next we would subclassify exercise interventions according to their most important features. You already did this in your review with exercises that use imagery to enhance participation. All four studies that used imagery report endurance or the number of exercises that participants were able to perform and they use the same control group with rote exercise, which all in all makes for a perfectly homogenous comparison. Moreover, we thought that even when studies are heterogeneous, it is worthwhile to extract data about the outcomes and report them. In your review, you report outcomes only as the conclusions of the authors of the primary studies. This makes it, in our view, impossible to draw conclusions about the results. For example, four imagery studies with a non-significant outcome could well add up to a significant result in a meta-analysis. In our view, a meta-analysis of the four imagery studies would be well warranted by the homogeneity of the studies. This in turn could lead to a very relevant practical recommendation to use imagery to improve the results of exercise.

We hope that, with an update, better data extraction and better construction of comparisons will lead to better underpinned conclusions from this important review.

Reply

Many thanks for your comments on our review. The review was complex so we much appreciate any comments which will help us enhance the quality.

We are uncertain of the meaning of your first comment. We state in the review the number of trials reported an outcome measure related to ADL, our primary outcome measure.

We are currently updating the review and will consider classifying the interventions based on the most important features as you suggest.

We considered presentation of results in the review extremely carefully, and the current format seemed the best option at the time. However we are updating our review and during this process we will consider other ways of presenting the data.

We agree that it may be appropriate to undertake meta-analysis on the imagery studies.

Thank you for your comments, and the time you and your colleagues have taken to consider and feedback on our review. We will re-consider all your comments as we are up-dating.

Contributors

Feedback submitted by: Jos Verbeek

Reply provided by: Anne Forster

WHAT'S NEW

Date	Event	Description
2 October 2012	New search has been performed	Eighteen new studies have been incorporated. Meta-analyses of activities of daily living outcomes and death from all causes have been included for the first time. The Background, Methods, Results and Discussion have been substantially rewritten.
2 October 2012	New citation required and conclusions have changed	Conclusions have become more cautious on the basis of evidence from meta-analyses about effect size. New authors have been included. The title has been modified to clarify the content of the review

HISTORY

Date	Event	Description
3 March 2011	Feedback has been incorporated	Feedback and the authors' response has been added to the review
1 February 2010	Amended	Minor amendments.
17 March 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

Anne Forster conceived and designed the review and wrote the funding application, with the assistance of John Young, Jane Smith, and John Green. Jo Hardy and Anne Forster took a lead role in writing the protocol, with advice from John Young, Jane Smith, and John Green. Anne Forster co-ordinated the review, with assistance from Jo Hardy and Tom Crocker. Jo Hardy and Anne Forster developed the search strategy and organised the retrieval of papers. Anne Forster, Jo Hardy, and Tom Crocker screened search results. Jo Hardy, Tom Crocker, Lesley Brown, and Seline Ozer wrote to authors of papers for additional information. All co-authors assisted in the identification of papers for inclusion into the review, appraised quality of papers, assisted in the design of the data extraction protocol, and extracted data from papers. For this updated review, Tom Crocker developed the database and managed the data. Lesley Brown, Tom Crocker, and Seline Ozer combined the independent data extractions. Darren Greenwood led and conducted the meta-analyses, which were reproduced in Review Manager by Tom Crocker. Tom Crocker assimilated the information and led the writing of this update, with support from Anne Forster.

DECLARATIONS OF INTEREST

John Young was a co-applicant for a research grant from BUPA to investigate delirium prevention in care homes. Anne Forster, John Young, and Ruth Lambley were developing a research project to investigate exercise programmes in care homes. This work started after the results of the original Cochrane review had been submitted.

Anne Forster and John Young have conducted a NIHR (National Institute for Health Research) development programme to investigate activity in care homes (barriers, enablers, and its measurement). They are applying for a NIHR programme grant to develop and test the feasibility of an intervention to increase activity in care homes.

Darren Greenwood has received grant funding for statistical analysis from Bradford Teaching Hospitals NHS Foundation Trust, and he has received funding from the Department of Health for a systematic review of diet and stroke.

SOURCES OF SUPPORT

Internal sources

- NHS R&D Levy Funding, UK.

External sources

- Physiotherapy Research Foundation, UK.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

Title

The title has been amended to clarify that the review focuses on the physical aspects of rehabilitation.

Study criteria

The original intention was to limit inclusion to studies that undertook follow up at a minimum of one month. However, because of a lack of such studies, this criterion was not applied.

Outcome measures

We clarified our meaning of function in activities of daily living to include specific measures of performance in physical ADL function, e.g. mobility.
We specified economic outcomes and additional adverse outcomes.
The original intention was to assess outcomes at the scheduled end of each trial (after follow up). However, as many studies lacked follow up, we assessed outcomes at the end of the intervention for consistency. In the narrative synthesis, we also reported follow-up data.
We had planned, in the face of varied assessment tools, to dichotomise outcomes into deteriorated versus maintained or improved prior to meta-analysis. For the same purpose, we specified a global poor outcome (death or deterioration). However, we have not included such varied measures in meta-analysis because we lack the individual level data required to do this.

Search methods for identification of studies

We originally planned to search SIGLE (System for Information on Grey Literature in Europe), but we did not do so because it is no longer accessible. Furthermore, we planned to handsearch relevant journals, but because of their inclusion in electronic databases and the extensive results returned through electronic searches, we considered this unnecessary. In addition to the planned searches, we searched Google Scholar.

Data collection and analysis

We replaced the assessment of methodological quality described in the protocol and undertaken in the original review with The Cochrane Collaboration's new 'Risk of bias' assessment tool (Higgins 2011). We reassessed all studies in the original review in line with these criteria. We performed data collection on a standardised electronic database, rather than a paper form. We clarified our approach to analysing data from cluster trials. We originally intended to combine results in a fixed-effect meta-analysis where sufficient homogeneity existed. However, because of the extensive heterogeneity in interventions (contents, intensity, and duration), we used a random-effects meta-analysis as our primary approach, but we still report the results of fixed-effect models as sensitivity analyses. We did not perform all the subgroup analyses originally proposed in the protocol because there are too few pathology-specific interventions for any one pathology, and studies often include both nursing and residential care homes. However, both of these groupings were partly intended to split participants by functional ability. Therefore, we instead grouped studies by baseline function in the measure being analysed. In addition to the subgroups suggested in the protocol, we added gender, duration of intervention, and risk of bias. We specified all of these subgroups before analysis commenced and presented and reported all of them for each measure.

INDEX TERMS

Medical Subject Headings (MeSH)

*Long-Term Care; *Rehabilitation; Activities of Daily Living; Cognition Disorders [rehabilitation]; Exercise Therapy; Homes for the Aged; Nursing Homes; Randomized Controlled Trials as Topic

MeSH check words

Aged; Aged, 80 and over; Female; Humans; Male