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[Intervention Review]

Progressive resistance strength training for improving physical function in older adults

Chiung-ju Liu[1], Nancy K Latham[2]

[1]Department of Occupational Therapy, Indiana University at Indianapolis, Indianpolis, Indiana, USA. [2]Health and Disabilty Research Institute, School of Public Health, Boston University, Boston, MA, USA

Contact address: Chiung-ju Liu, Department of Occupational Therapy, Indiana University at Indianapolis, 1140 W Michigan ST CF 303, Indianpolis, Indiana, 46202, USA. liu41@iupui.edu.

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ABSTRACT

Background

Muscle weakness in old age is associated with physical function decline. Progressive resistance strength training (PRT) exercises are designed to increase strength.

Objectives

To assess the effects of PRT on older people and identify adverse events.

Search methods

We searched the Cochrane Bone, Joint and Muscle Trauma Group Specialized Register (to March 2007), the Cochrane Central Register of Controlled Trials (*The Cochrane Library* 2007, Issue 2), MEDLINE (1966 to May 01, 2008), EMBASE (1980 to February 06 2007), CINAHL (1982 to July 01 2007) and two other electronic databases. We also searched reference lists of articles, reviewed conference abstracts and contacted authors.

Selection criteria

Randomised controlled trials reporting physical outcomes of PRT for older people were included.

Data collection and analysis

Two review authors independently selected trials, assessed trial quality and extracted data. Data were pooled where appropriate.

Main results

One hundred and twenty one trials with 6700 participants were included. In most trials, PRT was performed two to three times per week and at a high intensity. PRT resulted in a small but significant improvement in physical ability (33 trials, 2172 participants; SMD 0.14, 95% CI 0.05 to 0.22). Functional limitation measures also showed improvements: e.g. there was a modest improvement in gait speed (24 trials, 1179 participants, MD 0.08 m/s, 95% CI 0.04 to 0.12); and a moderate to large effect for getting out of a chair (11 trials, 384 participants, SMD -0.94, 95% CI -1.49 to -0.38). PRT had a large positive effect on muscle strength (73 trials, 3059 participants, SMD 0.84, 95% CI 0.67 to 1.00). Participants with osteoarthritis reported a reduction in pain following PRT(6 trials, 503 participants, SMD -0.30, 95% CI -0.48 to -0.13). There was no evidence from 10 other trials (587 participants) that PRT had an effect on bodily pain. Adverse events were poorly recorded but adverse events related to musculoskeletal complaints, such as joint pain and muscle soreness, were reported in many of the studies that prospectively defined and monitored these events. Serious adverse events were rare, and no serious events were reported to be directly related to the exercise programme.

Authors' conclusions

This review provides evidence that PRT is an effective intervention for improving physical functioning in older people, including improving strength and the performance of some simple and complex activities. However, some caution is needed with transferring these exercises for use with clinical populations because adverse events are not adequately reported.

PLAIN LANGUAGE SUMMARY

Progressive resistance strength training for improving physical function in older adults

Older people generally lose muscle strength as they age. This reduction in muscle strength and associated weakness means that older people are more likely to have problems carrying out their daily activities and to fall. Progressive resistance training (PRT) is a type of exercise where participants exercise their muscles against some type of resistance that is progressively increased as their strength improves. The exercise is usually conducted two to three times a week at moderate to high intensity by using exercise machines, free weights, or elastic bands.This review sets out to examine if PRT can help to improve physical function and muscle strength in older people.

Evidence from 121 randomised controlled trials (6,700 participants) shows that older people who exercise their muscles against a force or resistance become stronger. They also improve their performance of simple activities such as walking, climbing steps, or standing up from a chair more quickly. The improvement in activities such as getting out of a chair or stair climbing is generally greater than walking speed. Moreover, these strength training exercises also improved older people's physical abilities, including more complex daily activities such as bathing or preparing a meal. PRT also reduced pain in people with osteoarthritis. There was insufficient evidence to comment on the risks of PRT or long term effects.

BACKGROUND

Description of the condition

Muscle strength is the amount of force produced by a muscle. The loss of muscle strength in old age is a prevalent condition. Muscle strength declines with age such that, on average, the strength of people in their 80s is about 40% less than that of people in their 20s (Doherty 1993). Muscle weakness, particularly of the lower limbs, is associated with reduced walking speed (Buchner 1996), increased risk of disability (Guralnik 1995) and falls in older people (Tinetti 1986).

Description of the intervention

Progressive resistance training (PRT) is often used to increase muscle strength. During the exercise, participants exercise their muscles against some type of resistance that is progressively increased as strength improves. Common equipment used for PRT includes exercise machines, free weights, and elastic bands.

How the intervention might work

Contrary to long held beliefs, the muscles of older people (i.e. people aged 60 years and older) continue to be adaptable, even into the extremes of old age (Frontera 1988). Trials have revealed that older people can experience large improvements in their muscle strength, particularly if their muscles are significantly overloaded during training (Brown 1990; Charette 1991; Fiatarone 1994).

Why it is important to do this review

Despite evidence of benefit from PRT in terms of improving muscle strength, there is still uncertainty about how these effects translate into changes in substantive outcomes such a reduction in physical disability (Chandler 1998). Most studies have been under-powered to determine the effects of PRT on these outcomes or have included PRT as part of a complex intervention. In addition, there is uncertainty about the effects of PRT when more pragmatic, home or hospital-based programmes are used, and the safety and effectiveness of this intervention in older adults who have health problems and/or functional limitations. Finally, there is uncertainty about the relative benefits of PRT compared with other exercise programmes, or the effectiveness of varying doses of PRT (i.e. programmes of varying intensity and duration). This update of our review (Latham 2003a) has continued to assess and summarise the evidence for PRT.

OBJECTIVES

To determine the effects of progressive resistance strength training (PRT) on physical function in older adults through comparing PRT with no exercise, or another type of care or exercise (e.g. aerobic training). Comparisons of different types (e.g. intensities, frequencies, or speed) of PRT were included also. We considered these effects primarily in terms of measures of physical (dis)ability and adverse effects, and secondary measures of functional impairment (muscle strength & aerobic capacity) and limitation (e.g. gait speed).

METHODS

Criteria for considering studies for this review

Types of studies

Any randomised clinical trials meeting the specifications below were included. All non-randomised controlled trials (e.g. controlled before and after studies) were excluded. Also excluded were trials for which details were provided that indicated these used quasi-randomised methods, such as allocation based on date of birth.

Types of participants

Older people, resident in institutions or at home in the community. Trials were included if the mean age of participants was 60 or over, but excluded if participants aged less than 50 were enrolled. The participants could include frail or disabled older people, people with identified diseases or health problems, or fit and healthy people.

Types of interventions

Any trial that had one group of participants who received PRT as a primary intervention was considered for inclusion. PRT was defined as a strength training programme in which the participants exercised their muscles against an external force that was set at specific intensity for each participant, and this resistance was adjusted throughout the training programme. The type of resistance used included elastic bands or tubing (i.e. therabands), cuff weights, free weights, isokinetic machines or other weight machines. This type of training could take place in individual or group exercise programmes, and in a home-based or gymnasium/clinic setting. Studies that utilised only isometric exercises were excluded. Studies that included balance, aerobic or other training as part of the exercise intervention (and not simply part of the warm-up or cool-down) were also excluded.

We found the following comparisons between groups in the trials:

- PRT versus no exercise (greatest difference between groups was expected)
- Different types of PRT: high intensity versus low intensity, high frequency versus low frequency, or higher speed (power training) versus regular speed (greatest effect expected in the higher intensity groups). Power training refers to the type of PRT that emphasizes speed.
- PRT versus regular care (including regular therapy or exercise)
- PRT versus another type of exercise (smaller difference between groups expected)

Types of outcome measures

Primary outcomes

This review assessed physical function in older adults at the level of impairment, functional limitation and disability. The primary outcome of this review was physical disability. This was assessed as a continuous variable. The outcomes were categorized based on the Nagi model of health states (Nagi 1991). In this model, disability is considered to be a limitation in performance of socially defined roles and tasks that can relate to self-care, work, family etc. In this review, the primary assessment of physical disability included the evaluation of self-reported measures of activities of daily living (ADL, i.e. the Barthel Index) and the physical domains

of health-related quality of life (HRQOL, i.e. the physical function domain of the SF-36). Data from these measures were pooled for the main analysis of physical disability. However, because these two types of measures (ADL and physical domains of HRQOL) evaluate different health concepts, they were also evaluated in separate analyses. The Nagi model also includes firstly, the domain of 'functional limitations' which are limitations in performance at the level of the whole person and includes activities such as walking, climbing or reaching, and secondly, 'impairments' that are defined as anatomical or physiological abnormalities.

Since the protocol of this review was written, the International Classification of Functioning, Disability and Handicap (ICF) has been released (WHO 2001). Under this system, disability is an umbrella term for impairments, activity limitations and participation restrictions. Using the ICF, the outcome measures evaluated in this review fall under the domains of impairments, limitations in simple activities (similar to 'functional limitations' in Nagi's system) and limitations in complex activities (similar to some aspects of disability in Nagi's model).

Secondary outcomes

Measures of impairment (outcome comparisons 2 and 3)

The following secondary outcomes were assessed as continuous variables:

- muscle strength (e.g. 1 repetition maximum test, isokinetic and isometric dynamometry)
- aerobic capacity (e.g. 6 minute walk test, VO2 max: maximal oxygen uptake during exercise)

Measures of functional limitation (simple physical activities)

The following secondary outcomes were assessed as continuous variables:

- balance (e.g. Berg Balance Scale, Functional Reach Test)
- gait speed, timed walk
- timed 'up-and-go' test
- chair rise (sit to stand)
- stair climbing (added in 2008)

The balance outcome is also reviewed in a separate Cochrane review (Howe 2007).

Other outcomes

The dichotomous secondary outcomes assessed were adverse events, admission to hospital and death. The effect of PRT on falls was also evaluated, although these outcomes are considered in a separate Cochrane review (Gillespie 2003). Pain and vitality measures were evaluated as continuous outcomes, and were used to provide additional information about the potential adverse effects or benefits of PRT.

Outcomes removed after the protocol

In the original protocol for this review, measures of fear of falling and participation in social activities were also included as outcomes. However, when the size and complexity of this review became apparent, the authors decided to limit this review to assessments of physical disability as this was the prespecified primary aim of the review. Therefore, these outcomes are not included in the current review. In addition, the protocol also stated that assessments of disability using the Barthel Index and Functional Independence Measure (FIM) would be dichotomised. However, as no trials included the FIM as an outcome and only three trials used the Barthel Index, the decision was made to report these data as continuous outcomes only.

Search methods for identification of studies

Electronic searches

We searched the Cochrane Bone, Joint and Muscle Trauma Group Specialised Register (March 2007), the Cochrane Central Register of Controlled Trials (*The Cochrane Library* 2002, Issue 2; February 2007), MEDLINE (1966 to May 01, 2008), EMBASE (1980 to February 06, 2007), CINAHL (1982 to July 01, 2007), SPORTDiscus (1948 to February 07, 2007), PEDro - The Physiotherapy Evidence Database (accessed February 07, 2007) and Digital Dissertations (accessed February 01, 2007). No language restrictions were applied.

In MEDLINE (OVID Web) the subject specific search strategy was combined with the first two phases of the Cochrane optimal search strategy (Higgins 2006). This search strategy, along with those for EMBASE (OVID Web), *The Cochrane Library* (Wiley InterScience), CINAHL (OVID Web), SPORTDiscus (OVID Web) and PEDro, can be found in Appendix 1.

Searching other resources

We contacted authors and searched reference lists of identified studies, and reviews (Anonymous 2001; Buchner 1993; Chandler 1996; Fiatarone 1993; Keysor 2001; King 1998; King 2001; Mazzeo 1998; Singh 2002).

We also handsearched the following conference proceedings:

- 16th International Association of Gerontology World Congress; 1997; Adelaide (Australia).
- 17th International Association of Gerontology World Congress; 2001; Vancouver (Canada).
- Proceedings of the 13th World Congress of Physical Therapy; 1995; Washington (DC).
- Proceedings of the 14th World Congress of Physical Therapy; 1999; Japan.
- New Zealand Association of Gerontology Conferences - 1996 Dunedin, 1999 Wellington and 2002 Auckland (New Zealand).
- The 60th annual scientific meeting of the Gerontological Society of America; 2007, San Francisco, CA.
- The American Congress of Rehabilitation Medicine - American Society of Neurorehabilitation Joint Conference; 2006, Boston, MA.

Data collection and analysis

Selection of studies

For this update (Issue 3, 2009), one author (CJL) conducted the searches. Both listed authors (CJL, NL) reviewed the titles, descriptors or abstracts identified from all literature searches to identify potentially relevant trials for full review. A copy of the full text of all trials that appeared to be potentially suitable for the review was obtained. Both authors independently used previously defined inclusion criteria to select the trials. In all cases, the reviewers reached a consensus when they initially disagreed about

the inclusion of a trial. Before this update, the same method of identifying and assessing studies was used, although other members of the previous review team assisted (Latham 2003a).

Data extraction and management

Two authors independently extracted the data and recorded information on a standardised paper form. They considered all primary and secondary outcomes. If the data were not reported in a form that enabled quantitative pooling, the authors were contacted for additional information. If the authors could not be contacted or if the information was no longer available, the trial was not included in the pooling for that specific outcome.

Assessment of risk of bias in included studies

The methodological quality of each trial was independently assessed by two authors (NL, CS in the first review; CJL, NL in the update) using a scoring system that was based on the Cochrane Bone, Joint and Muscle Trauma Group's former evaluation tool. The review authors were blinded to the trial authors' institution, journal that the trial was published in and the results of the trial. A third review author (CA) was consulted in the first review if a consensus about the trial quality could not be reached. No third review author was involved in the review update. The criteria for assessing internal and external validity can be found in Table 1.

Assessment of heterogeneity

The chi^2 test was used to assess heterogeneity. In future updates, we will also assess heterogeneity by visual inspection of the forest plots and consideration of the I^2 statistic.

Data synthesis

Where it was thought appropriate, the results from the studies were combined. Data synthesis was carried out using MetaView in Review Manager version 5.0. For continuous outcomes, mean differences (MD) and 95% confidence intervals (CI) were calculated when similar measurement units were used. To pool outcomes using different units, standardised units (i.e. standardised mean differences, SMD) were created as appropriate. We calculated risk ratios and 95% CI for dichotomous outcomes, where possible.

If minimal statistical heterogeneity ($P < 0.1$) existed, fixed-effect meta-analysis was performed.

For trials that compared two or more different dosages of PRT versus a control group, data from the higher or highest intensity group were used in the analyses of PRT versus control.

Subgroup analysis and investigation of heterogeneity

If substantial statistical heterogeneity existed, the review authors looked for possible explanations. Specifically, we considered differences in age and baseline disability of the study participants, the methodological quality of the trials and the intensity and duration of the interventions. If the statistical heterogeneity could be explained, we considered the possibility of presenting the results as subgroup analyses. If the statistical heterogeneity could not be explained, we considered not combining the studies at all, using a random-effects model with cautious interpretation or using both fixed-effect and random-effects models to assist in explaining the uncertainty around an analysis with heterogeneous studies.

Sensitivity analysis

Sensitivity analyses were conducted to assess the effect of differences in methodological quality. These included allocation concealment, blinding of outcome assessors, statements of intention-to-treat analysis and use of attention control.

RESULTS

Description of studies

Results of the search

Please see the 'Characteristics of included studies'.

One hundred and twenty-one trials with 6700 participants at entry were included in this review. Four studies were published only as abstracts and/or theses (Collier 1997; Fiatarone 1997; Moreland 2001; Newnham 1995).

Included studies

There was variation across the trials in the characteristics of the participants, the design of the PRT programmes, the interventions provided for the comparison group and the outcomes assessed. More detailed information is provided in the 'Characteristics of included studies'; however, a brief summary is provided here.

Language

All reviewed trials were published in English.

Location

Sixty-eight trials were conducted in the USA, 13 in Canada, 9 in Australia or New Zealand, and 31 in various European countries.

Study size

Most of these studies were small, with less than 40 participants in total, but 14 studies had 100 or more participants in total in a PRT group and a control group (Buchner 1997; Chandler 1998; Chin A Paw 2006; de Vos 2005; Ettinger 1997; Jette 1996; Jette 1999; Judge 1994; Latham 2003; Maurer 1999; McCartney 1995; Mikesky 2006; Moreland 2001; Segal 2003).

Participants

Health status

The participants in 59 trials were healthy older adults. In the remaining 62 trials, the participants had a health problem, functional limitation and/or were residing in a hospital or residential care. Thirty-two trials included older people with a specific medical condition, including diabetes (Brandon 2003), prostate cancer (Segal 2003), osteoarthritis (Baker 2001; Ettinger 1997; Foley 2003; Maurer 1999; Mikesky 2006; Schilke 1996; Topp 2002), osteoporosis/osteopenia (Liu-Ambrose 2005), peripheral arterial disease (Hiatt 1994; McGuigan 2001), recent stroke (Moreland 2001; Ouellette 2004), congestive heart failure (Brochu 2002; Pu 2001; Selig 2004; Tyni-Lenne 2001), chronic airflow limitation (Casaburi 2004; Kongsgaard 2004; Simpson 1992), clinical depression (Sims 2006; Singh 1997; Singh 2005), low bone-mineral density (Parkhouse 2000), hip replacement due to osteoarthritis (Suetta 2004), hip/lower limb fracture (Mangione 2005; Miller 2006), obesity (Ballor 1996), chronic renal insufficiency (Castaneda 2001; Castaneda 2004) and coronary artery bypass graft surgery three or more months before exercise training (Maiorana

1997). Nineteen other trials recruited participants who did not have a specific health problem, but were considered frail and/or to have a functional limitation (Bean 2004; Boshuizen 2005; Chandler 1998; Fiatarone 1994; Fiatarone 1997; Fielding 2002; Hennessey 2001; Jette 1999; Krebs 2007; Latham 2003; Manini 2005; McMurdo 1995; Mihalko 1996; Miszko 2003; Newnham 1995; Skelton 1996; Sullivan 2005; Topp 2005; Westhoff 2000). In nine trials, the participants resided in a rest-home or nursing home (Baum 2003; Bruunsgaard 2004; Chin A Paw 2006; Fiatarone 1994; Hruda 2003; McMurdo 1995; Mihalko 1996; Newnham 1995; Seynnes 2004). In addition, two trials included participants who were in hospital at the time the exercise programme was carried out (Donald 2000; Latham 2001). In the other trials, most or all of the participants lived in the community.

Gender

Most studies included both men and women, although 10 trials included men only (Fatouros 2002; Hagerman 2000; Haykowsky 2000; Hepple 1997; Izquierdo 2004; Katznelson 2006; Kongsgaard 2004; Maiorana 1997; Segal 2003; Sousa 2005) and 22 trials included women only (Bean 2004; Brochu 2002; Charette 1991; Damush 1999; Fahlman 2002; Flynn 1999; Frontera 2003; Haykowsky 2005; Jones 1994; Kallinen 2002; Liu-Ambrose 2005; Macaluso 2003; Madden 2006; Nelson 1994; Nichols 1993; Parkhouse 2000; Pu 2001; Rhodes 2000; Sipila 1996; Skelton 1995; Skelton 1996; Taaffe 1996).

Age

In 49 studies the mean or median age of the participants was between 60 and 69 years old; in 57 studies, the mean/median age was between 70 and 79 years old; and in 20 studies, it was 80 years old or over.

Lifestyle

Fifteen studies specifically recruited participants with a sedentary lifestyle (Ades 1996; Beneka 2005; Charette 1991; Fatouros 2002; Fatouros 2005; Frontera 2003; Kalapotharakos 2005; Katznelson 2006; Malliou 2003; Mihalko 1996; Parkhouse 2000; Pollock 1991; Rhodes 2000; Topp 1996; Tsutsumi 1997).

PRT Programmes

Settings

Most training programmes took place in gym or clinic settings with all sessions fully supervised. Ten studies were entirely home-based (Baker 2001; Chandler 1998; Fiatarone 1997; Jette 1996; Jette 1999; Katznelson 2006; Krebs 2007; Latham 2003; Mangione 2005; McMurdo 1995), while 12 additional studies carried out some of the training at home and some in gym/clinic settings (Boshuizen 2005; Ettinger 1997; Jones 1994; Mikesky 2006; Simoneau 2006; Skelton 1995; Skelton 1996; Topp 1993; Topp 1996; Topp 2002; Topp 2005; Westhoff 2000).

Intensity

The resistance training programmes in most trials (i.e. 83 trials) involved high intensity training. Most of these trials used specialized exercise machines for training. Thirty-six trials used low-intensity to moderate-intensity training, with most using elastic tubing or bands. All of the high-intensity training was carried out at least in part in gym or clinic based settings, with the exception of two published trials (Baker 2001; Latham 2003) and a trial published as an abstract (Fiatarone 1997).

Frequency and duration

The frequency of training was consistent across studies, with the exercise programme carried out two to three times a week in almost all trials. Two exceptions to this were the two trials conducted in hospital which carried out the exercises on a daily basis (Donald 2000; Latham 2001). In contrast, there was large variation in the duration of the exercise programmes and the number of exercises performed in each programme. Although most of the programmes (i.e. 71 trials) were eight to 12 weeks long, the duration ranged from two to 104 weeks. In 54 trials the exercise programme was longer than 12 weeks. The number of exercises performed also varied, from one to more than 14.

Adherence

Data about adherence to the PRT programme are reported in the 'Characteristics of included studies'. These data are difficult to interpret because different definitions for adherence or compliance were used across the trials. In most trials, adherence referred to the percentage of exercise sessions attended compared with the total number of prescribed sessions and in this case the reported adherence rate is high (i.e. greater than 75%). Many trials only included participants that completed the entire trial (i.e. excluded drop-outs), while some trials reported these data with drop-outs included.

Comparison interventions

Comparisons were conducted between a PRT group and a control group and between a PRT group and a group that received other type of intervention. In addition, comparisons between high intensity or frequency and low intensity or frequency, different sets, and different types of contraction training were also conducted. Multiple comparisons within a trial were possible when the trial included more than two groups that were relevant to the review. Twenty-eight trials had three groups. Among these trials, 14 included an aerobic training group in addition to a PRT group and a control group (Ettinger 1997; Fahlman 2002; Fatouros 2002; Haykowsky 2005; Hiatt 1994; Jubrias 2001; Kallinen 2002; Madden 2006; Malliou 2003; Mangione 2005; Pollock 1991; Sipila 1996; Topp 2005; Wood 2001), and seven included two PRT groups that exercised at different intensities in addition to a control group (de Vos 2005; Fatouros 2005; Hortobagyi 2001; Hunter 2001; Kalapotharakos 2005; Seynnes 2004; Singh 2005). One trial had a PRT group, a functional training group, and a PRT with functional training group (Manini 2005). The other six trials either had a balance training group (Judge 1994), functional training group (Chin A Paw 2006; de Vreede 2007), an endurance training group (Sipila 1996), a mobility training group (McMurdo 1995), or a power training group (Miszko 2003) in addition to a PRT group and a control group. One trial had three groups that exercised at three different frequencies in addition to a control group (Taaffe 1999).

PRT versus controls

One hundred and four trials compared PRT with a control group. The control group might receive no exercise, regular care, or attention control (i.e. the control group receives matching attention as the intervention group).

Comparisons of PRT dosage

High intensity versus low intensity

Ten studies compared PRT programmes at high intensity versus low intensity (Beneka 2005; Fatouros 2005; Harris 2004; Hortobagyi 2001; Seynnes 2004; Singh 2005; Sullivan 2005; Taaffe 1996; Tsutsumi 1997; Vincent 2002).

Different frequencies of PRT

Two trials (DiFrancisco 2007 ; Taaffe 1999) compared PRT performed at different frequencies (i.e. once, twice, or three times per week).

Different sets

One study compared PRT at different sets, i.e. 3-sets versus 1-set (Galvao 2005). One set of exercise means several continuous repeated movements.

Concentric versus eccentric training

One study (Symons 2005) compared PRT at two types of contraction training: concentric versus eccentric training. During concentric training, speed was added at concentric contraction phase and vise versa for eccentric training.

PRT versus aerobic training

PRT was compared with aerobic (endurance) training in 17 trials (Ballor 1996; Buchner 1997; Earles 2001; Ettinger 1997; Fatouros 2002; Hepple 1997; Hiatt 1994; Izquierdo 2004; Jubrias 2001; Kallinen 2002; Madden 2006; Malliou 2003; Mangione 2005; Pollock 1991; Sipila 1996; Topp 2005; Wood 2001).

PRT versus balance training

One study compared PRT with balance training (Judge 1994). Balance training included training on a computerized balance platform and non-platform training (i.e. balancing on different surfaces, with varying bases of support, with different perturbations). Both exercise programmes were performed in a research center three times per week for three months.

PRT versus functional training

Three studies compared PRT to functional training (Chin A Paw 2006; de Vreede 2007; Manini 2005). Functional training involves game-like activities or exercise movements in various directions. In Chin A Paw 2006, functional training involved game-like or cooperative activities; and in de Vreede 2007, functional training involved moving with a vertical or horizontal component, carrying an object, and changing position between lying, sitting, and standing.

PRT versus flexibility training

One study compared PRT with flexibility training (Barrett 2002).

Power training

Power training refers to the type of PRT that emphasizes speed. Three studies applied this type of training (de Vos 2005; Macaluso 2003; Miszko 2003).

Outcomes

A variety of outcomes were assessed in these studies: the primary outcomes of physical function and secondary outcomes of measures of impairment and functional limitation.

Excluded studies

The excluded studies and their reasons for exclusion are listed in the 'Characteristics of excluded studies'. The main reasons for exclusion were that the study was not a randomised controlled trial or that the study design caused serious threats to its internal validity (57 trials); the studies used a combination of exercise interventions (i.e. not resistance training alone) (51 trials); the strength training programme did not use a progressive resistance approach (32 trials); and some participants were not elderly (i.e. did not have a mean age of at least 60 years and/or included some participants below 50 years of age) (25 trials).

Studies awaiting assessment

Nine trials were identified on a search update to May 2008, and a further trial was added after a referee's comment.

Risk of bias in included studies

Methodological quality scores of each item for all included studies are given in Table 2. A summary of the findings of key indicators of internal validity are listed below.

Allocation concealment

Eleven studies provided some information about the method of randomisation that suggested that randomisation was probably concealed (i.e. the use of concealed envelopes or the randomisation was generated by an independent person) (Baker 2001; Chin A Paw 2006; Donald 2000; Foley 2003; Jette 1999; Latham 2001; Latham 2003; McMurdo 1995; Moreland 2001; Sims 2006; Sullivan 2005). Nineteen studies used randomisation list/table but allocation concealment was unclear (Barrett 2002; Baum 2003; Buchner 1997; de Vos 2005; de Vreede 2007; DiFrancisco 2007; Ettinger 1997; Krebs 2007; Liu-Ambrose 2005; Maurer 1999; Miller 2006; Schilke 1996; Segal 2003; Singh 1997; Singh 2005; Skelton 1995; Suetta 2004; Vincent 2002; Wieser 2007).

Loss to follow-up

Some trials had high drop-out rates, with several studies reporting more than 20% of their participants were lost to follow-up (Bruunsgaard 2004; Chin A Paw 2006; DeBeliso 2005; Donald 2000; Katznelson 2006; Kongsgaard 2004; Mangione 2005; Mikesky 2006; Topp 1996). In some studies there was clear evidence of bias associated with the deliberate exclusion of patients such as those who failed to adhere to the exercise programme (Izquierdo 2004; Madden 2006; Topp 1996; Vincent 2002) or those who had adverse responses (Hagerman 2000).

Intention-to-treat analysis

Twenty-two studies stated that they used intention-to-treat analysis (Baker 2001; Barrett 2002; Baum 2003; Buchner 1997; Chin A Paw 2006; Ettinger 1997; Fiatarone 1994; Foley 2003; Judge 1994; Katznelson 2006; Latham 2003; Liu-Ambrose 2005; Macaluso 2003; Mikesky 2006; Miller 2006; Moreland 2001; Nelson 1994; Ouellette 2004; Pu 2001; Segal 2003; Sims 2006; Sullivan 2005).

Blinded outcome assessment

Thirty-three studies stated that they used a blinded assessor for all outcome measures (Barrett 2002; Baum 2003; Bean 2004; Boshuizen 2005; Buchner 1997; Casaburi 2004; Castaneda 2004; Chin A Paw 2006; de Vreede 2007; Ettinger 1997; Foley 2003; Haykowsky 2005; Jette 1996; Jette 1999; Jones 1994; Judge 1994; Kalapotharakos 2005; Katznelson 2006; Krebs 2007; Latham 2003; Liu-Ambrose 2005; Mangione 2005; Maurer 1999; McMurdo 1995; Mikesky 2006; Miller 2006; Moreland 2001; Newnham 1995; Segal 2003; Sims 2006; Singh 2005; Sullivan 2005; Westhoff 2000).

Eight additional studies used a blinded outcome assessor for some, but not all outcome assessments (Baker 2001; Castaneda 2001; de Vos 2005; Fiatarone 1994; Ouellette 2004; Pu 2001; Singh 1997; Suetta 2004).

Blinding of participants

Blinding of participants is difficult in studies of exercise interventions. However, the use of attention control groups can help to minimise bias. Thirty-six studies used some type of attention programme for the control group (Baker 2001; Baum 2003; Bean 2004; Brochu 2002; Bruunsgaard 2004; Castaneda 2001; Castaneda 2004; Chin A Paw 2006; Damush 1999; Ettinger 1997; Fiatarone 1994; Fiatarone 1997; Foley 2003; Judge 1994; Kongsgaard 2004; Latham 2003; Liu-Ambrose 2005; Mangione 2005; Maurer 1999; McCartney 1995; McMurdo 1995; Mihalko 1996; Mikesky 2006; Miller 2006; Miszko 2003; Moreland 2001; Newnham 1995; Ouellette 2004; Pu 2001; Seynnes 2004; Simons 2006; Sims 2006; Singh 1997; Suetta 2004; Topp 1993; Topp 1996). In 10 of these studies, the control group received 'sham' exercise programmes (Bean 2004; Brochu 2002; Castaneda 2001; Castaneda 2004; Kongsgaard 2004; Liu-Ambrose 2005; Mikesky 2006; Ouellette 2004; Pu 2001; Seynnes 2004).

Duration of follow-up

Five studies continued to follow up the participants after intervention had ended (Buchner 1997; Fiatarone 1994; Moreland 2001; Newnham 1995; Sims 2006). Two of these followed up falls for more than one year (Buchner 1997; Fiatarone 1994).

Effects of interventions

Eleven studies did not report final means and standard deviations for some or all of their outcome measures but instead reported baseline mean scores and mean change in scores from baseline (Baum 2003; Bean 2004; Buchner 1997; Chandler 1998; Fiatarone 1994; Hiatt 1994; Jette 1996; Lamoureux 2003; Madden 2006; Sullivan 2005; Topp 1996). If additional data could not be obtained from the investigators, the final mean score was estimated by adding the change in score to the baseline score, and the standard deviation of the baseline score was used for the final score.

Four studies did not report standard deviations for some or all of their outcome measures but instead reported standardized errors (Ouellette 2004; Seynnes 2004; Suetta 2004; Topp 2002). The standard deviations were estimated based on reported standardized errors and sample sizes.

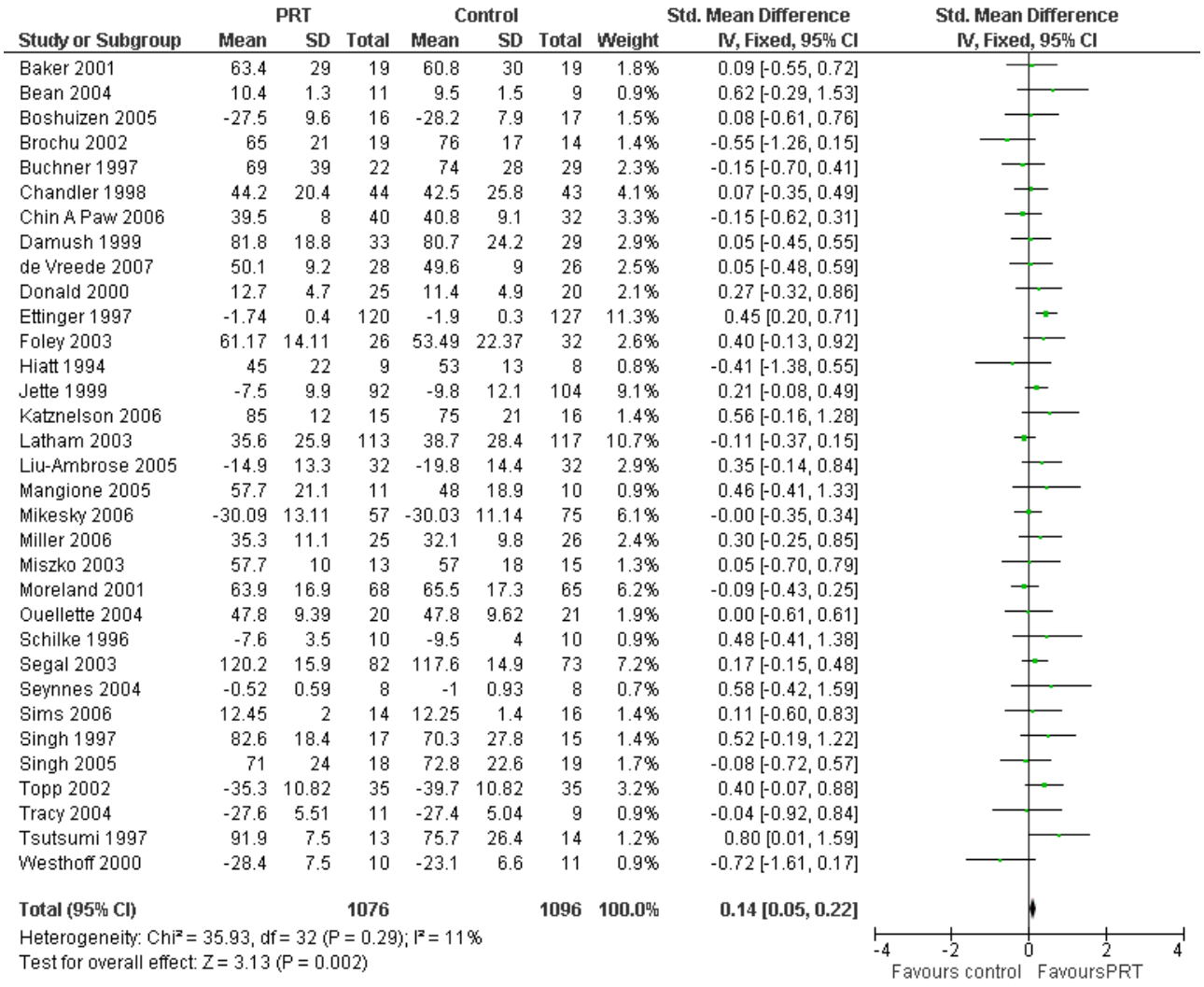
Eight studies did not report numerical results of outcomes of interest for the purpose of this review and additional data were not provided by the investigators (Castaneda 2004; Fielding 2002; Harris 2004; Haykowsky 2005; Krebs 2007; Miller 2006; Topp 2005; Wieser 2007).

PRT versus control

Measures of physical (dis)ability/HRQOL (complex physical activities)

The main function (disability) measures from trials that had appropriate data were pooled using the standardised mean difference (SMD) and a fixed-effect model. Because studies measured function in scales with different directions, a higher score indicates either less disability/better function or more disability/poor function, a transformation was conducted to make all the scales point in the same direction. Mean values from trials in which a higher score indicates more disability/poor function were multiplied by -1. There is a significant effect of PRT in decreasing disability (*see* Figure 1; Analysis 1.1 : 33 trials, 2172 participants; SMD 0.14, 95% CI 0.05 to 0.22). When the physical function domain of SF-36 or SF-12 was pooled from 14 studies (n = 778) using a fixed-effect model, no difference was found (Analysis 1.2 : SMD 0.07, 95% CI -0.08 to 0.21). No difference was found from the pooled results of three trials for activity of daily living measures (Analysis 1.3). A number of studies had function measures (i.e. measures of activity, function or HRQOL) that could not be pooled. The available data from these measures are reported in Table 3.

Figure 1. Forest plot of comparison: 1 PRT versus control, outcome: 1.1 Main function measure (higher score = better function).



Measures of impairment

Strength

Many different muscle groups were tested and a number of methods were used to evaluate muscle strength in these trials. To minimise clinical heterogeneity, data were pooled from one muscle group. The leg extensor group of muscles was selected since this group was the most frequently evaluated. The effect size was calculated using standardised mean difference (SMD) to allow the pooling of data that used different units of measurement. Seventy-three studies involving 3059 participants reported the effect of resistance training on a lower-limb extensor muscle group and provided data that allowed pooling. A moderate-to-large beneficial effect was found (Analysis 1.5: SMD 0.84, 95% CI 0.67 to 1.00, random-effects model; fixed-effect model: SMD 0.53, 95% CI 0.46 to 0.61).

Supplementary analyses

Significant statistical heterogeneity was apparent in these data (P < 0.0001). Since a large number of studies assessed this outcome, it was possible to explore this heterogeneity by stratifying the data. Differences in treatment effects due to the quality of the trials were investigated. We also explored subgroups of trials that were based on the design of the treatment programmes and the characteristics of the participants.

To explore the effect of data quality on treatment effects, data were stratified by four design features that are associated with internal validity. These are allocation concealment; blinded assessors; intention-to-treat analysis (ITT); and attention control groups. The fixed-effect model was used throughout in order to obtain the results for the test for subgroup differences. The effect was smaller in the few studies with clear allocation concealment (6 trials, 607 participants) compared with studies with unknown concealment of allocation (67 trials, 2452 participants): Analysis 10.1: test for subgroup differences: Chi^2 = 32.69, df = 1 (P < 0.00001). The effect was also smaller in studies that used blinded assessors (19 trials, 1523 participants) compared with studies that did not use blinded assessors (54 trials, 1536 participants): Analysis 10.2: test for subgroup differences: Chi^2 = 70.56, df = 1 (P < 0.00001). This was also true for studies that used intention-to-treat analysis (ITT) (12 trials, 1041 participants) versus no ITT (61 trials, 2018 participants):

Analysis 10.3: test for subgroup differences: Chi² = 49.74, df = 1 (P < 0.00001). It is noticable that trials that applied better design features tend to be the larger trials. The effect was smaller when attention control groups were used (attention control: 24 studies, 1408 participants, no attention control: 49 studies, 1651 participants): Analysis 10.4: test for subgroup differences: Chi² = 25.04, df = 1 (P < 0.00001).

Subgroup analyses were conducted to explore the effect of PRT when the design of the exercise programme and the characteristics of the participants differed. The effect of differences in the exercise programme was explored by examining effect estimates in studies that used different intensity and duration. High intensity strength training was compared with low to moderate intensity training. This analysis suggests that while both training approaches are probably effective in improving strength, higher intensity training (54 trials, 2026 participants) has a larger effect on strength than low to moderate intensity training (19 trials, 1033 participants): Analysis 10.5: test for subgroup differences: Chi² = 7.24, df = 1 (P = 0.007). Longer duration programmes (i.e. greater than 12 weeks) were also compared with shorter duration programmes (less than 12 weeks). The duration of the trial appeared to have minimal effect on the strength outcome (< 12 weeks: 20 trials, 828 participants; > 12 weeks: 36 trials, 1736 participants): Analysis 10.6: test for subgroup differences: Chi² = 0.04, df = 1 (P = 0.85).

Treatment effects in older people with and without a chronic disease (or functional limitation) were also assessed. Again, resistance training appeared to be effective in improving strength in both groups of older people, but there was statistical heterogeneity in the effects. Studies that included participants who had specific health problems and/or functional limitations were compared with studies that included only healthy older people. The effect in older adults who were healthy has a larger effect size than older adults with specific health problems (healthy older adults: 46 trials, 1502 participants; older adults with specific health problems: 19 trials, 926 participants): Analysis 10.7: test for subgroup differences: Chi² = 19.85, df = 1 (P < 0.00001). In addition, PRT in studies that included older adults who had a physical disability or functional limitation appeared to be less effective than in those that included older adults who did not have functional limitations (people with functional limitations: 13 studies, 784 participants; people with no functional limitations: 41 studies, 1349 participants): Analysis 10.8: test for subgroup differences: Chi² = 29.33, df = 1 (P < 0.00001). However, this result could be confounded by the intensity of the PRT programmes, as almost all programmes that included people with functional limitations were carried out at a low to moderate intensity. There were insufficient data available to compare the results by gender (men only: 5 trials with 107 participants; women only: 15 trials with 486 participants) .

Aerobic capacity

The main measure of aerobic capacity was pooled from 29 studies (n = 1138) using a random-effects model. These results suggest that PRT has a significant effect on aerobic capacity (Analysis 1.6 : SMD 0.31, 95% CI 0.09 to 0.53). Further analyses were performed for three specific measures of aerobic capacity: VO2 max (ml/kg/min), peak oxygen uptake (L/min) and the six-minute walk test (meters). A consistent significant effect was found for VO2 max (Analysis 1.7: 18 trials, n = 710, MD 1.5 ml/kg/min, 95% CI 0.49 to 2.51). Similarly, a significant positive effect was found for the six-minute walk test (Analysis 1.8: 11 trials, n = 325, MD 52.37 meters, 95% CI 17.38 to 87.37).

Measures of functional limitations (simple physical activities)

Balance/postural control

Results from all balance performance measures were pooled using SMD and a fixed-effect model. Data pooled from 17 studies with 996 participants showed a small but non-significant benefit (higher score indicates better balance) for balance (Analysis 1.9: SMD 0.12 (95% CI 0.00 to 0.25).

Gait speed

Two different measures of walking speed were used: gait speed (measured in meters per second) and timed walk (i.e. time to walk a set distance, measured in seconds). A higher gait speed score indicates faster mobility, while a higher timed walk score indicates slower mobility. Because of this difference, these data were analyzed separately. Data for gait speed were available from 24 studies that included 1179 participants (Analysis 1.11 : MD 0.08 m/s, 95% CI 0.04 to 0.12, random-effects). This indicated that PRT has a modest but significant beneficial effect on gait speed. Only eight trials measured the timed walk (seconds) as an outcome measure and no evidence of an effect was found (Analysis 1.12; 204 participants, MD -0.23 seconds, 95% CI -1.07 to 0.62, fixed-effect).

Timed up-and-go

Timed up-and-go (i.e. time to stand from a chair, walk three meters, turn, and return to sitting, measured in seconds) was analysed using a fixed-effect model. Data, available from 12 trials and a total of 691 participants, showed the PRT group took significantly less time to complete this mobility task (Analysis 1.13: MD -0.69 seconds, 95% CI -1.11 to -0.27).

Timed chair rise

Time to stand up from a sitting position data were available in 11 studies (n = 384). Because different numbers of sit-to-stand were counted, SMD and a random-effects model was used to pool these results. These showed a significant, moderate to large effect on this task in favour of the PRT group (Analysis 1.14: SMD -0.94, 95% CI -1.49 to -0.38).

Stair climbing

Time to climb stairs data, which were available from eight trials, also favoured PRT (Analysis 1.15). However, these results were highly heterogenous.

Falls

Thirteen studies collected data about the effect of resistance training on falls or reported the incident of falls, but the outcomes reported did not allow pooling of the data. The available data is reported in Table 4. Three of these studies (Buchner 1997; Fiatarone 1994; Judge 1994) were part of the FICSIT trial, a prospective preplanned meta-analysis to determine the effectiveness of exercise to prevent falls in older people (Province 1995). The data were extracted from the main FICSIT paper, because papers published about the individual exercise programmes did not provide useful data about the effect of resistance training alone on falls. One additional trial investigated the effect of resistance training on falls in older people while they were in hospital (Donald 2000). Another trial also assessed the effect of PRT on frail older

people following discharge from hospital (Latham 2003). There is a more comprehensive review of the effect of exercise on falls in a separate Cochrane review (Gillespie 2003).

With the exception of Latham 2003, all of these trials were small (i.e. less than 80 participants in the resistance training and control groups). Only Donald 2000 found a significant reduction in falls, but there were few fall events in this trial.

Adverse events

Adverse events are reported for all trials in the review at the end of the results section.

Vitality

The vitality (VT) domain of the SF-36 health status measure was assessed in 10 studies involving 611 participants. For this measure, a higher score indicates better health (i.e. more vitality): there was no evidence of an effect of PRT from the pooled data (Analysis 1.17: MD 1.33 95% CI -0.89 to 3.55).

Pain

Data of bodily pain (BP) domain of the SF-36 health status measure were provided by 10 studies involving 587 participants. For this measure, a higher score indicates better health (i.e. less pain), there was no evidence that PRT had an effect on bodily pain (Analysis 1.18 : MD 0.34, 95% CI -3.44 to 4.12). In contrast, six studies with 503 participants included pain measures where a higher score indicates more pain, and found evidence to support a modest reduction in pain following PRT (Analysis 1.19: SMD -0.30, 95% CI -0.48 to -0.13). These six studies all included participants with osteoarthritis and used pain measures designed specifically for this population, which could have increased their sensitivity to change.

Health service use, hospitalization and death

Five studies provided data about hospitalization rates, length of stay and/or outpatient visits. Donald 2000 reported that people who received PRT in addition to regular in-hospital physiotherapy had a length of stay of 27 days compared with 32 days for the control group. Latham 2003 found that 42/120 people in the PRT group were admitted to hospital over six months compared to 35/123 in the control group. The third trial by Singh 1997 reported that, over a 10 week period, people in the PRT group had mean 2.1 (SD 0.4) visits to a health professional and mean 0.24 (SD 0.2) hospital days compared to controls mean of 2.0 (SD 0.5) visits and mean 0.53 (0.4) hospital days. The fourth study by Singh 2005 reported visits to a health professional over the study (average numbers per person): high intensity group, 2 (2); low intensity group, 2 (1.8); controls, 5 (1.8). The fifth study by Miller 2006 reported participants' discharge destinations but did not specify the group: 52 participants were discharged to a rehabilitation programme, 12 were transferred to a community hospital, 16 were discharged to higher level care, and 20 returned directly to their pre-injury admission accommodation. An additional study, Buchner 1997, provided data about health service use, but only reported data that were pooled to include participants in aerobic training, combined aerobic training and PRT and PRT alone. This study found no change in hospital admissions between those in the exercise and control groups, but an increased number of outpatient visits by those in the control group. Finally, two studies stated that there was no difference in health care visits (Fiatarone 1997) or hospitalization (Pu 2001) but no specific data were provided.

Thirteen studies provided data about participant deaths that allowed pooling (Baum 2003; Boshuizen 2005; Chin A Paw 2006; Donald 2000; Ettinger 1997; Fiatarone 1994; Kallinen 2002; Latham 2003; Mangione 2005; Miller 2006; Moreland 2001; Newnham 1995; Selig 2004). The risk ratio of death in the PRT group was not significantly different from the control group (Analysis 1.20: 20 deaths versus 21 deaths; RR = 0.89, 95% CI 0.52 to 1.54).

Comparisons of PRT dosage

Thirteen trials investigated the effects of different doses of PRT. Note that data from medium intensity were not examined in the following.

High versus low intensity PRT

Physical function, pain and vitality

Of the 10 studies comparing high versus low intensity PRT, only two (Singh 2005; Tsutsumi 1997), evaluated physical function, pain and vitality using the domains of the SF-36. No significant difference was found for physical function (Analysis 2.1) or pain (Analysis 2.4), but vitality scores were statistically significantly higher for high intensity (Analysis 2.5: MD = 6.54, 95% CI 0.69 to 12.39).

Strength

Data from all nine studies (n = 219) were available to examine the effect of high versus low intensity PRT on lower limb strength (Beneka 2005; Fatouros 2005; Harris 2004; Hortobagyi 2001;Seynnes 2004; Sullivan 2005; Taaffe 1996; Tsutsumi 1997; Vincent 2002). The results indicate that high intensity training results in greater lower limb strength, as a moderate effect was seen (Analysis 2.2: SMD = 0.48, 95% CI 0.03 to 0.93; random-effects model).

Aerobic capacity

Three studies compared the effect of high versus low intensity PRT on aerobic capacity (Fatouros 2005; Tsutsumi 1997; Vincent 2002). These studies (n = 101) did not show greater benefit from high intensity compared with low intensity training (Analysis 2.3: MD 1.82 ml/kg/min, 95% CI -0.79 to 4.43; higher score favours high-intensity group).

High intensity versus variable intensity PRT

One trial (Hunter 2001) comparing high intensity PRT with variable intensity PRT showed no statistically significant differences for strength (Analysis 3.1: n = 24, MD = 0.61, 95% CI -0.21 to 1.44) and aerobic capacity (Analysis 3.2).

Frequency

Taaffe 1999 and DiFrancisco 2007 compared PRT at different frequencies, respectively three times a week versus once a week, and twice a week versus once a week. Both studies recruited few participants and applied high intensity intervention. There were no significant differences between the two exercise frequencies in muscle strength (Analysis 4.1: MD = 0.40, 95% CI -0.44 to 1.25; MD = -0.46, 95% CI -1.40 to 0.48).

Sets

Galvao 2005 compared PRT at 3-sets versus 1-set in 28 participants. No significant differences between the two groups were found for muscle strength (Analysis 5.1), six minute walk test (Analysis

5.2), sit-to-stand (Analysis 5.4) and stair climbing (Analysis 5.5). However, participants who exercised at 3-sets walked significantly faster than those who exercised at 1-set (Analysis 5.3: MD = -29.6 seconds, 95% -54.23 to -4.97).

PRT versus aerobic training

Physical function

Five studies evaluated the effect of PRT compared with aerobic training on physical function. Four studies (Buchner 1997; Earles 2001; Hiatt 1994; Mangione 2005) used outcomes in which a higher score indicates less disability (n = 125), and found no significant difference (see Analysis 6.1: SMD -0.21, 95% CI -0.56 to 0.15; lower score favours the aerobic training group). The other study (Ettinger 1997) (n = 237) also found no significant difference between the groups for function (see Analysis 6.2: SMD 0.05, 95% CI -0.21 to 0.30; higher score favours aerobic group).

Strength

Data on lower extremity strength were available from 10 studies (n = 487) (Ballor 1996; Buchner 1997; Earles 2001; Ettinger 1997; Fatouros 2002; Izquierdo 2004; Malliou 2003; Pollock 1991; Sipila 1996; Wood 2001). These data when pooled using a random-effects model showed that PRT had a significant benefit compared with aerobic training on strength (see Analysis 6.3: SMD 0.44, 95% CI 0.08 to 0.80; higher score favours PRT).

Aerobic capacity

Aerobic capacity was evaluated in eight studies involving 423 participants (Ballor 1996; Buchner 1997; Ettinger 1997; Hepple 1997; Hiatt 1994; Kallinen 2002; Madden 2006; Pollock 1991). This was measured using VO2 max in ml/kg/min. Using the random-effects model, aerobic training had a non-significant benefit compared to PRT for this outcome (Analysis 6.4: MD -1.13 ml/kg/min, 95% CI -2.63 to 0.38; higher values favours PRT).

Gait speed

Mangione 2005 reported on gait speed (m/s) and found no significant difference between groups (Analysis 6.6: MD -0.08 m/s, 95% CI -0.30 to 0.14; higher speed favours PRT group)

Pain

Ettinger 1997 found no significant difference between groups in pain (Analysis 6.7: MD 0.12; 95% CI -0.14 to 0.37; lower score favours PRT).

PRT versus balance

One study (Judge 1994) compared PRT with balance retraining (n = 55). This study found that strength improved in the PRT group, but not in the balance training group. Chair rise time and gait speed did not improve in any group, with gait speed actually declining in the balance training group. However, balance improved in the balance training group compared with the PRT group.

PRT versus functional training

Three studies compared PRT with functional training (Chin A Paw 2006; de Vreede 2007; Manini 2005). No significant differences between the two interventions were found for the reported outcomes (see: Analysis 7.1 physical function; Analysis 7.2 strength; Analysis 7.3 timed up and go; Analysis 7.4 vitality; Analysis 7.5 pain).

PRT versus flexibility training

Barrett 2002 (n = 40) compared a group of older adults who undertook PRT with a control group who did mainly stretching for the major muscle groups (flexibility training). No statistically significant differences were found for any of the reported outcomes (see: Analysis 8.1: SF-36 physical function; Analysis 8.2: strength; Analysis 8.3: timed walk; Analysis 8.4: chair stand; Analysis 8.5: vitality; Analysis 8.6: pain).

Power training

Two studies (de Vos 2005; Miszko 2003) (n = 76) compared power training with a control group. de Vos 2005 and another study (Macaluso 2003) also compared different intensities of power training. While the data for muscle strength for de Vos 2005 favoured high intensity power training, data pooling was inappropriate given the substantial and significant heterogeneity (see Analysis 9.1).

Adverse events

Among 121 studies that were reviewed, 53 studies provided no comment at all about adverse events associated with the training programme. Of the remaining 68 studies, 25 reported no adverse events and 43 reported some adverse reaction to the exercise programme. An additional eight studies did not report adverse events as such, but it is possible that an event occurred since these studies reported drop-outs from the exercise group secondary to increasing pain or specific injuries (Chandler 1998; Charette 1991; Fiatarone 1997; Hagerman 2000; Hortobagyi 2001; Jette 1996; Maurer 1999; Topp 1993). Given that there were considerably more drop-outs from the PRT group than from the control group (see methodological quality section above), it is possible that the number of cases of adverse events reported here are an underestimate.

Only nine studies provided an a priori definition of an adverse event in the study methods or objectives (Earles 2001; Ettinger 1997; Judge 1994; Kallinen 2002; Latham 2003; Liu-Ambrose 2005; Moreland 2001; Pollock 1991; Singh 1997). Eight of these nine studies detected adverse events (Earles 2001; Ettinger 1997; Judge 1994; Kallinen 2002; Latham 2003; Liu-Ambrose 2005; Moreland 2001; Pollock 1991). However, there was little consistency in the definition that was used, with some studies only reporting serious events that the investigators thought were possibly related to the exercise programme (i.e. Ettinger 1997) while other studies reported all adverse events that occurred in each group. Most adverse events were musculoskeletal problems. Serious adverse events were rare, and none appeared to be directly related to the exercise programme. One study reported one death of myocardial information in the PRT group (Kallinen 2002). Another two studies reported one death in the PRT group but the reason of death was not reported (Baum 2003; Chin A Paw 2006). Further details about all adverse events reported in these trials can be found in Table 5.

DISCUSSION

Summary of main results

This review identified, graded and synthesized the available literature regarding the effect of a specific exercise intervention, PRT, on a particular population, older people. To increase the generalisability of these data, the trials included participants with

a range of health problems, and the dose and delivery of the PRT programmes varied. This made it possible to assess overall effects of the intervention on older people, with a potential for exploring the effects on subgroups (i.e. in different groups of older people or with different doses of PRT). Overall, this review suggests that PRT has a small but significant effect on improving physical function (complex activities), a small to moderate effect on decreasing some impairments and functional limitations, and a large effect on increasing strength. Adverse events were poorly reported in most studies, which limits the ability of this review to assess the risks associated with this intervention. Additionally, there is some preliminary evidence that suggests that PRT might reduce pain in older people with osteoarthritis. The effect of exercise on reducing pain in people with osteoarthritis is reported in another Cochrane review (Brosseau 2003). The sparse data did not allow an adequate assessment of the effect of PRT on fall risk. However, a separate Cochrane review (Gillespie 2003) has reviewed fall prevention.

Overall completeness and applicability of evidence

This review update highlights the fact that exercise training in older adults continues to be a dynamic area of research, with the number of included studies doubling in the five years since the previous review. A quick update extending the MEDLINE search to May 2008 identified nine further studies. However, the majority of the trials continue to be studies with small sample sizes.

This review deliberately used broad inclusion criteria and multiple strategies to try to identify as many studies as possible that used PRT training with older adults. Despite these efforts, given the broad coverage of our review it is inevitable that we have missed some trials. It is particularly challenging to identify unpublished trials in this area because the studies could have been presented at many different types of conferences (stoke, OA, CHD etc). We acknowledge that it was not possible to hand search all of the potential conferences where studies in this area could be presented, and it is therefore possible that we missed some studies that had negative or neutral results and are more difficult to get published. Although we attempted to contact authors when there was any uncertainty about data, it is also likely that data could also have been missed both from the excluded trials (i.e. the outcomes may have been recorded but not reported) and the included trials (i.e. data not reported and/or data not available for pooling).

Quality of the evidence

The 121 studies in this review were generally of poor methodological quality, as most of the studies did not use design features that are known to increase internal validity, such as concealed randomisation; intention-to-treat analysis, blinded outcome assessors, or attention control groups. Only 11 studies used concealed randomisation; 22 studies used intention-to-treat analysis; and 33 studies used blinded outcome assessors for all outcomes. Therefore, caution is required when drawing conclusions from these data. When data were stratified by indicators of study quality for the outcome muscle strength, results from the high quality trials continued to support the positive effect of resistance training on strength. However, these data also indicate that low quality trials, usually small studies, that comprise the majority of the studies in the review probably overestimate the effect of resistance training because of random chance effects from small studies. The long-term outcome of PRT is unclear because the majority of studies stopped following up participants once the intervention had ended.

PRT versus control

PRT shows small positive effect on measures of physical function (disability). PRT also appears to have a positive effect on aerobic capacity and most measures of functional limitations, including gait speed, timed "Up-and-Go" and, the time to stand up from a chair. All of these effects were statistically significant, although the effect sizes tended to be small to moderate, and the clinical significance of these effects is unclear. PRT appears to have a large positive effect on strength and aerobic capacity in older people. However, there was a large amount of statistical heterogeneity associated with the estimate in strength. This variation was reduced, but not eliminated, by investigating differences in outcome in different groups of participants, types of intervention and in trials that used different quality indicators. Please note that results from such exploratory analysis are tentative. In exploratory subgroup analyses, it appeared that training intensity has the greatest effect on strength (i.e. high intensity training has a greater effect on strength than lower intensity training), while the duration of the training appears to have a reduced effect. The magnitude of the effect was influenced by participants' health status or functional status. PRT in healthy participants had a greater effect than in those with a chronic disease or functional limitation. In other words, it appeared that people with a pre-existing health condition or with functional limitations had smaller gains in strength. Additionally, men had larger gains in strength than women; although there were fewer trials in men. These subgroup analyses must be interpreted with caution as the number of participants is reduced which decreases the precision of these estimates. In addition, it is possible that study size is a source of heterogeneity, as several of the largest and highest quality trials included people with function limitations and/or lower intensity training programmes, and study quality appears to reduce the effect estimates. Overall, the effect of PRT on function is positive for older adults; although the effect seems diminished when it transfers from muscle strength to functional limitations and disability.

It was not possible to pool fall data because falls were reported differently in the five studies that measured this outcome. These data might suggest a trend towards PRT reducing falls, since four of the five studies found that participants in the PRT group had fewer falls than those in the control group. However, the effect of PRT alone on falls is still not clear.

Adverse events were poorly monitored and reported in most of these trials. This makes it difficult to assess the risk of injury or other adverse events associated with resistance training. The finding that several studies reported drop-outs from the exercise programme due to pain or injury, yet failed to report any adverse events, suggests that adverse events might have been under-reported in some trials. This hypothesis is further supported by the finding that the studies with a clear definition of adverse events in their study methods were more likely to detect these events than those with no definition. The large number of drop-outs from the PRT group compared to controls also raises the possibility that people are experiencing adverse effects from PRT that are not identified in these trials. However, it is reassuring that participant's pain and vitality were not affected by PRT, and in fact PRT appeared to decrease pain in people with osteoarthritis. Furthermore, there

was no evidence of increased risk of hospitalization. A few studies reported decreased use of health care services in the PRT group. Finally, there were a few reports of serious adverse events (i.e. myocardial infarction or death) in the PRT group but there was no evidence that these events were directly associated with the intervention. There was also no evidence of increased risk of death in the PRT group when compared with the control group.

Comparison of PRT dosage

There are currently few randomised data available to guide the dose and prescription of PRT. Trials investigated different aspects of this issue were all small studies and most were of poor quality. When high intensity training was compared with low intensity training, data from 10 trials show that high intensity training has a greater effect on strength than lower intensity training. Among these 10 trials, three show that high intensity training has a greater effect on aerobic capacity. Eight of the 10 trials were healthy older people who participated in highly supervised, gym-based programmes. Therefore, it is not clear if high intensity PRT is more beneficial than low intensity training in less fit or healthy older people and/or in home or hospital based programmes. Limited evidence are available for exercise frequencies and sets.

PRT versus other training

Overall, no significant differences were found between the different types of training. When PRT is compared to aerobic training, PRT tended to produced larger gains in strength than aerobic training. However, these two types of training are not different in aerobic capacity. This finding is to be expected, given that the strength outcome is more specific to PRT. There are fewer data available to determine the comparative effect of these types of training on physical disability, but the available data suggest that the two training programmes have a similar effect on this outcome. There are too few data to draw conclusions about other forms of training such as balance or mobility training compared to PRT.

AUTHORS' CONCLUSIONS

Implications for practice

Doing PRT two to three times a week can improve physical function in older adults, including reducing physical disability, some functional limitations (i.e. balance, gait speed, timed walk, timed 'up-and-go', chair rise; and climbing stairs) and muscle weakness in older people. Therefore, it would appear to be an appropriate intervention for many older people to improve performance of some simple physical tasks. The training also shows a reduction in pain in people with osteoarthritis. However, some caution is warranted with this intervention as in many studies adverse effects have been poorly monitored. Nonetheless, serious adverse events appear to be rare. When used in clinical practice, clinicians should monitor for adverse effects, particularly when older people who might be at higher risk of injury (i.e. frail or recently ill older people) are undertaking PRT. Additionally, there is no information regarding how long these effects can be maintained because the majority of the studies did not follow up the effect after the training had ended.

Implications for research

We recommend that future trials investigating the effect of PRT in older people should:

- minimise bias by using concealed randomisation, blinded outcome assessors, intention-to-treat analysis and attention control groups;
- recruit an adequate number of participants so that a precise estimate of the effect of the intervention can be determined (should have a priori power calculations);
- include a careful assessment of adverse events in both treatment groups, so that both the benefits and risks of PRT are fully evaluated;
- follow up participants after the programmes have completed to examine the long-term effects of PRT.

Future trials should include participants and interventions that are similar to those in health care settings (i.e. frail or recently ill older people), so that, if proven to be effective, resistance training can be incorporated into routine health care services. Well-designed trials are also required to determine the most appropriate dose of PRT to use with different participants and in different settings.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

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

Ades 1996

Methods	RCT (randomised controlled trial) Method of randomisation: unclear Assessor blinding: no Participant blinding: no

Ades 1996 *(Continued)*

	Loss to follow-up: not reported Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 24 Sample: healthy, sedentary Age: mean 70.4 years (SD 4) Inclusion criteria: healthy, sedentary older people Exclusion criteria: angina or electrocardiographic ischaemia during exercise test, resting BP >160/90, non-cardiopulmonary limitation of exercise capacity (i.e. claudication, arthritis, cerebrovascular disease)
Interventions	PRT (progressive resistance strength training) versus control 1. PRT Type of exercises: 4 UL (upper limb), 3LL (lower limb) Equipment: machines (Universal Gym) Intensity: high (50-80% of 1RM) Frequency: Ex3 Reps/ sets: 8/3 Duration: 12 weeks Setting: gym Supervision: not reported Adherence: not reported 2. Control Group: instructed not to alter their home activity habits
Outcomes	Strength (1 repetition maximum) Peak aerobic capacity Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Baker 2001

Methods	RCT Method of randomisation: generated by statistician, concealed from investigators Assessor blinding: blinded for primary measures, not for secondary (including strength) Participant blinding: yes Loss to follow-up: 2/46 Intention-to-treat analysis: yes for primary, no for secondary measures Post-program follow up: no
Participants	Location: USA N = 46 Sample: older people with osteoarthritis. Recruited through community advertising Age: mean 68 years (SD 6) in the treatment group Inclusion criteria: age 55 or older, body mass index less than 40 kg/m2, pain on more than half the days of the past month and during activities and radiographic evidence of OA Exclusion criteria: medical condition that precluded safe participation in an exercise program or was more limiting than OA, inflammatory OA, or had participated in any regular exercise program in the last 6 months

Baker 2001 *(Continued)*

Interventions	PRT versus control 1. PRT Type of Ex: 2 functional exercises (squats and step-ups), 5 LL isotonic exercises Equipment: velcro ankle weights (isotonic ex only) Intensity: initially low (3-5 on Borg scale), progressed to 8 ("hard" on Borg scale) Frequency: Ex3 Reps/ sets: 12/2 Program duration: 16 weeks Setting: home-based Supervision: low (12 visits over 16 weeks) Adherence: 84% (SD 27) of sessions 2. Control: given nutrition info, 7 home visits over 16 weeks, kept food logs 3/14 days
Outcomes	Primary: WOMAC pain and physical function subscales, SF-36 Secondary: Strength (1RM), clinical knee exam, nutrition, physical performance (stair climb, chair stand time) Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Balagopal 2001

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: not reported Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 20 Sample: healthy older people Age: mean 71 years (SD 1) Inclusion criteria: older people aged 65-79, healthy (based on physical exam and blood tests) Exclusion criteria: subjects who exercised regularly for > or = 2 days per week, women taking hormone replacement
Interventions	PRT versus control 1. PRT Type of Ex: 4UL, 3LL Equipment: resistance training machines Intensity: 50-80% 1RM Frequency: Ex3 Reps/ sets: 8/3 Duration: 3 months Setting: gym Supervision: full Adherence: not reported 2. Control Group: not reported

Balagopal 2001 *(Continued)*

Outcomes	Muscle strength (1RM) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Ballor 1996

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: not reported Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 18 Sample: obese, recently completed dietary program Age: mean 61 years (SE 1) Inclusion criteria: aged 55-70 years, a BMI before weight loss of > 32 kg/m squared, no signs, symptoms or history of heart disease, non-diabetic, non-smoker, resting blood pressure <160/90 mm Hg, no symptoms that would preclude safe participation in an exercise program Exclusion criteria: not reported
Interventions	PRT versus aerobic 1. PRT Type of Ex: 4UL, 3LL Equipment: machines (Universal Gym) Intensity: 50-80% of 1RM Frequency: Ex3 Reps/ sets: 8/3 Program duration: 12 weeks Setting: gym Supervision: full Adherence: not reported 2. Aerobic Training Group: exercised 3 times per week on a motorised treadmill at approximately 50% of maximum aerobic uptake for 20-60 minutes per session
Outcomes	Strength (1RM) Aerobic capacity Comments on adverse events: no
Notes	Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Barrett 2002

Methods	RCT Method of randomisation: a computer generalized list Assessor blinding: yes Participant blinding: yes Loss to follow-up: 4/44 Intention-to-treat analysis: yes for primary, no for secondary measures Post-program follow up: no
Participants	Location: Australia N = 40 (20 in each group) Sample: healthy elderly Age: mean 66.6 years Inclusion criteria: not reported Exclusion criteria: if participants general practitioners recommended against participation for health reasons or if for any reason they were unable to participate in a class situation
Interventions	PRT versus control (flexibility training) 1. PRT Type of Ex: 6UL/6LL Equipment: free weights Intensity: based on perceived exertion scale "hard" to "very hard" Frequency: Ex2 Reps/Sets: 8 reps/1 to 2 sets at the first two sessions; then 8 reps/2 to 3 sets Duration: 10 weeks Setting: recreational clubs (Gyms) Supervision: full by two fitness instructors Adherence: not reported 2. Control group (flexibility training): mainly stretch for the major muscle groups and some light cardio-vascular exercise, n = 22, mean age = 69.6 years
Outcomes	Primary: SF-36 Secondary: muscle strength (force-N/weight-N), sit to stand (seconds) Comments on adverse events: yes
Notes	Data from PRT and flexibility training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Baum 2003

Methods	RCT Method of randomisation: a computer generated algorithm stratified by the location of the facility Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 1/11 in PRT group Intention-to-treat analysis: yes Post-program follow up: no
Participants	Location: USA N = 20 (11 in PRT) Sample: frail older adults living in long-term care facility

Baum 2003 *(Continued)*

	Age: mean 88 years Inclusion criteria: age greater than 65, residence at the facility longer than 3 months, and the ability to ambulate alone, with assistive devises or one caregiver Exclusion criteria: unstable acute illness or chronic illness; an inability to follow a two-step command; and assaultive behavior pattern; or unwilling to discontinue any current physical therapy
Interventions	PRT versus control 1. PRT Type of Ex: 5LL Equipment: soft ankle or wrist weights, therabands, weighted ball Intensity: increased every week Frequency: Ex3 Reps/ sets: increased from 5/1 to 10/2 Duration: 1 year (after 6 months the two groups switched program. the results extracted at the end of the first 6 months) Setting: not reported, (Gym in the facility?) Supervision: full by an exercise physiologist Adherence: (80%-Ex group; 56%-control) 2. Control group: did activities such as painting, drawing, or puzzles with an art therapist or social worker, 3 times a week
Outcomes	Primary: FIM, physical performance test Secondary: TUAG, Berg balance scale Comments on adverse events: yes
Notes	Means and SDs at 12 months were not reported. Portion results at 6 months could be estimated from baseline score and change score. Because of small sample size, the precision is questionable.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Bean 2004

Methods	RCT Method of randomisation: not reported Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 1/10 in the control group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 21 (11 in PRT) Sample: community dwelling older females (with physical performance limitations??) Age: mean 77.1 years (SD = 5.7) Inclusion criteria: female sex, age of 70 and older, and a score between four and 10 on the Short Physical Performance Battery Exclusion criteria: unstable acute or chronic medical conditions, a score less than 23 on the MMSE, or a neuromusculoskeletal condition interfering with exercise participation
Interventions	PRT versus control 1. PRT Type of Ex: 2UL/4LL with fast concentric phase Equipment: weighted vest

Bean 2004 *(Continued)*

	Intensity: increased to the next level (increase 2% of the subject's baseline body mass) after 10 reps/3 sets Frequency: Ex3 Reps/Sets: 8/3 Duration: 12 weeks Setting: research center (Gym?) Supervision: full Adherence: 88 to 90 % 2. Control group: slow velocity and low resistance exercise with body or limb weight, 3 times a week
Outcomes	Primary: Short Physical Performance Battery (including chair rise) Secondary: Muscle strength Comments on adverse events: yes
Notes	Post mean = baseline + change score; baseline SD was used

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Beneka 2005

Methods	RCT with 4 groups: low intensity, medium intensity and high intensity and control group Method of randomisation: not reported, stratified by gender Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: no Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Greece N = 16 for each group (Control, LI, MI, & HI) Sample: healthy but inactive elderly Age: male-mean 70 years; female-mean 67 years Inclusion criteria: inactive prior to the study, no anaemia, hepatic complications, thyroid disorders, and kidney problems Exclusion criteria: hypertension or taking anti-hypertensive medication, didn't pass diagnostic tread-mill test, didn't pass physician's screen
Interventions	PRT (low intensity, medium intensity, and high intensity) versus control 1. PRT Type of Ex: 3 LL Equipment: Universal machines Intensity: LI-50% of 1 RM; MI-70% of 1 RM; HI-90% of 1 RM Frequency: Ex3 Reps/ sets: LI -12 to 14/3 ; MI-8 to 10 /3; HI-4 to 6 /3 Duration: 16 weeks Setting: not reported (Gym?) Supervision: not reported Adherence: not reported 2. Control group: no training
Outcomes	Muscle strength Comments on adverse events: no

Beneka 2005 *(Continued)*

Notes	Results from males were extracted Comparisons: low intensity versus high intensity, and high intensity versus control

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Bermon 1999

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 1 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: France N = 32 Sample: healthy older people Age: mean 70 years Inclusion criteria: elderly adults, free of cardiorespiratory and neurological diseases, sedentary to moderately active, passed screening procedure including medical history and physical examination Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex: 1UL, 2LL Equipment: weight machine (Marcy Vertex II) Intensity: (80% of 1RM) Frequency: Ex3 Reps/ sets: 8/3 Program duration: 8 weeks Setting: gym Supervision: full Adherence: not reported 2. Control Group: asked to maintain customary activities and dietary patterns
Outcomes	Strength (1RM) Anthropometry Hormones Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Boshuizen 2005

Methods	RCT Method of randomisation: not reported Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 18 in total (2 in high-guidance group, 10 in medium-guidance group, and 5 in controls, 1 was not mentioned) Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Netherlands N = 46 (24 in high-guidance group; 22 in control) Sample: experiencing difficulty in chair rising Age: mean = 80 years (SD = 6.7) Inclusion criteria: experiencing difficulty in chair rising Exclusion criteria: with a maximum knee-extensor torque of both legs exceeding 25 kg force; self-reported diseases that would be adversely affected by the exercises
Interventions	PRT Group (high-guidance) versus control 1. PRT Type of Ex : LLs Equipment: elastic bands Intensity: increased to the next level after 8 reps/3sets Frequency: Ex3 Reps/ sets: 8/3 Duration: 10 weeks Setting: welfare centers (Gym?) Supervision: two supervised sessions/week by two physical therapists and one unsupervised home session/week Adherence: 73% at group sessions and 90% at home sessions 2.Control group: no exercise training
Outcomes	Primary: disability measure (Groningen Activity Restriction Scale) Secondary: muscle strength, timed walk, TUAG, balance test Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Brandon 2000

Methods	RCT BUT some changing of groups allowed before intervention began (husband/wives or people sharing rides changed groups) Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: not reported Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 85

Brandon 2000 *(Continued)*

	Sample: healthy older adults, participants in community activities Age: mean 72 years Inclusion criteria: "community-dwelling older adults", no symptoms of cardiovascular disease, consent from physician, Exclusion criteria: depression (according to Beck Inventory), MMSE > 19, contraindications on submaximal aerobic test
Interventions	PRT versus control 1. PRT Type of Ex: 3LL Equipment: Nautilaus machines Intensity: moderate-high (50-70% of 1RM) Frequency: Ex3 Reps/ sets: 8-12/3 Duration: 4 months Setting: gym-based Supervision: full Adherence: 95% 2. Control Group: no intervention
Outcomes	Strength (1RM) Physical Performance Test (PPT)-including chair rise performance Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Brandon 2003

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 13/29 in the PRT group; 8/23 in the control group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 52 (29 in PRT) Sample: community dwelling, diabetes Age: mean 65.8 years (SD =7.6) Inclusion criteria: not reported Exclusion criteria: elevated blood glucose, depression, altered cognitive function, cardiovascular diseases, strokes, and hypertension
Interventions	PRT versus control 1. PRT Type of Ex: 5LL Equipment: Nautilus machine Intensity: (50%, 60%, and 70% for set 1, 2, and 3 separately) Frequency: Ex3 during the first 6 months, and Ex2 from month 7 to 24 Reps/Sets: 8-12 /3

Brandon 2003 *(Continued)*

	Duration: 24 months Setting: not reported, (Gym?) Supervision: full Adherence: > 85% 2. Control group: no training
Outcomes	Muscle strength (1RM/body weight) TUAG 50-foot walk Walk up and down stairs Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Brochu 2002

Methods	RCT Method of randomisation: stratified by physical function scores of SF-36 Assessor blinding: no Participant blinding: no Loss to follow-up: 5/30 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 30 (15 in each group) Sample: disabled women with CHD Age: mean 70.5 years (SD = 4) Inclusion criteria: age > 65 years SF-36 physical function < 85 Had definite CHD Exclusion criteria: hospitalization for an acute coronary syndrome within 6 months, very low threshold angina, exercise-test limiting noncardiac comorbility, uncontrolled BP, sternal nonunion after coronary surgery, recent participation in a cardiac rehabilitation program, inflammatory arthritis, and dementia
Interventions	PRT versus control 1. PRT Type of Ex: 5UL, 3LL Equipment: Universal weights and dumbbells Intensity: high (80% of 1RM) Frequency: Ex3 Reps/Sets: 10/2 Duration: 24 weeks Setting: gym Supervision: not reported Adherence: required to be 75% 2. Control Group: 30 to 40 minutes of stretching, calisthenics, light yoga, and deep-breathing progressive relaxation exercise
Outcomes	Primary: CS physical performance test , SF-36 Secondary: strength (1 RM), peak V02, 6-minute walk Comments on adverse events: yes

Brochu 2002 *(Continued)*

Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Bruunsgaard 2004

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 18 (39 enrolled) Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Demark N = 21 (10 in PRT) Sample: frail nursing home residents Age: mean 88.6 years-PRT, 90.6 years-control Inclusion criteria: not reported Exclusion criteria: acute illness, hypertension, severe cardiovascular disease, moderate/severe cognitive impairment, severe impairment of motor function, and neurological disorder
Interventions	PRT versus control 1. PRT Type of Ex: 2 LL Equipment: training chair (Quadriceps Exercise Table) Intensity: 50% to 80% of 1 RM Frequency: Ex3 Reps/Sets: 8/3 Duration: 12 weeks Setting: nursing home facility (Gym?) Supervision: full by a physiotherapist Adherence: 84% for the PRT group, 97% for the control group 2. Control group: social activities, twice a week by an occupational therapist
Outcomes	Muscle strength (1 RM) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Buchner 1997

Methods	RCT: with four groups: strength training alone, endurance training alone, strength and endurance training and control group

Buchner 1997 *(Continued)*

	Method of randomisation: variation of randomly permuted blocks Assessor blinding: yes Participant blinding: no Loss to follow-up: 4 (from PRT/control) Intention to-treat analysis: yes Post-program follow up: exercisers assessed at 9 months, all participants monitored for falls for median 1.42 years (max 2.35 years)
Participants	Location: USA N = 105 total (55 in PRT vs control) Sample: older people with muscle weakness, recruited from primary care physicians in a HMO Age: mean 75 years Inclusion criteria: between 68 and 85 years of age; unable to do an eight-step tandem gait without errors; below the 50th percentile in knee extensor strength for the subject's height and weight Exclusion criteria: active cardiovascular, pulmonary, vestibular and bone diseases; positive cardiac stress test; body weight >180% of ideal; major psychiatric illness; active metabolic diseases; chronic anemia; amputation; chronic neurological or muscle disease; inability to walk; dependency in eating, dressing transfer or bathing; inability to speak English or fill out written forms
Interventions	PRT versus control 1. PRT Type of Ex : 2UL, 9LL, 1Tr Equipment: machines (Cybex) Intensity: high (set 1: 50-60% of 1RM; set 2: 75% of 1RM) Frequency: Ex3 Reps/Sets: 10/2 Program Duration: 24-26 weeks Setting: gym Supervision: not reported Adherence: 95% excluding drop-outs; 81% including drop-outs 2. Control Group: maintained usual activity levels, allowed to join exercise program after 6 months
Outcomes	Aerobic capacity Strength (isokinetic) Balance Gait SF-36 Sickness Impact Profile Lawton IADL scale Stair climbing Falls Health care use Comments on adverse events: yes
Notes	Data from PRT and control group were compared Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Casaburi 2004

Methods	RCT

Casaburi 2004 *(Continued)*

	Method of randomisation: not reported Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 1/12-Tx, 1/12-Control Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N=24 (12 for each group) Sample: people with COPD Age: mean 68.9 years (SD=9.8) Inclusion criteria: age 55 to 80 years, FEV1 of 60% predicted or less, and FEV1 to vital capacity ratio of 60% or less. Screening serum testosterone was 400 ng/dl or less Exclusion criteria: significant cardiovascular or orthopedic impairments, body weight of less than 75% or more than 130% of ideal, symptomatic benign prostatic hypertrophy, prostate cancer history, serum prostate specific antigen of more than 4 ?g/L, or hemoglobin of more than 16 ug/dl.
Interventions	PRT versus control 1. PRT Type of Ex: 5 LL with eumetabolic diet Equipment: not reported Intensity: first 4 weeks, 60% of 1RM then increased to 80% of 1 RM Frequency: Ex3 Reps/Sets: first 4 weeks, 12/3 then increased to 8-10 /4 Duration: 10 weeks Setting: not reported Supervision: full by an exercise trainer Adherence: at least 25 of 30 scheduled sessions 2. Control Group: no training
Outcomes	Muscle strength VO2max Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Castaneda 2001

Methods	RCT both groups were also on a low-protein diet (run-in period for 6 weeks to evaluate this); comparison was between low-protein diet alone or low-protein diet plus resistance training Method of randomisation: not reported Assessor blinding: blind for all assessments except strength Participant blinding: yes, sham-exercises Loss to follow-up: no Intention-to-treat analysis: not stated Post-program follow up: no
Participants	Location: USA N = 26 Sample: patients with moderate chronic renal insufficiency, recruited from nephrology clinics Age: mean 65 years (SD 9)

Castaneda 2001 *(Continued)*

	Inclusion criteria: older than 50 years of age; serum creatinine concentrations between 133-422 umol/L (1.5 and 5.0 mg/dL); physician approval to follow a low protein diet; nephrologist confirmed diagnosis of chronic renal insufficiency Exclusion criteria: myocardial infarction within the last 6 months; any unstable chronic condition; dementia; alcoholism; dialysis or previous renal; current resistance training; recent involuntary weight change (+/- 2kg); albumin level less than 30g/L; proteinuria greater than 10g/d; abnormal stress test on screening
Interventions	PRT versus control 1. PRT plus low-protein diet Type of Ex: 2UL, 3LL Equipment: machines (Keiser) Intensity: 80% of 1RM Frequency: Ex3 Reps/Sets: 8/3 Duration: 12 weeks Setting: gym at research centre Supervision: full Adherence: 91% 2. Control Group: on low-protein diet; performed 5-8 sham exercises (gentle movements while standing sitting and bending) for upper and lower body
Outcomes	Strength (1RM), Peak oxygen consumption Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Castaneda 2004

Methods	RCT Method of randomisation: not reported Assessor blinding: yes Participant blinding: yes Loss to follow-up: 0 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 26 (14 in PRT) Sample: chronic kidney disease but not on dialysis therapy Age: mean 65 years (SD = 9) Inclusion criteria: older than 50 years old with moderately severe chronic kidney disease and not on dialysis therapy, serum creatinine concentrations from 1.5 to 5.0 mg/dL and to be able to take a low protein diet Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex : 2UL/3 LL Equipment: Keiser Sports Health Equipments

Castaneda 2004 *(Continued)*

	Intensity: 80% of 1 RM Frequency: Ex3 Reps/Sets: 8/3 Duration: 12 weeks Setting: research center (Gym?) Supervision: full Adherence: not reported 2.Control group: stretching and flexibility exercise
Outcomes	Muscle strength (1 RM) Comments on adverse events: yes
Notes	Reported whole body muscle strength (data were not pooled)

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Chandler 1998

Methods	RCT Method of randomisation: block randomised and stratified by 2 levels of functioning Assessor blinding: some measures Participant blinding: no Loss to follow-up: 13 Intention-to-treat analysis: no Post-program follow-up: no
Participants	Location: USA N = 100 Sample: community-dwelling older people with functional limitations Age: mean 77.6 years Inclusion criteria: community-dwelling; aged 64 or above; unable to descend stairs step over step without holding onto the railing Exclusion criteria: > or = 3 on Reuben's Advanced Activities of Daily Living; terminal illness (i.e. not expected to survive 6 months); severe unstable cardiac disease including MI in the past 6 months; severe fixed or progressive neurologic disease; complete blindness; lower extremity amputation; score below 18 on MM SE and unable to follow a 3-step command
Interventions	PRT versus control 1. PRT Type of Ex: 8LL Equipment: Theraband Intensity: progressively increased (8 RM to 2 sets of 10RM) Frequency: Ex3 Reps/Sets: 10/2 Duration:10 weeks Setting: home-based Supervision: not reported Adherence: not reported 2. Control Group: could begin exercise after 10 weeks, one friendly phone call at 5 weeks
Outcomes	HRQoL (SF-36) Lower limb strength (Cybex) 6-minute walk test

Chandler 1998 *(Continued)*

	Chair rise Functional reach Falls Self-Efficacy (/100) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B- Unclear

Charette 1991

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding : no Loss to follow-up: 8 Intention-to-treat analysis: no Post-program follow-up: no
Participants	Location: USA N = 27 Sample: healthy, sedentary women Age: mean 69 years Inclusion criteria: aged 64-86; healthy; female, Palo Alto community Exclusion criteria: pre-existing disability or illness that would preclude participation in a weight training program of moderate intensity
Interventions	PRT versus control 1. PRT Type of Ex: 7LL Equipment: weight training machines Intensity: 65-75% of 1RM Frequency: Ex3 Reps/Sets: 6/3, increased to 6 sets for leg extension and press after 2 weeks Program Duration: 12 weeks Setting: gym Supervision: full Adherence: 90% completed all sessions 2. Control Group: maintain normal activities, asked not to start an exercise program. Could undertake training at the end of the program. Contacted to make appointments/ maintain interest.
Outcomes	Strength (1RM) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Chin A Paw 2006

Methods	RCT with 4 groups: PRT, control, functional training, and combined training Method of randomisation: the random allocation sequence was generated by computer by two independent students Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 21/57 in PRT; 22/60 in function-skills; 17/56 in combined training; 23/51 in controls Intention-to-treat analysis: yes. Data analysed: 40 in PRT, 44 in function-skills, 44 in combined training, 31 in controls Post-program follow up: no
Participants	Location: Netherlands N = 108 (57 in PRT) Sample: elders lived in long-term care facilities Age: mean 81.3 (SD = 4.4) Inclusion criteria: 1) aged 65 or older; 2) living in a nursing home or residential care facility; 3) able to walk 6 m 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) and not moving away from the home within the 6-months intervention period Exclusion criteria: not reported
Interventions	PRT versus control, versus functional training, and versus combined training 1. PRT Type of Ex: 3UL/2LL Equipment: TechnoGym equipment, dump bells and ankle/wrist weights Intensity: high (60-80% of 1 RM) Frequency: Ex2 Reps/Sets: 8-12/2 Duration: 24 weeks Setting: long-term care facility (Gym?) Supervision: full by a physical therapist and an assistant Adherence: 78 % 2.Control group: mean age =81, educational program (group discussion about topics of interest) 3. Functional training group: N=60, mean age = 82 years, game-like or cooperative activities 4. Combined training group: N=56, mean age = 81 years, one strength training and one functional training per week
Outcomes	Primary: physical activities/ADL disability Secondary: muscle strength, vitality plus scales, balance, gait speed, chair rise Comments on adverse events: yes
Notes	Comparisons: PRT versus control, PRT versus functional training

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Collier 1997

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 1

Collier 1997 *(Continued)*

	Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 39 Sample: healthy, community-dwelling Age: range 65-85 years Inclusion criteria: aged 65-85, approval of physician, community residents Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex: 5UL, 2LL Equipment: Universal Hercules Gym Machine Intensity: not specified, but progressed throughout Frequency: Ex3 Reps/Sets: 10/2 Program Duration: 10 weeks Setting: gym Supervision: full Adherence: not reported 2. Control Group: no active intervention
Outcomes	Strength (number of reps at % of body weight) Functional Fitness Assessment for adults >60 Agility Assessment (walking between cones) Hand-eye co-ordination ("soda pop" test) Grip strength Physical Self-Efficacy Scale (PSE) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Damush 1999

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no, attention control group used Loss to follow-up: 9 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 71 Sample: community-dwelling women, recruited through media-based promotion Age: mean 68 years (SD 5.6) Inclusion criteria: age 55+, living in retirement residential community, clearance from GP Exclusion criteria: GP-identified contraindications to exercise
Interventions	PRT versus control

Damush 1999 *(Continued)*

	1.PRT Type of Ex: 4UL, 3LL Equipment: Theraband Intensity: low to moderate (4/10 on Borg scale) Frequency: Ex3 Reps/Sets: 1 set, as many reps to reach 4/10 on Borg Program Duration: 8 weeks Setting: gym, group-based Supervision: full Adherence: 88% 2. Control Group: attended all of the exercise sessions to allow social contact
Outcomes	HRQoL (SF-36) Strength (3RM) Grip strength Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

de Vos 2005

Methods	RCT with 4 groups: high intensity, medium intensity, and low intensity, and control Method of randomisation: computerized randomisation program, stratified by gender Assessor blinding: only for tests at baseline Participant blinding: blinded to the research hypothesis Loss to follow-up: 12 (4-high intensity, 3-medium intensity, 3-low intensity, 2-control) Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Australia N = 28-HI; N = 28-MI; N = 28-LI; N = 28-control Sample: independent living older adults Age: mean 69 years Inclusion criteria: > 60 years old, living independently in the community, willingness to be randomised and to commit to the study requirements Exclusion criteria: participation in resistance/power training in the last 6 months, acute or terminal illness, had myocardial infarction in the past 6 months, unstable disease or physical status would interfere with exercise, limb amputation/fraction in the past 3 months, currently symptomatic hernias or hemorrhoids, or cognitive impairment.
Interventions	PRT (high intensity, medium intensity, and low intensity) versus control 1. PRT Type of Ex: rapid concentric and slow eccentric Equipment: Keiser machines Intensity: high (80% of 1RM), medium (50% of 1 RM), low (20% of 1RM) Frequency: Ex2 Reps/Sets: 8/3 Duration: 8-12 weeks (M = 10 weeks) Setting: not reported Supervision: Experienced exercise trainers Adherence: > 90% for each training group

de Vos 2005 *(Continued)*

	2. Control Group: maintain current level of activities
Outcomes	Dynamic muscle strength Muscle power Muscle endurance Balance Comments on adverse events: yes
Notes	Involved power training

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

de Vreede 2007

Methods	RCT with 3 groups: PRT, control, and functional task exercise group Method of randomisation: by computer using a random numbers table Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 6/34 in PRT group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Netherlands N = 65 (34 in PRT) Sample: community-dwelling older adults Age: mean 74.8 years (SD = 4) Inclusion Criteria: age over 70 years Exclusion Criteria: recent fractures, unstable cardiovascular or metabolic disease, musculoskeletal condition or chronic illness, severe airflow obstruction, recent depression or emotional distress, loss of mobility for more than one week in the previous months, exercised at a sports club more than 3 times a week
Interventions	PRT versus control and versus functional task exercise 1. PRT Type of Ex: 5UL, 9LL Equipment: weights, elastic tub Intensity: 7-8 on a 10-point rated perceived exertion scale Frequency: Ex3 Reps/Sets: 10/3 Duration:12 weeks Setting: a local leisure center Supervision: at least two experienced instructors Adherence: 74% (SD = 34.6%) 2. Control Group: to keep normal activity level 3. Functional task exercise group: N = 33, moving with a vertical component, moving with a horizontal component, carrying an object, and changing position between lying, sitting, and standing. Practice phase for 2 weeks, variation phase for 4 weeks, and daily tasks for 6 weeks
Outcomes	Primary: SF-36 Secondary: TUAG Comments on adverse events: yes
Notes	Data of SF-36 were provided by the trial authors

de Vreede 2007 *(Continued)*

	Data from PRT and functional training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

DeBeliso 2005

Methods	RCT Method of randomisation: not reported-stratified by gender and strength Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 8/21 in control; 5/18 in fixed repetition group; 4/21 in periodised group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 18-fixed repetition; N = 21-periodised repetition; N = 21-control Sample: independent and community dwelling older adults Age: fixed repetition, mean 71.4 years (SD = 5.4); periodised, mean = 70.6 years (SD = 4.7) Inclusion Criteria: no previous background in resistance training Exclusion Criteria: not reported
Interventions	PRT (fixed repetition and periodised repetition) versus control 1. PRT Type of Ex: 5UL/3LL Equipment: Flex machines Intensity: fixed repetition-9 RM; periodised-week 1 to 6, 15 RM; week 7 to 12, 9 RM; week 13 to 18, 6 RM Frequency: Ex2 Reps/Sets: fixed repetition-9/3; periodised-week 1 to 6, 15/2; week 7 to 12, 9/3; week 13 to 18, 6/4 Duration: 18 weeks Setting: training facility (Gym?) Supervision: full by trainers Adherence: fixed repetition group 77%; periodised group 62% 2. Control group: maintain current recreational activities
Outcomes	Muscle strength (1 RM) Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

DiFrancisco 2007

Methods	RCT Method of randomisation: a table of random numbers Assessor blinding: not reported

DiFrancisco 2007 *(Continued)*

	Participant blinding: not reported Loss to follow-up: 0 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 9 for each group Sample: see below Age: mean = 77.3 years (SD = 0.7) Inclusion criteria: convenience sample from Academic Health Care Center Exclusion criteria: participated in a strength-training programme within 6 months, pre-existing orthopaedic complications that would have affected any of the exercise, cardiac and respiratory conditions
Interventions	PRT (once a week versus twice a week) Type of Ex: 3UL/ 3LL Equipment: Cybex machines Intensity: high (75% of 1RM) Frequency: Ex2 versus Ex1 Reps/Sets: 10-15 /1 for each exercise Duration: 9 weeks Setting: gym Supervision: not reported Adherence: not reported
Outcomes	Strength (1RM) Comments on adverse events: yes
Notes	Date from 2 times a week and one time a week were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Donald 2000

Methods	RCT, factorial design (comparison of floor surface types not included here) Method of randomisation: randomised envelopes Assessor blinding: no Participant blinding: no Loss to follow-up: 22 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: UK N = 58 Sample: hospitalised older people Age: mean 81 years Inclusion criteria: admitted to elderly care rehabilitation ward from Feb to Sept 1996, consent from patient and carers Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex: 2 LL

Donald 2000 *(Continued)*

	Equipment: not reported Intensity: high (maximum weight the patient could manage) Frequency: twice daily Reps/Sets: 10/3 Program duration: not reported (length of hospital stay) Setting: hospital Supervision: full Adherence: not reported 2. Control Group: regular in-hospital daily physiotherapy
Outcomes	Falls (during hospital stay) Barthel Index (ADL measure) Strength (hand-held dynamometer, hand-grip strength) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Earles 2001

Methods	RCT, PRT vs moderate aerobic exercise Method of randomisation: randomised, with subjects blocked for gender and residence Assessor blinding: no Participant blinding: no Loss to Follow-up: 3 Intention-to-treat analyses: no Post-program follow up: no
Participants	Location: USA N = 43 Sample: independent community volunteers Age: mean 77 years (SD 5) in PRT group Inclusion criteria: age greater than 70 years; score of 8 or higher on the Short Physical Performance Battery; ability to travel (by using public or private transportation) to the retirement community where exercise sessions were held; willingness to attend exercise sessions for 12 weeks Exclusion criteria: myocardial infarction in the past 6 months; heart failure (New York Heart Association classification <1); angina with moderate activity; chronic obstructive pulmonary disease or shortness of breath while walking at a normal pace; stroke with residual motor deficits; poorly controlled hypertension (>174mmHg systolic, >100mmHg diastolic); cancer with chemotherapy or radiation in the past year; physical performance limited by arthritis; on any of the following medications: neuroleptics, oral steroids, testosterone or growth hormones
Interventions	PRT versus aerobic 1. PRT Type of Ex: 2 LL; also did step-ups, chair rises and plantar flexion exercises in standing Equipment: Pneumatic resistance machines Intensity: high for leg press- started at 50% of 1RM, increased by 10% during each week of training; moderate for other exercises Frequency: Ex3 Reps/Sets: 10/3 Duration: 12 weeks Setting: gym at retirement center

Earles 2001 *(Continued)*

	Supervision: full Adherence: 90% 2. Aerobic training group: moderate intensity exercise 30 minutes daily, 6 days weekly
Outcomes	Short physical performance battery (SPPB) Balance (semi-tandem stance, single leg stance) Chair rise (5) 8-foot walk Aerobic capacity (6-minute walk) Muscle strength Comments on adverse events: yes
Notes	Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B- Unclear

Ettinger 1997

Methods	RCT with 3 groups: PRT, aerobic training and health education (attention control) Method of randomisation: stratified, variable block randomisation, computer generated Assessor blinding: yes Participant blinding: attention control group used Loss to follow-up: 75 total (48 from PRT and control group) at 18 months Intention-to-treat analysis: yes Post-program follow up: participants followed after initial supervised sessions (3 months) to home-based sessions (3 -18 months)
Participants	Location: USA N = 439 total (295 in PRT versus control) Sample: community-dwelling people with osteoarthritis resulting in functional limitation Age: mean 68 years (SD 6) in PRT group Inclusion criteria: age 60 years or more, pain on most days in 1 or more knees, difficulty with at least 1 of the following due to knee pain: walking a quarter mile, climbing stairs, getting in and out of a car, lifting and carrying groceries, getting out of bed, getting out of the bathtub or performing shopping, cleaning or self-care activities; radiographic evidence of knee osteoarthritis in the tibial-femoral compartment. Exclusion criteria: person has a medical condition that precluded safe participation in the exercise program or prevented completion of the study (myocardial infarction or stroke in the past 3 months, evidence of ischemia during the exercise treadmill test, congestive heart failure, severe chronic obstructive pulmonary disease, active treatment for cancer, insulin dependent diabetes mellitus, hemoglobin less than 110g/L, creatinine greater than 176.8 umol/L, severe systemic disease or major psychiatric disease), inflammatory arthritis (i.e., rheumatoid or psoriatic), exercised regularly (defined as aerobic activity or resistance training more than 1 time per week for 20 minutes or longer), planned to move from the area or be admitted to a long-term care facility in the next 2 years; unable to walk at least 420 feet in 6 minutes without a cane or assistive device; unable to walk on a treadmill without an assistive device; participating in another research study; resided in a long-term care facility
Interventions	PRT versus control and versus aerobic 1. PRT Type of Ex: 4UL, 4LL, 1Tr Equipment: cuff-weights, dumb bells Intensity: moderate to high (2 sets of 12 reps max) Frequency: Ex3

Ettinger 1997 *(Continued)*

	Reps/Sets: 12/2 Duration: 78 weeks Setting: facility-based group for 3 months, then home- based for 15 months Supervision: high for gym-based, telephone contact and visits during home based phase (diminishing contact over time) Adherence: 70% at 18 months 2. Control Group: health education program (meetings and telephone contact) 3. Aerobic Training Group: walking program for 40 minutes 3 times per week at 50-70% of HR reserve group facility based for 3 months then home-based for 15 months (same contact as PRT)
Outcomes	Primary: self-report physical disability (23 item scale developed for use in this trial) Secondary: 6 minute walk test, stair climbing, lifting object, timed task in and out of car, graded sub-maximal aerobic treadmill test, strength (isokinetic dynamometer), knee x-rays, knee pain Comments on adverse events: yes
Notes	Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Fahlman 2002

Methods	RCT with 3 groups: PRT, control, and aerobic group Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 0 Intention-to-treat analysis: N/A Post-program follow-up: no
Participants	Location: USA N = 30 (15 in each group) Sample: highly active and functioning women Age: mean 73 years (SD = 3) Inclusion criteria: not reported Exclusion criteria: dementia screened by MMSE, did not meet the criteria of the American College of Sports Medicine, the presence of activity-limiting arthritis; being bedridden within 3 months of the study; the presence of central or peripheral nervous system disorders, stroke, acute or chronic infection, major affective disorder, human immunodeficiency virus infection or autoimmune disorders, or metabolic disorders (type I diabetes mellitus); being a smoker or smokeless tobacco user; participating in regular aerobic or resistance training within the previous 3 months; using oral steroids or medications known to have an effect on blood lipids except hormone replacement therapy; having surgery within the previous 3 months; and consuming caffeine in excess of the equivalent of 4 cups of coffee per day.
Interventions	PRT versus control and aerobic 1. PRT Type of Ex: 7 LL Equipment: not reported Intensity: 8RM Frequency: Ex3 Reps/Sets: 8/3 Duration: 10 weeks Setting: not reported

Fahlman 2002 *(Continued)*

	Supervision: not reported Adherence: > 95 % 2. Control Group: maintain normal activity level 3. Aerobic training group: stretching and walking exercise at 70% heart rate reserve, duration increased from 20 minutes to 30 minutes through out the program
Outcomes	Muscle strength (1RM) 1-minet walk (no data available for the PRT group) VO2 max Comments on adverse events: no
Notes	Comparisions: PRT versus control, and PRT versus aerobic

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Fatouros 2002

Methods	RCT with 3 groups: PRT, control, and aerobic group Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 0 Intention-to-treat analysis: no Post-program follow-up: no
Participants	Location: Greece N = 8 in each group Sample: inactive elder men Age: mean 71.8 years (SD = 2.5) Inclusion criteria: completely inactive prior to the study, VO2 max below 25 ml/kg/min, no anemia, hepatic complications, thyroid disorders or kidney problems, normal blood pressure Exclusion criteria: respiratory complications or BP > 240/110 mmHg during the exercise test
Interventions	PRT versus control and versus aerobic (cardiovascular training) 1. PRT Type of Ex: 5 UL/3 LL Equipment: Universal resistance exercise machines Intensity: Week 1-4 (55%-60% of 1 RM); Week 5-8 (60%-70% of 1 RM); week 9-12 (70%-80% of 1 RM); week 13-16 (80% of 1 RM) Frequency: Ex3 Reps/Sets: Week 1-4 (12-14/2); Week 5-8 (10-12/3); week 9-12 (8-10/3); week 13-16 (8/3) Duration: 16 weeks Setting: not reported Supervision: not reported Adherence: required the participants not miss more than 4 training sessions, 2. Control Group: no exercise 3. Cardiovascular training group: walking, jogging on a treadmill, the intensity was increased through out the training
Outcomes	Muscle strength (1 RM) Comments on adverse events: no

Fatouros 2002 *(Continued)*

Notes	Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Fatouros 2005

Methods	RCT with 3 groups: high intensity PRT, low intensity PRT, and control Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: not reported Intention-to-treat analysis: N/A Post-program follow-up: yes
Participants	Location: Greece N = 18 (LI); N = 20 (HI); N = 14 (control) Sample: inactive older adults Age: HI-mean 72.4 years (SD = 3.5); LI-mean 70.3 years (SD = 4.4) Inclusion criteria: at least 65 years of age, inactive before the study, free from health problems and potentially damaging orthopedic, neuromuscular, metabolic, and cardiovascular limitations Exclusion criteria: not reported
Interventions	PRT (high intensity and low intensity) versus control 1. PRT Type of Ex: 5 UL/3LL Equipment: Universal machines Intensity: low- 55% of 1RM; high- 82% of 1RM Frequency: Ex3 Reps/Sets: low intensity: 14-16/2 (after week 8, 3 sets), high intensity: 6-8 /2 (after week 8, 3 sets) Duration: 24 weeks Setting: not reported Supervision: Full Adherence: 98% 2. Control Group: not reported
Outcomes	Muscle strength VO2max TUAG Step climbing 50-feet walk Comments on adverse comments: yes
Notes	Data from high intensity and low intensity PRT group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Fiatarone 1994

Methods	RCT, factorial design (comparison of nutritional supplements versus placebo not considered here) Method of randomisation: not reported Assessor blinding: for some assessments, not for all Participant blinding: no, but recreational activities offered to control group (? quantity) Loss to follow-up: 6 total (4 in PRT and control groups) Intention-to-treat analysis: yes Post-program follow up: falls monitored median 1.53 years, max 4.11 years
Participants	Location: USA N = 51 in PRT vs control Sample: residents of a long term care facility for older people Age: mean 87.1 years (SE 0.6) Inclusion criteria: residential status, age over 70 years, ability to walk 6m Exclusion criteria: severe cognitive impairment; rapidly progressive or terminal illness, acute illness or unstable chronic illness; myocardial infarction; fracture of a lower extremity within the six months before the study; insulin dependent diabetes mellitus; on a weight-loss diet or undergoing resistance training at the time of enrolment; tests of muscle strength revealed a musculoskeletal or cardiovascular abnormality
Interventions	PRT versus control 1. PRT Type of Ex: 2LL Equipment: weight training machines Intensity: high (80% of 1RM) Frequency: Ex3 Reps/sets: 8/3 Program duration: 10 weeks Setting: nursing home Supervision: full Adherence: 97% 2. Control Group: engaged in 3 activities of their choice offered by recreational therapy
Outcomes	Strength (1RM) Gait speed Stair climbing power Anthropometric measurements Physical activity (leg monitors) Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Fiatarone 1997

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no, but control group received weekly phone calls Loss to follow-up: 4 Intention-to-treat analysis: no

Fiatarone 1997 *(Continued)*

	Post-program follow up: no
Participants	Location: USA N = 34 Sample: frail older people Age: mean 82 years Inclusion criteria: community dwelling older people, moderate to severe functional impairment Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex: 11 total to UL and LL Equipment: arm and leg weights Intensity: high Frequency: Ex3 Reps/Sets: not reported Program Duration: 16 weeks Setting: home-based Supervision: low - 2 weeks of home instruction, then phone calls Adherence: 90% 2. Control Group: weekly phone calls
Outcomes	Strength Gait velocity Self-reported activity level Attitude towards Ageing on the PGC Morale Scale Bed days Falls Health care visits Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Fielding 2002

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 3/15 in high velocity group, 2/15 in low velocity group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 30 (15 in high velocity, 15 in low velocity) Sample: community dwelling elderly with self reported disability Age: high velocity-mean 73.2 years (SD = 1.2); low velocity-mean 72.1 years (SD = 1.3) Inclusion criteria: at least of 65 years of age, community dwelling, could walk with or without an assistive device, reported 2 or more deficits on the physical function subscale of SF-36 Exclusion criteria: acute or terminal illness, myocardial infarction in the past 6 months, unstable cardiovascular disease or other medical condition, upper extremities or lower extremities fractures in the

Fielding 2002 *(Continued)*

	past 6 months, amputations, cognitive impairments, current participations in regular exercise sessions, and unwilling to be randomised
Interventions	PRT (high velocity versus low velocity) Type of Ex: 2LL, leg press & knee extension Equipment: machines (Keiser pneumatic resistance training equipment) Intensity: high velocity group-70% of 1 RM, extension as fast as possible during concentric phase, then maintain full extension for 1 second, and eccentric phase of each repetition over 2 seconds; low velocity group- extension concentric phase, maintain full extension, and eccentric phase of each repetition 2, 1, 2 seconds Frequency: Ex3 Reps/Sets: 8/3 Duration: 16 weeks Setting: human physiology lab Supervision: exercise trainers Adherence: 95% for high velocity group, 94% for low velocity group
Outcomes	Muscle strength Chair rise Stair climbing Comments on adverse events: yes
Notes	No reported results can be pooled (missing M and SD for each group)

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Flynn 1999

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: not reported Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 29 Sample: healthy older women Age: mean 73 years Inclusion criteria: older community-dwelling women Exclusion criteria: dementia, exclusion criteria of the American College of Sports Medicine, arthritis, bedridden within 3 months of the study, central or peripheral nervous system disorders, stroke, use of anti-depressant medications, acute or chronic infection, major affective disorder, human immunodeficiency virus infection or autoimmune disorders, metabolic disorders (type I diabetes mellitus), oral steroid use, cigarette or smokeless tobacco use, regular aerobic or resistance training within previous 3 months, surgery within the previous 3 months, caffeine consumption in excess of four cups of coffee per day, adequate flexibility and mobility (screened with performance tests)
Interventions	PRT versus control 1. PRT Type of Ex: 8 LL Equipment: not reported

Flynn 1999 *(Continued)*

	Intensity: high (70-80% of 1RM) Frequency: Ex3 Reps/sets: 8/3 Duration: 10 weeks Setting: gym Supervision: not reported Adherence: not reported 2. Control Group: asked to maintain their normal activity level
Outcomes	Strength (1RM - ? data collected for controls) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Foley 2003

Methods	RCT Method of randomisation: a computer generated randomisation list generated by person external to the study as was managed by an external department Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 3/35 in the gym group, 3/35 in the control group Intention-to-treat analysis: yes Post-program follow up: no
Participants	Location: Australia N = 70 (35 in each group) Sample: community living adults with OA of the hip or knee Age: mean 69.8 years (SD = 9.2) Inclusion criteria: read, write, and speak English, could give informed consent, and provide transport to attend the training sessions Exclusion criteria: had received physiotherapy or hydrotherapy in the past 6 weeks, attending community exercise classes; joint replacement surgery within the past 12 months or the next 12 weeks; and cognitive impairment
Interventions	PRT versus control 1. PRT Type of Ex: 1UE/4 LL Equipment: weighted gaiters Intensity: 10 RM Frequency: Ex3 Reps/Sets: not reported Duration: 6 weeks Setting: gym Supervision: not reported Adherence: 75 % 2. Control Group: telephone calls to record any changes in their condition drug use or injuries
Outcomes	Primary: SF-12, Adelaide Activities profile, WOMAC Secondary: muscle strength, Arthritis Self-Efficacy Questionnaire Comments on adverse events: yes

Foley 2003 *(Continued)*

Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Frontera 2003

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 0 Intention-to-treat analysis: N/A Post-program follow up: no
Participants	Location: USA N = 14 (7 in each group) Sample: community-dwelling healthy women Age: mean 73.7 years (SD = 3.4) Inclusion criteria: not involved in regular exercise Exclusion criteria: had conditions that could interfere with neuromuscular function
Interventions	PRT versus control 1. PRT Type of Ex: knee extensors/flexors, each leg was trained separately Equipment: Keiser Sports Health Equipment Intensity: (80% of 1 RM) Frequency: Ex3 Reps/Sets: 8/4 Duration: 12 weeks Setting: not reported Supervision: not reported Adherence: 98% 2. Control Group: not reported
Outcomes	Muscle strength (1RM, isokinetic strength of knee extension) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Galvao 2005

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported

Galvao 2005 *(Continued)*

	Participant blinding: not reported Loss to follow-up: 4/16 in 1-set PRT group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Australia N = 16 for each group Sample: community dwelling elderly Age: 1-set PRT group-mean 68.9 years (SD=4.8); 3-set PRT group-mean 69.7 years (SD=4.4) Inclusion criteria: not reported Exclusion criteria: musculoskeletal, cardiovascular, or neurological disorder; PRT in the previous 12 months, inability to undertake upper and lower limb ex. or walk less than 100 meters; unwilling to undertake 20 weeks of training
Interventions	PRT (3-set versus 1-set) Type of Ex: 4UL/3LL Equipment: Strength Fitness Equipment Intensity: 8 RM Frequency: Ex2 Reps/Sets: 8/3 versus 8/1 Duration: 20 weeks Setting: not reported (Gym?) Supervision: full Adherence: All completed 40 training sessions (make-up sessions were provided)
Outcomes	Muscle strength (1 RM) Chair rise 6-minute walk Stair climbing 400-m-walk Comments on adverse events: yes
Notes	3-set PRT versus 1-set PRT

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Hagerman 2000

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 4 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 22 Sample: untrained but physically active older men Age: mean 63.7 years Inclusion criteria: male, aged 60-75, physically active but not engaged in resistance training Exclusion criteria: not reported

Hagerman 2000 *(Continued)*

Interventions	PRT versus control 1. PRT Type of Ex: 3 LL Equipment: machines Intensity: high (85-90% of 1RM) Frequency: Ex2 Reps/Sets: 6-8/3 Program Duration: 16 weeks Setting: gym Supervision: full Adherence: 100% 2. Control Group: not reported
Outcomes	Strength (1RM) Peak aerobic capacity Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Harris 2004

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 2/19 in LI (2 sets of 15 RM); 1/18 in HI (4 sets of 6 RM) Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N: HI = 18; LI = 19 Sample: independent community dwelling older adults Age: HI- mean =69.4 years (SD = 4.4); LI- mean =71.4 years (SD = 4.6) Inclusion criteria: independent and community dwelling; no previous background in resistance training Exclusion criteria: not reported
Interventions	PRT (high intensity versus low intensity) Type of Ex : 3LL/5UL Equipment: Flex machines Intensity: HI-6RM; LI-15RM Frequency: Ex2 Reps/Sets:HI-6 /4; LI-15 /2 Duration: 18 weeks Setting: not reported (Gym?) Supervision: full by trainers Adherence: 85.4%
Outcomes	Muscle strength Comments on adverse events: yes

Harris 2004 *(Continued)*

Notes	No numerical results for the control group Date from high intensity PRT and low intensity PRT were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Haykowsky 2000

Methods	RCT Method of randomisation: matched according to combined leg press and bench press strength scores, then randomly assigned Assessor blinding: no Participant blinding: no Loss to follow-up: 4 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Canada N = 22 Sample: healthy older men Age: mean 68 years (SD 3) Inclusion criteria: aged 61-76; no clinical evidence of cardiovascular disease or hypertension; normal resting electrocardiograms; normal electrocardiographic response to graded treadmill exercise; not requiring or using cardiovascular medications; no regular participation in endurance or RT; absence of cerebrovascular or orthopaedic disability that would limit RT Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex: 5UL, 3LL Equipment: machines Intensity: 60-80% of 1RM Frequency: Ex3 Reps/Sets: 3/10 Duration: 16 weeks Setting: gym Supervision: not reported Adherence: 97% attended 2. Control Group: continued normal activities
Outcomes	Strength (1RM) Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Haykowsky 2005

Methods	RCT with 3 groups: PRT, control, and aerobic group Method of randomisation: not reported Assessor blinding: not reported Participant blinding: yes for echocadiograms Loss to follow-up: no Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Canada N = ? (did not report sample size for each group) Sample: women Age: mean = 70 years (SD = 4) Inclusion criteria: a) no clinical evidence of cardiovascular disease; b) normal resting electrocardiogram (ECG); c) normal ECG response to graded exercise; d) no requirement or use of cardiovascular medications; e) no regular participation in AT and/or ST; and f) absence of any cerebrovascular or orthopedic disability that would limit exercise training. Exclusion criteria: not reported
Interventions	PRT versus control and versus aerobic 1. PRT Type of Ex: 3LL/5UL Equipment: not reported Intensity: 50% of 1RM and increased 2.5% per week until 75% of 1 RM Frequency: Ex3 Reps/Sets: 10/2 Duration: 12 weeks Setting: not reported (Gym?) Supervision: full Adherence: not reported 2. Control group: continue normal daily activities 3. Aerobic training: cycle exercise at 60-80% of heart rate reserve
Outcomes	Muscle strength Absolute VO2peak Comments on adverse events: yes
Notes	sample size for each group was not reported. 12 weeks of strength training is as effective as 12 weeks of aerobic training for increasing relative VO2peak, however, strength training is more effective than aerobic training for improving overall muscle strength.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Hennessey 2001

Methods	RCT trial with 4 groups: PRT alone, growth hormone treatment alone, PRT and growth hormone treatment and control. Only PRT alone and control are included in this review Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: not reported Intention-to-treat analysis: no

Hennessey 2001 *(Continued)*

	Post-program follow up: no
Participants	Location: USA N = 16 in PRT and control Sample: frail older people Age: mean 71.3 years (SD 4.5) Inclusion criteria: frail which was defined as scoring between 12 and 28 on Reuben's Physical Performance Test; Exclusion criteria: medical conditions (cancer, heart disease, diabetes, recent fracture, carpal tunnel syndrome) that would interfere with administration of growth hormone or the performance of regular exercise 3 times per week; did not expect to spend a year in Rhode Island; their doctor convinced them not to participate for medical reasons or otherwise; unwilling to inject the drug and be randomised to exercise or no exercise
Interventions	PRT versus control 1. PRT Type of Ex: 11 exercises (UL & LL) Equipment: ankle and wrist weights and exercise equipment Intensity: increased from 20% to 95% of 1 RM-most training was at high intensity Frequency: Ex3 Reps/Sets: 8/3 Duration: 25 weeks Setting: gym (in study facilities or local community centers) Supervision: Full Adherence: not reported 2. Control Group: not reported
Outcomes	Strength (isokinetic dynamometry) Physical Performance Test (PPT) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Hepple 1997

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to Follow-up: 1 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Canada N = 20 Sample: healthy older men, recruited through newspaper advertisement Age: mean 68.3 years (se 1.1) Inclusion criteria: male, aged 65-74 Exclusion criteria: positive Physical Activity Readiness Questionnaire, abnormal ECG or blood pressure response, musculoskeletal impairment

Hepple 1997 *(Continued)*

Interventions	PRT versus control and versus aerobic 1. PRT Type of Ex: 5LL Equipment: cuff weights Intensity: high (6RM) Frequency: Ex3 Reps/Sets: 6/3 Duration: 12 weeks Setting: gym Supervision: full Adherence: not reported 2. Control Group: usual level of activity 3. Aerobic Training Group: intermittent walking on treadmill until pain subsided, 3 times per week
Outcomes	Peak VO2 Comments on adverse events: no
Notes	Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Hiatt 1994

Methods	RCT with 3 groups: PRT, walking (aerobic training) and control Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 2 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 29 (19 in PRT versus control) Sample: people who have peripheral arterial disease and intermittent claudication Age: mean 67 years Inclusion criteria: intermittent claudication (disabling but stable for 3 months prior to enrolment); peripheral arterial disease Exclusion criteria: leg pain at rest, ischemic ulceration, gangrene, unable to walk on the treadmill at a speed of at least 2mph; exercise capacity limited by symptoms of angina, congestive heart failure, chronic obstructive pulmonary disease, arthritis; diabetes; vascular surgery or angioplasty in the past year
Interventions	PRT versus control and versus aerobic 1. PRT Type of Ex: 5LL Equipment: cuff weights Intensity: high (6RM) Frequency: Ex3 Reps/Sets: 6/3 Duration: 12 weeks Setting: gym Supervision: full Adherence: not reported

Hiatt 1994 *(Continued)*

	2. Control Group: usual level of activity 3. Aerobic Training Group: intermittent walking on treadmill until pain subsided, 3 times per week
Outcomes	Strength (Cybex dynamometer) Peak Vo2 Comments on adverse events: no
Notes	Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Hortobagyi 2001

Methods	RCT with 3 groups: High-intensity PRT, Low-intensity PRT and Control Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 3 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 30 total (20 in high-intensity PRT versus control) Sample: healthy older people Age: mean 72 years (SD 4.7) Inclusion criteria: older men and women, healthy, had not exercised more than once a week in the previous 3 years, approval of GP Exclusion criteria: more than two risk factors for coronary artery disease; a history of falls, osteoporosis, osteoarthritis, or orthopaedic or neurological conditions (i.e. stroke); took medications that cause dizziness or slow movement; smoked; had a BMI greater than 28 kg/m squared; blood pressure greater than 140/90 mmHg or a heart condition
Interventions	PRT (high intensity and low intensity) versus control 1. PRT Type of Ex: 1 LL Equipment: machine Intensity: HI - 80% 1RM; LI - 40% 1RM Frequency: Ex3 Reps/Sets: HI: 4-6/5; LI: 8-12/5 Duration: 10 weeks Setting: gym Supervision: not reported Adherence: 98% 2. Control Group: not reported
Outcomes	Force accuracy and steadiness Maximal strength (Cybex) Comments on adverse events: no (not identified as such)
Notes	Date from high intensity PRT and low intensity PRT were compared

Risk of bias

Hortobagyi 2001 *(Continued)*

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Hruda 2003

Methods	RCT Method of randomisation: in a lottery format, 2:1 ratio Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 2/20 in PRT group, 3/10 in control group Intention-to-treat analysis: no Program-post follow up: no
Participants	Location: Canada N = 30 (20 in PRT) Sample: frail older adults (residents of a long-term care facility) Age: mean 84.9 years (SD = 4.8) Inclusion criteria: able to follow directions and walk across the room; no recent history of cardiovascular, cerebrovascular, respiratory, systemic, muscular, or uncontrolled metabolic disease Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex : LLs Equipment: Therabands Intensity: Increasing repetitions, sets, and speed, 20 minutes class progressed to an hour Frequency: Ex3 Reps/Sets: 4-8/1 Duration:10 weeks Setting: long-term care facility Supervision: not reported Adherence: 71% 2. Control Group: maintain usual daily activities
Outcomes	TUAG Chair stand 6-meter walk Muscle strength Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Hunter 2001

Methods	RCT with people randomised to variable intensity resistance training and high-intensity resistance training NOTE: control group participants were not randomly assigned, and are not included in this review

Hunter 2001 *(Continued)*

	Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 2 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 28 Sample: healthy male and female volunteers over 60 Age: mean 67.4 years in high intensity group Inclusion criteria: normal body mass index, free of metabolic disorders or medications that might affect energy expenditure, non-smokers, stable weight Exclusion criteria: not reported
Interventions	PRT (high versus variable resistance) versus control 1. PRT Type of Ex: 5 UL, 2LL, 2 Tr Equipment: resistance training machines Intensity: high intensity group: 80% of 1RM; variable resistance group: 50%, 65%, 80% of 1RM across the 3 training days each week Frequency: Ex3 Reps/Sets: 10/2 Duration: 25 weeks Setting: gym Supervision: full Adherence: not reported 2. Control Group: not randomly assigned, not included in this review
Outcomes	Strength (1RM and isometric) Perceived exertion and HR during daily tasks Submaximal aerobic capacity Comments on adverse events: no
Notes	Date from high intensity PRT and variable intensity PRT were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Izquierdo 2004

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 0 Intention-to-treat analysis: N/A Post-program follow-up: no
Participants	Location: Spain N = 10 in PRT, N = 11 in endurance training Sample: healthy men Age: mean 64.8 years (SD = 2.6)

Izquierdo 2004 *(Continued)*

	Inclusion criteria: had not participated in regular resistance/endurance training or competitive sports for the last 5 years Exclusion criteria: cardiovascular, neuromuscular, arthritic, pulmonary, other debilitating diseases
Interventions	PRT versus endurance training (aerobic) 1. PRT Type of Ex: 4LL/3UL Equipment: resistance machines (Technogym) Intensity: first 8 weeks, 50-70% of 1 RM; last 8 weeks, 70-80% of 1RM Frequency: Ex2 Reps/Sets: first 8 weeks: 10-15/3; last 8 weeks: 5-6/3-5 Duration: 16 weeks + 4 weeks for baseline testing Setting: training facility Supervision: full by researchers Adherence: at least 90% to be considered compliant and remain in the study 2. Endurance training group: mean age =68.2 years, endurance cycling at 60 rpm, the work-rate level was increased or decreased accordingly
Outcomes	Muscle strength (1RM-half squat) Cycling test Comments on adverse events: no
Notes	Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Jette 1996

Methods	RCT Method of randomisation: not reported Assessor blinding: yes Participant blinding: no Loss to follow-up: 9 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 102 Sample: non-disabled community-dwelling older people Age: mean 72 years Inclusion criteria: non-disabled, community dwelling, aged 65 and over; clearance from GP Exclusion criteria: significant coronary artery disease, angina, congestive heart failure, myocardial infarction, cardiac surgery, or significant or new onset rhythm disturbance; neurological disorders with residual deficit; renal failure requiring dialysis; recent cancer with active chemotherapy or radiation treatment; uncontrolled hypertension, diabetes or seizure disorders; recent fracture; legal blindness; major mobility limitations; failed exercise safety evaluation (i.e. resting heart rate greater than 120 bpm, resting systolic/ diastolic great than 165/100 or less than 80/50, or failed treadmill test; English speaking; have access to a VCR or willing and able to use one provided by the study
Interventions	PRT versus control 1.PRT Type of Ex: 10 exercises to the UL, LL and Tr Equipment: Theraband

Jette 1996 *(Continued)*

	Intensity: low to moderate Frequency: Ex3 Reps/Sets: 10/1 Duration: 12-15 weeks Setting: home-based Supervision: low Adherence: mean 58%, median 71% 2. Control Group: continued with normal activities , on a waiting list for exercises
Outcomes	Strength (Cybex isokinetic dynamometer) Psychological well-being (Profile of Mood States battery) SF-36 Comments on adverse events: no (not identified as such)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Jette 1999

Methods	RCT Method of randomisation: randomly permuted blocks by size 4, assigned by a staff member not involved in data collection Assessor blinding: yes Participant blinding: no Loss to follow-up: 15 at 6 months Intention-to-treat analysis: no Post-program follow up: no, but 6 months of exercise
Participants	Location: USA N = 215 Sample: older adults with disabilities Age: PRT group mean 75.4 years (SD 7.4) Inclusion criteria: aged 60 years or over; limitations in at least one of 9 functional areas Exclusion criteria: medical history that contained current treatment for cancer, kidney disease requiring dialysis, recent fracture, uncontrolled diabetes or seizures, regular use of a wheelchair, current rehabilitation care, current fainting or dizzy spells, sudden loss of coordination or legal blindness or physician identified contraindications to exercise
Interventions	PRT versus control 1. PRT Type of Ex: 11 exercises to UL, LL and Tr Equipment: Theraband Intensity: low-moderate Frequency: Ex3 Reps/Sets: 10 reps Duration: 6 months Setting: home-based Supervision: low Adherence: 89% 2. Control Group: on a waiting list
Outcomes	Strength (hand-held dynamometer)

Jette 1999 *(Continued)*

	Balance (functional reach, unilateral stance, tandem stance) TUAG Profile of Mood States Sickness Impact Profile 68 Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Jones 1994

Methods	RCT: (note: data reported by dominant and non-dominant leg. Data for dominant leg used in analyses) Method of randomisation: not stated Assessor blinding: yes Participant blinding: no Loss to follow-up: 4 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 46 Sample: women from a community senior center Age: mean 67.4 years Inclusion criteria: female, from a community senior centre, age>60, independently ambulatory Exclusion criteria: unstable cardiovascular disease, orthopaedic or neurological dysfunction, any other uncontrolled chronic conditions that would interfere with the safety and conduct of the training protocol
Interventions	PRT versus control 1.PRT Type of Ex: 7 LL Equipment: velcro leg weights Intensity: started low, progressed to moderate Frequency: Ex3 Reps/Sets: 3 of 14 by end of program Duration: 16 weeks Setting: group at local community centre (2 days/week) and home (1 day/week) Supervision: full in group, none at home Adherence: 86-93% 2. Control Group: no intervention - contacted to monitor health and activity level
Outcomes	Strength and muscular endurance (isokinetic dynamometer) Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Jubrias 2001

Methods	RCT with 3 groups: PRT, aerobic training and control Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: no Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 40 total (n = 26 in PRT and control) Sample: healthy, active older people Age: 69.2 years (SD = 0.6) Inclusion criteria: healthy (screened with physical exam, exercise testing), physically active, not engaged in PRT or aerobic training before this study Exclusion criteria: not reported
Interventions	PRT versus control and versus aerobic 1. PRT Type of Ex: 1LL, 2 UL Equipment: resistance training machines Intensity: phase 1-60-70% of 1RM; phase 2-70-85% of 1RM Frequency: Ex3 Reps/Sets: phase 1: 10-15/3; phase 2: 4-8/ 3-5 Duration: 24 weeks Setting: gym Supervision: not reported Adherence: 94.2% attendance 2. Control Group: continued normal activities, asked not to begin PRT or aerobic training during the trial 3. Aerobic Training Group: training began at 60% heart rate reserve for 10-20 minutes, progressed to 80-85% HR reserve for a total of 40 minutes, three times per week
Outcomes	Muscle size Energy and fibre properties Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Judge 1994

Methods	RCT with factorial design: PRT alone, balance training alone, PRT and balance, control Method of randomisation: balance block design (blocks of 4 subjects) Assessor blinding: yes Patient blinding: no, but control group received educational sessions Loss to follow-up: 3 from PRT and control group Intention-to-treat analysis: yes Post-program follow up: yes, monitored for 6 months after intensive program while participants undertook tai chi. Falls monitored for median 0.88 years, max 1.86 years

Judge 1994 *(Continued)*

Participants	Location: USA N = 110 total (55 in PRT vs control) Sample: ambulatory older people from voter registration list Age: mean 80 years Inclusion criteria: age 75 years or greater, the ability to walk without an assistive device for 8 meters, MMSE >24 Exclusion criteria: symptomatic cardiovascular disease, poorly controlled hypertension (>160/96), history or physical findings of focal neurological deficit, Parkinson disease, peripheral neuropathy of the legs, hip or knee joint replacement, hip fracture, cancer (metastatic or under active treatment), taking neuroleptic, prednisolone > 5mg/day, benzodiazepines, significant hip or knee arthritis that requires a cane for ambulation
Interventions	PRT versus control 1. PRT Type of Ex: 6 LL Equipment: cuff-weights and exercise machines Intensity: 60-75% for exercises with machines; low to moderate for other Frequency: 3 times per week Reps/Sets: 3 sets to failure with machines; 13/2 with sandbags; 10/2 with body weight Duration: 12 weeks Setting: group exercise Supervision: full Adherence: 82% 2. Control group: 5 education sessions 3. Balance training: 3 times per week, 45 minute sessions, one-on-one with exercise leader including balance platform and floor-based exercises (eyes open and closed on different surfaces, with pertubations and base of support changes)
Outcomes	Strength (isokinetic dynamometer) Side effects of training (musculoskeletal or neurologic complaints) Gait velocity Chair rise Balance Comments on adverse events: yes (a priority outcome of study)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Kalapotharakos 2005

Methods	RCT Method of randomisation: not reported Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 1 in the high resistance group, 1 in the control group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Greece N = 12- HI; N = 12-MI; N = 11-control Sample: healthy, inactive but independent living older adults Age: HI-mean 64.6 years (SD = 5.1); MI-mean 65.7 years (SD = 4.2)

Kalapotharakos 2005 *(Continued)*

	Inclusion criteria: non smokers, free of medication, no symptoms of cardiovascular, orthopedic, or neuromuscular disease, and physically inactive before Exclusion criteria: MMSE < 24, depression (GDS > 5)
Interventions	PRT (high intensity and moderate intensity) versus control 1. PRT Type of Ex: 4UL/2 LL Equipment: Universal gym machines Intensity: high intensity group: 80% of 1 RM; moderate intensity group: 60% of 1 RM Frequency: Ex3 Reps/Sets: 8/3 for high intensity group; 15/ 3 for moderate intensity group Duration: 12 weeks Setting: not reported Supervision: not reported Adherence: 98.5% 2. Control Group: no exercise
Outcomes	Muscle strength (1-RM) 6-min walk Chair rise Vertical jump 1-leg standing time, Walking speed Stair climb Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Kallinen 2002

Methods	RCT with 3 groups: PRT, control, and aerobic group Method of randomisation: manually perform by drawing lots Assessor blinding: No Participant blinding: not reported Loss to follow-up: 4 in PRT group, 3 in endurance group (aerobic) Intention-to-treat analysis: yes done at the 30th month Post-program follow up: no
Participants	Location: Finland N = 27 (16 in PRT) Sample: elder women Age: range 76-78 years Inclusion criteria: no severe diseases or functional impairments Exclusion criteria: not reported
Interventions	PRT versus control and versus aerobic (Note: participants in all groups were given 600mg calcium per day) 1. PRT Type of Ex: 4UL, 4LL Equipment: resistance training machines Intensity: high - completed 8RM

Kallinen 2002 *(Continued)*

	Frequency: Ex3 Reps/Sets: 8/3 Program Duration: 2 years Setting: gym Supervision: full Adherence: 74% 2. Control Group: non-exercise group 3. Aerobic Fitness Group: N = 15; 3 sessions per week, performed same exercises as PRT group but with no resistance, plus added stationary cycling for 40 second stations
Outcomes	PeakVO2 Peak Power Comments on adverse events: yes
Notes	Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Katznelson 2006

Methods	RCT Method of randomisation: by a block design Assessor blinding: yes Participant blinding: yes Loss to follow-up: 4/19- placebo + ex; 1/17- placebo only Intention-to-treat analysis: yes Post-program follow up: no
Participants	Location: USA N = 26 (19 in PRT) Sample: men with relative testosterone insufficiency, sedentary and community dwelling Age: mean 72 years (SD = 5.4) Inclusion criteria: a single fasting serum free-testosterone value < 14.5 pg/ml and BMI is between 18-32; sedentary status Exclusion criteria: clinically unstable coronary artery or cerebrovascular disease, osteoarthritis of the lower extremity that could limit ambulation, clinically significant benign prostatic hypertropy (BPH), prostate cancer, an elevated prostate-specific antigen (PSA) value, hematocrit>52%, disorders known to affect body composition including hypokalemia, renal insufficiency, liver dysfunction, diabetes mellitus, hypothyroidism, alcoholism, thromoboembolic disease or coagulopathy, supraphysiologic glucocorticoid medication during the previous 12 months, androgen medications including supplements during the past 5 years, clinically significant psychiatric disease, or known pituitary disease, or radiation of the hypothalamus or pituitary gland.
Interventions	PRT versus control 1. PRT Type of Ex: 11 resistance exercises adapted from the Strong for Life video Equipment: elastic bands Intensity: used the next level of elastic band when the perceived exertion was less than moderate Frequency: 3 to 4 times a week Reps/Sets:10/1 Duration: 12 weeks Setting: home

Katznelson 2006 *(Continued)*

	Supervision: returned for an out-patient visit every two weeks and phone calls Adherence: 90% 2. Control Group: non exercise intervention
Outcomes	SF-36 Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Kongsgaard 2004

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 3/9 in the ex group; 2/9 in the control group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Denmark N = 18 (9 in each group) Sample: home-dwelling elder men with COPD Age: mean 71 years (SD = 1.3) Inclusion criteria: can transport to the hospital Exclusion criteria: fractures of the lower extremities within the last 6 months, neurological disease, cardio-vascular diseases, dependence on more than one walking device and cognitive dysfunction
Interventions	PRT versus control 1. PRT Type of Ex: 3 LL Equipment: Technogym Intensity: 80% of 1 RM Frequency: Ex2 Reps/Sets: 8/4 Duration: 12 weeks Setting: not reported (Gym?) Supervision: full Adherence: extending the training period until a total of 24 training sessions were finished 2. Control Group: daily non-supervised breathing ex
Outcomes	Primary: simple ADL (interview) Secondary: forced expiratory volume, muscle strength (5 RM), gait speed, timed stair climbing Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement

Kongsgaard 2004 *(Continued)*

Allocation concealment?	Unclear risk	B - Unclear

Krebs 2007

Methods	RCT Method of randomisation: a computer-generated table Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 0 Intention-to-treat analysis: NA Post-program follow up: no
Participants	Location: USA N = 15 (6 in PRT) Sample: community dwelling elders with disability Age: mean 70.4 years (SD = 6.5) Inclusion criteria: at least 60 years of age, cognitive intactness, ambulate independently more than 15 feet, had more than one lower-limb impairment, and have more than one functional limitation on SF-36 Exclusion criteria: terminal illness, progressive neurological disease, major loss of vision, and acute pain and non-ambulatory status
Interventions	PRT versus functional training 1. PRT Type of Ex: resisted proprioceptive neuromuscular facilitation exercise, 9 LL/2UL Equipment: elastic bands Intensity: 10 RM increased to 6 RM Frequency:3 to 5 times a week Reps/Sets: 4-level of normal progression and 4-level of advanced levels Duration: 6 weeks Setting: home? Supervision: two physical therapists taught the exercises and checked the exercise log at out-patient visits Adherence: PRT group- exercised average 5 days per week; functional training group- exercise average 5.39 days per week 2. Functional training group: N=6, average age =78.1 years, simulating locomotion activities at 3 different speeds, 3-5 days a week
Outcomes	Primary: SF-36 Secondary: muscle strength, paced gait, chair rise, standing balance Comment on adverse events: yes
Notes	Numerical results of means and SDs were not reported. Reported/figured % difference

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Allocation concealment?	Unclear risk	B - Unclear

Lamoureux 2003

Methods	RCT Method of randomisation: not reported

Lamoureux 2003 *(Continued)*

	Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 1/29 in the experimental group, 1/16 in the control group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Australia N = 45 (29 in PRT) Sample: community dwelling elderly Age: mean 68.5 years (SD = 1.2) Inclusion criteria: no resistance-training background, no cardiovascular disease, musculoskeletal disorders, neurological dysfunction and uncontrolled chronic conditions Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex: 5 LL Equipment: Pin-loaded weigh machines Intensity: from 60% 1RM in week 1 to 85% 1RM in week 14 Frequency: Ex3 -first 3 months; then Ex2-last 3 months Reps/Sets: 5-8/2-5 Duration: 24 weeks Setting: not reported Supervision: not reported Adherence: 95.5% 2. Control Group: maintain normal activities
Outcomes	Muscle strength Gait velocity Comments on adverse events: no
Notes	Final muscle strength outcome was not available Data at week 12 were extracted = baseline + change score. Final SD = baseline SD

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Latham 2001

Methods	RCT Method of randomisation: concealed envelopes Assessor blinding: no Participant blinding: no Loss to follow-up: 3 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: New Zealand N = 20 Sample: hospitalised older people Age: mean 81 years (SD 8.6) Inclusion criteria: 65 years or older, patient on hospital ward, expected length of stay of > 1 week Exclusion criteria: unable to perform knee extension against gravity with both legs, recent lower limb fracture, cognitive impairment which limited participation, leg ulcers on lower calf region

Latham 2001 *(Continued)*

Interventions	PRT versus control 1. PRT Type of Ex: 1 LL Equipment: velcro ankle weights Intensity: 50-80% 1RM Frequency: 5 times a week Reps/Sets: 8/3 Duration: duration of hospital stay (app 2 weeks) Setting: gym in rehabilitation wards of a hospital Supervision: full Adherence: 90% 2. Control Group: regular physiotherapy
Outcomes	Strength (1RM) Gait speed TUAG Balance (Berg) Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Latham 2003

Methods	RCT with a factorial design (only information about PRT vs control reported, 3- month outcomes reported) Method of randomisation: central computerised randomisation, blocks of 6 by centre Assessor blinding: yes Participant blinding: no, but attention control Loss to follow-up: 21 Intention-to-treat analysis: yes Post-program follow up: yes, at the 6th month
Participants	Location: New Zealand and Australia N = 243 Sample: frail older adults recruited from hospital geriatric services Age: mean 79.1 years (SD 6.9) Inclusion criteria: age 65 years or more, receiving hospital care from geriatric services, considered to be frail, not clear indication or contraindication to study treatments Exclusion criteria: responsible physician considered the interventions definitely hazardous or required, patients unlikely to survive 6 months, severe cognitive impairment which could compromise adherence to the exercise programme, not fluent in the English language
Interventions	PRT versus control 1. PRT Type of Ex: 1 LL Equipment: velcro ankle weights Intensity: aimed for 50-80% for most of the programme Frequency: Ex3 Reps/Sets: 8/3 Duration: 10 weeks Setting: home-based

Latham 2003 *(Continued)*

	Supervision: limited - fortnightly home visits alternating with phone calls Adherence: 82% (including drop-outs) 2. Control Group: frequency-matched phone calls and home visits
Outcomes	Primary: falls over 6 months, HRQoL (SF-36) Secondary: balance (Berg), strength (hand-held dynamometer), gait speed, TUAG, Barthel Index, Adelaide Activities Profile, Falls Self-Efficacy Index, adverse events (limitation in ADL for 2+ days and/or attention sought from health care professional) Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Liu-Ambrose 2005

Methods	RCT Method of randomisation: computer-generalized list Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 2/34 in PRT, 2/34 in stretching Intention-to-treat analysis: yes Post-program follow up: no
Participants	Location: Canada N = 68 (34 in each group) Sample: elder women with osteoporosis or osteopenia Age: mean 79.6 years (SD = 2.1) Inclusion criteria: age between 75-85 years with low bone mass and diagnosed with osteoporosis/osteopenia Exclusion criteria: living in care facilities, non-Caucasian, exercise regularly more than 2 times a week, illness or condition that would affect balance, MMSE score lowers than 23
Interventions	PRT versus control 1. PRT Type of Ex: 4 UL, 5LL Equipment: machines (Keiser Pressurized Air system) or free weights Intensity: progressed from 50-60 % of 1 RM to 75-85% of 1 RM in 4 weeks Frequency: Ex2 Reps/Sets: 10-15/2 (first 3 weeks); 6-8/2 (after week 3) Duration: 25 weeks Setting: community center Supervision: certified fitness instructors Adherence: 85% for PRT, 79% for stretching (control) 2. Control Group: general stretching, deep breathing and relaxation
Outcomes	Primary: health related quality of life, general physical function Secondary: muscle strength, gait speed, fall risk assessment Comments on adverse events: yes
Notes	

Liu-Ambrose 2005 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Macaluso 2003

Methods	RCT Method of randomisation: the principal investigator drew numbers from a bowl that had been thoroughly mixed Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 7 Intention-to-treat analysis: yes Post-program follow up: no
Participants	Location: UK N = 10-speed group (LI), N=10-Strength group (HI) Sample: healthy elder women Age: mean = 69 years (SD = 2.7) Inclusion criteria: not reported Exclusion criteria: not "medical stable" for exercise studies
Interventions	PRT (speed versus strength) Type of Ex: pedal Equipment: mechanically braked cycle ergometer Intensity: speed group (LI)-40% of 2 max resistance to complete 2 revolutions (2RM); strength group (HI)-80% of 2 RM Frequency: Ex3 Reps/Sets: Speed group (LI)-16 pedal revolutions/8 sets; Strength group (HI)-8 pedals revolutions/8sets Duration: 16 weeks Setting: not reported (gym?) Supervision: not reported Adherence: speed group (LI)-93%; strength group (HI)-89%
Outcomes	Strength measure Max treadmill walking speed Box-stepping test Vertical jump Comments on adverse events: yes
Notes	Involved power training, no control group

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Madden 2006

Methods	RCT with 3 groups: PRT, control, and endurance (aerobic) group

Madden 2006 *(Continued)*

	Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 5 in the endurance training group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 30 (15 in each group) Sample: healthy elder women Age: mean 69.8 years (SD = 1.5) Inclusion criteria: a normal blood pressure, a normal physical exam, normal resting ECG, normal M-mode and two-dimensional echocardiograms showing no more than mild valvular regurgitation, a normal Bruce protocol treadmill maximal exercise stress test, and a normal hematocrit, fasting blood glucose, total cholesterol, and creatinine. Exclusion criteria: any history of angina, myocardial infarction, stroke, hypertension, chronic pulmonary disease, diabetes, current medication use (prescription or over the counter), current smoking, or exercise-limiting orthopedic impairment.
Interventions	PRT versus control and versus endurance (aerobic) 1. PRT Type of Ex: 10 UL and LL Equipment: not reported (weight?) Intensity: 85% 1RM Frequency: 5 times/week Reps/Sets: 8-12/3 Duration: 24 weeks Setting: not reported (Gym?) Supervision: full-certified trainer Adherence: required participants to attend 90% of all training sessions to remain enrolled in the study 2. Control Group: no training 3. Endurance Ex (aerobic) Group: N=15, mean age=70 years (SD = 2.6), using cycle ergometer, 50-60% Max HR to 80-85% Max HR, 5 times a week
Outcomes	VO2max Comments on adverse events: no
Notes	Baseline + relative change score Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Maiorana 1997

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 5 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Australia

Maiorana 1997 *(Continued)*

	N = 31 Sample: men at least 3 months after coronary bypass Age: mean 61.2 years (SD 8.4) in training group Inclusion criteria: male, at least 3 months after coronary artery bypass surgery, low risk for recurrent cardiac events (normal left ventricular function, no residual ischemia, and an exercise capacity exceeding 4 metabolic equivalents during graded exercise testing) Exclusion criteria: not in an exercise rehabilitation programme at time of recruitment, moderate/severe left ventricular function, valve replacement/repair, history of CHF, on beta-blocking medication, significant resting hypertension (systolic BP >160mmHg or diastolic 100 mmHg) angina or significant ST depression during graded exercise testing
Interventions	PRT versus control 1. PRT Type of Ex: 7UL, 4LL, 1 Tr Equipment: machines, dumb-bells Intensity: 40% of MVC at beginning or program, 60% by end Frequency: Ex3 Reps/Sets: 10-15/3 Duration: 10 weeks Setting: gym Supervision: full Adherence: all subjects completed at least 80% of sessions (excluding drop-outs) 2. Control Group: maintain current physical activity habits
Outcomes	Strength (1RM) Aerobic capacity (Peak VO2 on treadmill test) Self-efficacy Comments on adverse events: yes (safety an aim of study)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Malliou 2003

Methods	RCT with 3 groups: PRT, functional training, and PRT with functional training group Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 0 Intention-to-treat analysis: not reported Post-program follow up: no
Participants	Location: Greece N = 25 (15 in multi-joint resistance training group) Sample: healthy inactive elderly Age: mean 68 years Inclusion criteria: inactive prior to the study, not exhibited anemia, hepatic complications, thyroid disorders or kidney problems, no hypertension, no potential damaging orthopedic and neuromuscular problems. Exclusion criteria: not reported
Interventions	PRT versus control and versus aerobic

Malliou 2003 *(Continued)*

	1.PRT Type of Ex: 3 LL- multi-joint resistance training group Equipment: Universal exercise machines Intensity: 90% of 1 RM Frequency: Ex3 Reps/Sets: 12/3 Duration:10 weeks Setting: not reported (gym?) Supervision: full Adherence: not reported 2. Control group: no training 3. Aerobic ex. group: N = 15, mean age = 69 years, aerobic exercise with light leg weight
Outcomes	Strength measure Comments on adverse events: no
Notes	Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Mangione 2005

Methods	RCT with 3 groups: PRT, control, and aerobic group Method of randomisation: not reported Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 1/11-control group, 1/13-aerobic training group, 6/17-resistance training group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 28 (17 in PRT) Sample: post hip fracture Age: mean 77.9 years (SD = 7.9) Inclusion criteria: successful fixation of a hip fracture, at least 65 years old, living at home, and willing to come to the study site Exclusion criteria: history of unstable angina, uncompensated congestive heart failure, metabolic conditions (i.e., renal dialysis), stroke, Parkinson's disease, life expectancy of less than 6 months, MMSE score is less than 20, and living in a nursing home
Interventions	PRT versus control and versus aerobic 1.PRT Type of Ex: 4LL Equipment: portable progressive-resistance ex. machine and body weight Intensity: 8 RM Frequency: first 2 months-Ex2, the 3rd month-Ex1 Reps/Sets: 8/3 Duration: 12 weeks Setting: participant's home Supervision: full-6 physical therapists Adherence: 98% 2. Control group: received biweekly mailing of non-ex health topics

Mangione 2005 *(Continued)*

	3. Aerobic group: N=13, mean age =79.8 years , walking or stepping, LEs/UEs active ROM ex, 65-75% max heart rate
Outcomes	Primary: SF-36 Secondary: strength measure, 6-minute walking test, walking endurance, gait speed Comments on adverse events: yes
Notes	Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Manini 2005

Methods	RCT with 3 groups: PRT, functional training, and PRT with functional training Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 25 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 9-PRT Sample: functional limited older adults (low isometric knee extension strength) Age: mean 72 years (SD = 10) Inclusion criteria: bilateral isometric knee extension strength test < 3Nm/Kg; pass physician's clearance Exclusion criteria: had cardiac or pulmonary difficulty
Interventions	PRT versus functional training and versus PRT with functional training 1.PRT Type of Ex: 3 LL Equipment: Life-Fitness Inc. Intensity: 10 RM Frequency: Ex2 Reps/Sets: 8/2 Duration: 10 weeks (8-10 weeks of control period before intervention) Setting: not reported (Gym?) Supervision: not reported Adherence: not reported 2. Functional training group: N=7, rising from a chair, rising from kneeling, stair ascending/descending 3. PRT and functional training group: N = 8, 1/week PRT training and 1/week of functional training
Outcomes	Muscle strength Max. knee isometrics Comments on adverse events: yes
Notes	Data from PRT and functional training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement

Manini 2005 *(Continued)*

Allocation concealment?	Unclear risk	B - Unclear

Maurer 1999

Methods	RCT Method of randomisation: random number generator, stratified by disease severity Assessor blinding: yes Participant blinding: no, but attention control group Loss to Follow-up: 15 Intention-to-treat analysis: no Post-program follow up: yes - at 12 weeks (after 8 weeks of training)
Participants	Location: USA N = 113 Sample: people with diagnosed OA of the knee Age: mean 66.3 years (SD 8.8) in treatment group Inclusion criteria: met current American College of Rheumatology criteria for OA, between 50-80 years, receiving no drugs for their arthritis other than stable doses of analgesics or NSAIDs, had mild to moderate knee pain for at least the previous 3 months, scored 1-3 on the Kellgren radiographic scale Exclusion criteria: concurrently receiving physical therapy, actively involved in any other pharmaceutical or exercise study or had undergone isokinetic strength training within the previous 3 years, had significant cardiovascular disease, more than mild knee swelling, large popliteal cysts, knee instability, major hip or knee surgery on the side to be treated, systemic disease other than OA that might affect muscle function, severe osteopenia, history of fracture in the area of the joint to be treated, paresis of the lower extremity
Interventions	PRT versus control 1. PRT Type of Ex: 1 LL Equipment: isokinetic dynamometer Intensity: appears high Frequency: Ex3 Reps/Sets: 3 reps at 3 speeds (total 9 reps) in 3 sets Program Duration: 8 weeks Setting: gym Supervision: not reported Adherence: not reported 2. Control Group: four classes on OA education and self-management
Outcomes	Primary: WOMAC, SF-36 Secondary: strength (isokinetic dynamometer), AIMS index Comments on adverse events: yes
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Allocation concealment?	Unclear risk	B - Unclear

McCartney 1995

Methods	RCT. All results broken down into four groups by sex and age (60-70 or 70-80, only results for women aged 70-80 - the largest group - used for pooled comparisons in review) Method of randomisation: not reported Assessor blinding: no Participant blinding: no, but attention/exercise control group Loss to follow-up: 23 Intention-to-treat analysis: no Post-program follow up: no, but exercise program had 2 year duration
Participants	Location: Canada N = 142 Sample: healthy volunteers Age: mean 64 years (SD 2.4) for exercise group Inclusion criteria: approval of family physician, successful completion of cycle ergometer test, aged 60-80 years, no prior resistance training experience Exclusion criteria: evidence of coronary artery disease, chronic obstructive or restrictive lung disease, osteoporosis, major orthopaedic disability, smoking, body weight greater than 130% of ideal
Interventions	PRT versus control 1. PRT Type of Ex: 3UL, 3LL, 1Tr Equipment: weight-lifting machines Intensity: 50-80% 1RM Frequency: Ex2 Reps/Sets: 10-12/3 Program Duration: 42 weeks Setting: gym Supervision: not reported Adherence: 88% (at 1 year) 2. Control Group: 2 times per week low-intensity walking
Outcomes	Strength (1RM) Maximum cycle ergometry Treadmill testing Stair climbing ergometric muscle cross-sectional area Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

McGuigan 2001

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 4 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Australia N = 20

McGuigan 2001 *(Continued)*

	Sample: people with peripheral arterial disease Age: mean 66 years (SD 6) exercise group Inclusion criteria: PAD diagnosed by a vascular surgeon Exclusion criteria: leg pain at rest, ischemic ulceration or gangrene, inability to walk at lest 2km/h on a treadmill, limited exercise capacity by factors other than claudication, vascular surgery or angioplasty in previous year, smoking of cigarettes
Interventions	PRT versus control 1. PRT Type of Ex: 8 exercise that included UL, LL, Tr, combination varied in each session (1-3) per week Equipment: machines Intensity: used linear periodization, intensity varied with reps Frequency: Ex3 Reps/Sets: 8-15/2 Program Duration: 24 weeks Setting: gym Supervision: full Adherence: not reported 2. Control Group: no intervention
Outcomes	Strength (10 RM) 6 minute walk test Treadmill walk time Hemodynamic measures Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

McMurdo 1995

Methods	RCT with three groups, PRT, mobility exercise programme and attention control Method of randomisation: sealed envelopes in sequence, computer generated random number tables generated the sequence Assessor blinding: yes Participant blinding: no, but attention control used Loss to follow-up: 7 from PRT and control group Intention-to-treat analysis: no Post-program follow up: no, but program 6 months long
Participants	Location: UK N = 86 total (55 in PRT vs control) Sample: residents of sheltered housing complexes Age: mean 82 years Inclusion criteria: age 75 years and over, limited mobility requiring the use of a walking aid, dependence in functional activities of daily living requiring the assistance of home help at least once per week Exclusion criteria: major neurological disease, unstable cardiovascular disease, severe cognitive impairment
Interventions	PRT versus control and versus mobility 1. PRT

McMurdo 1995 *(Continued)*

	Type of Ex: 24 (UL, LL, trunk) Equipment: theraband, progressive thickness Intensity: low-moderate Frequency: daily Reps/Sets: 5-10/1 Program Duration: 26 weeks Setting: home Supervision: low - visited at home every 3-4 weeks Adherence: not reported 2. Control Group: health education visits every 3-4 weeks 3. Mobility Group: same 24 exercises, but with no resistance
Outcomes	TUAG Sit to stand test (time to complete 10 full stands) Grip strength Functional reach ADL (Barthel Index) Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Mihalko 1996

Methods	RCT cluster randomised by residence Method of randomisation: not reported Assessor blinding: no Participant blinding: no, but attention control group Loss to follow-up: not reported Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 58 Sample: sedentary residents of senior citizen or residential nursing homes Age: mean 82.7 years (SD 7.7) Inclusion criteria: residents of senior citizen and residential nursing home facilities, sedentary, clearance form personal physician Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex: 5 UL Equipment: dumb bells Intensity: high - worked until failure Frequency: Ex3 Reps/Sets: 10-12 reps Program Duration: 8 weeks Setting: gym Supervision: not reported Adherence: not reported 2. Control Group: fluid movement program

Mihalko 1996 *(Continued)*

Outcomes	ADL performance (modified version of Lawton and Brody's IADL scale) Strength (1RM) Satisfaction with Life Scale Positive and negative affect Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Mikesky 2006

Methods	RCT Method of randomisation: not reported-stratified Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 36% in PRT, 24% in Control (range of motion) Intention-to-treat analysis: yes, done at the 30th month Post-program follow up: no
Participants	Location: USA N = 221 (113 in PRT) Sample: knee OA Age: mean = 69.4 years (SD = 8) Inclusion criteria: not clearly described Exclusion criteria: cannot walk without assistance, amputation of either lower extremity, knee or hip replacement, history of stroke, myocardial infarction, CHF, uncontrolled hypertension, fibromyalgia…
Interventions	PRT versus flexibility (control) 1.PRT Type of Ex: 2UL/2LL Equipment: CYBEX machines at gym; Elastic bands at home, Intensity: 8-10 RM Frequency: Ex3; first 3 months (2/week in the gym, 1/week at home), month 4-6 (1/week in the gym, 2/week at home), month 7-9 (2/month in the gym, 3/week at home); month 10-12 (1/month in the gym, 3/week at home) Reps/Sets: from 8-10/ 3 to 12/2 Duration: 1 year Setting: gym and home Supervision: full-1 fitness trainer in the gym Adherence: attending gym (PRT-59%, control/ROM-64%); home ex (PRT-56%, control/ROM-62%) 2. Flexibility exercise group: N=108, mean age = 68.6 years (SD = 7.5), flexibility ex, 3 times/week
Outcomes	Primary: SF-36 (at the 30 month), WOMAC Secondary: Strength measure (1RM) Comments on adverse events: yes
Notes	SF-36 was not pooled because it was not measured right after the training

Risk of bias

Bias	Authors' judgement	Support for judgement

Mikesky 2006 *(Continued)*

Allocation concealment?	Unclear risk	B - Unclear

Miller 2006

Methods	RCT Method of randomisation: computer generated sequence, stratified and block randomization Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 3 withdrawn (1 in control), 4 death (2 in PRT) Intention-to-teat analysis: yes Post-program follow up: no
Participants	Location: Australia N = 51 (25 in PRT) Sample: fall-related lower limb fracture Age: mean 84.8 years Inclusion criteria: at least 70 years old, fall-related lower limb fracture Exclusion criteria: (1) did not reside within southern Adelaide, (2) were unable to comprehend instructions relating to positioning of the upper arm for eligibility assessment, (3) were unable to fully weight bear on the side of the injury for more than seven days post admission, (4) were not independently mobile prefracture, (5) were medically unstable more than 7 days post admission, (6) were suffering from cancer, chronic renal failure, unstable angina or unstable diabetes or (7) were not classified as malnourished
Interventions	PRT versus control 1. PRT Type of Ex: 5 LL Equipment: elastic band Intensity: was appropriate to baseline strength, pain level and range of motion Frequency: Ex3 Reps/Sets: increased to 8/2 if exercise could be completed in good form Duration: 12 weeks Setting: a teaching hospital Supervision: full-pysiotherapist Adherence: > 86% 2. Control group: attention control, week 1-6: tri-weekly home visits, week 7-12: weekly home visit; discussion of general information during the visit
Outcomes	Primary: SF-12 Secondary: strength measure, gait speed Comments on adverse events: no
Notes	Reported Median & 95%CI. Data from participants who took nutrition supplementation were not extracted.

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Allocation concealment?	Unclear risk	B - Unclear

Miszko 2003

Methods	RCT with 3 groups: PRE, control, and power exercise

Miszko 2003 *(Continued)*

	Method of randomisation: stratified by sex Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 4/17 in PRT, 7/18 in power Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 28 (13 in PRT) Sample: older adults with below average leg extensor power Age: mean 72.8 years (SD = 5.4) Inclusion criteria: below-average leg extensor power Exclusion criteria: poorly controlled or unstable cardiovascular disease or diabetes, recent unhealed bone fracture (within the past 12 months), severe hypertension while resting quietly in the supine position, leg or arm amputation, excessive alcohol intake (more than three drinks per day), a classic anterior compression fracture, neuromuscular disorders, being nonambulatory, or having recent (within 6 months) involvement in a strength-training or running or jogging program.
Interventions	PRT versus control and versus power exercise 1.PRT Type of Ex: 4UL/4LL & squats Equipment: Keiser Inc. Intensity: 50% -> 70% of 1RM by week 8, 80% of 1RM the last 8 weeks Frequency: Ex3 Reps/Sets: 6-8/3 Duration: 16 weeks Setting: not reported (Gym?) Supervision: not reported Adherence: not reported 2. Control Group: maintain usual activity and attend 3 educational presentations over the study period 3. Power Ex Group: N=11, mean age = 72.3 years (SD = 6.7), the same exercise as the PRT group but did jump squats instead of squats, 6-8 repetition at 40% of 1RM, move as fast as possible
Outcomes	Primary: Continuous Scale Physical Functional Performance Secondary: strength measure (1 RM) Comments on adverse events: yes
Notes	Involved power training

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Moreland 2001

Methods	RCT Method of randomisation: concealed, phoned central office Assessor blinding: yes Participant blinding: not reported Loss to follow-up: 10 Intention-to-treat analysis: yes Post-program follow up: yes, at the 6th month
Participants	Location: Canada N = 133 (68 in PRT)

Moreland 2001 *(Continued)*

	Sample: people post-stroke Age: mean 69 years Inclusion criteria: not reported Exclusion criteria: not reported
Interventions	PRT versus control 1.PRT Type of Ex: UL, LL Equipment: not reported Intensity: not reported Frequency: not reported Reps/Sets: not reported Program Duration: until hospital discharge Setting: hospital Supervision: full Adherence: not reported 2. Control Group: regular therapy
Outcomes	Primary: Chedoke-McMaster Stroke Assessment Secondary: 2-minute walk test Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Nelson 1994

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 1 Intention-to-treat analysis: yes Post-program follow up: no, but program had 1-year duration
Participants	Location: USA N=40 Sample: healthy females post-menopause Age:mean 61.1 years (SD 3.7) Inclusion criteria: at least 5 years post-menopausal but not older than 70, do not engage in any regular physical training, weigh less than 130% of ideal body weight, currently non-smoking, do not have more than one crush fracture of the spine, no history of other osteoporotic fractures, have not taken estrogen or other medications known to affect bone for 12 months, passed physical screening (including ECG during strength training session) Exclusion criteria: not reported
Interventions	PRT versus control 1.PRT Type of Ex: 2 LL, 1 UL, 2Tr Equipment: pneumatic resistance machines (Keiser) Intensity: 80% of 1RM Frequency: Ex2

Nelson 1994 *(Continued)*

	Reps/Sets: 8/ 3 Program Duration: 52 weeks Adherence: 87.5% Setting: gym Supervision: full 2. Control Group: asked to maintain normal level of activity, could receive the exercise program at the end of the trial
Outcomes	Strength (1RM) Balance (backward walking) Physical activity (Harvard Alumini Questionnaire, kJ/week) Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Newnham 1995

Methods	RCT Method of randomisation: not reported Assessor blinding: yes Participant blinding: no, but attention control Loss to follow-up: 6 Intention-to-treat analysis: no Post-program follow up: yes, at the 24 week
Participants	Location: Canada N = 30 Sample: residents of long-term care facility Age: mean 81.7 years (SD 5.6) Inclusion criteria: age 70+, independent in ambulation (with or without walking aid) over 40m at <0.9m/s, 20+ on TUAG; at least 90 degrees of available ROM at knee, can follow a 3-step command Exclusion criteria: have Parkinsons Disease or CVA; participation in strength training in the past year; unstable medical conditions
Interventions	PRT versus control 1. PRT Type of Ex: UL, LL Equipment: pullies Intensity: 80% of 1RM Frequency: Ex3 Reps/Sets: 10/3 Program Duration: 12 weeks Setting: gym in nursing home Supervision: full Adherence: 86% 2. Control Group: attention control
Outcomes	Strength (1RM) Gait velocity TUAG Balance (Berg)

Newnham 1995 *(Continued)*

	Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Nichols 1993

Methods	RCT Method of randomisation: stratified into rank-ordered pairs and randomised Assessor blinding: no Participant blinding: no Loss to follow-up: 6 Intention-to-treat analysis: no Post-program follow up: no, but 6 month duration of program
Participants	Location: USA N = 36 Sample: active healthy women Age: mean 67.8 years (SE 1.6) Inclusion criteria: greater than 60 years, active for at least 6 months prior to the trial with exercise at least 3 times per week, physician's consent Exclusion criteria: previous weight training, history of cardiovascular disease, taking thyroid or cardiac medications, nonestrogen repleted
Interventions	PRT versus control 1. PRT Type of Ex: 4UL, 2LL, 1Tr Equipment: variable resistance machines (Polaris) Intensity: 80% 1RM Frequency: Ex3 Reps/Sets: 8-10/3 Program Duration: 24 weeks Setting: gym Adherence: 87% of sessions Supervision: full 2. Control Group: maintain current routine
Outcomes	Strength (1RM) Activity performance Blair Seven Day Recall Comments on adverse events: yes (safety a priority objective)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Ouellette 2004

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to Follow-up: 0 Intention-to-treat analysis: yes Post-program follow up: no
Participants	Location: USA N = 42 (21 in each group) Sample: single mild to moderate stroke Age: mean 65.8 years (SD = 2.5) Inclusion criteria: subjects aged at least 50 years, 6 months to 6 years following a single unilateral mild to moderate stroke with residual lower extremity hemiparesis, community dwelling, independent ambulation with or without an assistive device, report of 2 or more limitations on the physical function subscale (PF 10) of the Medical Outcomes Survey Short-Form, ability to travel to the exercise laboratory, and willingness to be randomized. Stroke was diagnosed by history and clinical examination, and confirmed via medical records review. Exclusion criteria: myocardial infarction within the past 6 months, symptomatic coronary artery disease or congestive heart failure, uncontrolled hypertension, fracture within the past 6 months, acute or terminal illness, score less than 20 on the MMSE, inability to follow a 3-step command, current participation in regular strength training or supervised physical therapy, or pain during exercise.
Interventions	PRT versus control 1. PRT Type of Ex: 4 LLs Equipment: Pneumatic resistance training equipment (Keiser Sports Health Equipment) and modified stack-pulley system (Therapy Systems) Intensity: 70% of 1RM Frequency: Ex3 Reps/Sets: 8-10/3 Duration: 12 weeks Setting: gym Supervision: full Adherence: 85.4%-PRT; 79.9%-controls 2. Control group: bilateral range of motion ex and upper body flexibility exercise
Outcomes	Primary: Late-Life Function and Disability Instrument, sickness impact profile Secondary: strength measure (1 RM), 6-minutes walk, gait speed, stair climb, chair rise Comments on adverse events: yes
Notes	SD is obtained from SE for LLFD 1

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Parkhouse 2000

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to Follow-up: not reported

Parkhouse 2000 *(Continued)*

	Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Canada N = 22 Sample: sedentary older women with low bone mineral density Age: mean 68.1 years Inclusion criteria: community-dwelling, sedentary, post-menopausal women, aged 60-80 years, low bone mineral density Exclusion criteria: medical or orthopaedic problems that would interfere with their ability to participate in physical activity, on hormone replacement
Interventions	PRT versus control 1. PRT Type of Ex: 9 LL Equipment: not reported Intensity: 75-80% of 1RM Frequency: Ex3 Reps/Sets: 8-10/3 Program Duration: 8 months Setting: gym Supervision: not reported Adherence: not reported 2. Control Group: not reported
Outcomes	Strength (1RM) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Pollock 1991

Methods	RCT with 3 groups: PRT, control, and aerobic training group Method of randomisation: rank ordered then randomly stratified into 3 groups, with the restriction that more would be assigned to training groups Assessor blinding: no Participant blinding: no Loss to Follow-up: 8 total (4 in PRT and control) Intention-to-treat analysis: no Post-program follow up: no, but 6 month exercise program
Participants	Location: USA N = 57 in total (36 in PRT and control) Sample: sedentary men and women Age: mean 72 years Inclusion criteria: free from overt evidence of coronary heart disease or any other conditions that would limit their participation in vigorous exercise; aged 70-79, sedentary for one year Exclusion criteria: blood pressure >160/100; ECG changes or cardiac symptoms during exercise testing
Interventions	PRT versus control and versus aerobic 1. PRT

Pollock 1991 *(Continued)*

	Type of Ex: 5UL, 2LL, 3 Tr Equipment: variable resistance machines (Nautilus) Intensity: initially light to moderate, by week 14 encouraged to train to fatigue Frequency: Ex3 Reps/Sets: 8-12/ 1 Program Duration: 26 weeks Setting: gym Supervision: not reported Adherence: 97.8% sessions attended (excluding drop-outs), 87% stayed with program 2. Control Group: not reported 3. Aerobic Training Group: 3 sessions per week of walk/jog program for 26 weeks, aimed for duration of 35-45min minutes at 75-85% VO2 max by week 26
Outcomes	Strength VO2 max Adverse events Reaction time Comments on adverse events: yes (a priority outcome, well- defined)
Notes	Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Pu 2001

Methods	RCT Method of randomisation: matched by age then randomised Assessor blinding: no Participant blinding: no Loss to follow-up: 2 Intention-to-treat analysis: yes Post-program follow up: no
Participants	Location: USA N = 16 Sample: older women with CHF Age: mean 77 years (SE 6) Inclusion criteria: community-dwelling women; 65 years or older; mild to moderate systolic heart failure New York Heart Association (NYHA) class I to III; resting ejection fraction less than or equal to 45%, Exclusion criteria: NYHA class IV heart failure; myocardial infarction within 6 months of randomisation, hospitalization for CHF within 2 months, change of CHF therapy within 1 MO; unstable angina pectoris, fixed ventricular rate pacemaker, abdominal aortic aneurysm >4cm, major limb amputation, symptomatic abdominal or inguinal hernias, MMSE <23, signification abnormalities on treadmill or strength testing, any unstable medical conditions
Interventions	PRT versus control 1. PRT Type of Ex: 2UL, 2LL Equipment: pneumatic resistance equipment (Keiser) Intensity: 80% of 1RM Frequency: Ex3 Reps/Sets: 8/3 Program Duration: 10 weeks

Pu 2001 *(Continued)*

	Setting: Gym Adherence: 98% Supervision: Full 2. Control Group: sham exercise group 2 time per week of supervised, low-intensity stretches for 10 weeks
Outcomes	Exercise capacity (6-minute walk) Maximal oxygen consumption Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Rall 1996

Methods	RCT: (groups of healthy young people and middle-aged people with RA not included in this review) Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 0 Intention-to-treat analysis: no drop-outs, not stated Post-program follow up: no
Participants	Location: USA N = 14 Sample: healthy elderly Age: mean 70.3 years (SD 5) Inclusion criteria: healthy older people (ages 65-80) Exclusion criteria: obese (BMI>30), diabetes, cancer, renal disease, liver disease, cardiac artery disease, endocrine disorder, autoimmune disease
Interventions	PRT versus control 1. PRT Type of Ex: 1UL, 2LL, 2 Tr Equipment: pneumatic resistance machines (Keiser) Intensity: 80% of 1 RM Frequency: Ex2 Reps/Sets: 8/ 3 Program Duration: 12 weeks Setting: gym Supervision: full Adherence: 92% 2. Control Group: 15 minutes of water exercises
Outcomes	Strength (1RM) Aerobic capacity - VO2 max Comments on adverse events: yes
Notes	

Risk of bias

Rall 1996 *(Continued)*

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Reeves 2004

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 0 Intention-to-treat analysis: not reported Post-program follow up: no
Participants	Location: UK N = 18 (9 in each group) Sample: physically active volunteers Age: mean 74.3 years (SD = 3.5) Inclusion criteria: no neurological or musculoskeletal disorder that might prevent participation Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex: 2UL/2LL Equipment: Technogym machines Intensity: 80% of 5 RM Frequency: Ex3 Reps/Sets: 10/2 Duration: 14 weeks Setting: not reported Supervision: full Adherence: 93% 2. Control Group: to keep normal activity level
Outcomes	Muscle strength Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Rhodes 2000

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 6 Intention-to-treat analysis: no Post-program follow up: no, but exercise program 1 year duration

Rhodes 2000 *(Continued)*

Participants	Location: Canada N = 44 Sample: healthy, community-dwelling sedentary women Age: mean 68.8 years Inclusion criteria: aged 65-75, not actively engaged in an organised activity program, had independent community dwelling status, passed medical screening by doctor Exclusion criteria: recent hospital stay, blind, severe hearing impairment, uncontrolled hypertension and diabetes, symptomatic cardiorespiratory disease, severe renal or hepatic disease, uncontrolled epilepsy, progressive neurological disease, chronic disabling arthritis, MMSE<25/30, anaemia, marked obesity with the inability to exercise, regular exercise at the time of screening more than 3 times 30 minutes per week, current use of Beta-blockers, oral anti-coagulants or central nervous system stimulants
Interventions	PRT versus control 1. PRT Type of Ex: 3UL, 3LL Equipment: weight-lifting equipment (Universal Gym) Intensity: 75% 1RM Frequency: Ex3 Reps/Sets: 8/3 Program duration: 1 year Setting: first 3 months in supervised gym, last 9 months at a recreation facility close to participants' home Supervision: supervised for first 3 months, last 9 months had occasional visits from study staff Adherence: 86% (attendance) 2. Control Group: asked to maintain normal lifestyle, could participate in exercises at the end of the trial
Outcomes	Muscle strength (1RM, hand grip) Flexibility (trunk flexion test) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Schilke 1996

Methods	RCT Method of randomisation: table of random numbers used Assessor blinding: no Participant blinding: no Loss to follow-up: no Intention-to-treat analysis: No dropouts, not stated ITT Post-program follow up: no
Participants	Location: USA N = 20 Sample: man and women with knee OA Age: mean 64.5 years in PRT group Inclusion criteria: from rheumatology clinic, no condition to preclude increased activity/strength training, not currently involved in a scheduled program of regular of exercise and had not participated in a strength-training program in the last 6 months

Schilke 1996 *(Continued)*

	Exclusion criteria: not reported
Interventions	PRT versus control 1.PRT Type of Ex:1LL Equipment: isokinetic dynamometer (Cybex II) Intensity: high - maximal contractions Frequency: Ex3 Reps/Sets: 5/ 6 by session 6 (the end of week 2) Program duration: 8 weeks Setting: gym Supervision: full Adherence: not reported 2. Control Group: usual activities
Outcomes	Strength (isokinetic dynamometer) Timed walk Range of motion Health status (Arthritis Impact Measurement Scales; higher score = poor health status) Osteoarthritis Screening Index (OASI; modified from Rheumatoid Arthritis Disease Activity Index; higher score = worse health) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Schlicht 1999

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 2 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N=24 Sample: moderately active, community-dwelling men and women Age: mean 72 years (SD 6.3) Inclusion criteria: 60 years and older, community-dwelling, physician consent to participate Exclusion criteria: dependent living status, current involvement in a strength training program, physiological disorders that precluded strenuous exercise or affected vestibular function
Interventions	PRT versus control 1. PRT Type of Ex: 6LL Equipment: resistance training machines (Universal, Cybex and Paramount equipment) Intensity: 75% of 1RM Frequency: Ex3 Reps/Sets: 10/2 Program Duration: 8 weeks

Schlicht 1999 *(Continued)*

	Setting: gym Supervision: not reported Adherence: 99% (excluding drop outs) 2. Control Group: not reported
Outcomes	Muscle strength (1 RM) Maximum walking speed 5-rep sit-to-stand Balance (1-leg stance with eyes shut) Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Segal 2003

Methods	RCT Method of randomisation: using a table of random numbers, which was stratified by study centers and intent of treatment (curative or palliative) Assessor blinding: yes Participant blinding: no Loss to follow-up: 8/82 in the PRT group; 12/73 in the control group Intention-to-treat analysis: yes Post-program follow up: no
Participants	Location: Canada N = 155 (82 in PRT) Sample: men with prostate cancer Age: mean 68.2 years (SD = 7.9) Inclusion criteria: had prostate cancer, would received androgen deprivation therapy for at least 3 months after recruitment, and the treating oncologist provided consent Exclusion criteria: severe cardiac disease, uncontrolled hypertension, pain, unstable bone lesions, and residence more than 1 hr from the study center
Interventions	PRT versus control 1. PRT Type of Ex: 6UL/3LL Equipment: not reported Intensity: 60-70% of 1 RM, increased 5 lb after 12 successful repetitions Frequency: Ex3 Reps/Sets: 8-12/2 Duration: 12 weeks Setting: fitness center Supervision: full Adherence: 79% 2. Control Group: on a waiting list, offered the identical exercise advice and guideline as the exercise group after the study period
Outcomes	Primary: Health-related quality of life Secondary: Muscle fatigue (Number of repetition) Comments of adverse events: no

Segal 2003 *(Continued)*

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Selig 2004

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 3/19 in the PRT group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Australia N = 33 (14 in PRT) Sample: with chronic heart failure Age: mean 65 years (SD = 13) Inclusion criteria: left ventricular systolic failure except aortic stenosis, left ventricular ejection fraction below 40%, and stable pharmacologic therapy Exclusion criteria: New York Heart Association Class I or IV, mayocardiact infarction in the previous 6 months, cardiac arrest, symptomatic, sustained ventricular tachycardia, current angina, conditions that constraindicate exercise, did not pass baseline assessment
Interventions	PRT versus control 1. PRT Type of Ex : 5 UL/4 LL Equipment: multistation hydraulic resistance training system Intensity: by increasing resistance or the number of sets Frequency: Ex3 Reps/Sets: not reported Duration: 12 weeks Setting: hospital rehabilitation gym Supervision: not reported Adherence: not reported 2. Control Group: usual care
Outcomes	Muscle strength VO2 max Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Seynnes 2004

Methods	RCT with 3 groups: high intensity, low intensity, and control Method of randomisation: not reported Assessor blinding: no Participant blinding: yes Loss to follow-up: 5/27 drop out Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: France N = 8-HI; N = 6-LI; N = 8-control Sample: institutionalized elders Age: HI-mean 83.3 years (SD = 2.8); LI-mean 80.7 years (SD = 2.3) Inclusion criteria: at least 70 years of age, ambulatory, and understand simple instructions Exclusion criteria: (a) cognitive impairment precluding understanding of the written informed consent; (b) practice of regular exercise outside of the research activities; (c) unstable cardiovascular disease, hypertension, diabetes, or any other unstable medical condition; (d) amputations; (e) hernias; (f) symptomatic known unrepaired aortic aneurysm; (g) recent (within 6 months) hospitalization for myocardial infarction, stroke, fracture, eye surgery, or laser treatment; (h) skin disease precluding placement of ankle weights; (i) musculoskeletal deformity; (j) neuromuscular disease; and (k) symptomatic rheumatoid or osteoarthritis precluding planned exercises.
Interventions	PRT (high intensity and low intensity) versus control 1. PRT Type of Ex: 1LL Equipment: ankle cuff Intensity: HI-80% of 1RM; LI-40% of 1RM Frequency: Ex3 Reps/Sets: 8/3 Duration: 10 weeks Setting: not reported-gym? Supervision: full Adherence: 99% 2. Control Group: wearing empty ankle cuff and did the same exercise as the Ex group but without weights
Outcomes	Primary: self-reported disability Secondary: muscle strength (1RM), muscle endurance, 6-minute walking, chair rising, stair climbing Comments on adverse events: yes
Notes	SD was calculated from SEM Date from high intensity PRT and low intensity PRT were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Simoneau 2006

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: not reported Intention-to-treat analysis: no

Simoneau 2006 *(Continued)*

	Post-program follow up: no
Participants	Location: France N = 20 (11 in PRT) Sample: healthy and community dwelling people Age: mean 78.1 years (SD = 3.1) Inclusion criteria: no muscular, neurological, cardiovascular, metabolic, and inflammatory disease' moderately active individuals Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex : 1 LL-ankle joint Equipment: elastic bands-home Intensity: increased progressively from 50% - 55% of 3RM to 70% of 3 RM Frequency: Ex3 (2 supervised and 1 at home) Reps/Sets: 8/3 Duration: 24 weeks Setting: gym and home Supervision: 2 sessions were supervised Adherence: not reported 2. Control Group: maintain usual activities
Outcomes	Muscle strength (Torques) Comments on adverse events: no
Notes	Training at ankle joints

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Simons 2006

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 2/21 in the PRT group; 1/21 in the control group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 42 (21 in each group) Sample: older adults from independent living facility Age: mean 84.6 years (SD = 4.5) Inclusion criteria: had clearance by the primary physician, lack of regular exercise more than 1 year, and at least 65 years of age Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex: 3UL/3LL Equipment: Keiser machines Intensity: 75% of 1 RM, increased the load of 5%

Simons 2006 *(Continued)*

	Frequency: Ex2 Reps/Sets: 10/1 Duration: 16 weeks Setting: fitness center Supervision: full, by trained instructors Adherence: not reported 2. Control Group: controls and Ex group all had 6 one-hour health lectures at 3-week intervals
Outcomes	Muscle strength (1RM) Flexibility Balance and agibility Eye-hand coordination Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Simpson 1992

Methods	RCT Method of randomisation: stratified (don't know how) and randomly assigned Participant blinding: no Assessor blinding: no Loss to follow-up: 6 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Canada N = 34 Sample: people with chronic airflow obstruction Age: mean 73 years (SD 4.8) in PRT group Inclusion criteria: aged 58-80, attending a respiratory outpatient clinic, in a clinically stable state, no recent infective exacerbation, drug management was considered to be optimal, FE to VC ratio of less than 0.7, body weight within 30% of ideal weight, absence of disorders likely to affect exercise, capacity to take part in the training program, Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex: 1UL, 2LL Equipment: weight-lifting machines Intensity: 50-85% of 1RM Frequency: Ex3 Reps/Sets: 10/3 Program Duration: 8 weeks Setting: gym Supervision: not reported Adherence: 90% 2. Control Group: only attended testing sessions
Outcomes	Strength (1RM) Spirometry

Simpson 1992 *(Continued)*

	Aerobic capacity (VO2 max) 6-minute walk test Likert scale rating of discomfort during four daily activities (1= extreme disability, 7=none) assessed for fatigue, dyspnoea, emotion and mastery Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Sims 2006

Methods	RCT Method of randomisation: by an independent person with a previously block randomised list Assessor blinding: yes Participant blinding: no Loss to follow-up: 6 Intention-to-treat analysis: yes Post-program follow up: yes, at the 6th month
Participants	Location: Australia N = 32 (14 in PRT) Sample: older adults with depression symptoms Age: mean 74.28 years(SD = 5.87) Inclusion criteria: at least 65 years old; GDS score > 11 Exclusion criteria: unsuitable to exercise according to the score of the Physical Activity Readiness Questionnaire. Alcohol or drug related depression; depression with psychotic features; schizophrenia; bipolar disorder; other psychiatric diagnoses; suicidal ideation; dementia; terminally ill; uncontrolled hypertension, unstable insulin dependent diabetes, and unstable angina. They excluded those currently receiving antidepressants in order to determine the independent impact of PRT.
Interventions	PRT versus control 1. PRT Type of Ex: major UL and LL muscles Equipment: weights Intensity: 80% of 1RM & Borg's perceived exertion scale Frequency: Ex3 Reps/Sets: 8-10/3 Duration: 10 weeks Setting: gym Supervision: full Adherence: 5 attended 2-15 sessions, 7 attended 18-30 sessions 58% meet the adherence criterion of 60% of sessions completed 2. Control group: received ex information (Ex group received it too)
Outcomes	Human Activity Profile WHO-QOL PASE-functional health status PGMS-well being Comments on adverse events: no
Notes	

Sims 2006 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Singh 1997

Methods	RCT Method of randomisation: computer-generated list in blocks of five Assessor blinding: all outcomes except strength Participant blinding: no, but attention control group Loss to follow-up: 0 Intention-to-treat analysis: no drop-outs but not stated Post-program follow up: no
Participants	Location: USA N = 32 Sample: community-dwelling depressed older people Age: mean 70 years (SD 1.5) in PRT group Inclusion criteria: age 60 and over, fulfil DSM-IV diagnostic criteria for either unipolar major or minor depression or dysthymia. Exclusion criteria: dementia, MM SE<23, unstable diseases, bipolar disorder, active psychosis, suicidal plans, currently seeing a psychiatrist, on antidepressant drugs within the last 3 months, participating in any progressive resistance training or in aerobic exercise more than twice a week in the previous month
Interventions	PRT versus control 1. PRT Type of Ex: 2UL, 3LL Equipment: exercise machines (Keiser) Intensity: 80% of 1RM Frequency: Ex3 Reps/Sets: 8/3 Program Duration: 10 weeks Setting: gym Supervision: full Adherence: median 93% 2. Control Group: health education program, 2 times per week for 1 hour
Outcomes	Sickness Impact Profile Katz ADL scale Lawton Brody IADL scale SF-36 Strength (1RM) Adverse events (chest pain, musculoskeletal pain, medication change, intercurrent illness, hospitalisation, visits to a health professional, worsening of suicidality Comments on adverse events: yes (a priority outcome)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Singh 2005

Methods	RCT with 3 groups: high intensity, low intensity, and control Method of randomisation: by a computer generated random number program in blocks of 15 Assessor blinding: yes Participant blinding: yes Loss to follow-up: 2/20 in the high intensity group; 3/20 in the low intensity group; 1/20 in the control group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Australia N = 20 in each group Sample: major or minor depression Age: HI-mean 69 years (SD=5); LI- mean 70 years (SD = 7) Inclusion criteria: aged 60 years; major depression, minor depression, or dysthymia; and had a GDS score at least 14. Exclusion criteria: if demented clinically according to DSM-IV criteria or if their MMSE score was less than 23, if they were suffering from unstable medical disease which would preclude resistance training, had bipolar disorder or active psychosis, or were determined by the study physician to be actively suicidal. They were also excluded if they were currently seeing a psychiatrist, prescribed antidepressant drugs within the last 3 months, or were currently participating in any exercise training more than twice a week.
Interventions	PRT (high intensity versus low intensity) versus control 1. PRT Type of Ex: 3UL/3LL Equipment: Keiser Sports Health Equipment intensity: high intensity group- 80% of 1RM; low intensity group- 20% of 1 RM Frequency: Ex3 Reps/Sets: 8/3 Duration: 8 weeks Setting: outpatient gym in a hospital Supervision: full Adherence: high intensity group: 95-100%; low intensity group: 99-100% 2. Control Group: usual care
Outcomes	Primary: SF-36 Secondary: muscle strength (1RM) Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Sipila 1996

Methods	RCT with 3 groups: PRT, control and aerobic training group Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 4 in PRT/controls (8 total) Intention-to-treat analysis: no

Sipila 1996 *(Continued)*

	Post-program follow up: no
Participants	Location: Finland N = 42 total (27 in PRT and control) Sample: healthy older women Age: 76-78 years Inclusion criteria: born between 1915-17 (aged 76-78), no severe diseases or functional impairments, no indications against intensive physical exercise (medical exam and exercise test screening) Exclusion criteria: not reported
Interventions	PRT versus control and versus endurance (aerobic) 1. PRT Type of Ex: 4LL Equipment: variable resistance machines (HUR equipment) Intensity: 60-75% of 1RM Frequency: Ex3 Reps/Sets: 8-10/3-4 Program duration: 18 weeks Setting: gym Supervision: full Adherence: 71-86% (varied depending upon muscle group/exercise type) 2. Control Group: instructed to continue daily routines and not change their physical activity levels 3. Endurance exercise group: 18 weeks of track walking (2 times per week) and step aerobics (once per week) at 50%-80% of initial maximum heart rate reserve
Outcomes	Strength Walking speed Comments on adverse events: no
Notes	Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Skelton 1995

Methods	RCT Method of randomisation: a random numbers table Assessor blinding: no Participant blinding: no Loss to follow-up: 7 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: UK N = 47 Sample:healthy, independent women Age: median 79.5 years (range 76-93) in PRT group Inclusion criteria: healthy; medically stable; no recent history of cardiovascular, cerebrovascular, respiratory, systemic or muscular disease; any impairment that interfered with mobility, live independently, require not help with ADL's Exclusion criteria: not reported
Interventions	PRT versus control

Skelton 1995 *(Continued)*

	1. PRT Type of Ex: 3UL, 6LL Equipment: rice bags and elastic tubing Intensity: resistance increased as soon as participant could complete 3 sets of 8 reps Frequency: Ex3 Reps/Sets: 4-8/ 3 Program duration: 12 weeks Setting: group exercise class 1 day per week, home 2 days Supervision: not reported Adherence: no one attended fewer than 6 classes or 11 home sessions 2. Control Group: asked not to change their activities
Outcomes	Human Activity Profile Anthropometry Strength (isometric strength and handgrip): such as extensor power Functional reach Chair rise Timed walk Stair walking Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Skelton 1996

Methods	RCT Method of randomisation: matched by age then randomised Assessor blinding: no Participant blinding: no Loss to follow-up: 2 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: UK N = 20 Sample: women with functional limitations Age: median 81 years Inclusion criteria: age:75+, from GP practice, have minor or major functional/mobility laminations Exclusion criteria: any disease / condition adversely affected by exercise
Interventions	PRT versus control 1. PRT Type of Ex: 2UL, 6LL Equipment: theraband, cuff-weights Intensity: resistance increased as soon as participant could complete 3 sets of 8 reps Frequency: Ex3 Reps/Sets: 4-8/3 Program Duration: 8 weeks Setting: 1 class per week, 2 home sessions per week Supervision: class supervised, home exercises unsupervised Adherence: no subject performed fewer than 30 complete sessions

Skelton 1996 *(Continued)*

	2. Control Group: asked not to change activities
Outcomes	Human Activity Profile Strength (isometric strength and handgrip) 1-legged balance Chair rise Timed walk Timed up-and-go Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Sousa 2005

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 0 Intention-to-treat analysis: NA Post-program follow up: no
Participants	Location: Portugal N = 20 (10 in each group) Sample: healthy men Age: mean 73 years (SD = 6) Inclusion criteria: family physician's approval Exclusion criteria: taking medications that could affect balance, smokers, history of falls, and orthopedic, neurological, cardiac, or pulmonary problems
Interventions	PRT versus control 1. PRT Type of Ex: 4UL/3LL Equipment: Image Sport Machines Intensity: increased progressively from 50% to 80% of 1RM over the program Frequency: Ex3 Reps/Sets: first 8 weeks: 8-12/2-3; then 6-10/2-3 Duration: 14 weeks Setting: not reported-gym? Supervision: not reported Adherence: 95% 2. Control Group: not reported
Outcomes	Primary: self-reported disability Secondary: Muscle strength (1 RM), TUAG, functional reach test Comment on adverse events: no
Notes	

Risk of bias

Sousa 2005 *(Continued)*

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Suetta 2004

Methods	RCT Method of randomisation: by a computer program Assessor blinding: On measuring muscle cross-sectional area Participant blinding: not reported Loss to follow-up: 2/13-PRT group, 3/12-Control Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Denmark N = 25 (13 in PRT) Sample: unilateral hip replacement due to OA Age: Mean 71 years Inclusion criteria: age at least of 60 years, and unilateral primary hip replacement due to OA Exclusion criteria: cardiopulmonary, neurological, or cognitive problems
Interventions	PRT versus control 1. PRT Type of Ex: 2 LL and standard care Equipment: sandbags strapped to the ankle of the operated leg during hospitalization, after day 7, Technogym International machines Intensity: week 0-6, 20 to 12 RM; the last 6 weeks, 8 RM Frequency: daily during hospitalization, Ex3 after day 7 Reps/Sets: week 0-6, 10/ 3-5; the last 6 weeks, 8/3-5 Duration: 12 weeks Setting: not reported Supervision: physical therapist Adherence: not reported 2. Control Group: home-based standard care
Outcomes	Muscle strength Gait speed Stair climbing Sit-to-stand Comments on adverse events: yes
Notes	SD was calculated from SE

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Sullivan 2005

Methods	RCT Method of randomisation: done by a biostatistician Assessor blinding: yes

Sullivan 2005 *(Continued)*

	Participant blinding: yes for the testosterone Loss to follow-up: 2/17 in low resistance group with placebo, 4/17 in high resistance group with placebo Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 17-HI; N = 17-LI Sample: recent functional decline Age: mean 78.2 years (SD = 6.4) Inclusion criteria: recent functional decline, at least 65 years old, serum total testosterone less than 480 ngd/L, and can give informed consent Exclusion criteria: near terminal medical disorder, unresolved malignancy, prostate specific antigen > 10 ngm/L, possibility of prostate cancer, history of prostate cancer, disabling arthritis, neurological diseases or unstable cardiovascular disease
Interventions	PRT (High intensity versus low intensity) Type of Ex: 2 LL Equipment: Keiser Sport Health Equipment Intensity: low intensity: 20% 1RM; high intensity: 80% of 1 RM Frequency: Ex3 Reps/Sets: 8/3 Duration: 12 weeks Setting: not reported Supervision: not reported Adherence: 99%
Outcomes	Muscle strength Sit-to-stand Gait speed Stair climb Comments on adverse events: yes
Notes	Reported absolute change. High-intensity leg exercise led to greater leg strength, No significance in aggregate physical performance score change between any intervention groups. Final score = baseline + change score. Final SD = baseline SD Date from high intensity PRT and low intensity PRT were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Symons 2005

Methods	RCT Method of randomisation: random selection with continuing replacement method Assessor blinding: no Participant blinding: not reported Loss to follow-up: 5/14 in isokinetic eccentric group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Canada N = 10-isokinetic concentric; N = 14-isokinetic eccentric Sample: healthy adults

Symons 2005 *(Continued)*

	Age: mean 72 years Inclusion criteria: free of any debilitating cardiovascular, lower limb musculoskeletal or neuromuscular limitations; had not participated in resistance training for a period of at least 6 months Exclusion criteria: not reported
Interventions	PRT (isokinet concentric versus excentric) Type of Ex: voluntary contractions of the knee extensors using the specific contraction type of the training group Equipment: Biodex dynamometer Intensity: 10 RM Frequency: Ex3 Reps/Sets: 10/3 Duration: 12 weeks Setting: not reported (Gym?) Supervision: not reported Adherence: 90%
Outcomes	Muscle strength Stair climb Gait speed Comments on adverse events: yes
Notes	Eccentric versus concentric

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Taaffe 1996

Methods	RCT with 3 groups: high intensity training, low intensity and control (high-intensity only used for main comparisons) Method of randomisation: not reported Participant blinding: no Assessor blinding: no Loss to follow-up: 11 total (5 from HI PRT and control) Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 36 total (23 in control and main PRT group) Sample: healthy older women Age: mean 67 years (SE 0.2) in HI-PRT group Inclusion criteria: female, did not participate in a strength-training program; not taking HRT or on HRT for more than one year Exclusion criteria: evidence of acute or uncontrolled chronic illness or condition that would prevent participation in a resistance training program; presence of vertebral compression fracture; evidence of any disorder that would affect bone metabolism
Interventions	PRT (high intensity and low intensity) versus control 1. PRT Type of Ex: 3LL Equipment: weight machines (Universal Gym, and Marcy equipment) Intensity: HI-80% of 1RM; LI-40% of 1RM Frequency: Ex3

Taaffe 1996 *(Continued)*

	Reps/Sets: HI= first set at 40% 1RM for 14 reps, last 2 had 7 reps; LI=14/3 Program Duration: 52 weeks Setting: gym Supervision: full Adherence: 79% 2. Control Group: maintain customary dietary and activity patterns
Outcomes	Strength (1RM), Habitual activity (4 day activity records) Comments on adverse events: no
Notes	Date from high intensity PRT and low intensity PRT were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Taaffe 1999

Methods	RCT with 4 groups, PRT once per week, twice per week, 3 times per week and control (main analyses with 3 times per week and control) Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 7 total (2 in control and Ex3) Intention-to-treat analysis: no Post-program follow up: no, but 24 weeks duration
Participants	Location: USA N = 46 total (25 in Ex3 and control) Sample: community-dwelling, healthy men and women Age: mean 71.0 years (SD 4.1) in Ex3 group Inclusion criteria: aged 65-79 years, apparently healthy, BMI<30, no musculoskeletal disorder that could inhibit them from exercising, no weight training in previous 12 months, passed medical screening (including maximum exercise stress test)
Interventions	PRT (at different frequencies) versus control 1. PRT Type of Ex: 6UL, 6LL Equipment: Universal Gym, Marcy and Nautilus equipment Intensity: 80% 1RM Frequency: Ex1, Ex2, Ex3 Reps/Sets: 8/3 Program Duration: 24 weeks Setting: gym Supervision: full Adherence: 97-99% 2. Control Group: maintain customary dietary and activity patterns
Outcomes	Strength (1RM) Timed backward tandem walk Chair rise Comments on adverse events: no

Taaffe 1999 *(Continued)*

Notes	Data from 3 times per week and one time per week group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Topp 1993

Methods	RCT (note: results extrapolated from graph) Method of randomisation: not reported Assessor blinding: no Participant blinding: no but attention control group Loss to follow-up: 7 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 63 Sample: community-dwelling men and women Age: mean 69.2 years (SE 0.8) in the PRT group Inclusion criteria: community-dwelling, 65+, Exclusion criteria: cardiopulmonary/ cardiovascular disease, intolerance to exercise, functional disabilities that would contraindicate strength training, unable to commit to a 12-week program, currently involved in strength training more than 1 hour per week
Interventions	PRT versus control 1. PRT Type of Ex: 6UL, 6LL Equipment: surgical tubing Intensity: low-moderate - increased tubing thickness when they could perform 12 reps of an exercise Frequency: Ex3 Reps/Sets: upper body 10/ 2; lower body 10/ 3 Program Duration: 12 weeks Setting: exercise class for at least one session per week, home for other session(s) Supervision: full in exercise class, low at home Adherence: 90% 2. Control Group: attended two 3-hour driver education classes, continue usual activities, could have 4 weeks of exercise at the end of the trial
Outcomes	Gait speed Balance (modified Romberg protocol) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Topp 1996

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no, but attention control group Loss to follow-up: 19 Intention-to-treat analysis: no - excluded people who completed <70% of prescribed sessions Post-program follow up: no
Participants	Location: USA N = 61 Sample: community-dwelling, sedentary Age: mean 70.8 years (SE 1.03) in exercise group Inclusion criteria: community dwelling older adults Exclusion criteria: any contraindications to participating in regular exercise including a history of coronary artery disease, more than one major coronary risk factor or major symptoms or signs of cardiopulmonary or metabolic disease evident during a medically supervised history and physical; already participating in a program of regular resistance training, unable to make a 14-week commitment to the project
Interventions	PRT versus control 1. PRT Type of Ex: 11 exercises (UL, LL, Tr) Equipment: theraband Intensity: low-moderate - used theraband of a thickness sufficient to produce moderate fatigue during the final 2 reps of an exercise Frequency: Ex3 Reps/Sets: by end of study, 2/10 for UL, 3/10 for LL Program duration:14 weeks Setting: exercise class at least once per week, home for other session(s) Supervision: full for exercise class, none for home Adherence: 93% (excluding drop-outs) 2. Control Group: two 3-hour supervised driver-education classes
Outcomes	Strength Postural control (measured using a force plate) Gait speed Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Topp 2002

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 0 Intention-to-treat analysis: N/A Post-program follow up: no
Participants	Location: USA

Topp 2002 *(Continued)*

	N = 35 Sample: adults with knee OA Age: mean = 65.57 years (SD = 1.82) estimated Inclusion criteria: knee pain due to OA (based on WOMAC); physician validated the knee pain and the diagnosis of OA Exclusion criteria: had any contraindications for exercise, including a history of uncontrolled angina, cardiomyopathy severe enough to compromise cardiac functioning, electrolyte or metabolic disturbances, disabilities that prohibited resistance training of the lower extremities, or if they were currently taking nitrates, digitalis, or phenothiazine. Individuals were also excluded if they were currently participating in an organized exercise program or exercised more than 1 hour per week.
Interventions	PRT versus control 1. PRT Type of Ex: 6 LL for 30 minutes Equipment: Thera-Band elastic bands Intensity: self exertion of mild fatigue after 8RM Frequency: Ex3 (2 at home 1 at gym) Reps/Sets: increasing reps and sets every week and then reached 12 reps/3sets at week 9 to 16 Duration: 16 weeks Setting: home and gym Supervision: provided in the gym Adherence: each participant had exercise log, but results were not reported 2. Control Group: no intervention
Outcomes	WOMAC Knee pain Stair climbing Down and up off the floor Comments on adverse events: no
Notes	Calculated SDs from reported SEMs

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Topp 2005

Methods	RCT with 3 groups: PRT, control, and aerobic groups Method of randomisation: two-coin-flip methodology Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: yes, but the number was not reported Intention-to-treat analysis: not reported Post-program follow up: no
Participants	Location: USA N = 66 (31 in each group) Sample: older adults with limited functional ability, community dwelling Age: mean 74.1 years (SD = 6.2) Inclusion criteria: score lower then 24 in physical function domain of SF-36 Exclusion criteria: could not climb 26 stairs in 126 seconds; had contraindications to exercise
Interventions	PRT versus control and versus aerobic 1. PRT

Topp 2005 *(Continued)*

	Type of Ex: 12 exercises Equipment: Thera-Band elastic bands Intensity: self exertion of mild fatigue after 8RM Frequency: Ex3 (2 at home 1 at gym) Reps/Sets: started with 10/1-2, mild fatigue; then increased to 10/3 moderate fatigue at week 8 to week 16 Duration: 16 weeks Setting: home and gym Supervision: provided in the gym Adherence: each participant had exercise log, but results were not reported Participants in the final analysis had 70% compliance rate. 2. Control Group: no intervention, maintain usual activities 3. Aerobic walking group: N=33, 3 times/week; between 50% METs to 75% METs; endurance increased from 10 minutes to 35 minutes
Outcomes	Arm curls (repetitions) Chair rise (repetitions) Stair ascend/descend Down and up off the floor Comments on adverse events: no
Notes	Numerical results of SDs were not reported. Data were not pooled.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Tracy 2004

Methods	RCT Method of randomisation: not reported Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 0 (?) Intention-to-treat analysis: N/A Post-program follow up: no
Participants	Location: USA N = 20 (11 in PRT) Sample: healthy older adults Age: mean 73.1 years (SD = 4.9) Inclusion criteria: no neurological disease, free of medications known to affect the outcome measures; less than 3 hours a week of low to moderate intensity endurance exercise Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex : knee extension, each leg trained separately Equipment: weight-stack machine (Icarian) Intensity: 80% of 1RM Frequency: Ex3 Reps/Sets: 10/3 Duration: 16 weeks Setting: lab Supervision: full

Tracy 2004 *(Continued)*

	Adherence: not reported 2. Control Group: no training involved
Outcomes	Primary: physical function tests (including gait speed, chair rise, stair ascent/descent) Secondary: muscle strength (1RM) Comments on adverse events: no
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Tsutsumi 1997

Methods	RCT with 3 groups: High-intensity PRT, low-intensity PRT, and control Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 1 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 42 total (28 in HI and control) Sample: sedentary, healthy Age: mean 68.9 years (SD 5.7 years) Inclusion criteria: aged 60+, medically healthy, sedentary (no involvement in regular exercise for the previous 6 months) Exclusion criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex: 7UL/2LL, 2Tr Equipment: dynamic variable resistance weight machines Intensity: HI-75-85% 1RM; LI-55-65% 1RM Frequency: Ex3 Reps/Sets: HI 8-12/2; LI 12-16/2 Program duration: 12 weeks Setting: gym Supervision: full Adherence: not reported 2. Control Group: not reported
Outcomes	Strength (1RM) Aerobic capacity (VO2 max; bicycle ergometer testing) SF-36 Physical self-efficacy Comments on adverse events: no
Notes	Date from high intensity PRT and low intensity PRT were compared

Risk of bias

Tsutsumi 1997 *(Continued)*

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Tyni-Lenne 2001

Methods	RCT Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 0 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Sweden N = 24 Sample: people with moderate to severe CHF Age: mean 63 years (SD 9) in PRT group Inclusion criteria: diagnosed with CHF; medically stable CHF in New York Heart Association Class II or III Exclusion criteria: angina pectoris, valvular heart disease determined by Doppler, co-morbidity such as intermittent claudication, diabetes mellitus, chronic obstructive pulmonary disease or any other disorder limiting physical performance other than heart failure
Interventions	PRT versus control 1. PRT Type of Ex: many UL and LL exercises Equipment: theraband Intensity: low-moderate, used Borg rating scale and increased resistance when people rated peripheral resistance <13 Frequency: Ex3 Reps/Sets: 25/2 Program Duration: 8 weeks Setting: group activity Supervision: full Adherence: 95% 2. Control Group: not reported
Outcomes	Aerobic capacity (Peak VO2 and 6 minute walk test) Quality of life (Minnesota Living with Heart Failure Index) Comments on adverse events: yes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Vincent 2002

Methods	RCT with 3 groups: High-intensity PRT, low-intensity PRT and control Method of randomisation: stratified by strength, randomised using a random numbers table

Vincent 2002 *(Continued)*

	Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 22 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 38 (in HI group and control); N=36-LL Sample: healthy men and women Age: mean 67 years (SD 7) Inclusion criteria: free from cardiovascular or orthopedic problems that would limit exercise (assessment included physical exam), had not participated in resistance exercise for at least one year Excludion Criteria: not reported
Interventions	PRT versus control 1. PRT Type of Ex: 5UL/ 6LL Equipment: resistance machines (MedX) Intensity: high intensity: (80% of 1RM); low Intensity: (50% of 1RM) Frequency: Ex3 Reps/Sets: high Intensity: 8/1; low Intensity: 13/1 Program Duration: 6 months Setting: gym Supervision: full Adherence: excluded those who completed less than 85% of sessions 2. Control Group: instructed not to make any changes in their lifestyle during the study
Outcomes	Strength (1RM) Peak VO2 (update) Stair climb (update) Comments on adverse events: yes
Notes	Added results from more recent publications Date from high intensity PRT and low intensity PRT were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B- Unclear

Westhoff 2000

Methods	RCT Method of randomisation: not reported Assessor blinding: yes Participant blinding: no Loss to follow-up: 5 Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: The Netherlands N = 26 Sample: low knee-extensor muscle strength Age: mean 75.9 years (SD 6.8) in the exercise group Inclusion criteria: local residents 65 years and over

Westhoff 2000 *(Continued)*

	Exclusion criteria: maximum knee extensor torque for both legs >87.5 Nm, self-reported disease or condition such as uncontrolled heart failure or a neurological disease that would be adversely affected by the exercises in the program
Interventions	PRT versus control and versus aerobic 1. PRT Type of Ex: 5UL, 3LL Equipment: resistance training machines Intensity: 75% of 5RM at first, progressed to 8-12RM Frequency: Ex3 Reps/Sets 8-12/1-2 Program Duration: 12 weeks Setting: gym Supervision: not reported Adherence: excluded those who did not have 80% or more attendance 2. Control Group: asked not to make significant changes in their physical activity and nutrition habits over a 12-week period 3. Aerobic Training: trained on treadmills and cycle ergometers 3 times per week at 60-70% estimated HR reserve, for 21- 45 minutes per session
Outcomes	Strength (maximum torque measured by the Quadriso-tester) Gronigen Activity Restriction Scale, an ADL/IADL Index with scores from 18 (no limitations) to 72 (fully dependent) Timed walking test Timed up-and-go Balance (FICSIT balance test, graded from 1-6) Comments on adverse events: yes (asked about complaints during exercise)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Wieser 2007

Methods	RCT Method of randomisation: used www.randomization.com Assessor blinding: not reported Participant blinding: not reported Loss to follow-up: 0 in PRT group, 4/14 in the control group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: Austria N = 28 (14 in each group) Sample: healthy older adults Age: mean 76.2 years (SD = 3.2) Inclusion criteria: older than 70 years, healthy cardio-pulmonary system, untrained Exclusion criteria: participated in a resistance training program; or cardiac arrhythmia, recent myocardial infarct, stroke, cancer, or an ill-treated hypertonia
Interventions	PRT versus control 1. PRT Type of Ex: 4UL/1LL

Wieser 2007 *(Continued)*

	Equipment: machines Intensity: increase weight after 10th repetitions Frequency: Ex2 Reps/sets week 1-4: 8/1 week 5-8: 8/3; week 9-12: 8/4 Duration: 12 weeks Setting: not reported Supervision: not reported Adherence: not reported, provided make-up sessions 2. Control Group: not reported
Outcomes	VO2max Muscle strength Comments on adverse events: no
Notes	Numerical results of muscle strength were not reported

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Wood 2001

Methods	RCT with 4 groups: PRT alone, aerobic training alone, combined PRT and aerobic training and control Method of randomisation: not reported Assessor blinding: no Participant blinding: no Loss to follow-up: 9 in four groups - drop outs not reported by group Intention-to-treat analysis: no Post-program follow up: no
Participants	Location: USA N = 45 total (16 in PRT and control) Sample: healthy older people Age: mean 69.8 years (SD 6) in PRT Inclusion criteria: aged 60-84, no diseases or conditions that would put them at high risk for adverse responses to exercise Inclusion criteria: history of surviving sudden cardiac death, recent myocardial infarction, unstable angina, poorly controlled hypertension, poorly controlled diabetes mellitus, frequent or complex ventricular ectopy, significant cognitive dysfunction that might interfere with one's ability to adhere to exercise protocols, in the inflammatory stage of arthritis, receiving medical treatment for osteoporosis
Interventions	PRT versus control and versus aerobic 1. PRT Type of Ex: 5UL, 3LL Equipment: resistance training machines Intensity: 75% of 5RM at first, progressed to 8-12RM Frequency: Ex3 Reps/Sets 8-12 from progressed from 1 set to 2 sets Program Duration: 12 weeks Setting: gym Supervision: not reported Adherence: excluded those who did not have 80% or more attendance 2. Control Group: asked not to make significant changes in their physical activity and nutrition habits over a 12-week period

Wood 2001 *(Continued)*

	3. Aerobic Training: trained on treadmills and cycle ergometers 3 times per week at 60-70% estimated HR reserve, for 21- 45 minutes per session
Outcomes	Strength (5RM) Submaximal aerobic capacity Co-ordination Comments on adverse events: no
Notes	Data from PRT and aerobic training group were compared

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

ADL: activities of daily living
Age: overall age of all groups. If this is not available age for progressive resistance training group alone is reported
CHF: congestive heart failure
CHD:coronary heart disease
COPD: chronic obstructive pulmonary disease
Ex: exercise
Ex1: exercise once per week
Ex2: exercise twice per week
Ex3: exercise three times per week
HI: high intensity
MI: Medium intensity
LI: low intensity
LL: lower limb
METs: maximum metabolic equivalents
MMSE: the Mini-Mental State Examination
N: number of participants allocated to strength training group and control group; or number of participants allocated to additional intervention group
NA: not applicable
OA: osteoarthritis
PAD: peripheral arterial disease RCT: Randomised controlled trial
PRT: progressive resistance strength training Reps: repetitions
RM: repetition maximum
SF-36: Medical Outcome Studies 36 Item Short Form questionnaire
Tr: trunk
TUAG: timed "up-and-go" test
UL: upper limb
WOMAC: Western Ontario/McMaster Universities Arthritis Index

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

Study	Reason for exclusion
Adami 1999	Not a RCT
Adams 2001	Participants too young (mean age <60)
Agre 1988	Not a RCT
Alexander 2003	Combined program - not PRT alone
Aniansson 1981	Not a RCT

Study	Reason for exclusion
Annesi 2004	Combined intervention program - not PRT alone
Ardman 1998	Not a RCT
Ballard 2004	Combined program - not PRT alone
Barbosa 2002	Not a RCT
Baum 2003b	Does not meet criteria for PRT
Bean 2002	Does not meet criteria for PRT
Bellew 2003	Not a RCT
Beniamini 1997	Participants too young (mean age <60)
Beniamini 1999	Participants too young (mean age <60)
Berg 1998	Not a RCT
Bernard 1999	Combined program - not PRT alone
Bilodeau 2000	Participants too young (mean age <60)
Binda 2003	Does not meet for criteria for PRT
Binder 2002	Combined program - not PRT alone
Boardley 2007	No relevant outcomes to the review
Braith 2005	No relevant outcomes to the review
Brandon 2003b	Does not meet the criteria for PRT - not progressive
Brandon 2004	Combined program - not PRT alone
Brill 1998	Not a RCT
Brose 2003	Combined program - not PRT alone
Brown 1990	Not a RCT
Brown 1991	Combined program - not PRT alone
Brown 2000	Combined program - not PRT alone
Bunout 2001	Combined program - not PRT alone
Campbell 2002	No relevant outcomes to the review
Campbell 2004	No relevant outcomes to the review
Cancela 2003	Article cannot be located.
Candow 2004	Combined program (with supplement) - not PRT alone

Study	Reason for exclusion
Capodaglio 2002	Not a RCT
Carter 2002	Does not meet the criteria for PRT
Carter 2005	Included participants younger than 60
Carvalho 2002	No relevant outcomes to the review
Cauza 2005	No relevant outcomes to the review
Cauza 2005b	Included young participants (younger than 60 years old)
Chaloupka 2000	Participants too young (mean age <60)
Chetlin 2004	Included young participants (younger than 60 years old)
Chiba 2006	Not a RCT
Chien 2005	Does not meet the criteria for PRT
Connelly 1995	Not a RCT
Connelly 2000	Not a RCT
Cramp 2006	Not a RCT
Cress 1991	Not a RCT
Cress 1999	Combined program - not PRT alone
Daepp 2006	Does not meet the criteria for PRT
Daly 2005	Combined program - not PRT alone
de Bruin 2007	No relevant comparisons to the review
de Vito 1999	Combined program - not PRT alone
DeBolt 2004	Included young participants (younger than 60 years old)
Delagardelle 2002	Combined program - not PRT alone
Delecluse 2004	Combined program - not PRT alone
DeVito 2003	Combined program - not PRT alone
Dibble 2006	Not a RCT
Dibble 2006b	Not a RCT
Dunstan 2002	Not PRT alone - with eating plan
Dunstan 2005	Not PRT alone - with eating plan
Dupler 1993	Not a RCT

Study	Reason for exclusion
Fernandez Ramirez 99	Combined program - not PRT alone
Ferrara 2006	Not a RCT
Ferri 2003	Not a RCT
Fiatarone 1990	Not a RCT
Fisher 1991	Not a RCT
Forte 2003	Not a RCT
Frontera 1988	Not a RCT
Frontera 1990	Not a RCT
Galvao 2006	Not a RCT
Grimby 1992	Not a RCT
Gur 2002	Included young participants (younger than 60 years old)
Hageman 2002	Not a RCT
Hakkinen 1999	Participants too young (mean age <60)
Hameed 2004	Combined program (with hormone intervention)
Hartard 1996	Not a RCT
Haub 2002	Combined program (protein) - not PRT alone
Heiwe 2005	No relevant outcomes to the review
Henwood 2006	Does not meet the criteria for PRT - not progressive
Hess 2005	Not a RCT
Hess 2006	Not a RCT
Hirsch 2003	Combined program - not PRT alone
Host 2007	Combined program - not PRT alone
Huggett 2004	No relevant outcomes to the review
Hughes 2004	Combined program - not PRT alone
Humphries 2000	Participants too young (mean age <60)
Hung 2004	Does not meet the criteria for PRT
Hunter 1995	Not a RCT
Hunter 2002	Not a RCT

Study	Reason for exclusion
Ibanez 2005	Not a RCT
Ivey 2000	Not a RCT
Johansen 2006	Included young participants (younger than 60 years old)
Jones 1987	Participants too young (mean age <60)
Judge 2005	No relevant outcomes to the review
Katula 2006	Not a RCT
Kerr 2001	No relevant outcomes to the review
Kolbe-Alexander 2006	Not a RCT
Komatireddy 1997	Participants too young (mean age <60)
La Forge 2002	No relevant outcomes to the review
Labarque 2002	Training did not meet criteria for PRT
Lambert 2002	No relevant outcomes to the review
Lambert 2003	Combined program (with hormone) - not PRT alone
Lamotte 2005	No relevant outcomes to the review
Levinger 2005	Included young participants (younger than 60 years old)
Lexell 1992	Not a RCT
Lexell 1995	Not a RCT (not clearly stated that patients were randomised)
Littbrand 2006	Combined program - not PRT alone
Liu 2004	Training did not meet criteria for PRT - not progressive
Liu-Ambrose 2004	No relevant outcomes to the review
Loeppky 2005	Does not meet the criteria for PRT
Lohman 1995	Participants too young (mean age <60)
Maddalozzo 2000	Participants too young (mean age <60)
Magnusson 1996	Participants too young (mean age <60)
Marcora 2005	Not a RCT
Martin Ginis 2006	No relevant comparisons to the review
McCool 1991	Not a RCT
McMurdo 1994	Training did not meet criteria for PRT

Study	Reason for exclusion
Mobily 2004	Not a RCT
Morey 1989	Combined program - not PRT alone
Morey 1991	Combined program - not PRT alone
Morse 2005	Combined program - not PRT alone
Narici 1989	Participants too young (mean age <60)
Nelson 1997	Combined program - not PRT alone
Ochala 2005	Training did not meet criteria for PRT
Ohira 2006	Training did not meet criteria for PRT - not progressive/included young participants
Oka 2000	Combined program - not PRT alone
Okawa 2004	Included younger participants (middle age)
Okumiya 1996	Combined program - not PRT alone
Panton 2004	Combined program - not PRT alone
Parsons 1992	Not a RCT
Perhonen 1992	Training did not meet criteria for PRT
Perkins 1961	Training did not meet criteria for PRT
Perrig-Chiello 1998	No relevant outcomes to the review
Petrella 2000	Training did not meet criteria for PRT
Phillips 2004	Not a RCT
Pyka 1994	Serious threats to internal validity - participants allowed to move from exercise to control group-Not a RCT
Rabelo 2004	Training did not meet criteria for PRT - not progressive
Ramsbottom 2004	Combined program - not PRT alone
Reeves 2004b	Does not meet the criteria for PRT
Reeves 2005	Not a RCT
Reeves 2006	Does not meet the criteria for PRT
Richards 1996	Not a RCT
Roman 1993	Not a RCT
Rooks 1997	Training did not meet criteria for PRT

Study	Reason for exclusion
Salli 2006	Training did not meet criteria for PRT - not progressive
Sallinen 2006	Combined program (with diet) - not PRT alone
Sanders 1998	Not a RCT
Sartorio 2001	No relevant outcomes to the review
Sauvage 1992	Combined program - not PRT alone
Sayers 2003	Not a RCT
Schott 2006	Combined program (with supplement) - not PRT alone
Sharp 1997	Not a RCT
Shaw 1998	Not a RCT
Sherrington 1997	Training did not meet criteria for PRT
Signorile 2005	Does not meet the criteria for PRT - not progressive
Sinaki 1996	Participants too young (mean age <60)
Sipila 1994	Not a RCT
Spruit 2002	Combined program - not PRT alone
Sullivan 2001	Not a RCT
Taaffe 1997	Not a RCT
Teixeira 2002	Does not meet the criteria for PRT
Teixeira 2003	Included young participants (younger than 60 years old)
Teixeira-Salm. 2005	Combined program - not PRT alone
Thielman 2004	No relevant outcomes to the review
Thomas 2004	Combined program - not PRT alone
Thomas 2005	Training did not meet criteria for PRT - The resistance was not progressively increased
Thompson 1988	Combined program - not PRT alone
Timonen 2002	Combined program - not PRT alone
Timonen 2006	Combined program - not PRT alone
Timonen 2006b	Combined program - not PRT alone
Treuth 1994	Not a RCT
Trudelle-Jack. 2004	Combined program - not PRT alone

Study	Reason for exclusion
Tsuji 2000	Combined program - not PRT alone
Vad 2002	Combined program - not PRT alone
Vale 2003	Article cannot be identified
Valkeinen 2005	Participants too young (mean age of the control group < 60)
Van den Ende 2000	Combined program - not PRT alone
Vanbiervliet 2003	Included young participants (younger than 60 years old)
Veloso 2003	Does not meet the criteria for PRT
Verfaillie 1997	Combined program - not PRT alone
Villareal 2003	Combined program (with hormone)-not PRT alone
Villareal 2006b	Combined program - not PRT alone
Vincent 2002b	No relevant outcomes to the review
Vincent 2003	No relevant outcomes to the review
Vincent 2006	Included young participants (younger than 60 years old)
Woo 2007	Training did not meet criteria for PRT. The resistance was not progressively increased
Yang 2006	Does not meet the criteria for PRT
Zion 2003	Not a RCT

RCT = randomised controlled trial; PRT = progressive resistance strength training

DATA AND ANALYSES

Comparison 1. PRT versus control

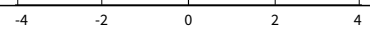
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Main function measure (higher score = better function)	33	2172	Std. Mean Difference (IV, Fixed, 95% CI)	0.14 [0.05, 0.22]
2 Physical function domain of SF-36/SF-12 (Higher score = better function)	14	778	Std. Mean Difference (IV, Fixed, 95% CI)	0.07 [-0.08, 0.21]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
3 Activities of daily living measure (higher score = better function)	3	330	Std. Mean Difference (IV, Fixed, 95% CI)	0.04 [-0.18, 0.26]
4 Activity level measure (kJ/week)	2		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
5 Main lower limb (LL) strength measure	73	3059	Std. Mean Difference (IV, Random, 95% CI)	0.84 [0.67, 1.00]
6 Main measure of aerobic function	29	1138	Std. Mean Difference (IV, Random, 95% CI)	0.31 [0.09, 0.53]
7 VO2 or peak oxygen uptake	19		Mean Difference (IV, Random, 95% CI)	Subtotals only
7.1 VO2max-ml/kg.min	18	710	Mean Difference (IV, Random, 95% CI)	1.50 [0.49, 2.51]
7.2 Peak oxygen uptake-L/min	2	47	Mean Difference (IV, Random, 95% CI)	0.10 [-0.04, 0.24]
8 Six-minute walk test (meters)	11	325	Mean Difference (IV, Random, 95% CI)	52.37 [17.38, 87.37]
9 Balance measures (higher = better balance)	17	996	Std. Mean Difference (IV, Fixed, 95% CI)	0.12 [-0.00, 0.25]
10 Balance measures (Low = better balance)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
10.1 PRT (high intensity) versus control	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
10.2 PRT (low intensity) versus control	1		Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
11 Gait speed (m/s)	24	1179	Mean Difference (IV, Random, 95% CI)	0.08 [0.04, 0.12]
12 Timed walk (seconds)	8	204	Mean Difference (IV, Fixed, 95% CI)	-0.23 [-1.07, 0.62]
13 Timed "Up-and-Go" (seconds)	12	691	Mean Difference (IV, Fixed, 95% CI)	-0.69 [-1.11, -0.27]
14 Time to stand from a chair	11	384	Std. Mean Difference (IV, Random, 95% CI)	-0.94 [-1.49, -0.38]
15 Stair climbing (seconds)	8	268	Mean Difference (IV, Random, 95% CI)	-1.44 [-2.51, -0.37]
16 Chair stand within time limit (number of times)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
17 Vitality (SF-36/Vitality plus scale, higher = more vitality)	10	611	Mean Difference (IV, Fixed, 95% CI)	1.33 [-0.89, 3.55]
18 Pain (higher = less pain, Bodily pain on SF-36)	10	587	Mean Difference (IV, Fixed, 95% CI)	0.34 [-3.44, 4.12]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
19 Pain (lower score = less pain)	6	503	Std. Mean Difference (IV, Fixed, 95% CI)	-0.30 [-0.48, -0.13]
20 Death	13	1125	Risk Ratio (M-H, Fixed, 95% CI)	0.89 [0.52, 1.54]

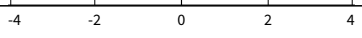
Analysis 1.1. Comparison 1 PRT versus control, Outcome 1 Main function measure (higher score = better function).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Baker 2001	19	63.4 (29)	19	60.8 (30)		1.78%	0.09[-0.55,0.72]
Bean 2004	11	10.4 (1.3)	9	9.5 (1.5)		0.87%	0.62[-0.29,1.53]
Boshuizen 2005	16	-27.5 (9.6)	17	-28.2 (7.9)		1.54%	0.08[-0.61,0.76]
Brochu 2002	19	65 (21)	14	76 (17)		1.45%	-0.55[-1.26,0.15]
Buchner 1997	22	69 (39)	29	74 (28)		2.33%	-0.15[-0.7,0.41]
Chandler 1998	44	44.2 (20.4)	43	42.5 (25.8)		4.07%	0.07[-0.35,0.49]
Chin A Paw 2006	40	39.5 (8)	32	40.8 (9.1)		3.32%	-0.15[-0.62,0.31]
Damush 1999	33	81.8 (18.8)	29	80.7 (24.2)		2.89%	0.05[-0.45,0.55]
de Vreede 2007	28	50.1 (9.2)	26	49.6 (9)		2.52%	0.05[-0.48,0.59]
Donald 2000	25	12.7 (4.7)	20	11.4 (4.9)		2.06%	0.27[-0.32,0.86]
Ettinger 1997	120	-1.7 (0.4)	127	-1.9 (0.3)		11.25%	0.45[0.2,0.71]
Foley 2003	26	61.2 (14.1)	32	53.5 (22.4)		2.63%	0.4[-0.13,0.92]
Hiatt 1994	9	45 (22)	8	53 (13)		0.77%	-0.41[-1.38,0.55]
Jette 1999	92	-7.5 (9.9)	104	-9.8 (12.1)		9.09%	0.21[-0.08,0.49]
Katznelson 2006	15	85 (12)	16	75 (21)		1.39%	0.56[-0.16,1.28]
Latham 2003	113	35.6 (25.9)	117	38.7 (28.4)		10.74%	-0.11[-0.37,0.15]
Liu-Ambrose 2005	32	-14.9 (13.3)	32	-19.8 (14.4)		2.95%	0.35[-0.14,0.84]
Mangione 2005	11	57.7 (21.1)	10	48 (18.9)		0.95%	0.46[-0.41,1.33]
Mikesky 2006	57	-30.1 (13.1)	75	-30 (11.1)		6.06%	-0[-0.35,0.34]
Miller 2006	25	35.3 (11.1)	26	32.1 (9.8)		2.36%	0.3[-0.25,0.85]
Miszko 2003	13	57.7 (10)	15	57 (18)		1.3%	0.05[-0.7,0.79]
Moreland 2001	68	63.9 (16.9)	65	65.5 (17.3)		6.21%	-0.09[-0.43,0.25]
Ouellette 2004	20	47.8 (9.4)	21	47.8 (9.6)		1.92%	0[-0.61,0.61]
Schilke 1996	10	-7.6 (3.5)	10	-9.5 (4)		0.9%	0.48[-0.41,1.38]
Segal 2003	82	120.2 (15.9)	73	117.6 (14.9)		7.2%	0.17[-0.15,0.48]
Seynnes 2004	8	-0.5 (0.6)	8	-1 (0.9)		0.71%	0.58[-0.42,1.59]
Sims 2006	14	12.5 (2)	16	12.3 (1.4)		1.39%	0.11[-0.6,0.83]
Singh 1997	17	82.6 (18.4)	15	70.3 (27.8)		1.44%	0.52[-0.19,1.22]
Singh 2005	18	71 (24)	19	72.8 (22.6)		1.73%	-0.08[-0.72,0.57]
Topp 2002	35	-35.3 (10.8)	35	-39.7 (10.8)		3.21%	0.4[-0.07,0.88]
Tracy 2004	11	-27.6 (5.5)	9	-27.4 (5)		0.93%	-0.04[-0.92,0.84]
Tsutsumi 1997	13	91.9 (7.5)	14	75.7 (26.4)		1.15%	0.8[0.01,1.59]
Westhoff 2000	10	-28.4 (7.5)	11	-23.1 (6.6)		0.91%	-0.72[-1.61,0.17]
Total ***	**1076**		**1096**			**100%**	**0.14[0.05,0.22]**
Heterogeneity: Tau²=0; Chi²=35.93, df=32(P=0.29); I²=10.93%							
Test for overall effect: Z=3.13(P=0)							



Analysis 1.2. Comparison 1 PRT versus control, Outcome 2 Physical function domain of SF-36/SF-12 (Higher score = better function).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Baker 2001	19	60.8 (30)	19	63.4 (29)		4.95%	-0.09[-0.72,0.55]
Brochu 2002	19	65 (21)	14	76 (17)		4.03%	-0.55[-1.26,0.15]
Chandler 1998	44	44.2 (20.4)	43	42.5 (25.8)		11.34%	0.07[-0.35,0.49]
Damush 1999	33	81.8 (18.8)	29	80.7 (24.2)		8.05%	0.05[-0.45,0.55]
de Vreede 2007	28	50.1 (9.2)	26	49.6 (9)		7.03%	0.05[-0.48,0.59]
Foley 2003	26	33.9 (9.3)	32	31.3 (8.3)		7.4%	0.3[-0.22,0.82]
Hiatt 1994	9	45 (22)	8	53 (13)		2.15%	-0.41[-1.38,0.55]
Katznelson 2006	15	85 (12)	16	75 (21)		3.86%	0.56[-0.16,1.28]
Latham 2003	113	35.6 (25.9)	117	38.7 (28.4)		29.94%	-0.11[-0.37,0.15]
Mangione 2005	11	57.7 (21.1)	10	48 (18.9)		2.65%	0.46[-0.41,1.33]
Miller 2006	25	35.3 (11.1)	26	32.1 (9.8)		6.57%	0.3[-0.25,0.85]
Singh 1997	17	82.6 (18.4)	15	70.3 (27.8)		4.01%	0.52[-0.19,1.22]
Singh 2005	18	71 (24)	19	72.8 (22.6)		4.82%	-0.08[-0.72,0.57]
Tsutsumi 1997	13	91.9 (7.5)	14	75.7 (26.4)		3.22%	0.8[0.01,1.59]
Total * **	**390**		**388**			**100%**	**0.07[-0.08,0.21]**
Heterogeneity: Tau^2=0; Chi^2=15.11, df=13(P=0.3); I^2=13.96%							
Test for overall effect: Z=0.9(P=0.37)							

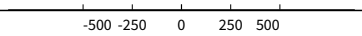


Analysis 1.3. Comparison 1 PRT versus control, Outcome 3 Activities of daily living measure (higher score = better function).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Chin A Paw 2006	40	39.5 (8)	32	40.8 (9.1)		21.6%	-0.15[-0.62,0.31]
Latham 2003	111	18.5 (2.4)	116	18.2 (3.2)		69.04%	0.11[-0.16,0.37]
Singh 1997	17	6.1 (0.8)	14	6.1 (0.9)		9.36%	0[-0.71,0.71]
Total * **	**168**		**162**			**100%**	**0.04[-0.18,0.26]**
Heterogeneity: Tau^2=0; Chi^2=0.9, df=2(P=0.64); I^2=0%							
Test for overall effect: Z=0.36(P=0.72)							

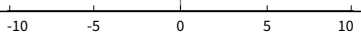
Analysis 1.4. Comparison 1 PRT versus control, Outcome 4 Activity level measure (kJ/week).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
Nelson 1994	20	8610 (1109)	19	5393 (697)		0%	3217[2638.68,3795.32]
Taaffe 1996	8	1870 (221.9)	11	1937.2 (201.4)		0%	-67.2[-261.65,127.25]



Analysis 1.5. Comparison 1 PRT versus control, Outcome 5 Main lower limb (LL) strength measure.

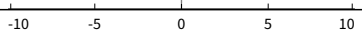
Study or subgroup	PRT		Control		Std. Mean Difference	Weight	Std. Mean Difference
	N	Mean(SD)	N	Mean(SD)	Random, 95% CI		Random, 95% CI
Ades 1996	12	46 (16)	12	29 (13)		1.3%	1.13[0.25,2]
Baker 2001	19	40.6 (31)	19	34.8 (16.4)		1.57%	0.23[-0.41,0.87]
Beneka 2005	8	75.2 (5.8)	8	67.9 (5.2)		1.06%	1.25[0.15,2.35]
Bermon 1999	16	23.6 (4)	16	19.2 (3.6)		1.43%	1.13[0.37,1.88]
Boshuizen 2005	16	69.3 (17.2)	17	56.2 (29.4)		1.5%	0.53[-0.17,1.22]
Brandon 2000	43	60.1 (19.9)	42	47.3 (13.6)		1.79%	0.74[0.3,1.18]
Brandon 2003	16	0.8 (0.3)	15	0.6 (0.2)		1.45%	0.75[0.02,1.48]
Brochu 2002	21	43.6 (10.8)	21	36.9 (14.2)		1.59%	0.52[-0.09,1.14]
Bruunsgaard 2004	10	13.2 (3.5)	11	9.5 (3.2)		1.24%	1.05[0.13,1.98]
Buchner 1997	22	99 (31)	29	84 (32)		1.65%	0.47[-0.09,1.03]
Casaburi 2004	12	344 (98)	12	274 (66)		1.33%	0.81[-0.03,1.65]
Castaneda 2001	14	55.9 (22.4)	12	38.8 (14)		1.36%	0.87[0.06,1.68]
Chandler 1998	44	63.7 (27)	43	48.3 (23)		1.8%	0.61[0.18,1.04]
Charette 1991	13	33.9 (7.6)	6	23.1 (3.4)		1.05%	1.55[0.44,2.67]
Chin A Paw 2006	40	73.2 (12.3)	31	77.5 (48.3)		1.76%	-0.13[-0.6,0.34]
Collier 1997	24	53.8 (37)	12	32.8 (11.7)		1.48%	0.66[-0.05,1.37]
Damush 1999	33	58 (17.6)	29	52 (17.4)		1.72%	0.34[-0.16,0.84]
de Vreede 2007	28	307.2 (90.9)	26	298.2 (81.2)		1.69%	0.1[-0.43,0.64]
DeBeliso 2005	13	105 (40)	13	58 (25)		1.3%	1.36[0.5,2.23]
Ettinger 1997	120	90.2 (21.9)	127	87 (21.4)		1.97%	0.15[-0.1,0.4]
Fahlman 2002	15	25 (1)	15	20 (1.9)		1.04%	3.2[2.08,4.33]
Fatouros 2002	8	116.1 (9.8)	8	66.5 (8.5)		0.41%	5.11[2.85,7.38]
Fatouros 2005	20	91.7 (8.2)	14	56.4 (8.5)		0.93%	4.14[2.89,5.39]
Foley 2003	26	26.7 (14.2)	32	21.9 (11.6)		1.7%	0.37[-0.15,0.89]
Frontera 2003	7	18.4 (5.1)	7	12.5 (2.8)		0.97%	1.34[0.14,2.54]
Haykowsky 2000	10	367 (47)	8	290 (53)		1.08%	1.48[0.4,2.55]
Hortobagyi 2001	18	1122 (340)	9	877 (203)		1.34%	0.78[-0.05,1.62]
Hruda 2003	18	81.9 (23.3)	7	71 (22.2)		1.28%	0.46[-0.43,1.34]
Jette 1996	35	52 (18.5)	38	45.8 (19.1)		1.77%	0.33[-0.14,0.79]
Jette 1999	96	15 (5.3)	104	13.7 (5.5)		1.94%	0.24[-0.04,0.52]
Jones 1994	30	55.2 (15.9)	12	50.2 (8.8)		1.52%	0.34[-0.33,1.02]
Judge 1994	22	8 (3.8)	23	6.9 (1.9)		1.62%	0.36[-0.23,0.95]
Kalapotharakos 2005	11	43.1 (11.5)	10	20.8 (7.2)		1.03%	2.22[1.08,3.35]
Kongsgaard 2004	6	61 (7)	7	51 (6.5)		0.92%	1.38[0.12,2.64]
Lamoureux 2003	29	31.8 (1.7)	15	21.2 (2.4)		0.88%	5.31[3.99,6.63]
Latham 2001	10	12.3 (7.1)	10	7.4 (3.5)		1.24%	0.84[-0.08,1.76]
Latham 2003	108	12.6 (5.4)	112	12.9 (5.3)		1.95%	-0.06[-0.32,0.21]
Liu-Ambrose 2005	32	18.9 (8.6)	32	17.5 (6.4)		1.74%	0.18[-0.31,0.67]
Maiorana 1997	12	132.4 (26.4)	14	116.6 (26.6)		1.39%	0.58[-0.21,1.37]
Malliou 2003	15	79.2 (6.8)	10	65.9 (5.2)		1.15%	2.07[1.05,3.08]
McCartney 1995	20	124 (22)	23	98 (18)		1.54%	1.28[0.62,1.94]
Mikesky 2006	59	109.4 (35.9)	78	103.9 (35.9)		1.89%	0.15[-0.19,0.49]
Miller 2006	25	5.9 (4.1)	26	5.4 (3.4)		1.67%	0.13[-0.42,0.68]
Miszko 2003	13	105.3 (53.1)	15	79.7 (37.5)		1.42%	0.55[-0.21,1.31]
Nelson 1994	20	37.8 (10.4)	19	25.8 (8.5)		1.5%	1.23[0.54,1.93]
Newnham 1995	12	15.3 (7.5)	12	7.4 (3.6)		1.27%	1.3[0.4,2.19]
Nichols 1993	15	39.2 (12.7)	15	32.2 (9.7)		1.45%	0.6[-0.13,1.34]
Parkhouse 2000	13	98 (21.6)	9	54 (18)		1.07%	2.09[1,3.18]
Pollock 1991	20	53.4 (21.1)	12	43.2 (20.3)		1.46%	0.48[-0.25,1.2]



Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
Pu 2001	9	1630 (516)	7	1292 (352)		1.13%	0.71[-0.32,1.73]
Rall 1996	8	47.3 (14.8)	6	32.2 (11.2)		1.01%	1.05[-0.1,2.21]
Reeves 2004	9	115 (51.7)	9	98.5 (29.9)		1.23%	0.37[-0.56,1.31]
Rhodes 2000	20	33.5 (4.3)	18	28 (4)		1.48%	1.29[0.59,2]
Schilke 1996	10	67.4 (28.6)	10	36.3 (27.8)		1.21%	1.06[0.11,2.01]
Selig 2004	15	111 (37)	17	110 (32)		1.5%	0.03[-0.67,0.72]
Seynnes 2004	8	11.3 (2.8)	8	6.1 (1.7)		0.9%	2.11[0.82,3.4]
Simoneau 2006	11	10.3 (3.4)	9	12.3 (3)		1.26%	-0.58[-1.49,0.32]
Simons 2006	21	48.3 (23)	21	31.7 (14.1)		1.57%	0.85[0.22,1.49]
Simpson 1992	14	24.8 (14)	14	25.1 (14)		1.45%	-0.02[-0.76,0.72]
Singh 1997	17	3241 (191)	14	2756 (334)		1.32%	1.78[0.93,2.64]
Sipila 1996	12	382 (116)	10	332 (77)		1.32%	0.48[-0.37,1.33]
Skelton 1995	20	239.7 (76.3)	20	242.9 (63.7)		1.59%	-0.04[-0.66,0.58]
Skelton 1996	9	279.6 (68.1)	9	195.2 (52.8)		1.12%	1.32[0.27,2.36]
Sousa 2005	10	83.5 (12.5)	10	57 (10.1)		1%	2.23[1.07,3.4]
Suetta 2004	11	86.4 (10.2)	9	70.5 (10.5)		1.14%	1.47[0.46,2.49]
Taaffe 1996	7	159.8 (30.7)	11	116.1 (18.5)		1.02%	1.75[0.6,2.89]
Taaffe 1999	11	62.6 (10.6)	12	45 (10.9)		1.2%	1.58[0.62,2.54]
Topp 1993	25	101.2 (40)	30	87.3 (32.9)		1.69%	0.38[-0.16,0.91]
Tracy 2004	11	88 (38)	9	69.1 (26.4)		1.26%	0.54[-0.36,1.44]
Tsutsumi 1997	13	30.9 (7)	14	25.8 (9.2)		1.41%	0.6[-0.17,1.38]
Vincent 2002	22	347.1 (167)	16	222.9 (75)		1.52%	0.89[0.21,1.57]
Westhoff 2000	10	88.7 (21.7)	11	75.7 (31.7)		1.3%	0.46[-0.41,1.32]
Wood 2001	10	229.1 (97.4)	6	201.7 (97.2)		1.14%	0.27[-0.75,1.28]
Total * **	**1562**		**1497**			**100%**	**0.84[0.67,1]**

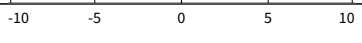
Heterogeneity: Tau^2=0.34; Chi^2=293.86, df=72(P<0.0001); I^2=75.5%

Test for overall effect: Z=10.07(P<0.0001)



Analysis 1.6. Comparison 1 PRT versus control, Outcome 6 Main measure of aerobic function.

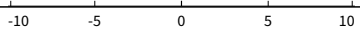
Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
Ades 1996	12	25 (6)	12	23 (6)		3.36%	0.32[-0.48,1.13]
Brochu 2002	21	15.1 (4.2)	21	16.7 (3.2)		4.17%	-0.42[-1.03,0.19]
Buchner 1997	22	17 (3.1)	29	16.7 (4.6)		4.44%	0.07[-0.48,0.63]
Casaburi 2004	12	1.1 (0.4)	12	1 (0.4)		3.37%	0.27[-0.53,1.08]
Chandler 1998	44	829.4 (283)	43	779.1 (332)		5.05%	0.16[-0.26,0.58]
Ettinger 1997	120	17.9 (2.2)	127	17.5 (2.3)		5.74%	0.18[-0.07,0.43]
Fatouros 2005	14	19.3 (2.3)	10	17.1 (2.9)		3.2%	0.83[-0.02,1.68]
Hagerman 2000	9	34.9 (4.8)	9	32 (7.4)		2.89%	0.44[-0.5,1.38]
Hiatt 1994	9	14.4 (4.2)	8	13.9 (3.5)		2.84%	0.12[-0.83,1.08]
Hruda 2003	18	7.7 (3.9)	7	13.4 (9.4)		2.96%	-0.94[-1.86,-0.02]
Kalapotharakos 2005	11	589.1 (50.4)	8	445.5 (40.9)		1.77%	2.94[1.55,4.32]
Kallinen 2002	12	1.2 (0.2)	11	1.1 (0.2)		3.26%	0.5[-0.33,1.34]
Madden 2006	15	22.3 (1)	15	17.6 (0.9)		1.6%	4.81[3.32,6.3]
Maiorana 1997	12	23.1 (4.9)	14	22.6 (3.8)		3.5%	0.11[-0.66,0.88]



Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
Mangione 2005	11	278.9 (114.6)	10	266.2 (82.4)		3.17%	0.12[-0.74,0.98]
McGuigan 2001	20	23.3 (4.8)	12	22 (6.4)		3.72%	0.23[-0.49,0.95]
Moreland 2001	9	15.1 (4.9)	7	14.8 (2.5)		2.74%	0.07[-0.92,1.06]
Ouellette 2004	21	239.1 (30.3)	21	234.8 (36.9)		4.2%	0.12[-0.48,0.73]
Pollock 1991	8	21.7 (5.5)	6	22.2 (5.1)		2.52%	-0.09[-1.15,0.97]
Pu 2001	13	23 (5.4)	14	22.9 (8.8)		3.57%	0.01[-0.74,0.77]
Rall 1996	16	15.9 (4.3)	8	14.4 (2.8)		3.18%	0.37[-0.48,1.23]
Selig 2004	14	16.9 (3.8)	19	14.9 (4)		3.78%	0.5[-0.2,1.2]
Seynnes 2004	8	225.5 (61.7)	8	173.2 (54.1)		2.59%	0.85[-0.18,1.89]
Simpson 1992	14	0.7 (0.2)	14	0.8 (0.3)		3.6%	-0.3[-1.04,0.45]
Singh 1997	9	456 (67)	7	345 (110)		2.42%	1.19[0.1,2.29]
Tsutsumi 1997	61	46.6 (38.2)	58	51.7 (41.4)		5.31%	-0.13[-0.49,0.23]
Tyni-Lenne 2001	17	1580 (94)	14	1552 (122)		3.75%	0.25[-0.46,0.96]
Vincent 2002	22	24.4 (5.8)	16	22.4 (3.4)		4%	0.4[-0.25,1.05]
Wieser 2007	14	21.9 (3.6)	10	19.4 (5.7)		3.28%	0.53[-0.3,1.35]
Total * **	**588**		**550**			**100%**	**0.31[0.09,0.53]**

Heterogeneity: Tau^2=0.2; Chi^2=76.95, df=28(P<0.0001); I^2=63.61%

Test for overall effect: Z=2.81(P=0.01)

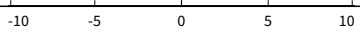


Analysis 1.7. Comparison 1 PRT versus control, Outcome 7 VO2 or peak oxygen uptake.

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
1.7.1 VO2max-ml/kg.min							
Ades 1996	12	25 (6)	12	23 (6)		3.02%	2[-2.8,6.8]
Brochu 2002	21	15.1 (4.2)	21	16.7 (3.2)		6.83%	-1.6[-3.86,0.66]
Buchner 1997	22	17 (3.1)	29	16.7 (4.6)		7.14%	0.3[-1.82,2.42]
Ettinger 1997	120	17.9 (2.2)	127	17.5 (2.3)		10.29%	0.4[-0.16,0.96]
Fatouros 2005	14	19.3 (2.3)	10	17.1 (2.9)		7.04%	2.2[0.04,4.36]
Hagerman 2000	9	34.9 (4.8)	9	32 (7.4)		2.3%	2.9[-2.86,8.66]
Hiatt 1994	9	14.4 (4.2)	8	13.9 (3.5)		4.31%	0.5[-3.16,4.16]
Kallinen 2002	12	19.7 (0.4)	11	16.9 (0.3)		10.55%	2.8[2.52,3.08]
Madden 2006	15	22.3 (1)	15	17.6 (0.9)		10.13%	4.7[4.02,5.38]
Maiorana 1997	12	23.1 (4.9)	14	22.6 (3.8)		4.68%	0.5[-2.91,3.91]
Pollock 1991	20	23.3 (4.8)	12	22 (6.4)		3.65%	1.3[-2.89,5.49]
Pu 2001	9	15.1 (4.9)	7	14.8 (2.5)		4.26%	0.3[-3.4,4]
Rall 1996	8	21.7 (5.5)	6	22.2 (5.1)		2.41%	-0.5[-6.08,5.08]
Selig 2004	14	16.9 (3.8)	19	14.9 (4)		5.96%	2[-0.68,4.68]
Tsutsumi 1997	13	23 (5.4)	14	22.9 (8.8)		2.49%	0.1[-5.36,5.56]
Tyni-Lenne 2001	16	15.9 (4.3)	8	14.4 (2.8)		5.61%	1.5[-1.36,4.36]
Vincent 2002	22	24.4 (5.8)	16	22.4 (3.4)		5.47%	2[-0.94,4.94]
Wieser 2007	14	21.9 (3.6)	10	19.4 (5.7)		3.85%	2.51[-1.51,6.53]
Subtotal * **	**362**		**348**			**100%**	**1.5[0.49,2.51]**

Heterogeneity: Tau^2=2.59; Chi^2=121.99, df=17(P<0.0001); I^2=86.06%

Test for overall effect: Z=2.9(P=0)



Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
1.7.2 Peak oxygen uptake-L/min							
Casaburi 2004	12	1.1 (0.4)	12	1 (0.4)		49.85%	0.1[-0.18,0.38]
Kallinen 2002	12	1.2 (0.2)	11	1.1 (0.2)		50.15%	0.1[-0.06,0.26]
Subtotal ***	**24**		**23**			**100%**	**0.1[-0.04,0.24]**
Heterogeneity: Tau^2=0; Chi^2=0, df=1(P=1); I^2=0%							
Test for overall effect: Z=1.44(P=0.15)							

Favours Control -10 -5 0 5 10 Favours PRT

Analysis 1.8. Comparison 1 PRT versus control, Outcome 8 Six-minute walk test (meters).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Singh 1997	17	1580 (94)	14	1552 (122)		8.48%	28[-49.98,105.98]
Kalapotharakos 2005	11	589.1 (50.4)	8	445.5 (40.9)		12.18%	143.6[102.49,184.71]
Chandler 1998	44	829.4 (283)	43	779.1 (332)		4.86%	50.3[-79.47,180.07]
Tyni-Lenne 2001	16	555 (59)	8	504 (27)		12.82%	51[16.56,85.44]
McGuigan 2001	9	456 (67)	7	345 (110)		7.24%	111[18.5,203.5]
Pu 2001	9	421 (150)	7	362 (82.2)		5.65%	59[-56.36,174.36]
Simpson 1992	14	427 (101.8)	14	376 (120.1)		8.07%	51[-31.47,133.47]
Mangione 2005	11	278.9 (114.6)	10	266.2 (82.4)		7.87%	12.7[-72.12,97.52]
Ouellette 2004	21	239.1 (30.3)	21	234.8 (36.9)		13.95%	4.3[-16.12,24.72]
Brochu 2002	13	440 (99)	12	429 (104)		8.32%	11[-68.74,90.74]
Seynnes 2004	8	225.5 (61.7)	8	173.2 (54.1)		10.56%	52.3[-4.53,109.13]
Total ***	**173**		**152**			**100%**	**52.37[17.38,87.37]**
Heterogeneity: Tau^2=2177.34; Chi^2=40.09, df=10(P<0.0001); I^2=75.06%							
Test for overall effect: Z=2.93(P=0)							

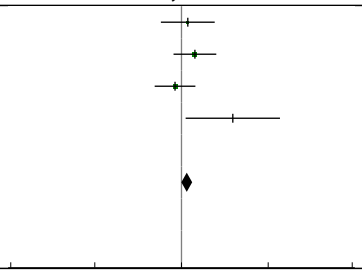
Favours control -1000 -500 0 500 1000 Favours PRT

Analysis 1.9. Comparison 1 PRT versus control, Outcome 9 Balance measures (higher = better balance).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Kalapotharakos 2005	11	85.4 (42.7)	8	55 (20)		1.71%	0.83[-0.13,1.78]
Newnham 1995	12	44.3 (10.2)	12	32.3 (18.7)		2.25%	0.77[-0.07,1.6]
Buchner 1997	22	9.5 (2.2)	29	8.4 (3.1)		5.01%	0.39[-0.17,0.95]
Topp 1993	25	25.1 (20)	30	21.3 (16.4)		5.54%	0.21[-0.33,0.74]
Chandler 1998	44	9.9 (2.8)	43	9.8 (3.3)		8.88%	0.03[-0.39,0.45]
Latham 2001	9	44.9 (10.5)	10	40.5 (10.4)		1.89%	0.4[-0.51,1.31]
Schlicht 1999	11	5.1 (3.5)	11	4.7 (4.2)		2.24%	0.09[-0.74,0.93]
Judge 1994	19	10 (10.9)	19	9.4 (8.7)		3.88%	0.06[-0.58,0.7]
Westhoff 2000	10	5.3 (0.8)	11	5.5 (0.8)		2.12%	-0.24[-1.1,0.62]
Boshuizen 2005	16	4.8 (1)	17	4.5 (1.5)		3.34%	0.23[-0.46,0.91]
Latham 2003	110	39.9 (10.6)	110	41.9 (11.1)		22.37%	-0.18[-0.45,0.08]
Jette 1999	92	10.9 (2.7)	104	10.1 (3.5)		19.78%	0.25[-0.03,0.53]
Bean 2004	11	6.8 (5.4)	9	6.3 (5.9)		2.02%	0.08[-0.8,0.96]

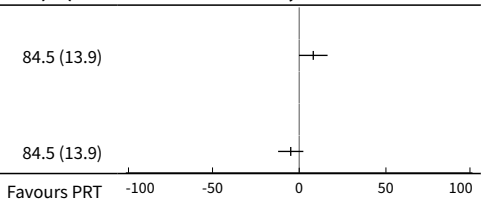
Favours control -4 -2 0 2 4 Favours PRT

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Skelton 1995	20	96 (5)	20	95 (8.1)		4.07%	0.15[-0.48,0.77]
Liu-Ambrose 2005	32	51.2 (21.9)	32	45 (17.4)		6.45%	0.31[-0.18,0.8]
Chin A Paw 2006	40	16.6 (12.8)	31	18.5 (12.4)		7.11%	-0.15[-0.62,0.32]
Skelton 1996	8	3.1 (1.3)	8	1.7 (0.9)		1.33%	1.18[0.1,2.27]
Total ***	**492**		**504**			**100%**	**0.12[-0,0.25]**
Heterogeneity: Tau²=0; Chi²=18.19, df=16(P=0.31); I²=12.06%							
Test for overall effect: Z=1.9(P=0.06)							



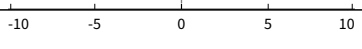
Analysis 1.10. Comparison 1 PRT versus control, Outcome 10 Balance measures (Low = better balance).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
1.10.1 PRT (high intensity) versus control						
de Vos 2005	24	92.6 (15.7)	26	84.5 (13.9)		8.1[-0.15,16.35]
1.10.2 PRT (low intensity) versus control						
de Vos 2005	25	79.6 (12.6)	26	84.5 (13.9)		-4.9[-12.18,2.38]



Analysis 1.11. Comparison 1 PRT versus control, Outcome 11 Gait speed (m/s).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Miller 2006	25	0.4 (0.3)	26	0.5 (0.3)		4.01%	-0.05[-0.2,0.1]
Singh 1997	17	1.2 (0.1)	14	1.1 (0.1)		7.06%	0.1[0.06,0.14]
Fiatarone 1994	22	0.6 (0.2)	25	0.5 (0.2)		4.89%	0.1[-0.01,0.21]
Topp 1993	25	1.2 (0.2)	30	1.2 (0.2)		5.43%	0.04[-0.06,0.14]
Foley 2003	26	1.2 (0.3)	32	1.1 (0.4)		3.37%	0.01[-0.16,0.18]
Kongsgaard 2004	6	1.1 (0.2)	7	0.8 (0.1)		4.41%	0.32[0.19,0.45]
Mangione 2005	11	0.7 (0.3)	10	0.7 (0.2)		2.52%	0.06[-0.16,0.28]
Sipila 1996	11	1.8 (0.4)	10	1.8 (0.3)		1.43%	0.05[-0.27,0.37]
Bean 2004	11	0.9 (0.2)	9	0.8 (0.2)		4.24%	0.17[0.03,0.31]
Kalapotharakos 2005	11	2.1 (0.2)	10	1.5 (0.3)		2.54%	0.61[0.39,0.83]
Tyni-Lenne 2001	16	1.5 (0.2)	8	1.4 (0.1)		4.72%	0.14[0.02,0.26]
Topp 1996	21	1.3 (0.1)	21	1.3 (0.1)		5.83%	0.03[-0.05,0.11]
Ouellette 2004	21	0.9 (0.1)	21	0.9 (0.1)		6.3%	-0.01[-0.08,0.06]
Liu-Ambrose 2005	32	1.1 (0.2)	32	1 (0.2)		5.32%	0.11[0.01,0.21]
Judge 1994	25	1.2 (0.2)	26	1.1 (0.2)		5.42%	0.03[-0.07,0.13]
Buchner 1997	22	1.3 (0.2)	29	1.3 (0.2)		5.12%	0.08[-0.03,0.19]
Brandon 2000	43	1.2 (0.3)	42	1.1 (0.2)		5.53%	0.1[0.01,0.19]
Skelton 1995	20	1.2 (0.3)	20	1.2 (0.2)		3.7%	0[-0.16,0.16]
Schlicht 1999	11	2.4 (0.4)	11	2.1 (0.7)		0.79%	0.24[-0.21,0.69]
Newnham 1995	12	0.6 (0.2)	12	0.5 (0.2)		3.64%	0.12[-0.04,0.28]
Chandler 1998	44	0.8 (0.2)	43	0.8 (0.3)		5.09%	0.02[-0.09,0.13]
Chin A Paw 2006	40	0.9 (0.5)	31	1 (0.5)		2.47%	-0.19[-0.41,0.03]



Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Suetta 2004	11	1.4 (2)	9	1.1 (0.9)		0.1%	0.33[-0.98,1.64]
Latham 2003	109	0.7 (0.3)	109	0.7 (0.3)		6.07%	-0.03[-0.11,0.05]
Total ***	**592**		**587**			**100%**	**0.08[0.04,0.12]**
Heterogeneity: Tau^2=0.01; Chi^2=68.89, df=23(P<0.0001); I^2=66.62%							
Test for overall effect: Z=3.58(P=0)							

Favours control -10 -5 0 5 10 Favours PRT

Analysis 1.12. Comparison 1 PRT versus control, Outcome 12 Timed walk (seconds).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
Boshuizen 2005	16	25.2 (8.2)	17	31.9 (20.4)		0.65%	-6.7[-17.2,3.8]
Brandon 2003	16	12.7 (2.6)	15	13 (2.2)		24.95%	-0.3[-1.99,1.39]
Donald 2000	14	69.1 (36.3)	11	76.1 (77.6)		0.03%	-7[-56.64,42.64]
Fatouros 2005	20	10.9 (1.7)	14	11.7 (2.2)		37.93%	-0.8[-2.17,0.57]
Hruda 2003	18	7.7 (3.9)	7	13.4 (9.4)		1.38%	-5.7[-12.89,1.49]
Latham 2001	9	17.7 (7.4)	8	15.6 (4.9)		2.05%	2.07[-3.84,7.98]
Skelton 1996	9	5.3 (1.5)	9	4.6 (1.8)		30.48%	0.7[-0.83,2.23]
Westhoff 2000	10	22.6 (6.7)	11	21.9 (5.6)		2.53%	0.7[-4.61,6.01]
Total ***	**112**		**92**			**100%**	**-0.23[-1.07,0.62]**
Heterogeneity: Tau^2=0; Chi^2=6.54, df=7(P=0.48); I^2=0%							
Test for overall effect: Z=0.53(P=0.6)							

Favours PRT -100 -50 0 50 100 Favours control

Analysis 1.13. Comparison 1 PRT versus control, Outcome 13 Timed "Up-and-Go" (seconds).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
Boshuizen 2005	16	14 (7.5)	17	17.5 (10.5)		0.46%	-3.5[-9.7,2.7]
Brandon 2003	16	7.6 (1.8)	15	8.3 (1)		16.99%	-0.7[-1.72,0.32]
de Vreede 2007	28	5.3 (1.1)	26	5.2 (1.3)		42.27%	0.1[-0.54,0.74]
Fatouros 2005	20	7.1 (1.1)	14	7.9 (2.6)		8.42%	-0.8[-2.24,0.64]
Hruda 2003	18	14.4 (6.5)	7	16.3 (18.9)		0.09%	-1.9[-16.22,12.42]
Jette 1999	92	11.6 (5)	103	13.3 (10)		3.68%	-1.7[-3.88,0.48]
Latham 2001	9	17.4 (8.1)	6	20.3 (8.9)		0.22%	-2.9[-11.77,5.97]
Latham 2003	111	28.1 (29.7)	110	22.6 (20.6)		0.39%	5.5[-1.23,12.23]
Newnham 1995	12	21.5 (8.9)	12	43.5 (52.5)		0.02%	-22[-52.13,8.13]
Skelton 1996	9	10.3 (6.6)	9	12.8 (4.9)		0.61%	-2.5[-7.87,2.87]
Sousa 2005	10	5.1 (0.4)	10	6.9 (1.3)		24.72%	-1.8[-2.64,-0.96]
Westhoff 2000	10	10.8 (3.1)	11	11.7 (3.6)		2.14%	-0.9[-3.77,1.97]
Total ***	**351**		**340**			**100%**	**-0.69[-1.11,-0.27]**
Heterogeneity: Tau^2=0; Chi^2=19.95, df=11(P=0.05); I^2=44.86%							
Test for overall effect: Z=3.24(P=0)							

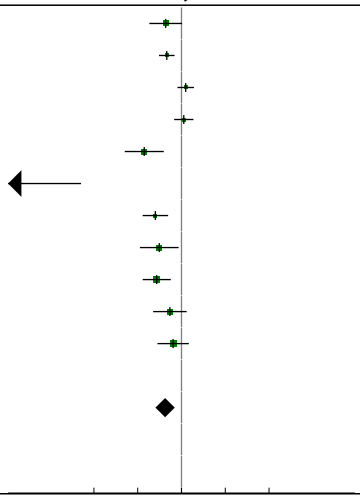
Favours PRT -100 -50 0 50 100 Favours control

Analysis 1.14. Comparison 1 PRT versus control, Outcome 14 Time to stand from a chair.

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
Bean 2004	11	10.3 (3.6)	9	13.9 (4.1)		9.23%	-0.9[-1.83,0.03]
Brandon 2000	43	7.3 (1.7)	42	8.7 (1.6)		11.61%	-0.84[-1.28,-0.4]
Chin A Paw 2006	40	28.9 (17.6)	31	24.7 (16.8)		11.5%	0.24[-0.23,0.71]
Judge 1994	25	1.2 (0.4)	26	1.1 (0.3)		11.16%	0.13[-0.42,0.68]
Kalapotharakos 2005	11	0.7 (0.1)	10	1 (0.1)		8.3%	-2.13[-3.24,-1.01]
Kongsgaard 2004	6	1.7 (0.2)	7	3.6 (0.2)		1.07%	-10.85[-15.96,-5.74]
Ouellette 2004	19	23.2 (2.7)	19	28.5 (4.2)		10.3%	-1.49[-2.22,-0.76]
Seynnes 2004	8	0.7 (0.2)	8	1.3 (0.6)		8.36%	-1.27[-2.37,-0.17]
Singh 1997	17	16.2 (1)	14	19.4 (3.1)		9.92%	-1.41[-2.22,-0.61]
Skelton 1996	9	25.4 (13.8)	9	34.3 (11.7)		9.12%	-0.66[-1.62,0.29]
Suetta 2004	11	8.8 (8.6)	9	13.3 (9.6)		9.43%	-0.48[-1.37,0.42]
Total * **	**200**		**184**			**100%**	**-0.94[-1.49,-0.38]**

Heterogeneity: Tau^2=0.63; Chi^2=54.39, df=10(P<0.0001); I^2=81.62%

Test for overall effect: Z=3.32(P=0)



Analysis 1.15. Comparison 1 PRT versus control, Outcome 15 Stair climbing (seconds).

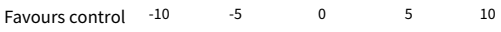
Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Brandon 2003	16	5.9 (1)	15	5.7 (1.3)		15.96%	0.2[-0.62,1.02]
Fatouros 2005	20	5.5 (0.9)	14	6.1 (1.4)		15.91%	-0.6[-1.43,0.23]
Kalapotharakos 2005	11	0.4 (0.1)	10	0.5 (0.1)		17.58%	-0.08[-0.17,0.01]
Kongsgaard 2004	6	3.9 (0.4)	7	8.4 (1.6)		14.3%	-4.5[-5.73,-3.27]
Ouellette 2004	20	15.4 (2.5)	21	19 (3.1)		12.14%	-3.52[-5.23,-1.81]
Suetta 2004	11	5.8 (9.3)	9	7 (6.3)		2.14%	-1.2[-8.05,5.65]
Topp 2002	35	16.3 (7)	35	17.5 (7)		6.59%	-1.2[-4.5,2.1]
Vincent 2002	22	7.8 (2)	16	9 (1)		15.39%	-1.2[-2.17,-0.23]
Total * **	**141**		**127**			**100%**	**-1.44[-2.51,-0.37]**

Heterogeneity: Tau^2=1.7; Chi^2=71.84, df=7(P<0.0001); I^2=90.26%

Test for overall effect: Z=2.63(P=0.01)

Analysis 1.16. Comparison 1 PRT versus control, Outcome 16 Chair stand within time limit (number of times).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
Hruda 2003	18	10 (3.1)	7	10.5 (2.3)		-0.5[-2.73,1.73]



Analysis 1.17. Comparison 1 PRT versus control, Outcome 17 Vitality (SF-36/Vitality plus scale, higher = more vitality).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
Baker 2001	19	60.8 (24.9)	19	55.3 (22.4)		2.17%	5.5[-9.56,20.56]
Brochu 2002	13	65 (15)	12	64.2 (23.2)		2.06%	0.8[-14.65,16.25]
Chin A Paw 2006	41	36.9 (6.6)	34	37.3 (7.3)		48.69%	-0.4[-3.58,2.78]
Damush 1999	33	61.8 (19.6)	29	62.4 (21.3)		4.69%	-0.6[-10.84,9.64]
de Vreede 2007	28	72.3 (16.1)	26	71.3 (17.5)		6.09%	1[-7.99,9.99]
Katznelson 2006	15	71 (17)	16	63 (18)		3.24%	8[-4.32,20.32]
Latham 2003	113	49 (21.6)	117	51.7 (21.2)		16.07%	-2.7[-8.23,2.83]
Singh 1997	17	61.7 (25.3)	15	48.7 (27.5)		1.45%	13[-5.39,31.39]
Singh 2005	18	61.4 (22)	19	38.9 (17.7)		2.95%	22.5[9.59,35.41]
Tsutsumi 1997	13	75.8 (6.7)	14	70.4 (9.7)		12.59%	5.4[-0.85,11.65]
Total * **	**310**		**301**			**100%**	**1.33[-0.89,3.55]**

Heterogeneity: Tau^2=0; Chi^2=18.25, df=9(P=0.03); I^2=50.68%

Test for overall effect: Z=1.18(P=0.24)

Analysis 1.18. Comparison 1 PRT versus control, Outcome 18 Pain (higher = less pain, Bodily pain on SF-36).

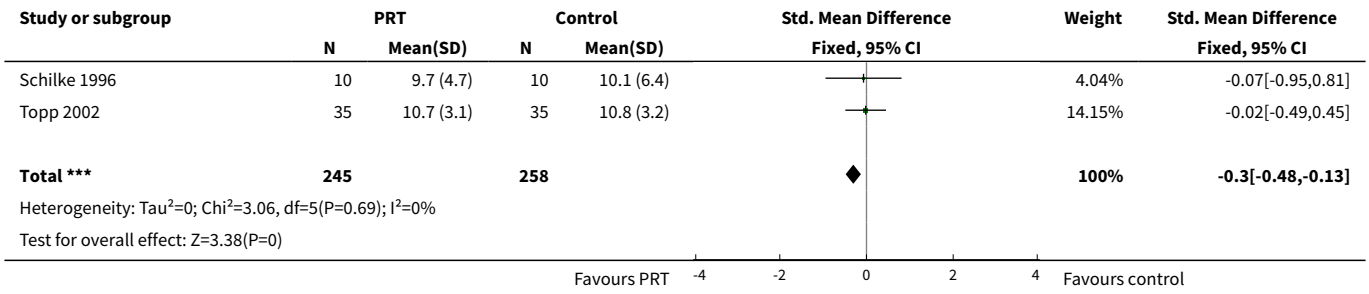
Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
Baker 2001	19	56.3 (21.8)	19	59.6 (24.7)		6.52%	-3.3[-18.11,11.51]
Brochu 2002	13	69.1 (16.7)	12	68.2 (29.9)		3.88%	0.9[-18.3,20.1]
Buchner 1997	22	76 (21)	29	77 (21)		10.57%	-1[-12.64,10.64]
Damush 1999	33	79 (20.4)	29	85.6 (18.7)		15.1%	-6.6[-16.33,3.13]
de Vreede 2007	28	74.3 (24.2)	26	72.7 (23.4)		8.87%	1.6[-11.1,14.3]
Katznelson 2006	15	81 (20)	16	75 (24)		5.94%	6[-9.52,21.52]
Latham 2003	113	64.8 (29.6)	117	69.2 (26.6)		26.99%	-4.4[-11.68,2.88]
Singh 1997	17	74.2 (19)	15	58.5 (28.6)		4.92%	15.7[-1.36,32.76]
Singh 2005	18	66 (29.6)	19	68 (25.6)		4.48%	-2[-19.87,15.87]
Tsutsumi 1997	13	89.6 (11.7)	14	76.8 (16.2)		12.72%	12.8[2.2,23.4]
Total * **	**291**		**296**			**100%**	**0.34[-3.44,4.12]**

Heterogeneity: Tau^2=0; Chi^2=12.9, df=9(P=0.17); I^2=30.22%

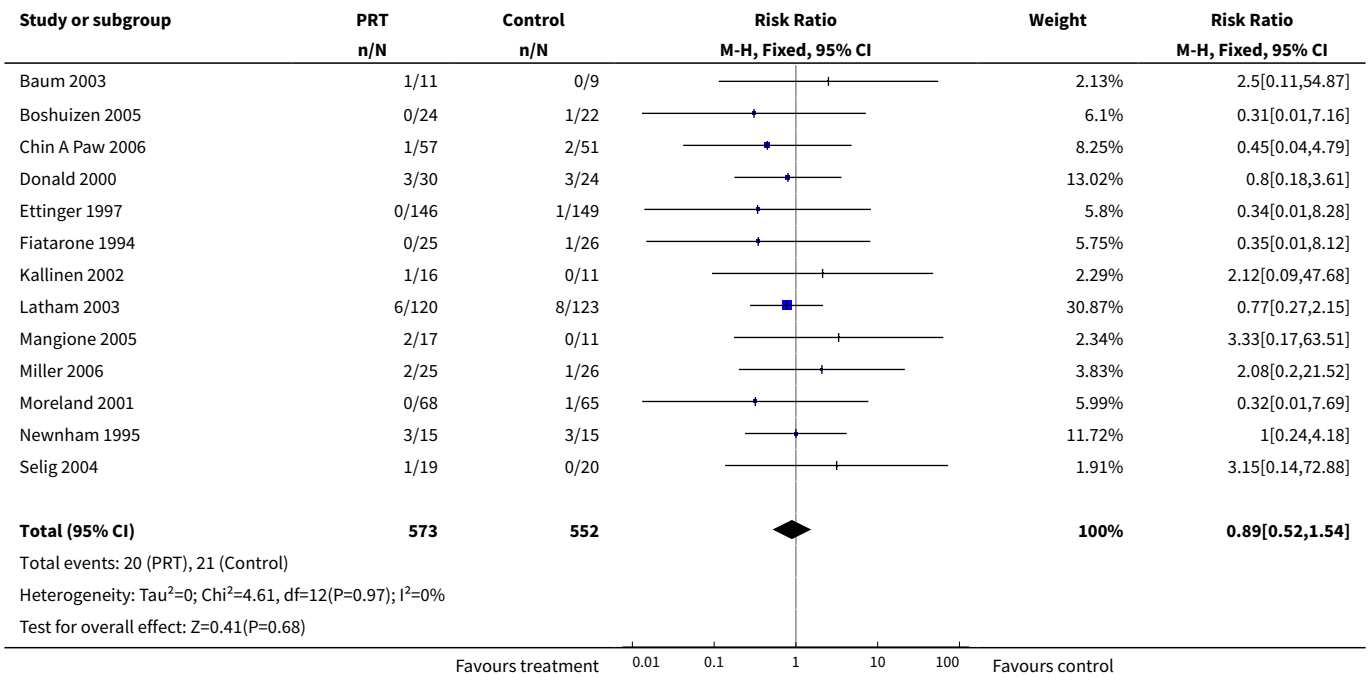
Test for overall effect: Z=0.18(P=0.86)

Analysis 1.19. Comparison 1 PRT versus control, Outcome 19 Pain (lower score = less pain).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Baker 2001	22	128 (98.6)	22	189 (112.6)		8.52%	-0.57[-1.17,0.04]
Ettinger 1997	120	2.2 (0.7)	127	2.4 (0.6)		49.3%	-0.31[-0.56,-0.06]
Foley 2003	26	7.6 (3.4)	32	9.6 (4)		11.2%	-0.52[-1.04,0.01]
Liu-Ambrose 2005	32	12.8 (17.7)	32	18.6 (19.1)		12.78%	-0.31[-0.8,0.18]



Analysis 1.20. Comparison 1 PRT versus control, Outcome 20 Death.



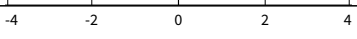
Comparison 2. High versus low intensity PRT

Outcome or subgroup title	No. of studies	No. of partici-pants	Statistical method	Effect size
1 Main function measure (higher score = better function)	2	62	Std. Mean Difference (IV, Fixed, 95% CI)	-0.17 [-0.67, 0.33]
2 Main lower limb (LL) strength measure	9	219	Std. Mean Difference (IV, Random, 95% CI)	0.48 [0.03, 0.93]
3 VO2 Max (ml/kg/min)	3	101	Mean Difference (IV, Random, 95% CI)	1.82 [-0.79, 4.43]
4 Pain (higher score = less pain)	2	62	Std. Mean Difference (IV, Fixed, 95% CI)	-0.05 [-0.55, 0.45]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
5 Vitality (SF-36, higher score = more vitality)	2	62	Mean Difference (IV, Fixed, 95% CI)	6.54 [0.69, 12.39]

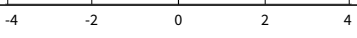
Analysis 2.1. Comparison 2 High versus low intensity PRT, Outcome 1 Main function measure (higher score = better function).

Study or subgroup	High intensity N	High intensity Mean(SD)	Low intensity N	Low intensity Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Singh 2005	18	71 (24)	17	73 (24)		56.75%	-0.08[-0.74,0.58]
Tsutsumi 1997	13	91.9 (7.5)	14	93.9 (5.6)		43.25%	-0.29[-1.05,0.46]
Total ***	**31**		**31**			**100%**	**-0.17[-0.67,0.33]**
Heterogeneity: Tau²=0; Chi²=0.17, df=1(P=0.68); I²=0%							
Test for overall effect: Z=0.68(P=0.5)							



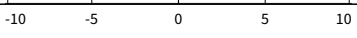
Analysis 2.2. Comparison 2 High versus low intensity PRT, Outcome 2 Main lower limb (LL) strength measure.

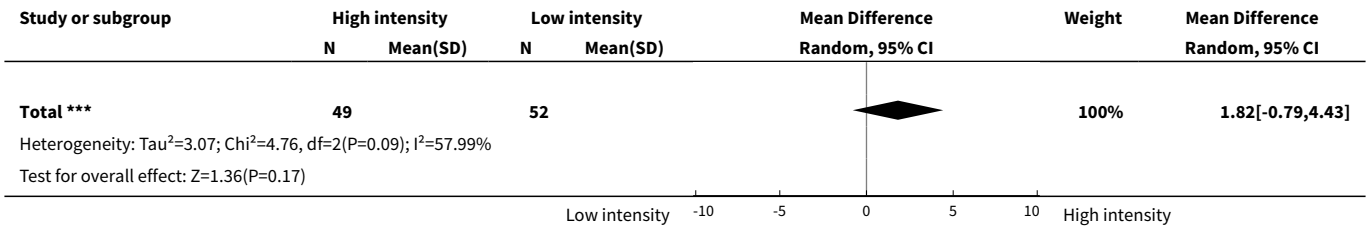
Study or subgroup	High Intensity N	High Intensity Mean(SD)	Low Intensity N	Low Intensity Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
Beneka 2005	8	75.2 (5.8)	8	68.4 (5.5)		9.2%	1.14[0.06,2.22]
Fatouros 2005	20	91.7 (8.2)	18	76.8 (9.4)		12.75%	1.66[0.91,2.41]
Harris 2004	17	507 (141)	17	491 (184)		13.7%	0.1[-0.58,0.77]
Hortobagyi 2001	9	1193 (320)	9	1050 (360)		10.63%	0.4[-0.54,1.34]
Seynnes 2004	8	11.3 (2.8)	6	9.7 (1.7)		9.09%	0.62[-0.48,1.71]
Sullivan 2005	7	69.7 (26.1)	7	92.7 (17.4)		8.76%	-0.97[-2.1,0.16]
Taaffe 1996	7	114.5 (35)	5	106.8 (14.6)		8.56%	0.25[-0.91,1.4]
Tsutsumi 1997	13	30.9 (7)	14	27.2 (5.1)		12.45%	0.59[-0.18,1.36]
Vincent 2002	22	347.1 (167)	24	305.6 (114)		14.86%	0.29[-0.29,0.87]
Total ***	**111**		**108**			**100%**	**0.48[0.03,0.93]**
Heterogeneity: Tau²=0.26; Chi²=19.29, df=8(P=0.01); I²=58.52%							
Test for overall effect: Z=2.1(P=0.04)							



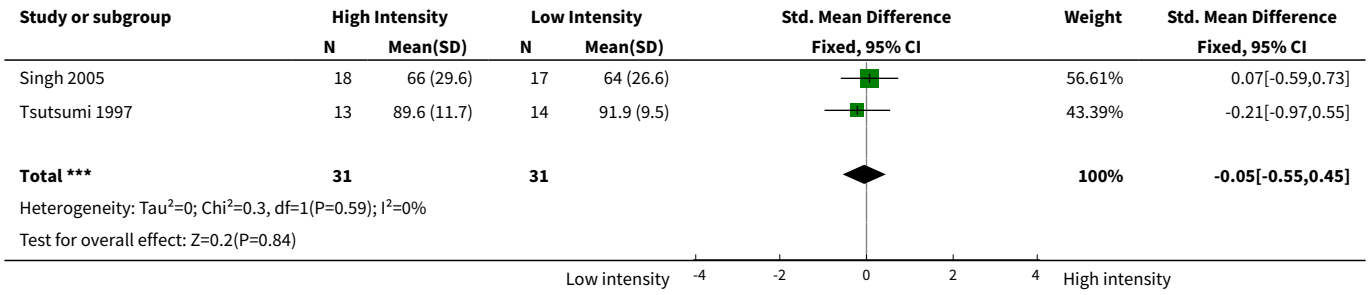
Analysis 2.3. Comparison 2 High versus low intensity PRT, Outcome 3 VO2 Max (ml/kg/min).

Study or subgroup	High intensity N	High intensity Mean(SD)	Low intensity N	Low intensity Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Fatouros 2005	14	19.3 (2.3)	14	17.9 (3.1)		42.88%	1.4[-0.62,3.42]
Tsutsumi 1997	13	23 (5.4)	14	17.8 (4.9)		25.23%	5.2[1.3,9.1]
Vincent 2002	22	24.4 (5.8)	24	24.7 (4.8)		31.89%	-0.3[-3.39,2.79]

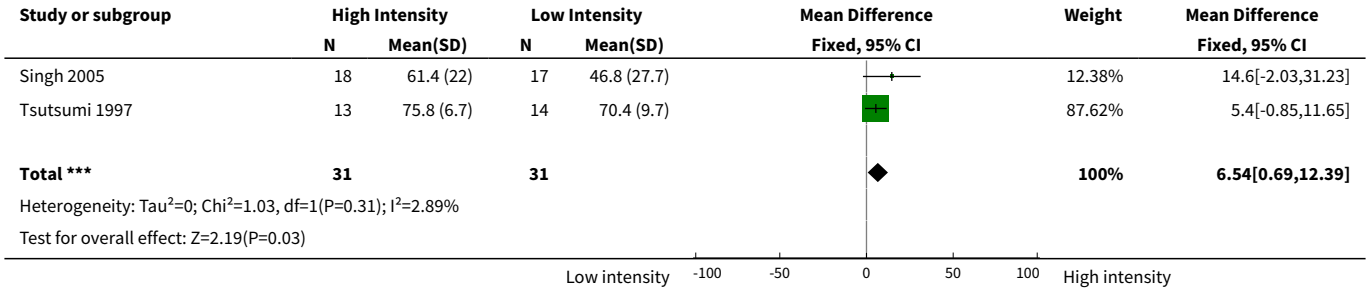




Analysis 2.4. Comparison 2 High versus low intensity PRT, Outcome 4 Pain (higher score = less pain).



Analysis 2.5. Comparison 2 High versus low intensity PRT, Outcome 5 Vitality (SF-36, higher score = more vitality).

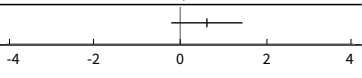


Comparison 3. High versus variable intensity PRT

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Main lower limb (LL) strength measure	1		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected
2 VO2 Max (ml/kg/min)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

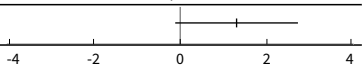
Analysis 3.1. Comparison 3 High versus variable intensity PRT, Outcome 1 Main lower limb (LL) strength measure.

Study or subgroup	High intensity N	High intensity Mean(SD)	Variable intensity N	Variable intensity Mean(SD)	Std. Mean Difference Random, 95% CI	Std. Mean Difference Random, 95% CI
Hunter 2001	12	620 (216)	12	499 (160)		0.61[-0.21,1.44]



Analysis 3.2. Comparison 3 High versus variable intensity PRT, Outcome 2 VO2 Max (ml/kg/min).

Study or subgroup	High intensity N	High intensity Mean(SD)	Variable intensity N	Variable intensity Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
Hunter 2001	14	13.3 (2.1)	14	12 (1.7)		1.3[-0.12,2.72]

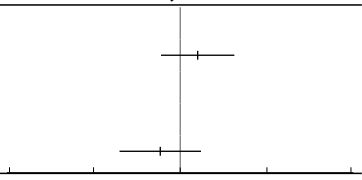


Comparison 4. PRT frequency

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Main LL strength measure	2		Std. Mean Difference (IV, Fixed, 95% CI)	Totals not selected
1.1 Three times versus once per week	1		Std. Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.2 Twice versus once per week	1		Std. Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 4.1. Comparison 4 PRT frequency, Outcome 1 Main LL strength measure.

Study or subgroup	2 or 3 times per week N	2 or 3 times per week Mean(SD)	Once per week N	Once per week Mean(SD)	Std. Mean Difference Fixed, 95% CI	Std. Mean Difference Fixed, 95% CI
4.1.1 Three times versus once per week						
Taaffe 1999	11	67.1 (10.9)	11	62.6 (10.6)		0.4[-0.44,1.25]
4.1.2 Twice versus once per week						
DiFrancisco 2007	9	40.7 (5.4)	9	42.9 (3.5)		-0.46[-1.4,0.48]



Comparison 5. PRT: 3-sets versus 1-sets

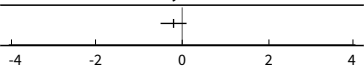
Outcome or subgroup title	No. of studies	No. of partici-pants	Statistical method	Effect size
1 Main lower limb (LL) strength measure	1		Std. Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2 Six-minute walk test (meters)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
3 Timed walk (seconds)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4 Time to stand from a chair (seconds)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
5 Stair climbing (seconds)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Analysis 5.1. Comparison 5 PRT: 3-sets versus 1-sets, Outcome 1 Main lower limb (LL) strength measure.

Study or subgroup	3-set N	3-set Mean(SD)	1-set N	1-set Mean(SD)	Std. Mean Difference Fixed, 95% CI	Std. Mean Difference Fixed, 95% CI
Galvao 2005	16	70.3 (20)	12	61 (26.1)		0.4[-0.36,1.15]

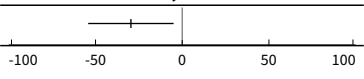
Analysis 5.2. Comparison 5 PRT: 3-sets versus 1-sets, Outcome 2 Six-minute walk test (meters).

Study or subgroup	3-set N	3-set Mean(SD)	1-set N	1-set Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
Galvao 2005	16	4.1 (0.4)	12	4.3 (0.4)		-0.2[-0.5,0.1]



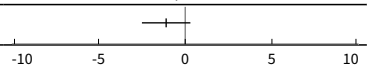
Analysis 5.3. Comparison 5 PRT: 3-sets versus 1-sets, Outcome 3 Timed walk (seconds).

Study or subgroup	3-set N	3-set Mean(SD)	1-set N	1-set Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
Galvao 2005	16	213.3 (26.1)	12	242.9 (37.2)		-29.6[-54.23,-4.97]



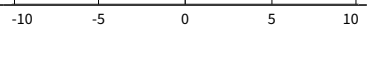
Analysis 5.4. Comparison 5 PRT: 3-sets versus 1-sets, Outcome 4 Time to stand from a chair (seconds).

Study or subgroup	3-set		1-set		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Galvao 2005	16	10.6 (1.5)	12	11.7 (2.1)		-1.1[-2.5,0.3]



Analysis 5.5. Comparison 5 PRT: 3-sets versus 1-sets, Outcome 5 Stair climbing (seconds).

Study or subgroup	3-set		1-set		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI	Fixed, 95% CI
Galvao 2005	16	4.2 (0.5)	12	4.8 (1.1)		-0.6[-1.27,0.07]

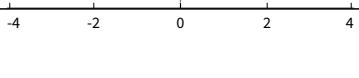


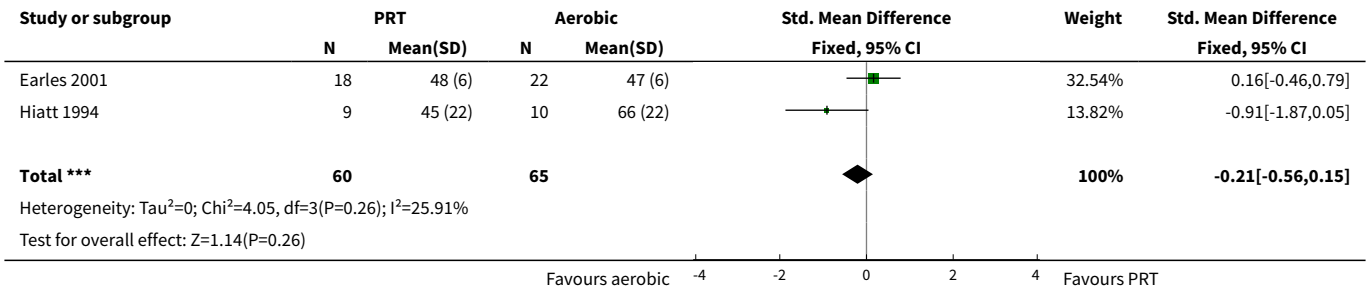
Comparison 6. PRT versus aerobic training

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Main function measure (higher score = better function)	4	125	Std. Mean Difference (IV, Fixed, 95% CI)	-0.21 [-0.56, 0.15]
2 Main function measure (lower score = better function)	1		Std. Mean Difference (IV, Fixed, 95% CI)	Totals not selected
3 Main lower limb strength measure	10	487	Std. Mean Difference (IV, Random, 95% CI)	0.44 [0.08, 0.80]
4 VO2 max (ml/kg.min)	8	423	Mean Difference (IV, Random, 95% CI)	-1.13 [-2.63, 0.38]
5 Six minute walk test (meters)	2	63	Mean Difference (IV, Fixed, 95% CI)	-4.28 [-48.24, 39.67]
6 Gait speed (m/s)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
7 Pain (lower score = less pain)	1		Std. Mean Difference (IV, Fixed, 95% CI)	Totals not selected

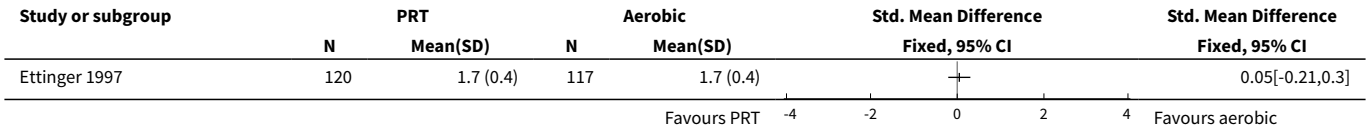
Analysis 6.1. Comparison 6 PRT versus aerobic training, Outcome 1 Main function measure (higher score = better function).

Study or subgroup	PRT		Aerobic		Std. Mean Difference	Weight	Std. Mean Difference
	N	Mean(SD)	N	Mean(SD)	Fixed, 95% CI		Fixed, 95% CI
Mangione 2005	11	57.7 (21.1)	12	57.5 (24.3)		18.93%	0.01[-0.81,0.83]
Buchner 1997	22	69 (39)	21	83 (31)		34.72%	-0.39[-0.99,0.22]

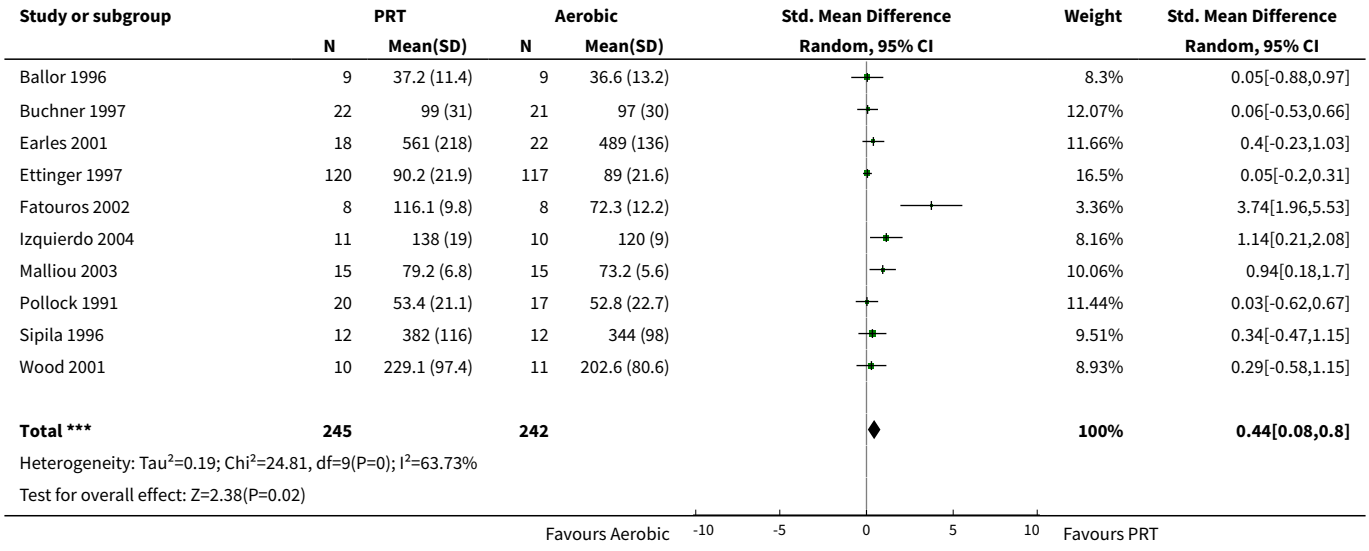




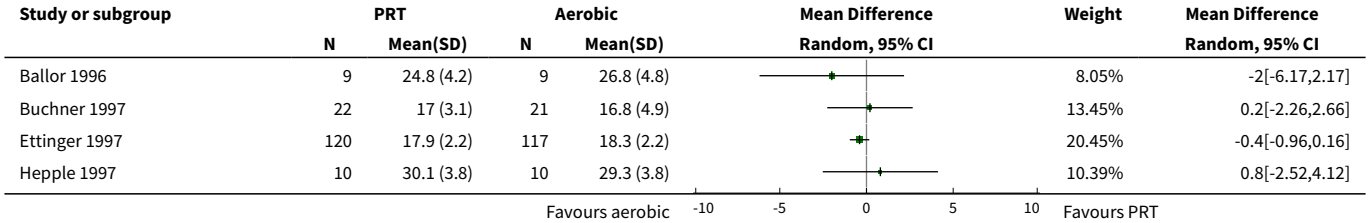
Analysis 6.2. Comparison 6 PRT versus aerobic training, Outcome 2 Main function measure (lower score = better function).

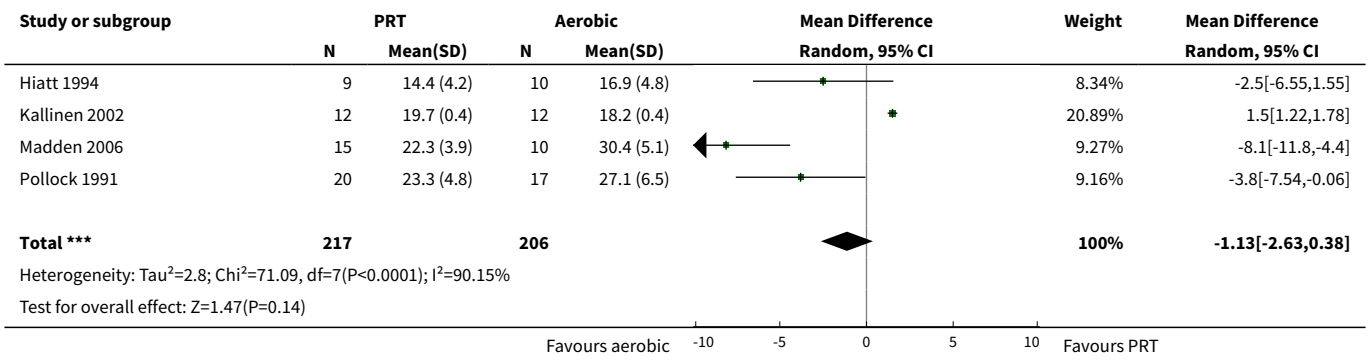


Analysis 6.3. Comparison 6 PRT versus aerobic training, Outcome 3 Main lower limb strength measure.

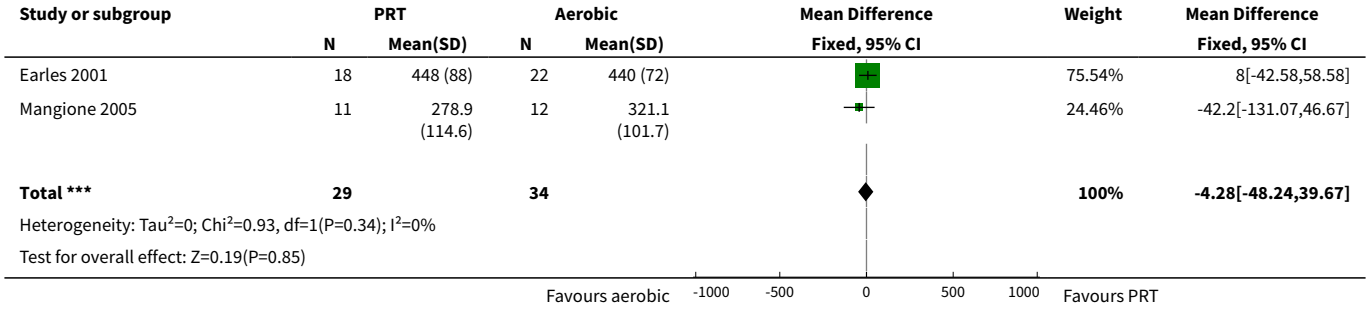


Analysis 6.4. Comparison 6 PRT versus aerobic training, Outcome 4 VO2 max (ml/kg.min).

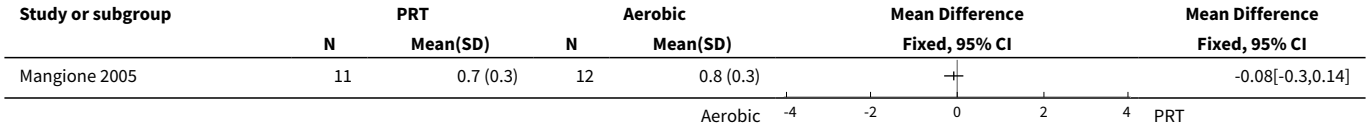




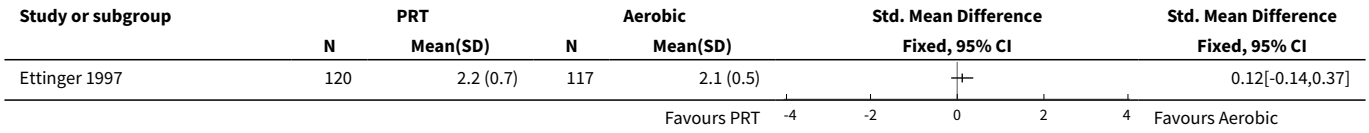
Analysis 6.5. Comparison 6 PRT versus aerobic training, Outcome 5 Six minute walk test (meters).



Analysis 6.6. Comparison 6 PRT versus aerobic training, Outcome 6 Gait speed (m/s).



Analysis 6.7. Comparison 6 PRT versus aerobic training, Outcome 7 Pain (lower score = less pain).

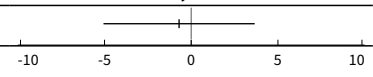


Comparison 7. PRT versus functional exercise

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Main function measure (higher score = better function)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2 Main lower limb strength measure	3	158	Mean Difference (IV, Fixed, 95% CI)	-6.51 [-21.05, 8.04]
3 Timed "Up-and-Go" (seconds)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4 Vitality (SF-36/Vitality plus scale, higher = more vitality)	2	147	Mean Difference (IV, Fixed, 95% CI)	-0.07 [-2.68, 2.54]
5 Pain (higher = less pain, Bodily pain on SF-36)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Analysis 7.1. Comparison 7 PRT versus functional exercise, Outcome 1 Main function measure (higher score = better function).

Study or subgroup	PRT N	PRT Mean(SD)	Functional ex N	Functional ex Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
de Vreede 2007	28	50.1 (9.2)	30	50.8 (7.6)		-0.7[-5.06,3.66]

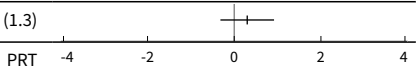


Analysis 7.2. Comparison 7 PRT versus functional exercise, Outcome 2 Main lower limb strength measure.

Study or subgroup	PRT N	PRT Mean(SD)	Functional ex N	Functional ex Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
Chin A Paw 2006	40	73.2 (12.3)	44	82.1 (52.7)		82.35%	-8.9[-24.93,7.13]
de Vreede 2007	28	307.2 (90.9)	30	300.3 (85.7)		10.2%	6.9[-38.64,52.44]
Manini 2005	9	166.2 (60.4)	7	164.6 (48.4)		7.45%	1.6[-51.72,54.92]
Total ***	**77**		**81**			**100%**	**-6.51[-21.05,8.04]**
Heterogeneity: Tau²=0; Chi²=0.51, df=2(P=0.78); I²=0%							
Test for overall effect: Z=0.88(P=0.38)							

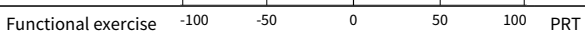
Analysis 7.3. Comparison 7 PRT versus functional exercise, Outcome 3 Timed "Up-and-Go" (seconds).

Study or subgroup	PRT N	PRT Mean(SD)	Functional ex N	Functional ex Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
de Vreede 2007	28	5.3 (1.1)	30	5 (1.3)		0.3[-0.32,0.92]



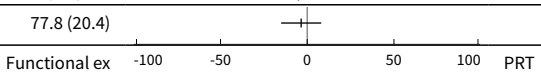
Analysis 7.4. Comparison 7 PRT versus functional exercise, Outcome 4 Vitality (SF-36/Vitality plus scale, higher = more vitality).

Study or subgroup	PRT N	PRT Mean(SD)	Functional ex N	Functional ex Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
Chin A Paw 2006	41	36.9 (6.6)	48	36.5 (6.6)		89.81%	0.4[-2.35,3.15]
de Vreede 2007	28	72.3 (16.1)	30	76.5 (15.6)		10.19%	-4.2[-12.37,3.97]
Total ***	**69**		**78**			**100%**	**-0.07[-2.68,2.54]**
Heterogeneity: Tau²=0; Chi²=1.09, df=1(P=0.3); I²=8.6%							
Test for overall effect: Z=0.05(P=0.96)							



Analysis 7.5. Comparison 7 PRT versus functional exercise, Outcome 5 Pain (higher = less pain, Bodily pain on SF-36).

Study or subgroup	PRT N	PRT Mean(SD)	Functional ex N	Functional ex Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
de Vreede 2007	28	74.3 (24.2)	30	77.8 (20.4)		-3.5[-15.06,8.06]



Comparison 8. PRT versus flexibility training

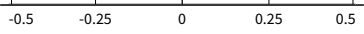
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 SF36 (higher score = better function)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
2 Main lower limb (LL) strength measure	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
3 Timed walk (seconds)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4 Time to stand from a chair (seconds)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
5 Vitality (SF-36/Vitality plus scale, higher = more vitality)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
6 Pain (higher = less pain, Bodily pain on SF- 36)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Analysis 8.1. Comparison 8 PRT versus flexibility training, Outcome 1 SF36 (higher score = better function).

Study or subgroup	PRT N	PRT Mean(SD)	Flexibility N	Flexibility Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
Barrett 2002	22	73.8 (19)	22	78.5 (16.9)		-4.7[-15.33,5.93]

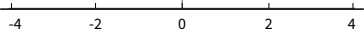
Analysis 8.2. Comparison 8 PRT versus flexibility training, Outcome 2 Main lower limb (LL) strength measure.

Study or subgroup	PRT N	PRT Mean(SD)	Flexibility N	Flexibility Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
Barrett 2002	20	0.4 (0.1)	20	0.4 (0.1)		-0.04[-0.1,0.02]



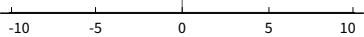
Analysis 8.3. Comparison 8 PRT versus flexibility training, Outcome 3 Timed walk (seconds).

Study or subgroup	PRT N	PRT Mean(SD)	Flexibility N	Flexibility Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
Barrett 2002	20	4.9 (1.1)	20	4.7 (0.9)		0.2[-0.42,0.82]



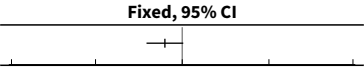
Analysis 8.4. Comparison 8 PRT versus flexibility training, Outcome 4 Time to stand from a chair (seconds).

Study or subgroup	PRT N	PRT Mean(SD)	Flexibility N	Flexibility Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
Barrett 2002	20	10.2 (2.3)	20	9.2 (1.2)		1[-0.14,2.14]



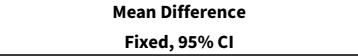
Analysis 8.5. Comparison 8 PRT versus flexibility training, Outcome 5 Vitality (SF-36/Vitality plus scale, higher = more vitality).

Study or subgroup	PRT N	PRT Mean(SD)	Flexibility N	Flexibility Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
Barrett 2002	22	53.5 (21.7)	22	63.5 (13.1)		-10[-20.59,0.59]



Analysis 8.6. Comparison 8 PRT versus flexibility training, Outcome 6 Pain (higher = less pain, Bodily pain on SF- 36).

Study or subgroup	PRT N	PRT Mean(SD)	Flexibility N	Flexibility Mean(SD)	Mean Difference Fixed, 95% CI	Mean Difference Fixed, 95% CI
Barrett 2002	22	76.7 (22.6)	22	73.6 (26.8)		3.1[-11.55,17.75]

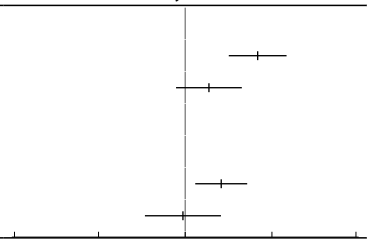


Comparison 9. Power training

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Main lower limb strength measure	3		Std. Mean Difference (IV, Fixed, 95% CI)	Totals not selected
1.1 High intensity (power treatment) versus control (control)	2		Std. Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.2 High intensity (treatment) versus low intensity (control)	2		Std. Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]

Analysis 9.1. Comparison 9 Power training, Outcome 1 Main lower limb strength measure.

Study or subgroup	Power Training N	Power Training Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Std. Mean Difference Fixed, 95% CI
9.1.1 High intensity (power treatment) versus control (control)						
de Vos 2005	22	36 (24)	26	4 (13)		1.67[1,2.34]
Miszko 2003	13	105.3 (53.1)	15	79.7 (37.5)		0.55[-0.21,1.31]
9.1.2 High intensity (treatment) versus low intensity (control)						
de Vos 2005	22	36 (24)	25	19 (16)		0.83[0.23,1.43]
Macaluso 2003	10	330.7 (81.7)	10	335 (73.5)		-0.05[-0.93,0.82]



Comparison 10. PRT versus control supplementary analyses

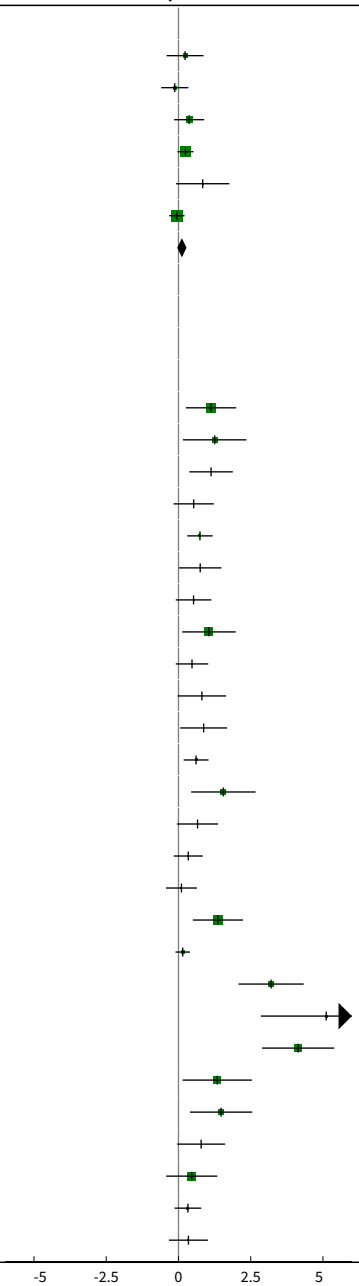
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Strength (grouped by allocation concealment)	73		Std. Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.1 Allocation concealed	6	607	Std. Mean Difference (IV, Fixed, 95% CI)	0.12 [-0.04, 0.28]
1.2 Concealment unknown	67	2452	Std. Mean Difference (IV, Fixed, 95% CI)	0.65 [0.56, 0.73]
2 Strength (grouped by assessor blinding)	73		Std. Mean Difference (IV, Fixed, 95% CI)	Subtotals only
2.1 Blinded assessors	19	1523	Std. Mean Difference (IV, Fixed, 95% CI)	0.23 [0.13, 0.34]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.2 Assessors were not blinded	54	1536	Std. Mean Difference (IV, Fixed, 95% CI)	0.88 [0.77, 0.99]
3 Strength (grouped by intention-to-treat)	73	3059	Std. Mean Difference (IV, Fixed, 95% CI)	0.53 [0.46, 0.61]
3.1 Intention-to-treat was used	12	1041	Std. Mean Difference (IV, Fixed, 95% CI)	0.18 [0.06, 0.30]
3.2 Intention-to-treat was not used	61	2018	Std. Mean Difference (IV, Fixed, 95% CI)	0.74 [0.64, 0.83]
4 Strength (grouped by attention control)	73	3059	Std. Mean Difference (IV, Fixed, 95% CI)	0.53 [0.46, 0.61]
4.1 Attention control	24	1408	Std. Mean Difference (IV, Fixed, 95% CI)	0.34 [0.23, 0.44]
4.2 No attention control	49	1651	Std. Mean Difference (IV, Fixed, 95% CI)	0.72 [0.61, 0.82]
5 Strength (grouped by exercise intensity)	72	3052	Std. Mean Difference (IV, Fixed, 95% CI)	0.53 [0.45, 0.60]
5.1 High intensity	54	2026	Std. Mean Difference (IV, Fixed, 95% CI)	0.60 [0.51, 0.70]
5.2 Low-to-moderate intensity	19	1026	Std. Mean Difference (IV, Fixed, 95% CI)	0.39 [0.26, 0.51]
6 Strength (grouped by exercise duration)	56	2564	Std. Mean Difference (IV, Fixed, 95% CI)	0.53 [0.45, 0.61]
6.1 Less than 12 weeks	20	828	Std. Mean Difference (IV, Fixed, 95% CI)	0.52 [0.37, 0.66]
6.2 Longer than 12 weeks	36	1736	Std. Mean Difference (IV, Fixed, 95% CI)	0.53 [0.43, 0.63]
7 Strength (grouped by health status)	65	2428	Std. Mean Difference (IV, Fixed, 95% CI)	0.60 [0.52, 0.69]
7.1 Healthy participants	46	1502	Std. Mean Difference (IV, Fixed, 95% CI)	0.77 [0.66, 0.88]
7.2 Older adults with a specific health problem	19	926	Std. Mean Difference (IV, Fixed, 95% CI)	0.37 [0.24, 0.51]
8 Strength (grouped by functional limitations)	54	2133	Std. Mean Difference (IV, Fixed, 95% CI)	0.60 [0.51, 0.70]
8.1 No functional limitations	41	1349	Std. Mean Difference (IV, Fixed, 95% CI)	0.81 [0.69, 0.93]

Outcome or subgroup title	No. of studies	No. of partici-pants	Statistical method	Effect size
8.2 With functional limitations	13	784	Std. Mean Difference (IV, Fixed, 95% CI)	0.30 [0.16, 0.44]

Analysis 10.1. Comparison 10 PRT versus control supplementary analyses, Outcome 1 Strength (grouped by allocation concealment).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
10.1.1 Allocation concealed							
Baker 2001	19	40.6 (31)	19	34.8 (16.4)		6.29%	0.23[-0.41,0.87]
Chin A Paw 2006	40	73.2 (12.3)	31	77.5 (48.3)		11.62%	-0.13[-0.6,0.34]
Foley 2003	26	26.7 (14.2)	32	21.9 (11.6)		9.4%	0.37[-0.15,0.89]
Jette 1999	96	15 (5.3)	104	13.7 (5.5)		33.04%	0.24[-0.04,0.52]
Latham 2001	10	12.3 (7.1)	10	7.4 (3.5)		3.01%	0.84[-0.08,1.76]
Latham 2003	108	12.6 (5.4)	112	12.9 (5.3)		36.65%	-0.06[-0.32,0.21]
Subtotal ***	**299**		**308**			**100%**	**0.12[-0.04,0.28]**
Heterogeneity: Tau²=0; Chi²=6.79, df=5(P=0.24); I²=26.36%							
Test for overall effect: Z=1.44(P=0.15)							
10.1.2 Concealment unknown							
Ades 1996	12	46 (16)	12	29 (13)		0.94%	1.13[0.25,2]
Beneka 2005	8	75.2 (5.8)	8	67.9 (5.2)		0.59%	1.25[0.15,2.35]
Bermon 1999	16	23.6 (4)	16	19.2 (3.6)		1.27%	1.13[0.37,1.88]
Boshuizen 2005	16	69.3 (17.2)	17	56.2 (29.4)		1.48%	0.53[-0.17,1.22]
Brandon 2000	43	60.1 (19.9)	42	47.3 (13.6)		3.71%	0.74[0.3,1.18]
Brandon 2003	16	0.8 (0.3)	15	0.6 (0.2)		1.34%	0.75[0.02,1.48]
Brochu 2002	21	43.6 (10.8)	21	36.9 (14.2)		1.9%	0.52[-0.09,1.14]
Bruunsgaard 2004	10	13.2 (3.5)	11	9.5 (3.2)		0.84%	1.05[0.13,1.98]
Buchner 1997	22	99 (31)	29	84 (32)		2.28%	0.47[-0.09,1.03]
Casaburi 2004	12	344 (98)	12	274 (66)		1.02%	0.81[-0.03,1.65]
Castaneda 2001	14	55.9 (22.4)	12	38.8 (14)		1.09%	0.87[0.06,1.68]
Chandler 1998	44	63.7 (27)	43	48.3 (23)		3.88%	0.61[0.18,1.04]
Charette 1991	13	33.9 (7.6)	6	23.1 (3.4)		0.58%	1.55[0.44,2.67]
Collier 1997	24	53.8 (37)	12	32.8 (11.7)		1.42%	0.66[-0.05,1.37]
Damush 1999	33	58 (17.6)	29	52 (17.4)		2.85%	0.34[-0.16,0.84]
de Vreede 2007	28	307.2 (90.9)	26	298.2 (81.2)		2.52%	0.1[-0.43,0.64]
DeBeliso 2005	13	105 (40)	13	58 (25)		0.96%	1.36[0.5,2.23]
Ettinger 1997	120	90.2 (21.9)	127	87 (21.4)		11.52%	0.15[-0.1,0.4]
Fahlman 2002	15	25 (1)	15	20 (1.9)		0.57%	3.2[2.08,4.33]
Fatouros 2002	8	116.1 (9.8)	8	66.5 (8.5)		0.14%	5.11[2.85,7.38]
Fatouros 2005	20	91.7 (8.2)	14	56.4 (8.5)		0.46%	4.14[2.89,5.39]
Frontera 2003	7	18.4 (5.1)	7	12.5 (2.8)		0.5%	1.34[0.14,2.54]
Haykowsky 2000	10	367 (47)	8	290 (53)		0.62%	1.48[0.4,2.55]
Hortobagyi 2001	18	1122 (340)	9	877 (203)		1.04%	0.78[-0.05,1.62]
Hruda 2003	18	81.9 (23.3)	7	71 (22.2)		0.92%	0.46[-0.43,1.34]
Jette 1996	35	52 (18.5)	38	45.8 (19.1)		3.36%	0.33[-0.14,0.79]
Jones 1994	30	55.2 (15.9)	12	50.2 (8.8)		1.58%	0.34[-0.33,1.02]

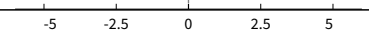


Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Judge 1994	22	8 (3.8)	23	6.9 (1.9)		2.07%	0.36[-0.23,0.95]
Kalapotharakos 2005	11	43.1 (11.5)	10	20.8 (7.2)		0.56%	2.22[1.08,3.35]
Kongsgaard 2004	6	61 (7)	7	51 (6.5)		0.45%	1.38[0.12,2.64]
Lamoureux 2003	29	31.8 (1.7)	15	21.2 (2.4)		0.41%	5.31[3.99,6.63]
Liu-Ambrose 2005	32	18.9 (8.6)	32	17.5 (6.4)		2.98%	0.18[-0.31,0.67]
Maiorana 1997	12	132.4 (26.4)	14	116.6 (26.6)		1.15%	0.58[-0.21,1.37]
Malliou 2003	15	79.2 (6.8)	10	65.9 (5.2)		0.7%	2.07[1.05,3.08]
McCartney 1995	20	124 (22)	23	98 (18)		1.64%	1.28[0.62,1.94]
Mikesky 2006	59	109.4 (35.9)	78	103.9 (35.9)		6.27%	0.15[-0.19,0.49]
Miller 2006	25	5.9 (4.1)	26	5.4 (3.4)		2.38%	0.13[-0.42,0.68]
Miszko 2003	13	105.3 (53.1)	15	79.7 (37.5)		1.25%	0.55[-0.21,1.31]
Nelson 1994	20	37.8 (10.4)	19	25.8 (8.5)		1.51%	1.23[0.54,1.93]
Newnham 1995	12	15.3 (7.5)	12	7.4 (3.6)		0.9%	1.3[0.4,2.19]
Nichols 1993	15	39.2 (12.7)	15	32.2 (9.7)		1.33%	0.6[-0.13,1.34]
Parkhouse 2000	13	98 (21.6)	9	54 (18)		0.61%	2.09[1,3.18]
Pollock 1991	20	53.4 (21.1)	12	43.2 (20.3)		1.36%	0.48[-0.25,1.2]
Pu 2001	9	1630 (516)	7	1292 (352)		0.68%	0.71[-0.32,1.73]
Rall 1996	8	47.3 (14.8)	6	32.2 (11.2)		0.54%	1.05[-0.1,2.21]
Reeves 2004	9	115 (51.7)	9	98.5 (29.9)		0.82%	0.37[-0.56,1.31]
Rhodes 2000	20	33.5 (4.3)	18	28 (4)		1.44%	1.29[0.59,2]
Schilke 1996	10	67.4 (28.6)	10	36.3 (27.8)		0.8%	1.06[0.11,2.01]
Selig 2004	15	111 (37)	17	110 (32)		1.49%	0.03[-0.67,0.72]
Seynnes 2004	8	11.3 (2.8)	8	6.1 (1.7)		0.43%	2.11[0.82,3.4]
Simoneau 2006	11	10.3 (3.4)	9	12.3 (3)		0.88%	-0.58[-1.49,0.32]
Simons 2006	21	48.3 (23)	21	31.7 (14.1)		1.79%	0.85[0.22,1.49]
Simpson 1992	14	24.8 (14)	14	25.1 (14)		1.31%	-0.02[-0.76,0.72]
Singh 1997	17	3241 (191)	14	2756 (334)		0.99%	1.78[0.93,2.64]
Sipila 1996	12	382 (116)	10	332 (77)		0.99%	0.48[-0.37,1.33]
Skelton 1995	20	239.7 (76.3)	20	242.9 (63.7)		1.87%	-0.04[-0.66,0.58]
Skelton 1996	9	279.6 (68.1)	9	195.2 (52.8)		0.66%	1.32[0.27,2.36]
Sousa 2005	10	83.5 (12.5)	10	57 (10.1)		0.53%	2.23[1.07,3.4]
Suetta 2004	11	86.4 (10.2)	9	70.5 (10.5)		0.69%	1.47[0.46,2.49]
Taaffe 1996	7	159.8 (30.7)	11	116.1 (18.5)		0.55%	1.75[0.6,2.89]
Taaffe 1999	11	62.6 (10.6)	12	45 (10.9)		0.78%	1.58[0.62,2.54]
Topp 1993	25	101.2 (40)	30	87.3 (32.9)		2.51%	0.38[-0.16,0.91]
Tracy 2004	11	88 (38)	9	69.1 (26.4)		0.89%	0.54[-0.36,1.44]
Tsutsumi 1997	13	30.9 (7)	14	25.8 (9.2)		1.2%	0.6[-0.17,1.38]
Vincent 2002	22	347.1 (167)	16	222.9 (75)		1.57%	0.89[0.21,1.57]
Westhoff 2000	10	88.7 (21.7)	11	75.7 (31.7)		0.95%	0.46[-0.41,1.32]
Wood 2001	10	229.1 (97.4)	6	201.7 (97.2)		0.69%	0.27[-0.75,1.28]
Subtotal * **	**1263**		**1189**			**100%**	**0.65[0.56,0.73]**

Heterogeneity: $Tau^2=0$; $Chi^2=254.38$, df=66(P<0.0001); $I^2=74.05\%$

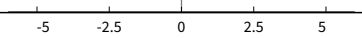
Test for overall effect: Z=14.94(P<0.0001)

Test for subgroup differences: $Chi^2=32.69$, df=1 (P<0.0001), $I^2=96.94\%$



Analysis 10.2. Comparison 10 PRT versus control supplementary analyses, Outcome 2 Strength (grouped by assessor blinding).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
10.2.1 Blinded assessors							
Boshuizen 2005	16	69.3 (17.2)	17	56.2 (29.4)		2.14%	0.53[-0.17,1.22]
Buchner 1997	22	99 (31)	29	84 (32)		3.29%	0.47[-0.09,1.03]
Casaburi 2004	12	344 (98)	12	274 (66)		1.48%	0.81[-0.03,1.65]
Chandler 1998	44	63.7 (27)	43	48.3 (23)		5.61%	0.61[0.18,1.04]
Chin A Paw 2006	40	73.2 (12.3)	31	77.5 (48.3)		4.71%	-0.13[-0.6,0.34]
de Vreede 2007	28	307.2 (90.9)	26	298.2 (81.2)		3.64%	0.1[-0.43,0.64]
Ettinger 1997	120	90.2 (21.9)	127	87 (21.4)		16.64%	0.15[-0.1,0.4]
Foley 2003	26	26.7 (14.2)	32	21.9 (11.6)		3.81%	0.37[-0.15,0.89]
Jette 1996	35	52 (18.5)	38	45.8 (19.1)		4.86%	0.33[-0.14,0.79]
Jette 1999	96	15 (5.3)	104	13.7 (5.5)		13.4%	0.24[-0.04,0.52]
Jones 1994	30	55.2 (15.9)	12	50.2 (8.8)		2.29%	0.34[-0.33,1.02]
Judge 1994	22	8 (3.8)	23	6.9 (1.9)		2.99%	0.36[-0.23,0.95]
Kalapotharakos 2005	11	43.1 (11.5)	10	20.8 (7.2)		0.81%	2.22[1.08,3.35]
Latham 2003	108	12.6 (5.4)	112	12.9 (5.3)		14.86%	-0.06[-0.32,0.21]
Liu-Ambrose 2005	32	18.9 (8.6)	32	17.5 (6.4)		4.31%	0.18[-0.31,0.67]
Mikesky 2006	59	109.4 (35.9)	78	103.9 (35.9)		9.06%	0.15[-0.19,0.49]
Miller 2006	25	5.9 (4.1)	26	5.4 (3.4)		3.44%	0.13[-0.42,0.68]
Newnham 1995	12	15.3 (7.5)	12	7.4 (3.6)		1.3%	1.3[0.4,2.19]
Westhoff 2000	10	88.7 (21.7)	11	75.7 (31.7)		1.37%	0.46[-0.41,1.32]
Subtotal ***	**748**		**775**			**100%**	**0.23[0.13,0.34]**
Heterogeneity: Tau^2=0; Chi^2=32.15, df=18(P=0.02); I^2=44.01%							
Test for overall effect: Z=4.51(P<0.0001)							
10.2.2 Assessors were not blinded							
Ades 1996	12	46 (16)	12	29 (13)		1.6%	1.13[0.25,2]
Baker 2001	19	40.6 (31)	19	34.8 (16.4)		3%	0.23[-0.41,0.87]
Beneka 2005	8	75.2 (5.8)	8	67.9 (5.2)		1.01%	1.25[0.15,2.35]
Bermon 1999	16	23.6 (4)	16	19.2 (3.6)		2.16%	1.13[0.37,1.88]
Brandon 2000	43	60.1 (19.9)	42	47.3 (13.6)		6.31%	0.74[0.3,1.18]
Brandon 2003	16	0.8 (0.3)	15	0.6 (0.2)		2.28%	0.75[0.02,1.48]
Brochu 2002	21	43.6 (10.8)	21	36.9 (14.2)		3.22%	0.52[-0.09,1.14]
Bruunsgaard 2004	10	13.2 (3.5)	11	9.5 (3.2)		1.42%	1.05[0.13,1.98]
Castaneda 2001	14	55.9 (22.4)	12	38.8 (14)		1.85%	0.87[0.06,1.68]
Charette 1991	13	33.9 (7.6)	6	23.1 (3.4)		0.98%	1.55[0.44,2.67]
Collier 1997	24	53.8 (37)	12	32.8 (11.7)		2.41%	0.66[-0.05,1.37]
Damush 1999	33	58 (17.6)	29	52 (17.4)		4.84%	0.34[-0.16,0.84]
DeBeliso 2005	13	105 (40)	13	58 (25)		1.62%	1.36[0.5,2.23]
Fahlman 2002	15	25 (1)	15	20 (1.9)		0.96%	3.2[2.08,4.33]
Fatouros 2002	8	116.1 (9.8)	8	66.5 (8.5)		0.24%	5.11[2.85,7.38]
Fatouros 2005	20	91.7 (8.2)	14	56.4 (8.5)		0.78%	4.14[2.89,5.39]
Frontera 2003	7	18.4 (5.1)	7	12.5 (2.8)		0.85%	1.34[0.14,2.54]
Haykowsky 2000	10	367 (47)	8	290 (53)		1.05%	1.48[0.4,2.55]
Hortobagyi 2001	18	1122 (340)	9	877 (203)		1.77%	0.78[-0.05,1.62]
Hruda 2003	18	81.9 (23.3)	7	71 (22.2)		1.56%	0.46[-0.43,1.34]
Kongsgaard 2004	6	61 (7)	7	51 (6.5)		0.77%	1.38[0.12,2.64]
Lamoureux 2003	29	31.8 (1.7)	15	21.2 (2.4)		0.7%	5.31[3.99,6.63]
Latham 2001	10	12.3 (7.1)	10	7.4 (3.5)		1.43%	0.84[-0.08,1.76]
Maiorana 1997	12	132.4 (26.4)	14	116.6 (26.6)		1.96%	0.58[-0.21,1.37]



Favours control — Favours PRT

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Malliou 2003	15	79.2 (6.8)	10	65.9 (5.2)		1.19%	2.07[1.05,3.08]
McCartney 1995	20	124 (22)	23	98 (18)		2.78%	1.28[0.62,1.94]
Miszko 2003	13	105.3 (53.1)	15	79.7 (37.5)		2.12%	0.55[-0.21,1.31]
Nelson 1994	20	37.8 (10.4)	19	25.8 (8.5)		2.56%	1.23[0.54,1.93]
Nichols 1993	15	39.2 (12.7)	15	32.2 (9.7)		2.27%	0.6[-0.13,1.34]
Parkhouse 2000	13	98 (21.6)	9	54 (18)		1.03%	2.09[1,3.18]
Pollock 1991	20	53.4 (21.1)	12	43.2 (20.3)		2.32%	0.48[-0.25,1.2]
Pu 2001	9	1630 (516)	7	1292 (352)		1.16%	0.71[-0.32,1.73]
Rall 1996	8	47.3 (14.8)	6	32.2 (11.2)		0.92%	1.05[-0.1,2.21]
Reeves 2004	9	115 (51.7)	9	98.5 (29.9)		1.4%	0.37[-0.56,1.31]
Rhodes 2000	20	33.5 (4.3)	18	28 (4)		2.45%	1.29[0.59,2]
Schilke 1996	10	67.4 (28.6)	10	36.3 (27.8)		1.36%	1.06[0.11,2.01]
Selig 2004	15	111 (37)	17	110 (32)		2.54%	0.03[-0.67,0.72]
Seynnes 2004	8	11.3 (2.8)	8	6.1 (1.7)		0.73%	2.11[0.82,3.4]
Simoneau 2006	11	10.3 (3.4)	9	12.3 (3)		1.5%	-0.58[-1.49,0.32]
Simons 2006	21	48.3 (23)	21	31.7 (14.1)		3.04%	0.85[0.22,1.49]
Simpson 1992	14	24.8 (14)	14	25.1 (14)		2.23%	-0.02[-0.76,0.72]
Singh 1997	17	3241 (191)	14	2756 (334)		1.68%	1.78[0.93,2.64]
Sipila 1996	12	382 (116)	10	332 (77)		1.68%	0.48[-0.37,1.33]
Skelton 1995	20	239.7 (76.3)	20	242.9 (63.7)		3.18%	-0.04[-0.66,0.58]
Skelton 1996	9	279.6 (68.1)	9	195.2 (52.8)		1.12%	1.32[0.27,2.36]
Sousa 2005	10	83.5 (12.5)	10	57 (10.1)		0.9%	2.23[1.07,3.4]
Suetta 2004	11	86.4 (10.2)	9	70.5 (10.5)		1.18%	1.47[0.46,2.49]
Taaffe 1996	7	159.8 (30.7)	11	116.1 (18.5)		0.93%	1.75[0.6,2.89]
Taaffe 1999	11	62.6 (10.6)	12	45 (10.9)		1.33%	1.58[0.62,2.54]
Topp 1993	25	101.2 (40)	30	87.3 (32.9)		4.26%	0.38[-0.16,0.91]
Tracy 2004	11	88 (38)	9	69.1 (26.4)		1.51%	0.54[-0.36,1.44]
Tsutsumi 1997	13	30.9 (7)	14	25.8 (9.2)		2.04%	0.6[-0.17,1.38]
Vincent 2002	22	347.1 (167)	16	222.9 (75)		2.66%	0.89[0.21,1.57]
Wood 2001	10	229.1 (97.4)	6	201.7 (97.2)		1.18%	0.27[-0.75,1.28]
Subtotal * **	**814**		**722**			**100%**	**0.88[0.77,0.99]**
Heterogeneity: Tau²=0; Chi²=191.16, df=53(P<0.0001); I²=72.27%							
Test for overall effect: Z=15.58(P<0.0001)							
Test for subgroup differences: Chi²=70.56, df=1 (P<0.0001), I²=98.58%							

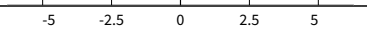
Favours control -5 -2.5 0 2.5 5 Favours PRT

Analysis 10.3. Comparison 10 PRT versus control supplementary analyses, Outcome 3 Strength (grouped by intention-to-treat).

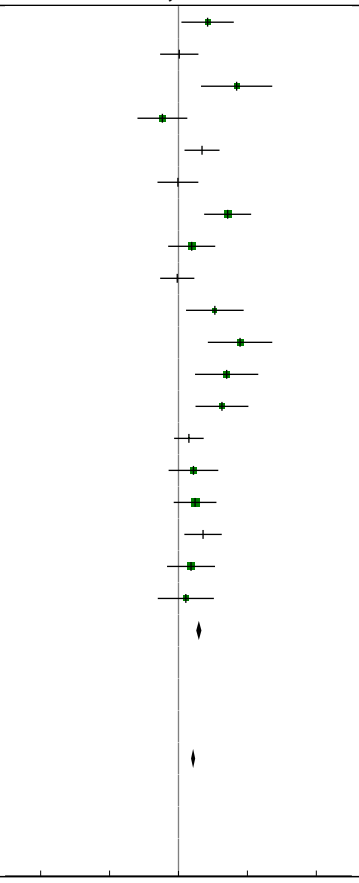
Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
10.3.1 Intention-to-treat was used							
Baker 2001	19	40.6 (31)	19	34.8 (16.4)		1.38%	0.23[-0.41,0.87]
Buchner 1997	22	99 (31)	29	84 (32)		1.78%	0.47[-0.09,1.03]
Chin A Paw 2006	40	73.2 (12.3)	31	77.5 (48.3)		2.55%	-0.13[-0.6,0.34]
Ettinger 1997	120	90.2 (21.9)	127	87 (21.4)		9%	0.15[-0.1,0.4]
Foley 2003	26	26.7 (14.2)	32	21.9 (11.6)		2.06%	0.37[-0.15,0.89]
Judge 1994	22	8 (3.8)	23	6.9 (1.9)		1.61%	0.36[-0.23,0.95]
Latham 2003	108	12.6 (5.4)	112	12.9 (5.3)		8.03%	-0.06[-0.32,0.21]

Favours experimental -5 -2.5 0 2.5 5 Favours control

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Liu-Ambrose 2005	32	18.9 (8.6)	32	17.5 (6.4)		2.33%	0.18[-0.31,0.67]
Mikesky 2006	59	109.4 (35.9)	78	103.9 (35.9)		4.9%	0.15[-0.19,0.49]
Miller 2006	25	5.9 (4.1)	26	5.4 (3.4)		1.86%	0.13[-0.42,0.68]
Nelson 1994	20	37.8 (10.4)	19	25.8 (8.5)		1.18%	1.23[0.54,1.93]
Suetta 2004	11	86.4 (10.2)	9	70.5 (10.5)		0.54%	1.47[0.46,2.49]
Subtotal ***	**504**		**537**			**37.21%**	**0.18[0.06,0.3]**
Heterogeneity: Tau²=0; Chi²=21.88, df=11(P=0.03); I²=49.72%							
Test for overall effect: Z=2.88(P=0)							
10.3.2 Intention-to-treat was not used							
Ades 1996	12	46 (16)	12	29 (13)		0.74%	1.13[0.25,2]
Beneka 2005	8	75.2 (5.8)	8	67.9 (5.2)		0.46%	1.25[0.15,2.35]
Bermon 1999	16	23.6 (4)	16	19.2 (3.6)		0.99%	1.13[0.37,1.88]
Boshuizen 2005	16	69.3 (17.2)	17	56.2 (29.4)		1.16%	0.53[-0.17,1.22]
Brandon 2000	43	60.1 (19.9)	42	47.3 (13.6)		2.9%	0.74[0.3,1.18]
Brandon 2003	16	0.8 (0.3)	15	0.6 (0.2)		1.05%	0.75[0.02,1.48]
Brochu 2002	21	43.6 (10.8)	21	36.9 (14.2)		1.48%	0.52[-0.09,1.14]
Bruunsgaard 2004	10	13.2 (3.5)	11	9.5 (3.2)		0.65%	1.05[0.13,1.98]
Casaburi 2004	12	344 (98)	12	274 (66)		0.8%	0.81[-0.03,1.65]
Castaneda 2001	14	55.9 (22.4)	12	38.8 (14)		0.85%	0.87[0.06,1.68]
Chandler 1998	44	63.7 (27)	43	48.3 (23)		3.03%	0.61[0.18,1.04]
Charette 1991	13	33.9 (7.6)	6	23.1 (3.4)		0.45%	1.55[0.44,2.67]
Collier 1997	24	53.8 (37)	12	32.8 (11.7)		1.11%	0.66[-0.05,1.37]
Damush 1999	33	58 (17.6)	29	52 (17.4)		2.22%	0.34[-0.16,0.84]
de Vreede 2007	28	307.2 (90.9)	26	298.2 (81.2)		1.97%	0.1[-0.43,0.64]
DeBeliso 2005	13	105 (40)	13	58 (25)		0.75%	1.36[0.5,2.23]
Fahlman 2002	15	25 (1)	15	20 (1.9)		0.44%	3.2[2.08,4.33]
Fatouros 2002	8	116.1 (9.8)	8	66.5 (8.5)		0.11%	5.11[2.85,7.38]
Fatouros 2005	20	91.7 (8.2)	14	56.4 (8.5)		0.36%	4.14[2.89,5.39]
Frontera 2003	7	18.4 (5.1)	7	12.5 (2.8)		0.39%	1.34[0.14,2.54]
Haykowsky 2000	10	367 (47)	8	290 (53)		0.48%	1.48[0.4,2.55]
Hortobagyi 2001	18	1122 (340)	9	877 (203)		0.81%	0.78[-0.05,1.62]
Hruda 2003	18	81.9 (23.3)	7	71 (22.2)		0.72%	0.46[-0.43,1.34]
Jette 1996	35	52 (18.5)	38	45.8 (19.1)		2.63%	0.33[-0.14,0.79]
Jette 1999	96	15 (5.3)	104	13.7 (5.5)		7.24%	0.24[-0.04,0.52]
Jones 1994	30	55.2 (15.9)	12	50.2 (8.8)		1.24%	0.34[-0.33,1.02]
Kalapotharakos 2005	11	43.1 (11.5)	10	20.8 (7.2)		0.44%	2.22[1.08,3.35]
Kongsgaard 2004	6	61 (7)	7	51 (6.5)		0.35%	1.38[0.12,2.64]
Lamoureux 2003	29	31.8 (1.7)	15	21.2 (2.4)		0.32%	5.31[3.99,6.63]
Latham 2001	10	12.3 (7.1)	10	7.4 (3.5)		0.66%	0.84[-0.08,1.76]
Maiorana 1997	12	132.4 (26.4)	14	116.6 (26.6)		0.9%	0.58[-0.21,1.37]
Malliou 2003	15	79.2 (6.8)	10	65.9 (5.2)		0.55%	2.07[1.05,3.08]
McCartney 1995	20	124 (22)	23	98 (18)		1.28%	1.28[0.62,1.94]
Miszko 2003	13	105.3 (53.1)	15	79.7 (37.5)		0.98%	0.55[-0.21,1.31]
Newnham 1995	12	15.3 (7.5)	12	7.4 (3.6)		0.7%	1.3[0.4,2.19]
Nichols 1993	15	39.2 (12.7)	15	32.2 (9.7)		1.04%	0.6[-0.13,1.34]
Parkhouse 2000	13	98 (21.6)	9	54 (18)		0.47%	2.09[1,3.18]
Pollock 1991	20	53.4 (21.1)	12	43.2 (20.3)		1.06%	0.48[-0.25,1.2]
Pu 2001	9	1630 (516)	7	1292 (352)		0.53%	0.71[-0.32,1.73]
Rall 1996	8	47.3 (14.8)	6	32.2 (11.2)		0.42%	1.05[-0.1,2.21]
Reeves 2004	9	115 (51.7)	9	98.5 (29.9)		0.64%	0.37[-0.56,1.31]
Rhodes 2000	20	33.5 (4.3)	18	28 (4)		1.12%	1.29[0.59,2]

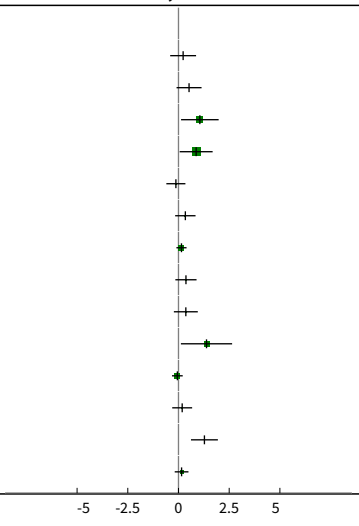


Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Schilke 1996	10	67.4 (28.6)	10	36.3 (27.8)		0.62%	1.06[0.11,2.01]
Selig 2004	15	111 (37)	17	110 (32)		1.16%	0.03[-0.67,0.72]
Seynnes 2004	8	11.3 (2.8)	8	6.1 (1.7)		0.34%	2.11[0.82,3.4]
Simoneau 2006	11	10.3 (3.4)	9	12.3 (3)		0.69%	-0.58[-1.49,0.32]
Simons 2006	21	48.3 (23)	21	31.7 (14.1)		1.39%	0.85[0.22,1.49]
Simpson 1992	14	24.8 (14)	14	25.1 (14)		1.02%	-0.02[-0.76,0.72]
Singh 1997	17	3241 (191)	14	2756 (334)		0.77%	1.78[0.93,2.64]
Sipila 1996	12	382 (116)	10	332 (77)		0.77%	0.48[-0.37,1.33]
Skelton 1995	20	239.7 (76.3)	20	242.9 (63.7)		1.46%	-0.04[-0.66,0.58]
Skelton 1996	9	279.6 (68.1)	9	195.2 (52.8)		0.51%	1.32[0.27,2.36]
Sousa 2005	10	83.5 (12.5)	10	57 (10.1)		0.41%	2.23[1.07,3.4]
Taaffe 1996	7	159.8 (30.7)	11	116.1 (18.5)		0.43%	1.75[0.6,2.89]
Taaffe 1999	11	62.6 (10.6)	12	45 (10.9)		0.61%	1.58[0.62,2.54]
Topp 1993	25	101.2 (40)	30	87.3 (32.9)		1.96%	0.38[-0.16,0.91]
Tracy 2004	11	88 (38)	9	69.1 (26.4)		0.69%	0.54[-0.36,1.44]
Tsutsumi 1997	13	30.9 (7)	14	25.8 (9.2)		0.94%	0.6[-0.17,1.38]
Vincent 2002	22	347.1 (167)	16	222.9 (75)		1.22%	0.89[0.21,1.57]
Westhoff 2000	10	88.7 (21.7)	11	75.7 (31.7)		0.74%	0.46[-0.41,1.32]
Wood 2001	10	229.1 (97.4)	6	201.7 (97.2)		0.54%	0.27[-0.75,1.28]
Subtotal * **	**1058**		**960**			**62.79%**	**0.74[0.64,0.83]**
Heterogeneity: Tau²=0; Chi²=222.25, df=60(P<0.0001); I²=73%							
Test for overall effect: Z=15.3(P<0.0001)							
Total * **	**1562**		**1497**			**100%**	**0.53[0.46,0.61]**
Heterogeneity: Tau²=0; Chi²=293.86, df=72(P<0.0001); I²=75.5%							
Test for overall effect: Z=13.88(P<0.0001)							
Test for subgroup differences: Chi²=49.74, df=1 (P<0.0001), I²=97.99%							



Analysis 10.4. Comparison 10 PRT versus control supplementary analyses, Outcome 4 Strength (grouped by attention control).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
10.4.1 Attention control							
Baker 2001	19	40.6 (31)	19	34.8 (16.4)		1.38%	0.23[-0.41,0.87]
Brochu 2002	21	43.6 (10.8)	21	36.9 (14.2)		1.48%	0.52[-0.09,1.14]
Bruunsgaard 2004	10	13.2 (3.5)	11	9.5 (3.2)		0.65%	1.05[0.13,1.98]
Castaneda 2001	14	55.9 (22.4)	12	38.8 (14)		0.85%	0.87[0.06,1.68]
Chin A Paw 2006	40	73.2 (12.3)	31	77.5 (48.3)		2.55%	-0.13[-0.6,0.34]
Damush 1999	33	58 (17.6)	29	52 (17.4)		2.22%	0.34[-0.16,0.84]
Ettinger 1997	120	90.2 (21.9)	127	87 (21.4)		9%	0.15[-0.1,0.4]
Foley 2003	26	26.7 (14.2)	32	21.9 (11.6)		2.06%	0.37[-0.15,0.89]
Judge 1994	22	8 (3.8)	23	6.9 (1.9)		1.61%	0.36[-0.23,0.95]
Kongsgaard 2004	6	61 (7)	7	51 (6.5)		0.35%	1.38[0.12,2.64]
Latham 2003	108	12.6 (5.4)	112	12.9 (5.3)		8.03%	-0.06[-0.32,0.21]
Liu-Ambrose 2005	32	18.9 (8.6)	32	17.5 (6.4)		2.33%	0.18[-0.31,0.67]
McCartney 1995	20	124 (22)	23	98 (18)		1.28%	1.28[0.62,1.94]
Mikesky 2006	59	109.4 (35.9)	78	103.9 (35.9)		4.9%	0.15[-0.19,0.49]

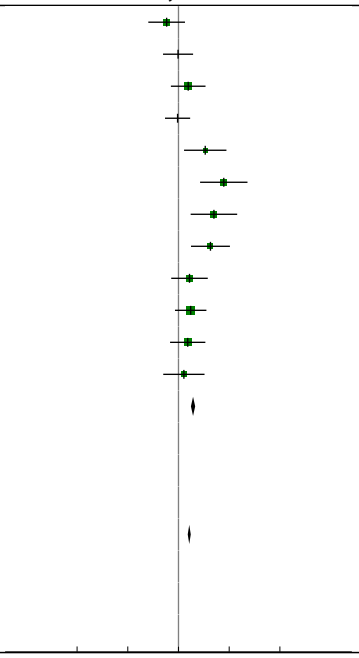


Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Miller 2006	25	5.9 (4.1)	26	5.4 (3.4)		1.86%	0.13[-0.42,0.68]
Miszko 2003	13	105.3 (53.1)	15	79.7 (37.5)		0.98%	0.55[-0.21,1.31]
Newnham 1995	12	15.3 (7.5)	12	7.4 (3.6)		0.7%	1.3[0.4,2.19]
Pu 2001	9	1630 (516)	7	1292 (352)		0.53%	0.71[-0.32,1.73]
Seynnes 2004	8	11.3 (2.8)	8	6.1 (1.7)		0.34%	2.11[0.82,3.4]
Simons 2006	21	48.3 (23)	21	31.7 (14.1)		1.39%	0.85[0.22,1.49]
Singh 1997	17	3241 (191)	14	2756 (334)		0.77%	1.78[0.93,2.64]
Suetta 2004	11	86.4 (10.2)	9	70.5 (10.5)		0.54%	1.47[0.46,2.49]
Topp 1993	25	101.2 (40)	30	87.3 (32.9)		1.96%	0.38[-0.16,0.91]
Vincent 2002	22	347.1 (167)	16	222.9 (75)		1.22%	0.89[0.21,1.57]
Subtotal * **	**693**		**715**			**48.99%**	**0.34[0.23,0.44]**
Heterogeneity: Tau²=0; Chi²=64.77, df=23(P<0.0001); I²=64.49%							
Test for overall effect: Z=6.14(P<0.0001)							
10.4.2 No attention control							
Ades 1996	12	46 (16)	12	29 (13)		0.74%	1.13[0.25,2]
Beneka 2005	8	75.2 (5.8)	8	67.9 (5.2)		0.46%	1.25[0.15,2.35]
Bermon 1999	16	23.6 (4)	16	19.2 (3.6)		0.99%	1.13[0.37,1.88]
Boshuizen 2005	16	69.3 (17.2)	17	56.2 (29.4)		1.16%	0.53[-0.17,1.22]
Brandon 2000	43	60.1 (19.9)	42	47.3 (13.6)		2.9%	0.74[0.3,1.18]
Brandon 2003	16	0.8 (0.3)	15	0.6 (0.2)		1.05%	0.75[0.02,1.48]
Buchner 1997	22	99 (31)	29	84 (32)		1.78%	0.47[-0.09,1.03]
Casaburi 2004	12	344 (98)	12	274 (66)		0.8%	0.81[-0.03,1.65]
Chandler 1998	44	63.7 (27)	43	48.3 (23)		3.03%	0.61[0.18,1.04]
Charette 1991	13	33.9 (7.6)	6	23.1 (3.4)		0.45%	1.55[0.44,2.67]
Collier 1997	24	53.8 (37)	12	32.8 (11.7)		1.11%	0.66[-0.05,1.37]
de Vreede 2007	28	307.2 (90.9)	26	298.2 (81.2)		1.97%	0.1[-0.43,0.64]
DeBeliso 2005	13	105 (40)	13	58 (25)		0.75%	1.36[0.5,2.23]
Fahlman 2002	15	25 (1)	15	20 (1.9)		0.44%	3.2[2.08,4.33]
Fatouros 2002	8	116.1 (9.8)	8	66.5 (8.5)		0.11%	5.11[2.85,7.38]
Fatouros 2005	20	91.7 (8.2)	14	56.4 (8.5)		0.36%	4.14[2.89,5.39]
Frontera 2003	7	18.4 (5.1)	7	12.5 (2.8)		0.39%	1.34[0.14,2.54]
Haykowsky 2000	10	367 (47)	8	290 (53)		0.48%	1.48[0.4,2.55]
Hortobagyi 2001	18	1122 (340)	9	877 (203)		0.81%	0.78[-0.05,1.62]
Hruda 2003	18	81.9 (23.3)	7	71 (22.2)		0.72%	0.46[-0.43,1.34]
Jette 1996	35	52 (18.5)	38	45.8 (19.1)		2.63%	0.33[-0.14,0.79]
Jette 1999	96	15 (5.3)	104	13.7 (5.5)		7.24%	0.24[-0.04,0.52]
Jones 1994	30	55.2 (15.9)	12	50.2 (8.8)		1.24%	0.34[-0.33,1.02]
Kalapotharakos 2005	11	43.1 (11.5)	10	20.8 (7.2)		0.44%	2.22[1.08,3.35]
Lamoureux 2003	29	31.8 (1.7)	15	21.2 (2.4)		0.32%	5.31[3.99,6.63]
Latham 2001	10	12.3 (7.1)	10	7.4 (3.5)		0.66%	0.84[-0.08,1.76]
Maiorana 1997	12	132.4 (26.4)	14	116.6 (26.6)		0.9%	0.58[-0.21,1.37]
Malliou 2003	15	79.2 (6.8)	10	65.9 (5.2)		0.55%	2.07[1.05,3.08]
Nelson 1994	20	37.8 (10.4)	19	25.8 (8.5)		1.18%	1.23[0.54,1.93]
Nichols 1993	15	39.2 (12.7)	15	32.2 (9.7)		1.04%	0.6[-0.13,1.34]
Parkhouse 2000	13	98 (21.6)	9	54 (18)		0.47%	2.09[1,3.18]
Pollock 1991	20	53.4 (21.1)	12	43.2 (20.3)		1.06%	0.48[-0.25,1.2]
Rall 1996	8	47.3 (14.8)	6	32.2 (11.2)		0.42%	1.05[-0.1,2.21]
Reeves 2004	9	115 (51.7)	9	98.5 (29.9)		0.64%	0.37[-0.56,1.31]
Rhodes 2000	20	33.5 (4.3)	18	28 (4)		1.12%	1.29[0.59,2]
Schilke 1996	10	67.4 (28.6)	10	36.3 (27.8)		0.62%	1.06[0.11,2.01]
Selig 2004	15	111 (37)	17	110 (32)		1.16%	0.03[-0.67,0.72]

Favours experimental

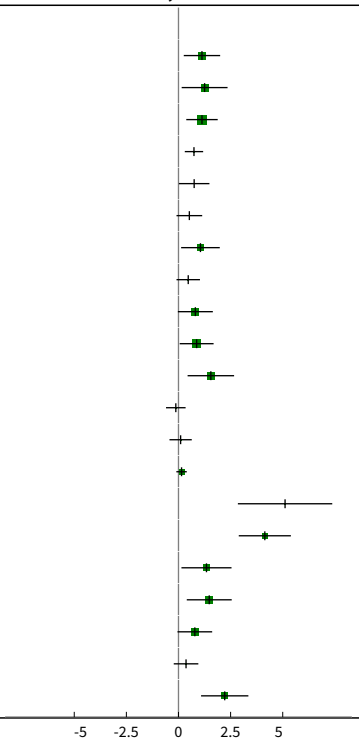
Favours control

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Simoneau 2006	11	10.3 (3.4)	9	12.3 (3)		0.69%	-0.58[-1.49,0.32]
Simpson 1992	14	24.8 (14)	14	25.1 (14)		1.02%	-0.02[-0.76,0.72]
Sipila 1996	12	382 (116)	10	332 (77)		0.77%	0.48[-0.37,1.33]
Skelton 1995	20	239.7 (76.3)	20	242.9 (63.7)		1.46%	-0.04[-0.66,0.58]
Skelton 1996	9	279.6 (68.1)	9	195.2 (52.8)		0.51%	1.32[0.27,2.36]
Sousa 2005	10	83.5 (12.5)	10	57 (10.1)		0.41%	2.23[1.07,3.4]
Taaffe 1996	7	159.8 (30.7)	11	116.1 (18.5)		0.43%	1.75[0.6,2.89]
Taaffe 1999	11	62.6 (10.6)	12	45 (10.9)		0.61%	1.58[0.62,2.54]
Tracy 2004	11	88 (38)	9	69.1 (26.4)		0.69%	0.54[-0.36,1.44]
Tsutsumi 1997	13	30.9 (7)	14	25.8 (9.2)		0.94%	0.6[-0.17,1.38]
Westhoff 2000	10	88.7 (21.7)	11	75.7 (31.7)		0.74%	0.46[-0.41,1.32]
Wood 2001	10	229.1 (97.4)	6	201.7 (97.2)		0.54%	0.27[-0.75,1.28]
Subtotal ***	**869**		**782**			**51.01%**	**0.72[0.61,0.82]**
Heterogeneity: Tau²=0; Chi²=204.05, df=48(P<0.0001); I²=76.48%							
Test for overall effect: Z=13.41(P<0.0001)							
Total ***	**1562**		**1497**			**100%**	**0.53[0.46,0.61]**
Heterogeneity: Tau²=0; Chi²=293.86, df=72(P<0.0001); I²=75.5%							
Test for overall effect: Z=13.88(P<0.0001)							
Test for subgroup differences: Chi²=25.04, df=1 (P<0.0001), I²=96.01%							

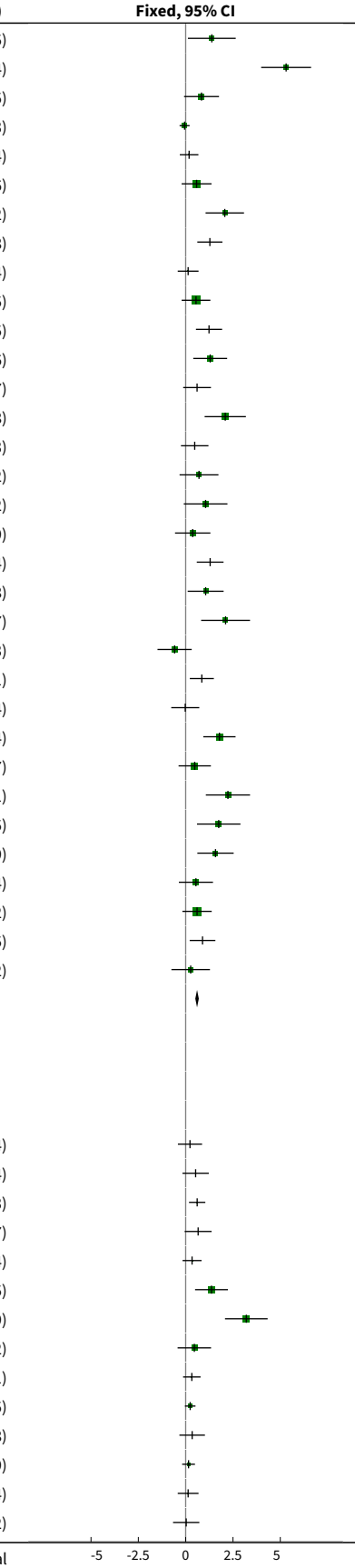


Analysis 10.5. Comparison 10 PRT versus control supplementary analyses, Outcome 5 Strength (grouped by exercise intensity).

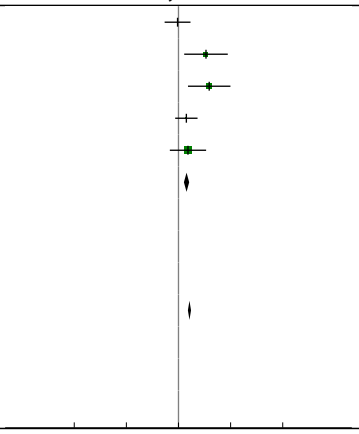
Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
10.5.1 High intensity							
Ades 1996	12	46 (16)	12	29 (13)		0.74%	1.13[0.25,2]
Beneka 2005	8	75.2 (5.8)	8	67.9 (5.2)		0.46%	1.25[0.15,2.35]
Bermon 1999	16	23.6 (4)	16	19.2 (3.6)		0.99%	1.13[0.37,1.88]
Brandon 2000	43	60.1 (19.9)	42	47.3 (13.6)		2.9%	0.74[0.3,1.18]
Brandon 2003	16	0.8 (0.3)	15	0.6 (0.2)		1.05%	0.75[0.02,1.48]
Brochu 2002	21	43.6 (10.8)	21	36.9 (14.2)		1.48%	0.52[-0.09,1.14]
Bruunsgaard 2004	10	13.2 (3.5)	11	9.5 (3.2)		0.66%	1.05[0.13,1.98]
Buchner 1997	22	99 (31)	29	84 (32)		1.78%	0.47[-0.09,1.03]
Casaburi 2004	12	344 (98)	12	274 (66)		0.8%	0.81[-0.03,1.65]
Castaneda 2001	14	55.9 (22.4)	12	38.8 (14)		0.85%	0.87[0.06,1.68]
Charette 1991	13	33.9 (7.6)	6	23.1 (3.4)		0.45%	1.55[0.44,2.67]
Chin A Paw 2006	40	73.2 (12.3)	31	77.5 (48.3)		2.55%	-0.13[-0.6,0.34]
de Vreede 2007	28	307.2 (90.9)	26	298.2 (81.2)		1.97%	0.1[-0.43,0.64]
Ettinger 1997	120	90.2 (21.9)	127	87 (21.4)		9.01%	0.15[-0.1,0.4]
Fatouros 2002	8	116.1 (9.8)	8	66.5 (8.5)		0.11%	5.11[2.85,7.38]
Fatouros 2005	20	91.7 (8.2)	14	56.4 (8.5)		0.36%	4.14[2.89,5.39]
Frontera 2003	7	18.4 (5.1)	7	12.5 (2.8)		0.39%	1.34[0.14,2.54]
Haykowsky 2000	10	367 (47)	8	290 (53)		0.48%	1.48[0.4,2.55]
Hortobagyi 2001	18	1122 (340)	9	877 (203)		0.81%	0.78[-0.05,1.62]
Judge 1994	22	8 (3.8)	23	6.9 (1.9)		1.62%	0.36[-0.23,0.95]
Kalapotharakos 2005	11	43.1 (11.5)	10	20.8 (7.2)		0.44%	2.22[1.08,3.35]



Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Kongsgaard 2004	6	61 (7)	7	51 (6.5)		0.35%	1.38[0.12,2.64]
Lamoureux 2003	29	31.8 (1.7)	15	21.2 (2.4)		0.32%	5.31[3.99,6.63]
Latham 2001	10	12.3 (7.1)	10	7.4 (3.5)		0.66%	0.84[-0.08,1.76]
Latham 2003	108	12.6 (5.4)	112	12.9 (5.3)		8.05%	-0.06[-0.32,0.21]
Liu-Ambrose 2005	32	18.9 (8.6)	32	17.5 (6.4)		2.33%	0.18[-0.31,0.67]
Maiorana 1997	12	132.4 (26.4)	14	116.6 (26.6)		0.9%	0.58[-0.21,1.37]
Malliou 2003	15	79.2 (6.8)	10	65.9 (5.2)		0.55%	2.07[1.05,3.08]
McCartney 1995	20	124 (22)	23	98 (18)		1.28%	1.28[0.62,1.94]
Miller 2006	25	5.9 (4.1)	26	5.4 (3.4)		1.86%	0.13[-0.42,0.68]
Miszko 2003	13	105.3 (53.1)	15	79.7 (37.5)		0.98%	0.55[-0.21,1.31]
Nelson 1994	20	37.8 (10.4)	19	25.8 (8.5)		1.18%	1.23[0.54,1.93]
Newnham 1995	12	15.3 (7.5)	12	7.4 (3.6)		0.7%	1.3[0.4,2.19]
Nichols 1993	15	39.2 (12.7)	15	32.2 (9.7)		1.04%	0.6[-0.13,1.34]
Parkhouse 2000	13	98 (21.6)	9	54 (18)		0.47%	2.09[1,3.18]
Pollock 1991	20	53.4 (21.1)	12	43.2 (20.3)		1.07%	0.48[-0.25,1.2]
Pu 2001	9	1630 (516)	7	1292 (352)		0.53%	0.71[-0.32,1.73]
Rall 1996	8	47.3 (14.8)	6	32.2 (11.2)		0.42%	1.05[-0.1,2.21]
Reeves 2004	9	115 (51.7)	9	98.5 (29.9)		0.64%	0.37[-0.56,1.31]
Rhodes 2000	20	33.5 (4.3)	18	28 (4)		1.13%	1.29[0.59,2]
Schilke 1996	10	67.4 (28.6)	10	36.3 (27.8)		0.62%	1.06[0.11,2.01]
Seynnes 2004	8	11.3 (2.8)	8	6.1 (1.7)		0.34%	2.11[0.82,3.4]
Simoneau 2006	11	10.3 (3.4)	9	12.3 (3)		0.69%	-0.58[-1.49,0.32]
Simons 2006	21	48.3 (23)	21	31.7 (14.1)		1.4%	0.85[0.22,1.49]
Simpson 1992	14	24.8 (14)	14	25.1 (14)		1.03%	-0.02[-0.76,0.72]
Singh 1997	17	3241 (191)	14	2756 (334)		0.77%	1.78[0.93,2.64]
Sipila 1996	12	382 (116)	10	332 (77)		0.77%	0.48[-0.37,1.33]
Sousa 2005	10	83.5 (12.5)	10	57 (10.1)		0.41%	2.23[1.07,3.4]
Taaffe 1996	7	159.8 (30.7)	11	116.1 (18.5)		0.43%	1.75[0.6,2.89]
Taaffe 1999	11	62.6 (10.6)	12	45 (10.9)		0.61%	1.58[0.62,2.54]
Tracy 2004	11	88 (38)	9	69.1 (26.4)		0.69%	0.54[-0.36,1.44]
Tsutsumi 1997	13	30.9 (7)	14	25.8 (9.2)		0.94%	0.6[-0.17,1.38]
Vincent 2002	22	347.1 (167)	16	222.9 (75)		1.22%	0.89[0.21,1.57]
Wood 2001	10	229.1 (97.4)	6	201.7 (97.2)		0.54%	0.27[-0.75,1.28]
Subtotal ***	**1044**		**982**			**64.88%**	**0.6[0.51,0.7]**
Heterogeneity: Tau²=0; Chi²=243.17, df=53(P<0.0001); I²=78.2%							
Test for overall effect: Z=12.67(P<0.0001)							
10.5.2 Low-to-moderate intensity							
Baker 2001	19	40.6 (31)	19	34.8 (16.4)		1.38%	0.23[-0.41,0.87]
Boshuizen 2005	16	69.3 (17.2)	17	56.2 (29.4)		1.16%	0.53[-0.17,1.22]
Chandler 1998	44	63.7 (27)	43	48.3 (23)		3.04%	0.61[0.18,1.04]
Collier 1997	24	53.8 (37)	12	32.8 (11.7)		1.11%	0.66[-0.05,1.37]
Damush 1999	33	58 (17.6)	29	52 (17.4)		2.23%	0.34[-0.16,0.84]
DeBeliso 2005	13	105 (40)	13	58 (25)		0.75%	1.36[0.5,2.23]
Fahlman 2002	15	25 (1)	15	20 (1.9)		0.44%	3.2[2.08,4.33]
Hruda 2003	18	81.9 (23.3)	7	71 (22.2)		0.72%	0.46[-0.43,1.34]
Jette 1996	35	52 (18.5)	38	45.8 (19.1)		2.63%	0.33[-0.14,0.79]
Jette 1999	96	15 (5.3)	104	13.7 (5.5)		7.26%	0.24[-0.04,0.52]
Jones 1994	30	55.2 (15.9)	12	50.2 (8.8)		1.24%	0.34[-0.33,1.02]
Mikesky 2006	59	109.4 (35.9)	78	103.9 (35.9)		4.91%	0.15[-0.19,0.49]
Miller 2006	25	5.9 (4.1)	26	5.4 (3.4)		1.86%	0.13[-0.42,0.68]
Selig 2004	15	111 (37)	17	110 (32)		1.17%	0.03[-0.67,0.72]

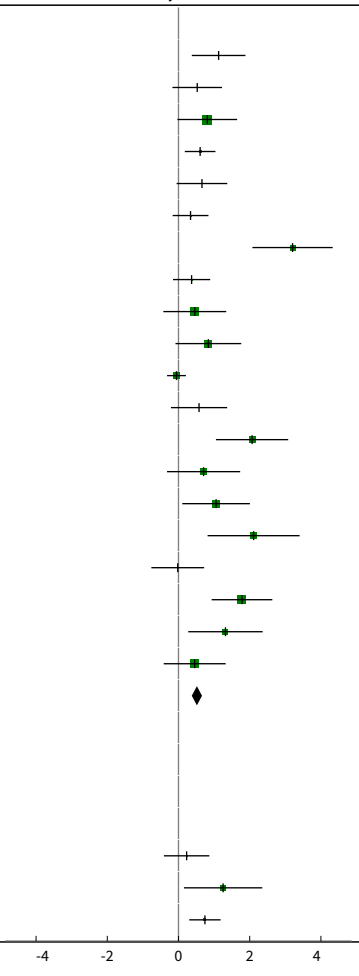


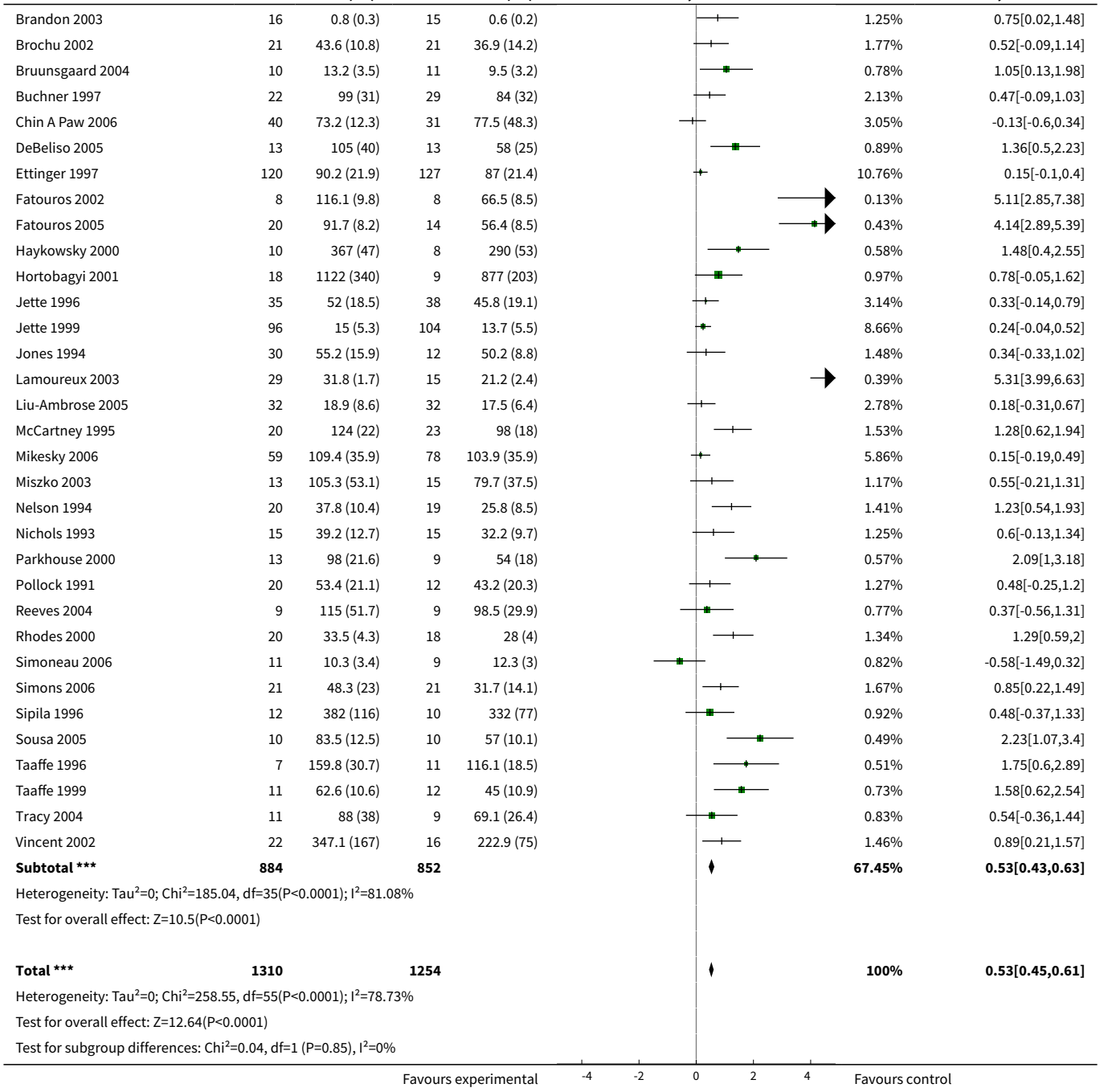
Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Skelton 1995	20	239.7 (76.3)	20	242.9 (63.7)		1.46%	-0.04[-0.66,0.58]
Skelton 1996	9	279.6 (68.1)	9	195.2 (52.8)		0.52%	1.32[0.27,2.36]
Suetta 2004	11	86.4 (10.2)	9	70.5 (10.5)		0.54%	1.47[0.46,2.49]
Topp 1993	25	101.2 (40)	30	87.3 (32.9)		1.96%	0.38[-0.16,0.91]
Westhoff 2000	10	88.7 (21.7)	11	75.7 (31.7)		0.74%	0.46[-0.41,1.32]
Subtotal ***	**517**		**509**			**35.12%**	**0.39[0.26,0.51]**
Heterogeneity: Tau²=0; Chi²=45.11, df=18(P=0); I²=60.1%							
Test for overall effect: Z=5.99(P<0.0001)							
Total ***	**1561**		**1491**			**100%**	**0.53[0.45,0.6]**
Heterogeneity: Tau²=0; Chi²=295.51, df=72(P<0.0001); I²=75.64%							
Test for overall effect: Z=13.76(P<0.0001)							
Test for subgroup differences: Chi²=7.24, df=1 (P=0.01), I²=86.18%							



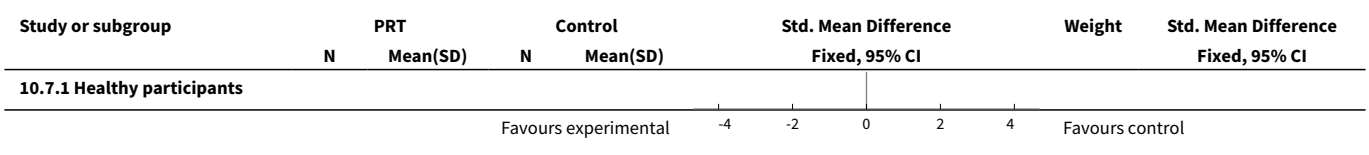
Analysis 10.6. Comparison 10 PRT versus control supplementary analyses, Outcome 6 Strength (grouped by exercise duration).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
10.6.1 Less than 12 weeks							
Bermon 1999	16	23.6 (4)	16	19.2 (3.6)		1.18%	1.13[0.37,1.88]
Boshuizen 2005	16	69.3 (17.2)	17	56.2 (29.4)		1.39%	0.53[-0.17,1.22]
Casaburi 2004	12	344 (98)	12	274 (66)		0.96%	0.81[-0.03,1.65]
Chandler 1998	44	63.7 (27)	43	48.3 (23)		3.63%	0.61[0.18,1.04]
Collier 1997	24	53.8 (37)	12	32.8 (11.7)		1.33%	0.66[-0.05,1.37]
Damush 1999	33	58 (17.6)	29	52 (17.4)		2.66%	0.34[-0.16,0.84]
Fahlman 2002	15	25 (1)	15	20 (1.9)		0.53%	3.2[2.08,4.33]
Foley 2003	26	26.7 (14.2)	32	21.9 (11.6)		2.46%	0.37[-0.15,0.89]
Hruda 2003	18	81.9 (23.3)	7	71 (22.2)		0.86%	0.46[-0.43,1.34]
Latham 2001	10	12.3 (7.1)	10	7.4 (3.5)		0.79%	0.84[-0.08,1.76]
Latham 2003	108	12.6 (5.4)	112	12.9 (5.3)		9.61%	-0.06[-0.32,0.21]
Maiorana 1997	12	132.4 (26.4)	14	116.6 (26.6)		1.08%	0.58[-0.21,1.37]
Malliou 2003	15	79.2 (6.8)	10	65.9 (5.2)		0.65%	2.07[1.05,3.08]
Pu 2001	9	1630 (516)	7	1292 (352)		0.64%	0.71[-0.32,1.73]
Schilke 1996	10	67.4 (28.6)	10	36.3 (27.8)		0.74%	1.06[0.11,2.01]
Seynnes 2004	8	11.3 (2.8)	8	6.1 (1.7)		0.4%	2.11[0.82,3.4]
Simpson 1992	14	24.8 (14)	14	25.1 (14)		1.22%	-0.02[-0.76,0.72]
Singh 1997	17	3241 (191)	14	2756 (334)		0.92%	1.78[0.93,2.64]
Skelton 1996	9	279.6 (68.1)	9	195.2 (52.8)		0.62%	1.32[0.27,2.36]
Westhoff 2000	10	88.7 (21.7)	11	75.7 (31.7)		0.89%	0.46[-0.41,1.32]
Subtotal ***	**426**		**402**			**32.55%**	**0.52[0.37,0.66]**
Heterogeneity: Tau²=0; Chi²=73.47, df=19(P<0.0001); I²=74.14%							
Test for overall effect: Z=7.06(P<0.0001)							
10.6.2 Longer than 12 weeks							
Baker 2001	19	40.6 (31)	19	34.8 (16.4)		1.65%	0.23[-0.41,0.87]
Beneka 2005	8	75.2 (5.8)	8	67.9 (5.2)		0.55%	1.25[0.15,2.35]
Brandon 2000	43	60.1 (19.9)	42	47.3 (13.6)		3.46%	0.74[0.3,1.18]





Analysis 10.7. Comparison 10 PRT versus control supplementary analyses, Outcome 7 Strength (grouped by health status).



Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Ades 1996	12	46 (16)	12	29 (13)		0.95%	1.13[0.25,2]
Beneka 2005	8	75.2 (5.8)	8	67.9 (5.2)		0.6%	1.25[0.15,2.35]
Bermon 1999	16	23.6 (4)	16	19.2 (3.6)		1.28%	1.13[0.37,1.88]
Brandon 2000	43	60.1 (19.9)	42	47.3 (13.6)		3.73%	0.74[0.3,1.18]
Bruunsgaard 2004	10	13.2 (3.5)	11	9.5 (3.2)		0.84%	1.05[0.13,1.98]
Buchner 1997	22	99 (31)	29	84 (32)		2.29%	0.47[-0.09,1.03]
Charette 1991	13	33.9 (7.6)	6	23.1 (3.4)		0.58%	1.55[0.44,2.67]
Chin A Paw 2006	40	73.2 (12.3)	31	77.5 (48.3)		3.28%	-0.13[-0.6,0.34]
Collier 1997	24	53.8 (37)	12	32.8 (11.7)		1.43%	0.66[-0.05,1.37]
Damush 1999	33	58 (17.6)	29	52 (17.4)		2.86%	0.34[-0.16,0.84]
de Vreede 2007	28	307.2 (90.9)	26	298.2 (81.2)		2.54%	0.1[-0.43,0.64]
DeBeliso 2005	13	105 (40)	13	58 (25)		0.96%	1.36[0.5,2.23]
Fahlman 2002	15	25 (1)	15	20 (1.9)		0.57%	3.2[2.08,4.33]
Fatouros 2002	8	116.1 (9.8)	8	66.5 (8.5)		0.14%	5.11[2.85,7.38]
Fatouros 2005	20	91.7 (8.2)	14	56.4 (8.5)		0.46%	4.14[2.89,5.39]
Frontera 2003	7	18.4 (5.1)	7	12.5 (2.8)		0.5%	1.34[0.14,2.54]
Haykowsky 2000	10	367 (47)	8	290 (53)		0.62%	1.48[0.4,2.55]
Hortobagyi 2001	18	1122 (340)	9	877 (203)		1.05%	0.78[-0.05,1.62]
Hruda 2003	18	81.9 (23.3)	7	71 (22.2)		0.93%	0.46[-0.43,1.34]
Jette 1996	35	52 (18.5)	38	45.8 (19.1)		3.38%	0.33[-0.14,0.79]
Jones 1994	30	55.2 (15.9)	12	50.2 (8.8)		1.59%	0.34[-0.33,1.02]
Judge 1994	22	8 (3.8)	23	6.9 (1.9)		2.08%	0.36[-0.23,0.95]
Kalapotharakos 2005	11	43.1 (11.5)	10	20.8 (7.2)		0.56%	2.22[1.08,3.35]
Lamoureux 2003	29	31.8 (1.7)	15	21.2 (2.4)		0.42%	5.31[3.99,6.63]
Latham 2001	10	12.3 (7.1)	10	7.4 (3.5)		0.85%	0.84[-0.08,1.76]
Malliou 2003	15	79.2 (6.8)	10	65.9 (5.2)		0.7%	2.07[1.05,3.08]
McCartney 1995	20	124 (22)	23	98 (18)		1.65%	1.28[0.62,1.94]
Nelson 1994	20	37.8 (10.4)	19	25.8 (8.5)		1.51%	1.23[0.54,1.93]
Nichols 1993	15	39.2 (12.7)	15	32.2 (9.7)		1.34%	0.6[-0.13,1.34]
Pollock 1991	20	53.4 (21.1)	12	43.2 (20.3)		1.37%	0.48[-0.25,1.2]
Rall 1996	8	47.3 (14.8)	6	32.2 (11.2)		0.54%	1.05[-0.1,2.21]
Reeves 2004	9	115 (51.7)	9	98.5 (29.9)		0.83%	0.37[-0.56,1.31]
Rhodes 2000	20	33.5 (4.3)	18	28 (4)		1.45%	1.29[0.59,2]
Seynnes 2004	8	11.3 (2.8)	8	6.1 (1.7)		0.43%	2.11[0.82,3.4]
Simoneau 2006	11	10.3 (3.4)	9	12.3 (3)		0.89%	-0.58[-1.49,0.32]
Simons 2006	21	48.3 (23)	21	31.7 (14.1)		1.8%	0.85[0.22,1.49]
Sipila 1996	12	382 (116)	10	332 (77)		0.99%	0.48[-0.37,1.33]
Skelton 1995	20	239.7 (76.3)	20	242.9 (63.7)		1.88%	-0.04[-0.66,0.58]
Sousa 2005	10	83.5 (12.5)	10	57 (10.1)		0.53%	2.23[1.07,3.4]
Taaffe 1996	7	159.8 (30.7)	11	116.1 (18.5)		0.55%	1.75[0.6,2.89]
Taaffe 1999	11	62.6 (10.6)	12	45 (10.9)		0.79%	1.58[0.62,2.54]
Topp 1993	25	101.2 (40)	30	87.3 (32.9)		2.52%	0.38[-0.16,0.91]
Tracy 2004	11	88 (38)	9	69.1 (26.4)		0.89%	0.54[-0.36,1.44]
Tsutsumi 1997	13	30.9 (7)	14	25.8 (9.2)		1.21%	0.6[-0.17,1.38]
Vincent 2002	22	347.1 (167)	16	222.9 (75)		1.58%	0.89[0.21,1.57]
Wood 2001	10	229.1 (97.4)	6	201.7 (97.2)		0.7%	0.27[-0.75,1.28]
Subtotal * **	**803**		**699**			**58.66%**	**0.77[0.66,0.88]**
Heterogeneity: Tau²=0; Chi²=201.2, df=45(P<0.0001); I²=77.63%							
Test for overall effect: Z=13.52(P<0.0001)							
10.7.2 Older adults with a specific health problem							
Baker 2001	19	40.6 (31)	19	34.8 (16.4)		1.78%	0.23[-0.41,0.87]

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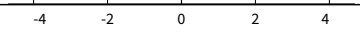
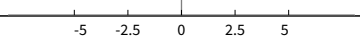
Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Brandon 2003	16	0.8 (0.3)	15	0.6 (0.2)		1.35%	0.75[0.02,1.48]
Brochu 2002	21	43.6 (10.8)	21	36.9 (14.2)		1.91%	0.52[-0.09,1.14]
Casaburi 2004	12	344 (98)	12	274 (66)		1.03%	0.81[-0.03,1.65]
Castaneda 2001	14	55.9 (22.4)	12	38.8 (14)		1.1%	0.87[0.06,1.68]
Ettinger 1997	120	90.2 (21.9)	127	87 (21.4)		11.59%	0.15[-0.1,0.4]
Foley 2003	26	26.7 (14.2)	32	21.9 (11.6)		2.65%	0.37[-0.15,0.89]
Kongsgaard 2004	6	61 (7)	7	51 (6.5)		0.45%	1.38[0.12,2.64]
Liu-Ambrose 2005	32	18.9 (8.6)	32	17.5 (6.4)		3%	0.18[-0.31,0.67]
Maiorana 1997	12	132.4 (26.4)	14	116.6 (26.6)		1.16%	0.58[-0.21,1.37]
Mikesky 2006	59	109.4 (35.9)	78	103.9 (35.9)		6.31%	0.15[-0.19,0.49]
Miller 2006	25	5.9 (4.1)	26	5.4 (3.4)		2.4%	0.13[-0.42,0.68]
Parkhouse 2000	13	98 (21.6)	9	54 (18)		0.61%	2.09[1,3.18]
Pu 2001	9	1630 (516)	7	1292 (352)		0.69%	0.71[-0.32,1.73]
Schilke 1996	10	67.4 (28.6)	10	36.3 (27.8)		0.8%	1.06[0.11,2.01]
Selig 2004	15	111 (37)	17	110 (32)		1.5%	0.03[-0.67,0.72]
Simpson 1992	14	24.8 (14)	14	25.1 (14)		1.32%	-0.02[-0.76,0.72]
Singh 1997	17	3241 (191)	14	2756 (334)		1%	1.78[0.93,2.64]
Suetta 2004	11	86.4 (10.2)	9	70.5 (10.5)		0.7%	1.47[0.46,2.49]
Subtotal * **	**451**		**475**			**41.34%**	**0.37[0.24,0.51]**
Heterogeneity: Tau^2=0; Chi^2=41.71, df=18(P=0); I^2=56.84%							
Test for overall effect: Z=5.53(P<0.0001)							
Total * **	**1254**		**1174**			**100%**	**0.6[0.52,0.69]**
Heterogeneity: Tau^2=0; Chi^2=262.76, df=64(P<0.0001); I^2=75.64%							
Test for overall effect: Z=13.91(P<0.0001)							
Test for subgroup differences: Chi^2=19.85, df=1 (P<0.0001), I^2=94.96%							

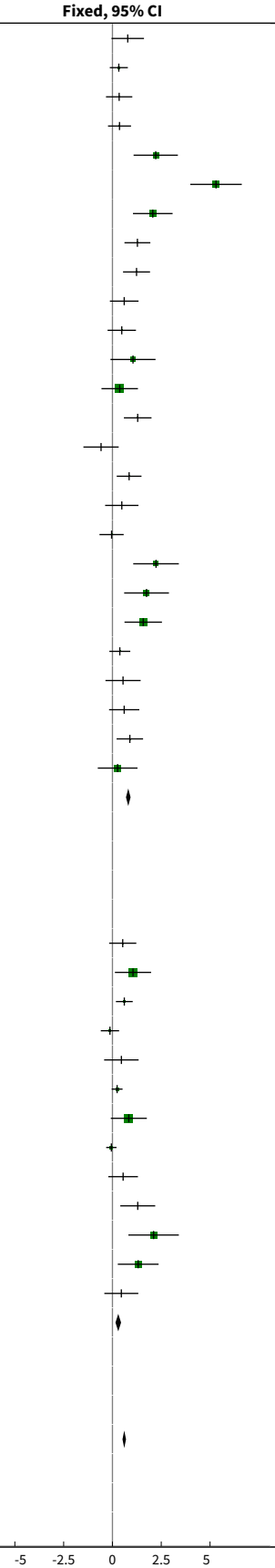


Analysis 10.8. Comparison 10 PRT versus control supplementary analyses, Outcome 8 Strength (grouped by functional limitations).

Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
10.8.1 No functional limitations							
Ades 1996	12	46 (16)	12	29 (13)		1.09%	1.13[0.25,2]
Beneka 2005	8	75.2 (5.8)	8	67.9 (5.2)		0.68%	1.25[0.15,2.35]
Bermon 1999	16	23.6 (4)	16	19.2 (3.6)		1.46%	1.13[0.37,1.88]
Brandon 2000	43	60.1 (19.9)	42	47.3 (13.6)		4.26%	0.74[0.3,1.18]
Buchner 1997	22	99 (31)	29	84 (32)		2.62%	0.47[-0.09,1.03]
Charette 1991	13	33.9 (7.6)	6	23.1 (3.4)		0.67%	1.55[0.44,2.67]
Collier 1997	24	53.8 (37)	12	32.8 (11.7)		1.63%	0.66[-0.05,1.37]
Damush 1999	33	58 (17.6)	29	52 (17.4)		3.27%	0.34[-0.16,0.84]
de Vreede 2007	28	307.2 (90.9)	26	298.2 (81.2)		2.9%	0.1[-0.43,0.64]
DeBeliso 2005	13	105 (40)	13	58 (25)		1.1%	1.36[0.5,2.23]
Fahlman 2002	15	25 (1)	15	20 (1.9)		0.65%	3.2[2.08,4.33]
Fatouros 2002	8	116.1 (9.8)	8	66.5 (8.5)		0.16%	5.11[2.85,7.38]
Fatouros 2005	20	91.7 (8.2)	14	56.4 (8.5)		0.53%	4.14[2.89,5.39]
Frontera 2003	7	18.4 (5.1)	7	12.5 (2.8)		0.57%	1.34[0.14,2.54]
Haykowsky 2000	10	367 (47)	8	290 (53)		0.71%	1.48[0.4,2.55]



Study or subgroup	PRT N	PRT Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Fixed, 95% CI	Weight	Std. Mean Difference Fixed, 95% CI
Hortobagyi 2001	18	1122 (340)	9	877 (203)		1.2%	0.78[-0.05,1.62]
Jette 1996	35	52 (18.5)	38	45.8 (19.1)		3.87%	0.33[-0.14,0.79]
Jones 1994	30	55.2 (15.9)	12	50.2 (8.8)		1.82%	0.34[-0.33,1.02]
Judge 1994	22	8 (3.8)	23	6.9 (1.9)		2.38%	0.36[-0.23,0.95]
Kalapotharakos 2005	11	43.1 (11.5)	10	20.8 (7.2)		0.64%	2.22[1.08,3.35]
Lamoureux 2003	29	31.8 (1.7)	15	21.2 (2.4)		0.48%	5.31[3.99,6.63]
Malliou 2003	15	79.2 (6.8)	10	65.9 (5.2)		0.8%	2.07[1.05,3.08]
McCartney 1995	20	124 (22)	23	98 (18)		1.88%	1.28[0.62,1.94]
Nelson 1994	20	37.8 (10.4)	19	25.8 (8.5)		1.73%	1.23[0.54,1.93]
Nichols 1993	15	39.2 (12.7)	15	32.2 (9.7)		1.53%	0.6[-0.13,1.34]
Pollock 1991	20	53.4 (21.1)	12	43.2 (20.3)		1.57%	0.48[-0.25,1.2]
Rall 1996	8	47.3 (14.8)	6	32.2 (11.2)		0.62%	1.05[-0.1,2.21]
Reeves 2004	9	115 (51.7)	9	98.5 (29.9)		0.95%	0.37[-0.56,1.31]
Rhodes 2000	20	33.5 (4.3)	18	28 (4)		1.65%	1.29[0.59,2]
Simoneau 2006	11	10.3 (3.4)	9	12.3 (3)		1.01%	-0.58[-1.49,0.32]
Simons 2006	21	48.3 (23)	21	31.7 (14.1)		2.05%	0.85[0.22,1.49]
Sipila 1996	12	382 (116)	10	332 (77)		1.13%	0.48[-0.37,1.33]
Skelton 1995	20	239.7 (76.3)	20	242.9 (63.7)		2.15%	-0.04[-0.66,0.58]
Sousa 2005	10	83.5 (12.5)	10	57 (10.1)		0.61%	2.23[1.07,3.4]
Taaffe 1996	7	159.8 (30.7)	11	116.1 (18.5)		0.63%	1.75[0.6,2.89]
Taaffe 1999	11	62.6 (10.6)	12	45 (10.9)		0.9%	1.58[0.62,2.54]
Topp 1993	25	101.2 (40)	30	87.3 (32.9)		2.88%	0.38[-0.16,0.91]
Tracy 2004	11	88 (38)	9	69.1 (26.4)		1.02%	0.54[-0.36,1.44]
Tsutsumi 1997	13	30.9 (7)	14	25.8 (9.2)		1.38%	0.6[-0.17,1.38]
Vincent 2002	22	347.1 (167)	16	222.9 (75)		1.8%	0.89[0.21,1.57]
Wood 2001	10	229.1 (97.4)	6	201.7 (97.2)		0.8%	0.27[-0.75,1.28]
Subtotal ***	**717**		**632**			**59.78%**	**0.81[0.69,0.93]**
Heterogeneity: Tau^2=0; Chi^2=181.69, df=40(P<0.0001); I^2=77.98%							
Test for overall effect: Z=13.51(P<0.0001)							
10.8.2 With functional limitations							
Boshuizen 2005	16	69.3 (17.2)	17	56.2 (29.4)		1.71%	0.53[-0.17,1.22]
Bruunsgaard 2004	10	13.2 (3.5)	11	9.5 (3.2)		0.96%	1.05[0.13,1.98]
Chandler 1998	44	63.7 (27)	43	48.3 (23)		4.46%	0.61[0.18,1.04]
Chin A Paw 2006	40	73.2 (12.3)	31	77.5 (48.3)		3.75%	-0.13[-0.6,0.34]
Hruda 2003	18	81.9 (23.3)	7	71 (22.2)		1.06%	0.46[-0.43,1.34]
Jette 1999	96	15 (5.3)	104	13.7 (5.5)		10.67%	0.24[-0.04,0.52]
Latham 2001	10	12.3 (7.1)	10	7.4 (3.5)		0.97%	0.84[-0.08,1.76]
Latham 2003	108	12.6 (5.4)	112	12.9 (5.3)		11.83%	-0.06[-0.32,0.21]
Miszko 2003	13	105.3 (53.1)	15	79.7 (37.5)		1.44%	0.55[-0.21,1.31]
Newnham 1995	12	15.3 (7.5)	12	7.4 (3.6)		1.03%	1.3[0.4,2.19]
Seynnes 2004	8	11.3 (2.8)	8	6.1 (1.7)		0.5%	2.11[0.82,3.4]
Skelton 1996	9	279.6 (68.1)	9	195.2 (52.8)		0.76%	1.32[0.27,2.36]
Westhoff 2000	10	88.7 (21.7)	11	75.7 (31.7)		1.09%	0.46[-0.41,1.32]
Subtotal ***	**394**		**390**			**40.22%**	**0.3[0.16,0.44]**
Heterogeneity: Tau^2=0; Chi^2=33.17, df=12(P=0); I^2=63.82%							
Test for overall effect: Z=4.08(P<0.0001)							
Total ***	**1111**		**1022**			**100%**	**0.6[0.51,0.7]**
Heterogeneity: Tau^2=0; Chi^2=244.18, df=53(P<0.0001); I^2=78.3%							
Test for overall effect: Z=13.03(P<0.0001)							
Test for subgroup differences: Chi^2=29.33, df=1 (P<0.0001), I^2=96.59%							



ADDITIONAL TABLES

Table 1. Assessment of methodological quality scheme

Items	Scores	Notes
A. Was the assigned treatment adequately concealed prior to allocation?	2 = method did not allow disclosure of assignment. 1 = small but possible chance of disclosure of assignment or unclear. 0 = quasi-randomised or open list/tables.	
B. Were the outcomes of patients/participants who withdrew described and included in the analysis (intention-to-treat)?	2 = withdrawals well described and accounted for in analysis. 1 = withdrawals described and analysis not possible. 0 = no mention, inadequate mention, or obvious differences and no adjustment.	
C. Were the outcome assessors blind to treatment status?	2 = effective action taken to blind assessors. 1 = small or moderate chance of un blinding of assessors. 0 = not mentioned, or not possible.	
D. Were the participants blinded to the treatment status?	2 = effective action taken to blind assessors. 1 = small or moderate chance of un blinding of assessors. 0 = not mentioned, or not possible.	
E. Were the treatment and control group comparable at entry? Specifically, were the groups comparable with respect to age, medical co-morbidities (one or more of history of coronary artery disease, stroke, hypertension, diabetes, chronic lung disease), pre-entry physical dependency (independent vs dependent in self-care ADL) and mental status (clinical evidence of cognitive impairment, yes or no)?	2 = good comparability of groups, or confounding adjusted for in analysis. 1 = confounding small; mentioned but not adjusted for. 0 = large potential for confounding, or not discussed.	
F. Were care programmes, other than the trial options, identical?	2 = care programmes clearly identical. 1 = clear but trivial differences. 0 = not mentioned or clear and important differences in care programmes.	
G. Were the inclusion and exclusion criteria clearly defined?	2 = clearly defined. 1 = inadequately defined. 0 = not defined.	
H. Were the interventions clearly defined?	2 = clearly defined interventions are applied with a standardised protocol. 1 = clearly defined interventions are applied but the application protocol is not standardised. 0 = intervention and/or application protocol are poorly or not defined.	
I. Were the outcome measures used clearly defined?	2 = clearly defined measures and the method of data collection and scoring are clearly described 1 = inadequately defined measures 0 = not defined.	For our primary outcome, physical disability in terms of self-report measures of physical function, we considered the outcome clearly de-

Table 1. Assessment of methodological quality scheme *(Continued)*

		fined if a validated and standardised scale was used and the method of data collection was clearly described. Our secondary outcome measures included gait speed, muscle strength (e.g. one repetition maximum test, isokinetic and isometric dynamometry), balance (e.g. Berg Balance Scale, Functional Reach Test), aerobic capacity, and chair rise. These secondary outcomes were considered well defined if validated and standardised measures were used, and the method of data collection and scoring of any scales was clearly described.
J. Was the surveillance active and of clinically appropriate duration (i.e. at least 3 months)?	2 = active and appropriate duration (three months follow-up or greater). 1 = active but inadequate duration (less than three months follow-up). 0 = not active or surveillance period not defined.	

Table 2. Quality rating of trials

Study	Concealed allocation	ITT	Assessor blind	Participants blind	Comparable at entry	Identical care	Inclusion/ exclusion	Interventions defined	Outcomes defined
Ades 1996	1	0	0	0	2	2	0	2	1
Baker 2001	2	2/0	2/0	2	2	2	2	2	2
Balagopal 2001	1	0	0	0	2	2	1	1	2
Ballor 1996	1	0	0	0	2	2	1	2	2
Barrett 2002	1	2	2	0	2	2	1	2	2
Baum 2003	1	2	2	0	2	2	2	2	2
Bean 2004	1	1	2	0	2	2	2	2	2
Beneka 2005	1	0	0	0	2	2	1	2	2
Bermon 1999	1	0	0	0	2	1	0	2	2
Boshuizen 2005	1	1	2	0	1	2	2	2	2
Brandon 2000	0	0	0	0	2	2	1	2	2
Brandon 2003	1	1	0	0	2	0	1	2	2
Brochu 2002	1	1	0	0	2	2	2	2	2
Bruunsgaard 2004	1	1	0	0	2	2	1	2	1
Buchner 1997	1	2	2	0	2	2	2	2	2
Casaburi 2004	1	1	2	0	2	2	2	2	1
Castaneda 2001	1	1	2/0	2	2	2	2	2	2
Castaneda 2004	1	0	2	0	2	2	1	2	2
Chandler 19981	1	0	1	0	2	2	2	2	2

Table 2. Quality rating of trials *(Continued)*

Charette 1991	1	0	0	0	1	2	0	2	2
Chin A Paw 2006	2	2	2	0	2	2	2	2	2
Collier 1997	1	0	0	0	1	2	1	1	2
Damush 1999	1	0	0	1	2	2	1	1	2
de Vos 20051	1	1	1	2	2	2	2	2	2
de Vreede 2007	1	1	2	0	2	2	1	2	2
DeBeliso 2005	1	1	0	0	2	0	1	2	2
DiFrancisco 2007	1	0	0	0	1	2	1	2	2
Donald 2000	2	0	0	0	2	2	0	0	2
Earles 2001	1	0	0	0	2	2	2	2	2
Ettinger 1997	1	2	2	1	2	2	2	2	2
Fahlman 2002	1	0	0	0	1	2	1	2	2
Fatouros 2002	1	1	0	0	2	2	2	2	2
Fatouros 2005	1	1	0	0	2	2	1	2	2
Fiatarone 1994	1	2	2/0	1	2	2	2	2	2
Fiatarone 1997	1	0	0	1	0	2	0	2	2
Fielding 2002	1	1	0	0	2	2	2	2	2
Flynn 1999	1	0	0	0	2	2	1	2	2
Foley 2003	2	2	2	0	2	2	2	2	2
Frontera 2003	1	0	0	0	2	0	1	2	2
Galvao 2005	1	1	0	0	2	2	1	2	2

Table 2. Quality rating of trials *(Continued)*

Hagerman 2000	1	0	0	0	2	2	0	2	2
Harris 2004	1	1	0	0	2	2	1	2	2
Haykowsky 2005	1	1	2	0	0	2	1	2	2
Haykowsky 2000	1	0	0	0	2	2	1	1	2
Hennessey 2001	1	0	0	0	2	2	2	2	2
Hepple 1997	1	0	0	0	2	2	1	2	2
Hiatt 1994	1	0	0	0	1	2	2	2	2
Hortobagyi 2001	1	0	0	0	2	2	2	2	2
Hruda 2003	1	0	0	0	2	2	1	2	2
Hunter 2001	1	0	0	0	2	2	0	2	1
Izquierdo 2004	1	1	0	0	2	2	2	2	2
Jette 1996	1	0	2	0	2	2	2	2	2
Jette 1999	2	0	2	0	2	2	2	2	2
Jones 1994	1	0	2	0	2	2	1	2	2
Jubrias 2001	1	0	0	0	2	2	1	2	2
Judge 1994	1	2	2	1	2	2	2	2	2
Kalapotharakos 2005	1	1	2	0	2	2	1	2	2
Kallinen 2002	1	1	0	0	2	2	1	2	2
Katznelson 2006	1	1	2	2	2	2	2	2	2
Kongsgaard 2004	1	1	0	0	2	2	2	2	2
Krebs 2007	1	1	2	1	1	2	2	2	2

Table 2. Quality rating of trials *(Continued)*

Lamoureux 2003	1	1	0	0	2	2	1	2	2
Latham 2001	2	0	0	0	2	2	2	2	2
Latham 2003	2	2	2	1	2	2	2	2	2
Liu-Ambrose 2005	1	2	2	0	2	2	2	2	2
Macaluso 2003	1	2	0	0	0	2	1	2	2
Madden 2006	1	0	0	0	2	2	2	2	2
Maiorana 1997	1	0	0	0	2	2	2	2	1
Malliou 2003	1	0	0	0	2	2	1	2	2
Mangione 2005	1	1	2	0	2	2	2	2	2
Manini 2005	1	1	0	0	2	2	2	2	2
Maurer 1999	1	0	2	1	1	2	2	1	2
McCartney 1995	1	0	0	1	2	2	2	2	1
McGuigan 2001	1	0	0	0	2	2	1	2	1
McMurdo 1995	2	0	2	1	2	2	2	1	2
Mihalko 1996	1	0	0	1	1	2	0	1	1
Mikesky 2006	1	2	2	0	2	2	1	2	2
Miller 2006	1	2	2	0	2	2	2	2	2
Miszko 2003	1	1	0	0	2	2	2	2	2
Moreland 2001	2	2	2	1	2	2	0	0	0
Nelson 1994	1	2	0	0	2	2	2	2	2
Newnham 1995	1	0	2	1	2	2	2	2	2

Table 2. Quality rating of trials *(Continued)*

Nichols 1993	1	0	0	0	2	2	2	2	1
Ouellette 2004	1	2	2	0	2	2	2	2	2
Parkhouse 2000	1	0	0	0	1	2	2	1	1
Perrig-Chiello 1998	1	0	0	0	0	2	0	0	0
Pollock 1991	1	0	0	0	2	2	2	2	2
Pu 2001	1	2	2/0	2	2	2	2	2	2
Rall 1996	1	0	0	0	2	2	1	2	2
Reeves 2004	1	0	0	0	2	2	1	2	2
Rhodes 2000	1	0	0	0	2	2	1	2	1
Schilke 1996	1	0	0	0	2	2	0	1	2
Schlicht 1999	1	0	0	0	2	2	2	2	1
Segal 2003	1	2	2	0	2	2	2	2	2
Selig 2004	1	0	0	0	2	2	2	2	2
Seynnes 2004	1	1	0	2	2	2	2	2	2
Simons 2006	1	1	0	0	2	2	1	2	2
Simoneau 2006	1	0	0	0	2	2	1	2	2
Simpson 1992	1	0	0	0	2	2	2	1	1
Sims 2006	2	2	2	0	2	2	2	2	2
Singh 1997	1	0	2/0	1	2	2	2	2	2
Singh 2005	1	1	2	2	2	2	2	2	2
Sipila 1996	1	0	0	0	1	2	1	2	2

Table 2. Quality rating of trials *(Continued)*

Skelton 1995	1	0	0	0	2	2	1	2	2
Skelton 1996	1	0	0	0	2	2	1	2	1
Sousa 2005	1	0	0	0	2	0	1	2	2
Suetta 2004	1	1	1	0	2	2	2	2	2
Sullivan 2005	2	2	2	0/2	2	2	2	2	2
Symons 2005	1	1	0	0	2	2	1	2	2
Taaffe 1996	1	0	0	0	2	2	1	2	2
Taaffe 1999	1	0	0	0	2	2	2	2	2
Thielman 2004	1	0	0	0	1	2	1	2	2
Topp 1993	1	0	0	1	2	2	1	2	2
Topp 1996	1	0	0	1	2	2	1	2	2
Topp 2002	1	0	0	0	2	2	2	2	2
Topp 2005	1	1	0	0	2	2	2	2	2
Tracy 2004	1	0	0	0	2	2	1	2	2
Tsutsumi 1997	1	0	0	0	2	2	1	2	2
Tyni-Lenne 2001	1	0	0	0	2	1	2	1	2
Vincent 2002	1	0	0	0	2	2	1	2	2
Westhoff 2000	1	0	2	0	2	2	1	2	2
Wieser 2007	1	1	0	0	2	2	2	2	2
Wood 2001	1	0	0	0	2	2	2	2	2

Note: 2/0 indicates that different standards used to assess different outcomes in the same study
NA = not available, no full report published

Table 3. Functional or quality of life measures that could not be pooled

Study	Outcome Measure	Treatment Group	Control Group
Baum 2003	Physical performance test at 6 month. Mean = baseline score + change score. SD was not reported.	9.2	8.1
Buchner 1997	mean change in number of independent IADL's	mean 0.1 (SD 0.7)	mean 0.2 (SD 0.7)
Donald 2000	Barthel Index (actual data not in paper)	no significant difference	
Fiatarone 1994	ankle activity monitors (counts/day)	mean change 3412 (SD 1700)	mean change -1230 (SD 1670)
Fiatarone 1997	overall self-reported activity level (measure not specified)	significant improvement (p<0.05) in exercise group	NR
Fielding 2002	SF-36-PF	No significant differences between high intensity and low intensity groups	
Jette 1996	SF-36 - PF (actual data not reported)	no significant difference between groups (data not reported)	
Kongsgaard 2004	three ADLs of a questionnaire developed by the Danish Institute of Clinical Epidemiology	Actual data not reported. The author stated that the self-reported ADL level was significantly higher in the Ex group than in the control group	
Krebs 2007	SF-36. 7 people (2 in PRT, 5 in Functional training) reported improvement in the SF-36 items		
Maiorana 1997	Physical Activity Questionnaire (no reference) self report	mean 209.8 (SD 142.9) kJ/kg	mean 250.1 (SD 225) kJ/kg
Maurer 1999	SF-36 PF (no SD/SE reported)	mean 50.3	mean 49.2
Maurer 1999	WOMAC section C (no SD/SE reported)	464.4	606.6
Maurer 1999	Aims Mobility (no SD/SE reported)	1.28	1.21
McMurdo 1995	Barthel Index (medians reported)	median change 0 (range -1 to 2)	median change control 0 (range -1 to 1)
Mihalko 1996	adapted version of Lawton and Brody's IADL scale (higher = better, not pooled because study was cluster randomised)	mean 105 (SD 12)	mean 68 (SD 25)
Mikesky 2006	SF-36 physical function at 30 month (the intervention was 1 - year)	n =81, mean = 65.37 (SD = 25.05)	n = 79, mean = 63.88 (SD = 25.48)

Table 3. Functional or quality of life measures that could not be pooled *(Continued)*

Nichols 1993	Blair Seven-day recall Caloric Expenditure (KCalories)	not significantly altered	not significantly altered
Schilke 1996	AIMS mobility score (actual data not reported)	"no significant differences between or within groups"	
Singh 1997	IADL (Lawton Brody Scale)	mean 23.4 (SD 0.4)	mean 23.9 (SD 0.1)
Skelton 1996	Human Activity Profile - (only reported training groups % change and the P-value of the change)	3.9% change3.9% change	NR
Skelton 1996	Human Activity Profile - Max Activity Score	0% change	NR
Skelton 1995	Human Activity Profile	no difference from baseline	no difference from baseline
Thielman 2004	Rivermead Motor Assessment	Significant improvement was found for people in the control group with low-level function	
Tyni-Lenne 2001	Minnesota Living with Heart Failure Questionnaire (lower score = better QOL, medians reported)	median 19 (range 0-61)	median 44 (range 3-103)

Table 4. Falls

Study	Fall Statistic	PRT	Control
Buchner 1997	1) Cox regression analysis, time to first fall, 0.53, 95% CI 0.3-0.91 for exercise group (including endurance exercise groups)		
	2) proportion of people who fell in one year	all exercise groups: 42%	60%
	3) fall rate (falls/year)	all exercise: 0.81 falls/year	0.49 falls/year
Donald 2000	1) number of falls	7 (n = 32)	4 (n = 27)
	2) number of people who fell	6 (n = 32)	2 (n = 27)
* Fiatarone 1994	1) average falls/subject	2.32	2.77
	2) covariance adjusted treatment incidence ratio (PRT vs control)	0.95 (95% CI 0.64, 1.41)	
Fiatarone 1997	falls	no difference between groups (no data provided)	
* Judge 1994	1) Average falls/subject	0.82	1.22

Table 4. Falls *(Continued)*

	2) Co-variate adjusted treatment incidence ratio (PRT vs control)	0.61 (95%CI 0.34,1.09)	
* Buchner 1997	1) Average falls/subject	0.68	1.6
	2) Co-variate adjusted treatment incidence ratio (PRT vs control)	0.91 (95%CI 0.48,1.74)	
Krebs 2007	1 in the PRT group sustained an unrelated fall halfway through the 6-week intervention, resulting in injury of her dominate shoulder. Exercise was modified for her.	1	0
Latham 2001	total falls	164	149
Latham 2003	1) number of people who fell	60	64
	2) fall-rate, person years	1.02	1.07
Liu-Ambrose 2005	the frequency of falls (excluded falls occurred in exercise classes)	18 (1 subject fell 7 times)	0
Mangione 2005	Reported the number of participants fell during post-training examination (n = 1 - group was not reported)		
Miszko 2003	Report number of people	5	1
Singh 2005	Numbers per person, no statistical difference between groups	.15 (.37)	0

Note: Data marked with * were obtained from Province 1995

Table 5. Adverse events

Study	Any Comment re: AE	AE Occurred (y/n/nr)	Description	Dropout Pathologies	Pain	Medical Care	Deaths
Ades 1996	No			None reported			
Baker 2001	Yes	No	NR	Yes, 2 in treatment group (neck arthritis, prior back injury), 2 in control (illness, psoriatic arthritis)	Treatment group decreased in WOMAC, SF-36 BP no change	NR	
Balagopal 2001	No			NR			
Ballor 1996	No			NR			
Barrett 2002	Yes	Yes	2 in PRT group, aggravation of OA	2 in PRT group, aggravation of OA			
Baum 2003	Yes	Yes		The number of illness was not reported. 13% of repeated measurements after baseline were missing because of death or patient inability to perform the test because of acute illness.			1 in the PRT group
Bean 2004	Yes	no	No significant adverse events occurred				
Beneka 2005	No	NR					
Bermon 1999	No			No			
Boshuizen 2005	Yes	yes		9 dropout due to illness of participant or partner	4 reported pain during or after the exercise		1 in control
Brandon 2000	No				NR	NR	
Brandon 2003	Yes	8 members of exercise group had		Participant's disease (diabetics) got worse; specific number was not reported			

Table 5. Adverse events *(Continued)*

			BP raised to over 200 mmHg systolic or 100 mmHg diastolic at some point during the exercises during 24 months; and had to stop exercising that day				
Brochu 2002	Yes	Yes	2 experienced occasional significant exacerbation of arthritic conditions during the training. 1 experienced significant dizziness in a supine position.	Yes, 3 due to medical problems that are not related to the training	2 individuals experienced occasional significant exacerbation of arthritic conditions during the training	NR	NR
Bruunsgaard 2004	No	NR					
Buchner 1997	Yes	Yes	6 Injuries in strength training or in strength/endurance training group (not reported separately, n = 50)	Not described	no significant change in BP of SF-36	For all exercise groups (i.e. including endurance exercise groups): stable outpatient visits in exercise group/control increased, no difference in hospitalisation rates	

Table 5. Adverse events *(Continued)*

Casaburi 2004	Yes	No		5 (group?)-non protocol related health problems	NR		
Castaneda 2001	Yes	No		No			
Castaneda 2004	Yes	Yes		The authors did not report the number and group of the dropouts. The statement is "reasons for early termination of the study included loss of greater than 20% of initial body weight, need for dialysis therapy or transplantation, development of a serious condition requiring hospitalization or precluding exercise and signs of malnutrition"			
Chandler 1998	No			9 drop-outs due to illness, 1 due to increased hip pain, 1 refused further strength testing (not given by group)	NR	NR	
Charette 1991	No			1 discomfort after initial strength testing, 3 intercurrent illness not related to training	NR	NR	
Chin A Paw 2006	Yes	Yes	None withdrew because of adverse effects	9 illness in PRT; 9 illness in functional training group; 10 illness in combined training group; 6 illness in control group			1 in PRT; 4 in functional training; 1 in combined training; 2 in control group
Collier 1997	No			No			
Damush 1999	No			6 exercise drop-outs due to illness			
de Vos 2005	Yes	Yes	20 AEs reported in 17 participants. 16 were related to strength testing and 4 were related to power training. 8 were in high intensity group, 7 in medium, 4 in low, and 1 in control. AEs included minor strains, ten-	4 (1 in each group) dropout-joint pain 1 inguinal hernia in medium intensity group. 1 medical reason in low intensity group	Joint pain (see dropout pathologies)		

Table 5. Adverse events *(Continued)*

			donities, and exacerbation of osteoarthritis.				
de Vreede 2007	Yes	Yes	PRT: 1 had muscle strained. 10 reported muscle pain, 5 osteoarthritic joint pain, 3 prosthetic joint pain, and 4 lower back pain	PRT group: 1 hip fracture, 1 pneumonia, & 1 eye operation. Control: 1 wrist fracture	PRT: 10 reported muscle pain, 5 osteoarthritic joint pain, 3 prosthetic joint pain, and 4 lower back pain		
DeBeliso 2005	Yes	no	no injuries occurred during the training				
DiFrancisco 2007	Yes	No	Occasionally complaints of muscle soreness for 2 days after exercise, but it did not affect participants' daily routine or training				
Donald 2000	No			not clear			
Earles 2001	Yes (a priori outcome)	Yes	4 reported discomfort, 2 stopped program - 1 due to back pain, 1 due to lumbar disc herniation, possibly due to study intervention	Yes			
Ettinger 1997	Yes	Yes	PRT: 2 falls, one weight dropped on foot; Aerobic: 2 falls; Control: 1 sudden death (defined AE as death	NR	less for PRT group vs control	NR	NR

Table 5. Adverse events *(Continued)*

			or injury requiring medical care)				
Fahlman 2002	No	NR					
Fatouros 2002	No	NR					
Fatouros 2005	Yes	Yes		3 men stopped within the 1st week due to injury			
Fiatarone 1997	No			1 exercise drop-out due to increased musculoskeletal pain	NR	no difference in health care visits between groups	NR
Fiatarone 1994	Yes	Yes	PRT: 2 reports of joint pain, program was altered No control info No cardiovascular events	2 exercise drop outs, 1 due to musculoskeletal pain, 1 due to pneumonia	not measured	NR	0 PRT and 1 control
Fielding 2002	Yes	yes	see the dropout pathologies	4 (2 in each group) discontinued secondary to exacerbation of preexist OA. 1 in the high velocity group withdrew secondary to recurrence of chronic plantar fasciicis			
Flynn 1999	No			NR	NR	NR	NR
Foley 2003	Yes	Yes	Gym-based exercise group: 2 had increased pain and 1 had increased blood pressure. 1 - Dr. advised to cease program	Gym-based exercise group: 2 with increased pain, 1 with unrelated surgery, 1 with increased blood pressure, and 1 had joint replacement surgery. Control group: 2 with joint replacement surgery and 1 with illness.	2 reported increased pain the gym-based exercise group.		
Frontera 2003	No	NR					
Galvao 2005	Yes	No	1 in 1-set group withdrew due to illness, 1 due to injury sustained during part-time work,				

Table 5. Adverse events *(Continued)*

			and 1 due to aggravation of a preexisting hip injury				
Hagerman 2000	No			3 PRT and 1 control withdrew because of minor injuries or previous medical problems exacerbated by testing/training	"no complaints of excess or intolerable muscle soreness or fatigue"	NR	NR
Harris 2004	Yes	No					
Haykowsky 2005	Yes	Yes		1 in PRT withdrew because of shoulder discomfort and migraines. 1 in the combination training suffered a lower extremity injury not related to the study			
Haykowsky 2000	Yes	No (completed without complications)		NR			
Hennessey 2001	No			NR			
Hepple 1997	No			No			
Hiatt 1994	No			No			
Hortobagyi 2001	No (not identified as such)	Yes	Pain and bruising of shoulder from machine - dropped out	Yes	Yes	NR	NR
Hruda 2003	Yes	Yes?		5 (2 in the PRT group and 3 in the control group) dropped out due to health reasons			
Hunter 2001	No			NR			
Izquierdo 2004	No	NR					

Table 5. Adverse events *(Continued)*

Jette 1996	No (not identified as such)			Yes - 2 drop-outs because of the exercises, 1 due to back pain, 1 due to shortness of breath during exercise,			
Jette 1999	Yes	No		Reasons not described	NR, but fatigue significantly worse in exercise group	NR	NR
Jones 1994	Yes	No		NR			
Jubrias 2001	Yes	No		NR			
Judge 1994	Yes (a priori outcome of study)	Yes	10/55 people in RT or combined balance and RT developed musculoskeletal complaints, (specific details given), only 1 complaint in balance group, no control report, no serious injuries in any group	NR	NR		
Kalapotharakos 2005	NR	NR					
Kallinen 2002	Yes	Yes	1-PRT, died of myocardial infarction at 8 weeks; 1-PRT, unstable angina at 4 weeks; 1 in PRT, began to have occasional angina and dyspnoea at 8 weeks; 1-endurance, brainstem infarction at week 9, 1-endurance, abnormal aortic aneurysm	See the description			1 in PRT, died of myocardial infarction

Table 5. Adverse events *(Continued)*

			happened after the program		
Katznelson 2006	Yes	Yes		5 were due to events unrelated to study drug, including bruised ribs, need for knee replacement, angina prior to the baseline visit, nausea during the first week of the study, and excessive i e commitments. Another subject in the placebo arm withdrew because of depression.	
Kerr 2001	No			Yes - 3 in FITNESS group, including wrist and back injury	
Kongsgaard 2004	No	NR			
Krebs 2007	Yes	Yes	1 in the PRT group sustained an unrelated fall halfway through the 6-week intervention, resulting in injury of her dominate shoulder. Exercise was modified for her.		
Lamoureux 2003	No	NR			
Latham 2001	Yes	No		No	
Latham 2003	Yes (a priori outcome)	Yes	18 musculoskeletal adverse events in PRT group vs 5 in control group	No	6 in PRT versus 8 in control
Liu-Ambrose 2005	Yes	Yes	10 in PRT group and 2 in stretching control group had minor musculoskeletal complains but resolved	Yes, 1 in PRT and 1 in control drop out due to illness	

Table 5. Adverse events *(Continued)*

			or diminished within 3 weeks				
Macaluso 2003	Yes	Yes	1 back pain and 1 spur on the heel	1 back pain and 1 spur on the heel	1 back pain		
Madden 2006	No	NR					
Maiorana 1997	Yes (safety an aim of study)	Yes	In ex group: MI (before exercises began),1 vasovagal episode, 1 musculoskeletal pain. Control: 2 people stop testing because of aggravation of psoriatic arthritis(1) and atrial fibrilation (1)	Yes, as reported	NR	NR - ischaemic symptoms/ECG changes during training	
Malliou 2003	No	NR					
Mangione 2005	Yes	Yes	several participants reported muscle soreness or fatigue in the PRT group. 1 fell during post-training examination, 4 in the PRT were hospitalized	in the PRT group, 1-illness (progressive neuromuscular disorder), 4 were hospitalized.	1 in aerobic training group was unable to perform exercise at recommended intensity level		2 (among those who were hospitalized) in the PRT group
Manini 2005	Yes	Yes	11 were excluded from the steadiness experiment because of discomfort from knee OA during the testing protocol. 14 dropout for a variety of medical personal reasons	11 were excluded from the steadiness experiment because of discomfort from knee OA during the testing protocol. 14 others dropped out for a variety of medical and personal reasons.			

Table 5. Adverse events *(Continued)*

Maurer 1999	Yes	No		Yes, 4 drop-outs due to increased pain "but neither subjects nor investigators attributed pain to the treatment"	WOMAC pain, 143.8 in PRT vs 167.1 control	NR	NR
McCartney 1995	Yes	No		9 exercise drop-outs due to "illness", 3 controls due to medical problems. Stated "no injuries as a result of training"			
McGuigan 2001	No			NR			
McMurdo 1995	Yes	No		see hosp admissions		3 hospital admissions in PRT, 2 in control, 3 in home mobility - reported not related to exercise	2 in home mobility group, no others - not related to exercise
Mihalko 1996	No			NR			
Mikesky 2006	Yes	Yes	1 discontinued in the PRT group because of increased knee pain	1 discontinued in the PRT group because of increased knee pain	1 discontinued in the PRT group because of increased knee pain		
Miller 2006	No	NR				Discharge destination - on discharge from acute care, 52 participants were discharged to a rehabilitation programme, 12 were trans-	2 in PRT, 1 in attention control

Table 5. Adverse events *(Continued)*

					ferred to a community hospital, 16 were discharged to higher level care and 20 returned directly to their pre-injury admission accommodation.	
Miszko 2003	Yes	Yes	6 women fell (5 in PRT, 1 in control)	some (the number is not specified) due to personal medical reasons or injuries		
Moreland 2001	Yes (a priori outcome)	Yes	yes to pain or stiffness = 14 in PRT vs 8 in control; other adverse: 8 in PRT vs 3 in control	5 withdrew due to medical complications in PRT vs 3 in control		
Nelson 1994	Yes	Yes	7/20 in PRT group experienced transient musculoskeletal pain; 3 musculoskeletal injuries (2 fractures and 1 sprain) in the control group	No - MI in PRT group occurred while patient was on vacation		
Newnham 1995	No			No		3 in each group
Nichols 1993	Yes (safety a priori objective)	Yes	control subject contused sternum during baseline testing, mild to moderate delayed onset muscle soreness	PRT - 1 injury unrelated to program		
Ouellette 2004	Yes	Yes, 4 events	1 in the PRT group was withdrawn af-	Please see the description		

Table 5. Adverse events *(Continued)*

			ter coronary artery stent placement unrelated to study participation. 2 subjects did not undergo week-12 strength testing due to recurrence of an inguinal hernia (PRT group) and ECG abnormalities (control group). A fourth subject experienced anginal symptoms consistent with coronary artery disease but returned to the study after medical clearance.	
Parkhouse 2000	No			NR
Pollock 1991	Yes (a-priori outcome, well-defined)	Yes	11/57 subjects sustained an injury during 1RM testing; 2/23 sustained an injury during training. In aerobic group, no injuries during testing but 9/21 had an injury during training	NR by group
Pu 2001	Yes	Yes	1 control patient developed trochanteric bursitis from 1RM testing, 4 people had mild musculoskeletal soreness, no cardiac complications, deaths or	No

Table 5. Adverse events *(Continued)*

			hospitalisations occurred				
Rall 1996	Yes	No					
Reeves 2004	No	NR					
Rhodes 2000	No			NR			
Sartario 2001	No			NR			
Schilke 1996	No			No	decreased in OASI, no difference between groups on AIMS		
Schlicht 1999	Yes	No		No			
Segal 2003	No	NR					
Selig 2004	Yes	yes	1 illness (noncardiac) and 1 died at home in the exercise group				1 in exercise group
Seynnes 2004	Yes	No	No injuries, medical complications, or study-related AE	3 dropouts because of medical reasons not related to the study			
Simons 2006	Yes	NR	2 dropouts for non-study related illnesses				
Simoneau 2006	No	NR					
Simpson 1992	No			No			
Sims 2006	No	No		1 acquired a health problem that prohibited from driving			

Table 5. Adverse events *(Continued)*

Singh 1997	Yes (a priori outcome)	No		No	weeks of pain reported-: mean 5.4 (SD=0.7) in PRT, mean 5.6 (SD 0.7) in control	health prof visits mean 2.1 (SD 0.4) for PRT; mean 2.0 (SD 0.5) for control; hospital stays mean 0.24 (SD 0.2) for PRT, mean 0.53 (SD 0.4) for control
Singh 2005	Yes	Yes	visits to a health professional, minor illness, pain, injuries requiring training adjustment, hospital days, falls	2 drop out in low intensity group due to pain. I in the control due to hospitalisation	Muscular pain (number of weeks reported per person): High intensity group-4.1 (2.7); low intensity group-2.9 (2.6); control group-3.6 (2.5) Chest pain (number of weeks reported per person): High intensity group-0.9 (1.9); low-intensity group-0.5 (0.9);control group-.5 (0.8)	Visits to a health professional over the study (numbers per person): high intensity group - 2 (2); low intensity group - 2 (1.8); controls - 5 (1.8)

Table 5. Adverse events *(Continued)*

Sipila 1996	No			3 drop-outs due to illness "not related to exercise"
Skelton 1995	Yes	No		4 exercise and control participants dropped out because of ill-health "not related to exercise"
Skelton 1996	Yes	yes	patient fainted due to an arythmia during exercise	NR
Sousa 2005	No	NR		
Suetta 2004	yes	No		2 became ill (1 in PRT) for reasons unrelated to the study
Sullivan 2005	Yes	Yes	7 withdrew, developed an exacerbation of an underlying medical problem	7 withdrew, developed an exacerbation of an underlying medical problem
Symons 2005	Yes	Yes	5 knee discomfort; 1 bruising	5 knee discomfort; 1 bruising
Taaffe 1996	No			5 drop-outs from exercise groups for medical problems "not related to the exercise program"
Taaffe 1999	No			NR
Topp 1993	No			1 exercise drop-out due to worsening emphysema, 1 due to a stroke
Topp 1996	No			NR
Topp 2002	No	NR		
Topp 2005	No	NR		
Tracy 2004	No	NR		
Tsutsumi 1997	No			NR

Table 5. Adverse events *(Continued)*

Tyni-Lenne 2001	Yes	Maybe	increased oedema in exercise patient	No
Vincent 2002	Yes	Yes	6 participants stopped exercise for 6 weeks due to hip/knee pain	few (the number is not specified) dropped out for surgery/injury not related to the study protocol.
Westhoff 2000	Yes (asked about complaints during exercise)	Yes	increased knee pain in person with OA, 1 person had pain from elastic band	2 drop outs because of medica problems (1 had increased epileptic attacks, 1 was often ill)
Wieser 2007	No	NR		
Wood 2001	No	NR	stated none of the dropouts left the program as a result of adverse responses to treatment - not information about adverse events overall	No

APPENDICES

Appendix 1. Search strategies

MEDLINE (OVID WEB)

1. ((strength$ or resist$ or weight$) adj3 training).tw.
2. progressive resist$.tw.
3. or/1-2
4. Exercise/
5. Exercise Therapy/
6. exercise$.tw.
7. or/4-6
8. (Resist$ training or strength$).tw.
9. and/7-8
10. or/3,9
11. limit 10 to ("all aged (65 and over)" or "aged (80 and over)")
12. (elderly or senior$).tw.
13. and/10,12
14. or/11,13
15. randomized controlled trial.pt.
16. controlled clinical trial.pt.
17. Randomized Controlled Trials/
18. Random Allocation/
19. Double Blind Method/
20. Single Blind Method/
21. or/15-20
22. Animals/ not Humans/
23. 21 not 22
24. clinical trial.pt.
25. exp Clinical Trials as topic/
26. (clinic$ adj25 trial$).tw.
27. ((singl$ or doubl$ or trebl$ or tripl$) adj25 (blind$ or mask$)).tw.
28. Placebos/
29. placebo$.tw.
30. random$.tw.
31. Research Design/
32. or/24-31
33. 32 not 22
34. 33 not 23
35. or/23,34
36. and/14,35

EMBASE (OVID WEB)

1. ((strength$ or resist$ or weight$) adj3 training).tw.
2. progressive resist$.tw.
3. or/1-2
4. Exercise/
5. Kinesiotherapy/ or Therapy Resistance/
6. exercise$.tw.
7. or/4-6
8. (resist$ or strength$).tw.
9. and/7-8
10. or/3,9
11. limit 10 to aged <65+ years>
12. (elderly or senior$).tw.
13. and/10,12
14. or/11,13
15. Clinical trial/
16. Randomized controlled trial/
17. Randomization/

18. Single blind procedure/
19. Double blind procedure/
20. Crossover procedure/
21. Placebo/
22. Randomi?ed controlled trial$.tw.
23. Rct.tw.
24. Random allocation.tw.
25. Randomly allocated.tw.
26. Allocated randomly.tw.
27. (allocated adj2 random).tw.
28. Single blind$.tw.
29. Double blind$.tw.
30. ((treble or triple) adj blind$).tw.
31. Placebo$.tw.
32. Prospective study/
33. or/15-32
34. Case study/
35. Case report.tw.
36. Abstract report/ or letter/
37. or/34-36
38. 33 not 37
39. limit 38 to human
40. and/14,39

The Cochrane Library (Wiley)

#1 ((strength* or resist* or weight*) NEAR/3 training):ti,ab,kw
#2 (progressive resist*):ti,ab,kw
#3 #1 OR #2
#4 MeSH descriptor Exercise, this term only
#5 MeSH descriptor Exercise Therapy, this term only
#6 (exercise*):ti,ab,kw
#7 (#4 OR #5 OR #6)
#8 (resist* or strength*):ti,ab,kw
#9 (#7 AND #8)
10(#3 OR #9)
#11 (elderly or senior*):ti,ab,kw
#12 (#10 AND #11)

CINAHL (OVID WEB)

1. ((strength$ or resist$ or weight$) adj3 training).tw.
2. progressive resist$.tw.
3. or/1-2
4. Exercise/
5. Therapeutic Exercise/
6. "Exercise therapy: ambulation (iowa nic)"/ or "Exercise therapy: balance (iowa nic)"/ or "Exercise therapy: joint mobility (iowa nic)"/ or "Exercise therapy: muscle control (iowa nic)"/ or "Teaching: prescribed activity/exercise (iowa nic)"/
7. exercise$.tw.
8. or/4-7
9. (resist$ or strength$).tw.
10. and/8-9
11. or/3,10
12. limit 11 to (aged <65 to 79 years> or "aged <80 and over>")
13. (elderly or senior$).tw.
14. and/11,13
15. or/12,14
16. exp Clinical Trials/
17. exp Evaluation Research/
18. exp Comparative Studies/
19. exp Crossover Design/
20. clinical trial.pt.
21. or/16-20

22. ((clinical or controlled or comparative or placebo or prospective or randomi#ed) adj3 (trial or study)).tw.
23. (random$ adj7 (allocat$ or allot$ or assign$ or basis$ or divid$ or order$)).tw.
24. ((singl$ or doubl$ or trebl$ or tripl$) adj7 (blind$ or mask$)).tw.
25. (cross?over$ or (cross adj1 over$)).tw.
26. ((allocat$ or allot$ or assign$ or divid$) adj3 (condition$ or experiment$ or intervention$ or treatment$ or therap$ or control$ or group $)).tw.
27. or/22-26
28. or/21,27
29. and/15,28

SPORTDiscus (OVID WEB)

1. ((strength$ or resist$ or weight$) adj3 training).tw.
2. progressive resist$.tw.
3. or/1-2
4. Exercise/
5. Exercise therapy/
6. exercise$.tw.
7. or/4-6
8. (resist$ or strength$).tw.
9. and/7-8
10. or/3,9
11. (elderly or senior$).tw.
12. and/10-11
13. exp Clinical trial/
14. exp Randomized controlled trial/
15. Placebo/
16. ((clinical or controlled or comparative or placebo or prospective or randomi#ed) adj3 (trial or study)).tw.
17. (random$ adj7 (allocat$ or allot$ or assign$ or basis$ or divid$ or order$)).tw.
18. ((singl$ or doubl$ or trebl$ or tripl$) adj7 (blind$ or mask$)).tw.
19. (cross?over$ or (cross adj1 over$)).tw.
20. ((allocat$ or allot$ or assign$ or divid$) adj3 (condition$ or experiment$ or intervention$ or treatment$ or therap$ or control$ or group $)).tw.
21. or/13-20
22. and/12,21

PEDro

Abstract and Title: "strength training", "resistance training", "progressive resistance"
Therapy: Strength training
Subdiscipline: Gerontology
Method: Clinical trial

When searching match any term "AND"

WHAT'S NEW

Date	Event	Description
6 May 2009	New search has been performed	For the update published in Issue 3, 2009: • the title was changed from 'Progressive resistance strength training for physical disability in older people'; • the literature search was extended to February 2007; • 55 new trials, involving 2917 participants, were included; • the review results were restructured to increase the emphasis on function. The analyses are now presented by comparison; • the authorship changed.
6 May 2009	New citation required and conclusions have changed	The conclusions were adjusted to reflect the accumulated evidence and changed emphasis of the review.

HISTORY

Protocol first published: Issue 4, 2000
Review first published: Issue 2, 2003

Date	Event	Description
13 January 2009	Amended	Converted to new review format.
19 February 2003	New citation required and conclusions have changed	First review version published

CONTRIBUTIONS OF AUTHORS

For the first version of the review (completed 2002), Dr Nancy Latham, Dr Craig Anderson, Dr Derrick Bennett and Dr Caroline Stretton contributed to the development of the protocol, the analysis and interpretation of the data and the write-up of the review. Dr Nancy Latham took the lead in conducting the analyses and writing the protocol and review. In addition, Dr Latham and Dr Stretton conducted the searches, identified the trials, conducted the quality assessments and extracted the data. Dr Bennett provided methodological and statistical guidance for the review. Dr Anderson served as the adjudicator when a consensus about data issues could not be reached between the two reviewers, and provided guidance about the methods and interpretation of the review.

The review was substantially updated in 2009 by Dr Chiung-ju Liu and Dr Nancy Latham. Dr Liu took the lead in conducting the update, which included undertaking the searches, screening search results, organizing retrieval of papers, screening retrieved papers against inclusion criteria, appraising quality of papers, extracting data, contacting authors for additional information, entering data into RevMan, doing the analyses and writing up. The project was completed when Dr Liu was a post-doctoral research fellow at the Health and Disability Research Institute at Boston University. Dr Latham assisted in identifying the trials, conducting the quality assessments, extracting the data, interpreting the results and writing the review.

Both Dr Chiung-ju Liu and Dr Nancy Latham are guarantors for the review.

DECLARATIONS OF INTEREST

Dr. Latham is an author for two trials. The trials were rated independently by other reviewers in the first review.

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Internal sources

- Health and Disability Research Institute, School of Public Health, Boston University, USA.
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NOTES

Substantial updates of reviews such as this one often take a considerable time to prepare and then take through the editorial process. They can therefore seem 'out of date' before publication, particularly in research active areas. However, although an updated search made in May 2008 revealed nine more potentially eligible trials (which await assessment, pending the next update), it is unlikely that the review's main findings will be substantively changed by these. [Comment by Helen Handoll, Co-ordinating Editor, May 2009]

INDEX TERMS

Medical Subject Headings (MeSH)

Activities of Daily Living; Muscle Weakness [*rehabilitation]; Randomized Controlled Trials as Topic; Recovery of Function [physiology]; Resistance Training [adverse effects] [*methods]

MeSH check words

Aged; Humans