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# Interventions for promoting physical activity (Review)

Foster C, Hillsdon M, Thorogood M



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## ABSTRACT

### Background

Little is known about the effectiveness of strategies to enable people to achieve and maintain recommended levels of physical activity.

### Objectives

To assess the effectiveness of interventions designed to promote physical activity in adults aged 16 years and older, not living in an institution.

### Search strategy

We searched *The Cochrane Library* (issue 1 2005), MEDLINE, EMBASE, CINAHL, PsycLIT, BIDS ISI, SPORTDISCUS, SIGLE, SCISEARCH (from earliest dates available to December 2004). Reference lists of relevant articles were checked. No language restrictions were applied.

### Selection criteria

Randomised controlled trials that compared different interventions to encourage sedentary adults not living in an institution to become physically active. Studies required a minimum of six months follow up from the start of the intervention to the collection of final data and either used an intention-to-treat analysis or, failing that, had no more than 20% loss to follow up.

### Data collection and analysis

At least two reviewers independently assessed each study quality and extracted data. Study authors were contacted for additional information where necessary. Standardised mean differences and 95% confidence intervals were calculated for continuous measures of self-reported physical activity and cardio-respiratory fitness. For studies with dichotomous outcomes, odds ratios and 95% confidence intervals were calculated.

### Main results

The effect of interventions on self-reported physical activity (19 studies; 7598 participants) was positive and moderate (pooled SMD random effects model 0.28 95% CI 0.15 to 0.41) as was the effect of interventions (11 studies; 2195 participants) on cardio-respiratory fitness (pooled SMD random effects model 0.52 95% CI 0.14 to 0.90). There was significant heterogeneity in the reported effects as well as heterogeneity in characteristics of the interventions. The heterogeneity in reported effects was reduced in higher quality studies, when physical activity was self-directed with some professional guidance and when there was on-going professional support.

### Authors' conclusions

Our review suggests that physical activity interventions have a moderate effect on self-reported physical activity, on achieving a predetermined level of physical activity and cardio-respiratory fitness. Due to the clinical and statistical heterogeneity of the studies, only limited conclusions can be drawn about the effectiveness of individual components of the interventions. Future studies should provide greater detail of the components of interventions.

## PLAIN LANGUAGE SUMMARY

Not taking enough physical activity leads to an increased risk of a number of chronic diseases including coronary heart disease. Regular physical activity can reduce this risk and also provide other physical and possibly mental health benefits. The majority of adults are not active at recommended levels. The findings of this review indicate that professional advice and guidance with continued support can encourage people to be more physically active in the short to mid-term. More research is needed to establish which methods of exercise promotion work best in the long-term to encourage specific groups of people to be more physically active.

## BACKGROUND

Regular physical activity can play an important role both in the prevention and treatment of cardiovascular disease (CVD), hypertension, non-insulin dependent diabetes, diabetes mellitus, obesity, stroke, some cancers, and osteoporosis, as well as improve the lipid profile (DOH 2004; Folsom 1997; FNB 2002; US Dept. Health 1996; WHO 2004). A meta-analysis of the relationship between physical activity and coronary heart or cardiovascular disease reported a 30% lower risk for the most physically active versus the least physically active (Williams 2001). In addition, physical inactivity has been estimated to cause, globally, about 22% of ischaemic heart disease (WHO 2002).

The English Chief Medical Officer (CMO) advises that adults should undertake at least 30 minutes of 'moderate intensity' (5.0-7.5 kcal/min) physical activity on at least 5 days of the week to benefit their health (DOH 2004). The recommendations are similar to those published in the US and by the World Health Organisation (Pate 1995; US Dept. Health 1996; WHO 2004).

In England the prevalence of physical activity at recommended levels is low. The most recent data show that only 37% of men and 25% of women meet the CMO's physical activity recommendation (DOH 2005a). Local government authorities have been set a target to 'increase the number of adults who engage in at least 30 minutes of moderate intensity level sport three times a week, by 3% by 2008' (DOH 2005b; HM Treasury 2002).

There are randomised controlled trials assessing the effects of physical activity in the management of specific diseases, notably hypertension, hyperlipidaemia, obesity and CVD (DOH 2004). These show the effects of exercise on various physiological and biological outcomes and demonstrate the importance of exercise in the management of disease. However, because the main outcome of these trials is not physical activity, they do not help us understand the effectiveness of physical activity promotion strategies in the general population. A number of Cochrane reviews have assessed the relationship of the effects of exercise upon type 2 diabetes and as part of cardiac rehabilitation (Jolliffe 2001; Thomas 2006).

One recent published review examined the evidence for the effectiveness of 'home based' versus 'centre based' physical activity programs on the health of older adults (Ashworth 2005). Study participants had to have either a recognised cardiovascular risk

factor, or existing cardiovascular disease, or chronic obstructive airways disease (COPD) or osteoarthritis. The authors found six trials involving 224 participants who received a 'home based' exercise program and 148 who received a 'centre based' exercise program. They concluded there was insufficient evidence to make any conclusions in support of either home or centre based physical activity programs.

## OBJECTIVES

To compare the effectiveness of interventions for physical activity promotion in adults aged 16 and above, not living in an institution, with no intervention, minimal intervention or attention control.

If sufficient trials existed, the following secondary objectives were to be explored:

- a) Are more intense interventions more effective in changing physical activity than less intense interventions (e.g. a greater frequency and duration of professional contact and support v single contact)?
- b) Are specific components of interventions associated with changes in physical activity behaviour (e.g. prescribed v self determined physical activity, supervised v unsupervised physical activity)?
- c) Are short-term changes in physical activity or fitness (e.g. less than 3 months from intervention, less than 6 months from intervention) maintained at 12 months?
- d) Is the promotion of some types of physical activity more likely to lead to change than other types of physical activity (e.g. walking versus exercise classes)?
- e) Are home-based interventions more successful than facility-based interventions?
- f) Are interventions more successful with particular participant groups (e.g. women, older, minority)?

## CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

### Types of studies

Randomised controlled trials (RCTs) comparing different strate-

gies to encourage sedentary, community dwelling adults to become more physically active, with a minimum of 6 months follow-up from the start of the intervention to the final results using either an intention to treat analysis or no more than 20% loss to follow up.

### Types of participants

Community dwelling adults, age 16 years to any age, free from pre-existing medical condition or with no more than 10% of subjects with pre-existing medical conditions that may limit participation in physical activity. Interventions on trained athletes or sports students were excluded.

### Types of intervention

One only or a combination of:

- One-to-one counselling/advice or group counselling/advice;
- Self-directed or prescribed physical activity;
- Supervised or unsupervised physical activity;
- Home-based or facility-based physical activity;
- Ongoing face-to-face support;
- Telephone support;
- Written education/motivation support material;
- Self monitoring.

The interventions were conducted by one or a combination of practitioners including a physician, nurse, health educator, counsellor, exercise leader or peer. Mass media interventions and multiple risk factor interventions were excluded.

The interventions were compared with a no intervention control, attention control (receiving attention matched to length of intervention, e.g. general health check) and/or minimal intervention control group.

### Types of outcome measures

#### Primary outcome measures

- Change in self-reported physical activity between baseline and follow-up.
- Cardio-respiratory fitness.
- Adverse events.

Physical activity measures were expressed as an estimate of total energy expenditure (kcal/kg/week, kcal/week), total minutes of physical activity, proportion reporting a pre-determined threshold level of physical activity (e.g., meeting current public health recommendation), frequency of participation in various types of physical activity e.g. walking, moderate intensity physical activity.

Cardio-respiratory fitness was either estimated from a sub-maximal fitness test or recorded directly from a maximal fitness test and

was expressed as maximal oxygen consumption (VO<sub>2</sub> max) either in ml·kg<sup>-1</sup>·min<sup>-1</sup> or ml·min<sup>-1</sup>. Aspects of cardio-respiratory fitness were also included as secondary outcome measures.

Adverse events included job-related injuries any reported musculoskeletal injury or cardiovascular events (and exercise-related cardiac events and injuries (fractures, sprains)).

## SEARCH METHODS FOR IDENTIFICATION OF STUDIES

See: Cochrane Heart Group methods used in reviews.

We searched *The Cochrane Library* (Issue 1, 2005), MEDLINE (January 1966 to December 2004), EMBASE (January 1980 to December 2004), CINAHL (January 1982 to December 2004), PsycLIT (1887 to December 2004), BIDS ISI (January 1973 to December 2004), SPORTDISCUS (January 1980 to December 2004), SIGLE (January 1980 to December 2004) and SCISEARCH (January 1980 to December 2004), and reference lists of articles. Hand searching was conducted on one journal *Medicine and Science in Sport and Exercise* from 1990 to December 2004. Published systematic reviews of physical activity interventions were used as a source of randomised controlled trials. Reference lists of all relevant articles, books and personal contact with authors were also used. All languages were included.

The search strategy below was used to search MEDLINE, with the addition of an RCT filter (Dickersin 1995). This strategy was modified for other databases, using an appropriate RCT filter for EMBASE (Lefebvre 1996). (see Table 01 through to Table 06).

- 1 exp Exertion/
- 2 Physical fitness/
- 3 exp "Physical education and training"/
- 4 exp Sports/
- 5 exp Dancing/
- 6 exp Exercise therapy/
- 7 (physical\$ adj5 (fit\$ or train\$ or activ\$ or endur\$)).tw.
- 8 (exercis\$ adj5 (train\$ or physical\$ or activ\$)).tw.
- 9 sport\$.tw.
- 10 walk\$.tw.
- 11 bicycle\$.tw.
- 12 (exercise\$ adj aerobic\$).tw.
- 13 (("lifestyle" or life-style) adj5 activ\$).tw.
- 14 (("lifestyle" or life-style) adj5 physical\$).tw.
- 15 or/1-14
- 16 Health education/
- 17 Patient education/
- 18 Primary prevention/
- 19 Health promotion/
- 20 Behaviour therapy
- 21 Cognitive therapy
- 22 Primary health care

23 Workplace/  
24 promot\$.tw.  
25 educat\$.tw.  
26 program\$.tw.  
27 or/16-26  
28 15 and 27

## METHODS OF THE REVIEW

All abstracts were reviewed independently by two investigators who applied the following criteria to determine if the full paper was needed for further investigation:

- a) did the study aim to examine the effectiveness of a physical activity promotion strategy to increase physical activity behaviour?
- b) did the study have a control group (e.g. a no intervention control, attention control and/or minimal intervention control group)?
- c) did the study allocate participants into intervention or control groups by a method of randomisation?
- d) did the study include adults of 16 years or older?
- e) did the study recruit adults not living in institutions and free of chronic disease?
- f) was the study's main outcome physical activity or physical fitness?
- g) were the main outcome(s) measured at least 6 months after the start of the intervention?
- h) did the study analyse the results by intention-to-treat or, failing that was there less than 20% loss to follow up?

Two reviewers examined a hard copy of every paper that met the inclusion criteria on the basis of the abstract alone (or title and keywords if no abstract was available). When a final group of papers was identified all papers were reviewed again by two reviewers independently. Any disagreement at this stage was discussed between the three reviewers and resolved by consensus.

From the final set of studies that met the inclusion criteria, study details were extracted independently by two reviewers onto a standard form. Again any disagreements were discussed between three reviewers and resolved by consensus. Extracted data included date and location of study, study design variables, methodological quality, characteristics of participants (age, gender, ethnicity), intervention strategies, frequency and type of intervention and follow-up contacts, degree of physical activity supervision, study outcome measure, effectiveness of intervention and adverse events.

We wrote to and received clarification from 11 authors of the studies selected for the review. Our requests focused on data missing or unclear from the published papers and included data on study numbers at final analysis, means and standard deviations for intervention and control arms. For incomplete responses, we wrote again to authors asking for further data.

We found different types of outcome results published in two included papers for the Sendai Silver Centre Trial (SSCT 2000). Tsuji 2000 reported changes in cardiovascular fitness and Fujita 2003 reported increases in self-reported physical activity.

Outcomes were analysed both as continuous outcomes and as dichotomous outcomes (active/sedentary) wherever possible. Standard statistical approaches were adopted:

(a) For each study with continuous outcomes; a standardised mean difference (SMD) and 95% confidence intervals (95% CI) were calculated. If the study had more than two arms then the overall effects of the intervention versus control (means and standard deviations) were examined by pooling the individual effect of each intervention arm (means and standard deviations). These pooled groups means and standard deviations were weighted for overall numbers within each arm (Higgins 2005). Pooled effect sizes were calculated as standardised mean differences with 95% CI using a random-effects model.

(b) For each study with dichotomous outcomes; an odds ratio (OR) and 95% CI were calculated. Pooled effect sizes were calculated as ORs and with 95% CI using a random-effects model.

We examined five thematic characteristics of each intervention to try to assess if they modified the main effects of the interventions. These five characteristics were the nature of direction at first contact, degree of programme supervision, frequency of intervention occasions, frequency of follow-up contacts and type of follow-up contacts.

We described the nature of the initial contact between the participant and professional/researcher as "the nature of direction". We found three types of intervention: (i) self-directed only - where the participant is not directed in their choices and thinking about which physical activities to start by the professional; (ii) self-directed plus professional guidance - where the participant can make a decision about their physical activity using a mixture of both self direction and professional advice and guidance; and (iii) prescribed by professional only - the participant receives the advice and prescription of physical activity from the professional.

We wanted to evaluate the type and supervision of physical activity adopted within studies. We developed three categories of programme supervision: (i) structured and supervised - the physical activity programme was structured and supervised by professional; (ii) unsupervised and independent - the physical activity programme was unstructured and performed independently by the participant; and (iii) mixed - the physical activity programme was both structured and supervised and unstructured and independent.

## DESCRIPTION OF STUDIES

From 35,524 hits, 287 papers were retrieved for examination



against the inclusion criteria (Figure 01). Thirty three papers describing 35 studies met the inclusion criteria. We were unable to secure the requested information from five studies. Halbert 2000 was not contactable and so this study is not presented in the final results. Four studies sent data but the data was incomplete or inappropriate for meta-analysis (Castro 2001; Lowther 2002a; Lowther 2002b; Mutrie 2002; Nies 2003). After excluding these studies with incomplete data, 29 studies remained (Calfas 2000; Cunningham 1987; Dubbert 2002; Elley 2003; Goldstein 1999; Green 2002; Harland 1999; Hillsdon 2002; Inoue 2003; Juneau 1987; King 1988a; King 1988b; King 1991; Kriska 1986; Lamb 2002; Lombard 1995; Marshall 2003a; Marshall 2004; Norris 2000; Petrella 2003; Pinto 2002; Reid 1979; Resnick 2002a; Simons-Morton 2001a; Simons-Morton 2001b; Smith 2000; Stevens 1998; Stewart 2001; SSCT 2000). All 29 studies were randomised controlled trials. Two papers each reported the results of two separate trials (King 1988a; King 1988b; Simons-Morton 2001a; Simons-Morton 2001b). Two papers reported different outcomes for one study (SSCT 2000).

### Participants of included studies

11,513 apparently healthy adults participated in the 29 included studies. The majority of studies recruited both genders with three studies recruiting men only (Cunningham 1987; Reid 1979; Simons-Morton 2001a) and four studies recruiting women only (Inoue 2003; Kriska 1986; Resnick 2002a; Simons-Morton 2001b). The stated age range of participants was from 18 to 95 years. Details on ethnic group of participants were reported in 13 studies, with proportions of participants in ethnic minorities ranging from 3% to 55%. Participants were recruited from four settings; primary healthcare, workplaces, university and the community (see Table 07).

### Interventions in included studies

We found a marked heterogeneity in the interventions used in each study. Studies used one, or combination of, one-to-one counselling/advice or group counselling/advice; self-directed or prescribed physical activity; supervised or unsupervised physical activity; home-based or facility-based physical activity; ongoing face-to-face support; telephone support; written education/motivation material; self monitoring. The intervention was delivered by one or a number of practitioners with various professional backgrounds including physicians, nurses, health educators, counsellors, exercise leaders and peers.

Only one study (SSCT 2000) adopted a structured and supervised approach to their intervention, encouraging participants to cycle on a static bike for 10 to 25 minutes at a pre-determined intensity, as part of a 2-hour exercise session. The majority of studies adopted an unstructured and independently performed physical activity regime.

We found the majority of studies contacted participants on at least three or more occasions in the first 4 weeks of the intervention to support and encourage any adoption of physical activity. Studies

offered a range of support and follow up to participants between week 5 and final outcome measure (a minimum of 6 months post baseline intervention). The types of follow-up offered to participants at any point ranged from postal only, telephone only, face-to-face meetings, or a mixture of postal, telephone or face-to-face.

We found an even distribution of studies using all three approaches as described in our explanation of 'nature of direction' with the more recently published studies preferring self direction or self direction with professional guidance.

### Design of included studies

Nine studies had a no-contact control group. Five studies had attention control groups with control participants receiving non-exercise related health advice. The remaining studies had comparison control groups, where participants received advice or written information about physical activity. In Petrella 2003 the control participants received exercise counselling and advice and were asked to keep a diary.

Eight studies had more than one intervention arm (Dubbert 2002; Harland 1999; Hillsdon 2002; King 1991; Norris 2000; Simons-Morton 2001a; Simons-Morton 2001b; Smith 2000). Four studies conducted an analysis of any intervention vs control by combining intervention arms (Harland 1999; Hillsdon 2002; Norris 2000; Smith 2000). We calculated pooled results for intervention arms for three further studies (King 1991; Simons-Morton 2001a; Simons-Morton 2001b). Our analysis of effectiveness when combining intervention arms, differed from the original results presented by two studies (King 1991; Simons-Morton 2001b). We also combined the results of two studies as the final results for control and intervention groups were reported separately by gender and there was no *a priori* hypothesis that the effect of the intervention would be different for men and women (Calfas 2000; Juneau 1987).

### Outcome measures

A number of secondary outcome measures, which were not the focus of this review, were also measured and included body mass index (King 1991; Kriska 1986; Petrella 2003; Stewart 2001), health status, smoking status (King 1991; Kriska 1986; Norris 2000), socio-behavioural constructs (e.g. self efficacy, reduction in barriers to physical activity), social support and 'stage of change' (Calfas 2000; Goldstein 1999; Norris 2000), time spent in flexibility and strength training (Calfas 2000), weight, height, lean body mass, body fat, plasma lipids (Cunningham 1987; Juneau 1987; Kriska 1986), minute ventilation, maximal heart rate, respiratory exchange ratio, blood cholesterol, flexibility, grip strength, health conditions, systolic and diastolic blood pressure (Cunningham 1987; King 1991; Kriska 1986; Petrella 2003), and alcohol consumption (Kriska 1986).

## METHODOLOGICAL QUALITY

Two of the three reviewers independently assessed the quality of each study that met the inclusion criteria. We did not rate studies on whether participants were blind to their allocation to intervention or control groups. This would not be appropriate for studies of this type, as it would be impossible to blind participants to a physical activity intervention. Generation of a formal quality score for each study was completed on a four point scale assigning a value of 0 or 1 to each of the factors described below.

a) Was the randomisation method described?

All studies reported using randomisation to allocate participants to intervention and control groups, but only 16 described the method of randomisation. Of these, four studies used cluster-randomisation, where the unit of randomisation was participating practices (Norris 2000; Elley 2003), matched pairs of participating practices (Goldstein 1999), or workplace shifts (Reid 1979). One study used quasi-randomisation - days of the week (Smith 2000). All other studies randomised individuals.

b) Was the outcome assessment independent and blind?

Twelve studies reported independent and blind outcome assessments (Dubbert 2002; Goldstein 1999; Green 2002; Harland 1999; Hillsdon 2002; King 1991; Marshall 2004; Petrella 2003; Pinto 2002; Simons-Morton 2001a; Simons-Morton 2001b; Smith 2000).

c) Was the final outcome measure controlled for baseline physical activity?

Sixteen studies reported adjusting their final results for baseline values of physical activity (Calfas 2000; Green 2002; Hillsdon 2002; Inoue 2003; King 1988a; King 1988b; King 1991; Lamb 2002; Marshall 2003a; Norris 2000; Petrella 2003; Pinto 2002; Simons-Morton 2001a; Simons-Morton 2001b; Smith 2000; Stewart 2001).

d) Was the analysis an intention-to-treat analysis?

Fourteen studies reported using an intention-to-treat analysis (Elley 2003; Hillsdon 2002; Kriska 1986; Lamb 2002; Lombard 1995; Marshall 2003a; Marshall 2004; Pinto 2002; Reid 1979; Simons-Morton 2001a; Simons-Morton 2001b; Smith 2000; Stewart 2001; Stevens 1998). The remaining nine studies did not use an intention-to-treat analysis but had less than 20% loss to follow up. The proportion of participants in studies that did not perform an intention-to-treat analysis who were lost to follow up ranged from 0% to 18.9% (see Table 08).

Twenty-three studies reported data for the number of those participants who completed their study and the number of participants eligible for the study before randomisation. We calculated the proportion of the eligible participants who completed the study and this percentage ranged from 15.5% to 100%. Table 08 presents the numbers of participants at different stages of each study. This data included the number of participants contacted to determine potential eligibility, number identified as eligible for study, number

randomised, number with complete data at final outcome measure, number of participants with complete data at final outcome measure as a proportion of number identified as eligible for study and proportion of participants who were lost to follow-up.

Details of the intensity of the interventions studied, control interventions used and length of follow-up are in Table 09 and Table 10.

## RESULTS

### Self-reported physical activity

#### *Reported as a continuous measure*

Nineteen studies (7,598 participants) reported their main outcome as one of several continuous measures of physical activity (Calfas 2000; Cunningham 1987; Elley 2003; Goldstein 1999; Green 2002; Hillsdon 2002; Inoue 2003; King 1988a; King 1988b; Kriska 1986; Marshall 2003a; Pinto 2002; Resnick 2002a; Simons-Morton 2001a; Simons-Morton 2001b; Smith 2000; SSCT 2000; Stevens 1998; Stewart 2001). Measures included estimated energy expenditure (kcal/day, kcal/week of moderate physical activity), total time of physical activity (mean mins/week of moderate physical activity) and mean number of occasions of physical activity in past four weeks. The pooled effect of these studies was positive but moderate (SMD 0.28, 95% CI 0.15 to 0.41) with significant heterogeneity in observed effects ( $I^2 = 83.5\%$ ). Seven studies reported positive effects (Cunningham 1987; Elley 2003; King 1988a; Kriska 1986; Stevens 1998; SSCT 2000; Stewart 2001) (see Table 11).

Studies with positive SMDs used a range of different intervention approaches with varying effect sizes. Kriska 1986 found that encouraging walking via an 8-week training programme, followed by a choice of group or independent walking, plus follow-up phone calls and incentives resulted in a mean increase of 479 kcal/week (95% CI 249 to 708) of physical activity of all intensities. Cunningham 1987 found that encouragement to attend three group exercise sessions per week and perform an additional weekly exercise session at home resulted in an additional mean 53.7 minutes of vigorous physical activity per day (95% CI 18.09 to 89.31).

King 1988a found a mean increase of 3.90 exercise sessions per month (95% CI 0.43 to 7.37), at 6 months, following 30 minutes of baseline instruction (15 minutes of advice and a 15 minute video about exercise training), and daily self monitoring of physical activity using exercise logs returned to staff every month. These additional sessions were approximately equivalent to 101 minutes of moderate intensity physical activity per week. Stevens 1998 saw a net difference between intervention and control groups of 2.31 'sessions' (one session was at least 20 minutes of continuous physical activity) of moderate or vigorous exercise per month (95% CI 1.91 to 2.71). At an initial meeting with a community exercise development officer intervention participants were encouraged to

extend a physical activity that they already did rather than start a new activity. A further meeting was offered ten weeks later to support and encourage any changes. Stewart 2001 reported a significant net difference of 82 kcal per day between the intervention and control arms (95% CI 73.9 to 90.1). The intervention group received face-to-face counselling based on social cognitive theory (Bandura 1986). In addition they were offered further individual follow up appointments, educational materials, phone calls and monthly workshops about physical activity.

Elley 2003 reported a between group mean difference of 2.67 kcal/kg/wk (95% CI 0.48 to 4.86). The authors estimate this was equivalent to a net difference of 247 kcals/week between groups. The intervention group received motivational counselling from their general practitioner, followed by three follow up phone calls from a local exercise specialist, plus written materials. Participants were asked to choose their own physical activity.

SSCT 2000 reported a large increase in mean self-reported physical activity in their intervention group. However the physical activity regime was very prescriptive. Participants were encouraged to attend at least two from three 2-hour exercise classes per week, held at a local community centre. The class contained endurance and resistance training typically involving 10-25 minutes of static cycling at prescribed heart rate reserve, with intensity monitored by heart monitors. In addition to attending classes participants were asked to monitor their walking behaviour using pedometers.

No statistically significant effects were observed for the other 12 studies (Calfas 2000; Goldstein 1999; Green 2002; Hillsdon 2002; Inoue 2003; King 1988b; Marshall 2003a; Pinto 2002; Resnick 2002a; Simons-Morton 2001a; Simons-Morton 2001b; Smith 2000). No studies had effects that favoured controls.

#### **Reported as a dichotomous measure**

Ten studies (3595 participants) reported physical activity as a dichotomous measure which represented achievement or not of a predetermined level of physical activity (Dubbart 2002; Harland 1999; Lamb 2002; Lombard 1995; Marshall 2004; Norris 2000; Pinto 2002; Reid 1979; Simons-Morton 2001a; Simons-Morton 2001b). The pooled odds ratio of these studies was positive but modest (OR 1.33, 95% CI 1.03 to 1.72) with significant heterogeneity in observed effects ( $I^2 = 53.4\%$ ). Only two studies reported a significantly positive effect (Dubbart 2002; Lombard 1995). Lombard 1995 found that participants who received a high frequency of follow up telephone calls (10 calls over 12 weeks) were more successful at changing their walking behaviour than participants who did not receive telephone calls (OR 10.95, 95% CI 1.42 to 84.15). Dubbart 2002 found that adult participants who received a video, walking plan, weekly walking diary, financial incentive for completing diary, plus follow up phone calls were more successful at adhering to a 3 walks per week programme than participants who did not receive any phone calls (OR 2.31, 95% CI 1.15 to 4.66) (see Table 12).

No effect was found in eight studies (Harland 1999; Lamb 2002; Marshall 2004; Norris 2000; Pinto 2002; Reid 1979; Simons-Morton 2001a; Simons-Morton 2001b). No studies had effects that favoured controls.

#### **Cardio-respiratory fitness**

In addition to self-reported physical activity, 11 studies (2195 participants) examined the effect of their intervention on cardio-respiratory fitness (Cunningham 1987; Dubbart 2002; Juneau 1987; King 1988a; King 1988b; King 1991; Lamb 2002; Petrella 2003; Simons-Morton 2001a; Simons-Morton 2001b; SSCT 2000) (see Table 13). The pooled effect was again positive and moderate with significant heterogeneity in the observed effects (SMD 0.52 95% CI 0.14 to 0.90). Five studies (1359 participants) had significant positive effects that favoured treatment (Cunningham 1987; Juneau 1987; Petrella 2003; Simons-Morton 2001b; SSCT 2000). Cunningham 1987 reported that recently retired men who were offered supervised exercise sessions increased their fitness by a greater amount than controls who continued with their usual physical activity programmes (SMD 0.44 95% CI 0.16 to 0.72). Juneau 1987 found a mean increase in fitness (SMD 1.49 95% CI 1.07 to 1.91) for participants who received a combination of a 30-minute consultation, an educational video, information on using a heart rate monitor and a daily physical activity log, compared to controls. Simons-Morton 2001b found that women who received an intensive mixture of behavioural counselling, support materials and telephone calls (assistance + counselling arms) were more likely to increase their fitness (SMD 0.47, 95% CI 0.23 to 0.71) than women who received a less intensive intervention (advice arm only). Petrella 2003 evaluated the effects of a fitness assessment using a step test and counselling from physician, plus a simple target heart rate goal and recording their physical activity in a diary on cardio-respiratory fitness. Controls received the same intervention without the heart rate goal setting. The standardised mean difference was 1.87 (95% CI 1.59 to 2.15).

Although King 1991 reported a significant difference in VO<sub>2</sub> max between intervention and control group at 12-months follow-up this difference did not remain when based on the standardised mean difference of the pooled intervention arms (SMD 0.17, 95% CI -0.09 to 0.43). In one other study (King 1988b), the author reported a significant difference in the change in fitness between groups, which did not remain significant when based on standardised mean differences at 12 month follow up using their published data. This may be an effect of pooling study arms.

#### **Adverse events**

Eight studies reported data on adverse events. Only one study found a difference in the rate of adverse events between the intervention and control groups. Reid 1979 reported the rate of job-related injuries was four times higher in the control group compared to the intervention group. The other seven studies reported no significant difference in rates of musculoskeletal injury (fractures and sprains), falls, illness and potential cardiovascular events between

groups (Dubbert 2002; Elley 2003; King 1991; Resnick 2002a; Simons-Morton 2001a; Simons-Morton 2001b; SSCT 2000).

### **Sensitivity analysis by study quality**

We examined the pooled effects for the three types of outcome data (self-reported physical activity, dichotomous and cardio-respiratory fitness outcomes) by an assessment of study quality. High quality studies scored more than 2 on the quality scale. A score of 2 or less was categorised as low quality. For the 19 studies that reported continuous outcomes for physical activity six were classified as high quality (comparison 02 01). The pooled effect of these interventions was again positive with no significant heterogeneity in the observed effects; the standardised mean difference was 0.11 (95% CI 0.04 to 0.17). Lower quality studies also had a positive pooled effect but with significant heterogeneity in the observed effects; the standardised mean difference was 0.36 (95% CI 0.17 to 0.56).

We found three high quality scoring studies from the 10 studies that reported dichotomous outcome data for self-reported physical activity (comparison 02 02). The pooled odds ratio of these three studies was positive but modest (OR 1.48, 95% CI 1.07 to 2.06) with no significant heterogeneity in observed effects.

We found five high quality studies from the 11 studies that reported continuous outcome data for cardio-respiratory fitness (comparison 02 03). The pooled effects of these studies was not significant and there was significant heterogeneity (SMD 0.54, 95% CI -0.07 to 1.14). We noted two studies had a string effect on the pooled analysis (Juneau 1987; Petrella 2003).

### **Secondary objectives**

#### ***a) Are more intense interventions more effective in changing physical activity than less intense interventions?***

Two studies attempted to investigate the effect of increasing intervention intensity. In Simons-Morton 2001a and Simons-Morton 2001b the three groups received different levels of intervention. The control group (advice) received physician advice to achieve the recommended level for exercise, then referral to an on-site health educator. At this appointment the health educator provided educational materials and repeated the physician advice to exercise with further follow-up appointments repeating this advice. No other follow-up activities were offered. The assistance group received the same advice from a physician and also received a 30–40 minute counselling session the health educator conducted, including a videotape and action planning. Participants then received follow-up phone calls, interactive mail, an electronic step counter, and monthly monitoring cards, which were returned to the health educator. Follow-up mail and incentives were sent to all participants. The counselling group received all of the components of the advice and assistance group with additional bi-weekly telephone calls for 6 weeks and then monthly telephone calls up to 12 months. Frequency of telephone calls for the final 12 months of the study was negotiated between the participant and their health educator.

Weekly behavioural classes on skills for adopting and maintaining physical activity were also offered to this group. In women, the addition of behavioural counselling, follow up support and materials produced a significant difference in fitness compared to the control groups. In men addition of these components did not lead to greater change (Simons-Morton 2001a and Simons-Morton 2001b).

#### ***b) Are specific components of interventions associated with changes in physical activity behaviour?***

We stratified the behavioural components of the interventions, according to a number of characteristics. These characteristics were the degree of nature of direction (the extent to which physical activity was prescribed or self-directed) and the level of on-going professional support (frequency of follow up after week five of the study). Although there were insufficient studies to statistically test the difference in observed effects between these various study characteristics, the significant heterogeneity in reported effects was reduced when physical activity was self-directed with some professional guidance and when there was on-going professional support (in studies with continuous outcome measures for self-reported physical activity).

#### ***c) Are short term changes in physical activity or fitness maintained at 12 months?***

Six studies reported outcomes more than 6 months after the initial intervention (e.g. at least a measure of the primary outcome at 6 months and 12 months post intervention). In King 1991 improvements in physical activity and cardio-respiratory fitness at 6 months were maintained at 12 months for cardio-respiratory fitness only. Simons-Morton 2001a and Simons-Morton 2001b presented data for cardio-respiratory fitness and self-reported physical activity at 6 and 24 months. All three study arms increased their cardio respiratory fitness and self reported levels of physical activity between baseline and 6 months. However there were no significant differences between groups. At 24 months there was a significant difference in VO<sub>2</sub> max between participants who received assistance and counselling compared to the advice group for women only (Simons-Morton 2001b). Calfas 2000 reported outcomes at 12 and 24 months with no significant effect observed at either time points. Lamb 2002 reported no significant effect in the likelihood of increasing walking at 6 and 12 months. Petrella 2003 reported a significant increase in cardio-respiratory fitness at 6 months and this effect was further increased at 12 months.

#### ***d) Is the promotion of some types of physical activity more likely to lead to change than other types of physical activity?***

We were unable to determine if any type of physical activity is more likely to be adopted than any other type of physical activity, (e.g. walking, jogging or running) as the studies were not designed to examine this question and as such generally did not report exactly what type of physical activity was performed.

#### ***e) Are home-based interventions more successful than facility-based interventions?***

No study specifically examined this question. However King 1991 compared the difference in adherence to prescribed physical activity sessions between participants who were prescribed home-based versus facility-based exercise. A greater number of participants completed at least 75% of prescribed exercise sessions in both home-based arms compared to the facility-based arms ( $P < 0.05$ ). This improved adherence to the home-based exercise sessions was not reflected in greater improvements in fitness.

#### ***f) Are interventions more successful with particular participant groups?***

Nine studies examined the differential effects of the interventions within various sub-groups.

Eight studies looked at the effect of gender (Calfas 2000; Elley 2003; Juneau 1987; King 1991; Petrella 2003; Simons-Morton 2001a; Simons-Morton 2001b; Stewart 2001). Greater effects were seen for improvements in cardio-respiratory fitness for women as compared to men in King 1991 and Simons-Morton 2001a and Simons-Morton 2001b, while Juneau 1987 reported a greater increase in VO<sub>2</sub> max in men than women. Elley 2003 reported greater increases in men compared to women in the intervention group in reported physical activity.

Two studies found no differential effects between high and low levels of baseline self-reported physical activity (Petrella 2003; Stewart 2001). No effects were seen for age (above or below 75 years) in Stewart 2001. The same study found a greater increase in physical activity for overweight participants (BMI more than 27.0), compared with participants who were not overweight (Stewart 2001). Petrella 2003 examined differential effects of their intervention in four sub groups (i) gender, (ii) age (above versus below 70 years), (iii) chronic health conditions (less than two reported health conditions versus more two or more health conditions) and (iv) BMI (<27, 27-31, >32 BMI). The intervention group showed a greater improvement in cardio-respiratory fitness compared to the control group, in a between group analysis regardless of gender, age, having more than 2 chronic health conditions and BMI >32.

## **DISCUSSION**

Our updated review suggests that physical activity interventions have a positive moderate sized effect on increasing self-reported physical activity and measured cardio-respiratory fitness, at least in the short to mid-term. Any conclusions drawn from this review require some caution given the significant heterogeneity in the observed effects. Despite the heterogeneity between the studies, there is some indication that a mixture of professional guidance and self direction plus on-going professional support leads to more consistent effect estimates. The long-term effectiveness of these interventions is not established as the majority of studies stopped after 12 months.

These conclusions differ from the findings of previous systematic reviews (Hillsdon 1996; Hillsdon 1999). Earlier reviews concluded that interventions that encouraged home-based activity were more effective than facility-based activity interventions. This review used more rigid inclusion criteria (for example outcome measures with at least 6 months follow-up) and subsequently excluded some studies included in these previous reviews. We were also able to collect unpublished data from study authors and this allowed us to perform a quantitative analysis using standardised mean differences for effects as opposed to just descriptions alone. The conclusions are similar to another published review (Hillsdon 2004). However this review was not a synthesis of primary studies but rather a synthesis of high-quality systematic reviews and meta-analyses of studies to increase physical activity among adults. It assessed studies in particular settings and found strong evidence of effectiveness of interventions within healthcare and community settings, particularly brief advice from a health professional, supported by written materials, which is likely to be effective in producing a modest, short-term (6-12 weeks) effect on physical activity (Hillsdon 2004).

The findings of this review are in contrast to the conclusions of a review produced by the Center for Disease Control (Kahn 2002). Kahn 2002 examined the effectiveness of individual-based behavioural interventions for the promotion of physical activity. The review calculated effects as the net percent change from baseline - the median change scores. In 10 studies (using continuous outcome measures of self-reported physical activity), the authors found a median net increase of 35.4% (interquartile range, 16.7% to 83.3%). Ten studies measured change in the time spent in physical activity, with a net median increase of 64.3% (interquartile range, 1.2% to 85.5%). Four studies measured change in VO<sub>2</sub>max with a median increase of 6.3% (interquartile range, 5.1% to 9.8%). Overall the authors concluded that there was “good” evidence to suggest that this type of intervention was effective in increasing physical activity. However the authors included studies with shorter periods of follow up, non randomised studies (including uncontrolled before and after studies), and did not take account of loss to follow up. Only one study, King 1991, was shared by both reviews.

#### **Quality of the evidence**

The quality of the studies in this current review was limited by a lack of intention-to-treat analysis and failure to examine the interaction between baseline levels of physical activity and exposure to the intervention. Only six studies (Green 2002; Hillsdon 2002; Lamb 2002; Petrella 2003; Simons-Morton 2001a; Simons-Morton 2001b) achieved all of the quality criteria. The observed effects were smaller but more consistent in studies with higher quality scores.

#### **Internal validity**

We found three main weaknesses to the studies in terms of their internal validity. First, none of the studies were able to blind par-

ticipants to their allocation to intervention at baseline. However this criterion is not appropriate to such studies. It is very difficult to blind a participant to their study group if exercise is the intervention. This element of quality is more appropriate to pharmaceutical interventions where blinding for both researchers and participants reduces the risk of selection bias. Second, studies failed to state their randomisation methods. And third, the studies did not use personnel to collect main outcome measures that were independent and blinded to group allocation.

Misclassification of physical activity also threatens internal validity of studies. The insensitivity of self-reported physical activity measures leads to less precision in its measurement and increases the variance in measures of behaviour. As intervention and control group participants completed the same self-report measure, any misclassification is likely to be non-differential leading to an attenuation of the effect of the intervention. This problem would not apply to measures of cardio-respiratory fitness.

### ***External validity***

Limitations in the external validity of the studies relate to recruitment and screening of participants and the generalisability of the interventions into everyday practice.

The majority of the studies in the review recruited volunteers, for example people replying to newspaper advertisements and the interventions may be less effective in non-volunteer populations recruited, for example, from primary care settings. Often participants had to agree to extensive screening prior to randomisation and, as a consequence, the people who finally participated in the study were likely to be highly motivated. Participants who were randomised in Project ACT (Simons-Morton 2001a; Simons-Morton 2001b) had already undergone three screening visits. Participants in other studies attended pre-study promotional events plus a baseline assessment (Stewart 2001) or attended two screening interviews (Inoue 2003). By contrast, only three studies, Stevens 1998, Hillsdon 2002 and Elley 2003, randomised all participants at the point of invitation to the study prior to them agreeing to participate. This method is called Zelen randomisation and is adopted to reduce non-consent rates (Zelen 1990).

The physicians in the studies based in a primary healthcare setting may have been more motivated to deliver the interventions than might be observed in a non-trial setting. We noted that studies described 'recruiting' participating practices and physicians and reported using financial incentives to physicians and practice staff during the time of the study.

We noted a large drop out of participants between the recruitment, eligibility screening and randomisation phases of studies (data presented in Table 08). This drop out would limit the possible effects of such interventions and the generalisability of the studies.

Many interventions provided components which would be difficult to deliver in usual practice as they would demand large resources. For example studies offered a choice of physical activities

plus offered initial support in supervised programmes of physical activity, as well as letting participants choose to exercise independently of professional support.

Only four studies reported data at 2 years, with one study demonstrating maintenance of improvement in cardio-respiratory fitness (Simons-Morton 2001b). Evidence for the long-term effectiveness of interventions is urgently required.

The participants in the studies reviewed were generally white, well educated and middle aged and it is possible that the observed effects may be different in the wider population. There were no studies in this review that examined the effectiveness of interventions in minority groups of any kind.

## **AUTHORS' CONCLUSIONS**

### **Implications for practice**

There is some evidence to suggest that interventions designed to increase physical activity can lead to moderate short and mid-term increases in physical activity, at least in middle age. Due to the clinical and statistical heterogeneity of the studies, only limited conclusions can be drawn about the effectiveness of individual components of the interventions. Nevertheless interventions which provide people with professional guidance about starting an exercise programme and then provide on going support may be more effective in encouraging the uptake of physical activity. There is no evidence that such interventions will reduce physical activity or cause other harm. There is only very limited evidence of the long-term effectiveness of interventions.

### **Implications for research**

Existing evidence about the effectiveness of physical activity interventions for sedentary adults in the general population is limited by the recruitment of motivated volunteers, and the problems of measuring of physical activity using self report. No studies examined the effect of interventions on participants from varying socioeconomic or ethnic groups. There is also an urgent need for studies with cost-effectiveness data. In order to better understand the independent effect of individual programme components, longer studies with greater power are required. High quality studies are required with larger numbers, with a greater variety of participants, and with longer follow-up periods. In this review we have been able to describe the quantity of the interventions but were unable to describe the quality of the components of the interventions. Future reports of studies should provide greater detail on the nature of the professional who delivered the interventions, the theoretical basis of the intervention and how the theory was translated into practice.

## POTENTIAL CONFLICT OF INTEREST

The authors of this review are also authors of one of the included studies (Hillsdon 2002).

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Stewart 2001 provided clarification regarding the means and standard deviations for the weekly caloric expenditure in all and moderate intensity physical activity at 12 months follow up.

Smith 2000 provided the mean change and standard deviation of the total minutes of activity for the three arms of the study at 7-8 months follow-up.

Norris 2000 was unable to provide the standard deviations for various physical activity outcomes.

Calfas 2000 confirmed the final numbers of participants at the 24-month follow-up.

Simons-Morton 2001a and Simons-Morton 2001b provided the standard errors for the physical activity and VO2max values for

men and women in all three study arms at 6-, 12- and 24- months follow-up.

Dubbert 2002 confirmed the numbers of participants in each study arm at baseline, 6 months and 12 months.

Marshall 2003a confirmed the details of the means and standard deviations of total average physical activity time (hrs/wk) for both study arms at 6 months follow-up.

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## T A B L E S

### Characteristics of included studies

Study	Calfas 2000
Methods	Randomised controlled trial
Participants	University students
Interventions	Intervention group received a 15 week cognitive behavioural education course, 15x50 minutes lectures followed by 15x110 minutes lab experience, led by peer health facilitators, plus homework including practice of behavioural management strategies. Participants received 2 course credits and could attend supervised x2 per week exercise sessions. All participants received 15 monthly follow up phone calls and monthly written materials.
Outcomes	+ Self reported physical activity
Notes	No significant differences in physical activity between groups

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### Characteristics of included studies (Continued)

Participants volunteered to participate in a health course and attend a baseline assessment  
Participants in both study arms had very high baseline levels of physical activity - mean 2+ hours of vigorous physical activity per week. Students also received academic credits for attending intervention sessions.

Allocation concealment B – Unclear

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#### Study **Cunningham 1987**

Methods Randomised controlled trial

Participants Retirees from community centre

Interventions Participants received 3 group exercise sessions per week and were encouraged to do one additional home based session.

Outcomes +  
Self reported physical activity  
Cardio-respiratory fitness

Notes Intervention group improved their fitness and vigorous physical activity levels versus control group.  
All exercise sessions were conducted on an indoor or outdoor running track

Allocation concealment B – Unclear

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#### Study **Dubbert 2002**

Methods Randomised controlled trial

Participants Primary care patients

Interventions All participants received a video, walking plan, weekly walking diary, (financial incentive for completing diary), plus (1) 20 counselling, goal setting phone calls from nurse, or (2) 10 nurse calls and 10 automated phone calls

Outcomes +  
Self reported physical activity  
0  
Cardio-respiratory fitness

Notes No effect found for fitness changes but effect seen for dichotomous outcome

Allocation concealment B – Unclear

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#### Study **Elley 2003**

Methods Randomised controlled trial

Participants Primary care patients

Interventions Participants received motivation counselling from their general practitioner. This included discussion on increasing physical activity and goal setting. The participants received a green prescription card stating their recommended physical activity. After this meeting a local exercise specialist called all participants at least 3 times to encourage physical activity using motivational interviewing techniques. Written materials were also sent to participants every 3 months. These materials included information about local physical activity opportunities and motivational material.

Outcomes +  
Self reported physical activity

Notes

Allocation concealment B – Unclear

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#### Study **Goldstein 1999**

Methods Randomised controlled trial

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**Characteristics of included studies (Continued)**

Participants	Primary care patients
Interventions	Participants received 5 minutes of stage of change matched counselling, plus a written prescription, materials plus the chance of a follow up appointment. Participants also received 5 monthly mailed written materials.
Outcomes	0 Self reported physical activity
Notes	No difference in stage of change or in physical activity in elderly score Active adults were excluded from the study
Allocation concealment	B – Unclear

**Study Green 2002**

Methods	Randomised controlled trial
Participants	Health maintenance organisation members
Interventions	Participants received self help materials via mail, plus 3 x 20 minute phone calls per month for 3 months (up to 9 calls).
Outcomes	0 Self reported physical activity
Notes	
Allocation concealment	B – Unclear

**Study Harland 1999**

Methods	Randomised controlled trial
Participants	Primary care patients
Interventions	All participants completed a baseline assessment of self reported physical activity, physical measures and cycle ergometer fitness test. They received feedback of their results, brief advice about their present level of physical activity and comparison to recommended levels, plus written health information, 19 leaflets about local physical activity facilities and activities. In addition there were four intervention group, (i) one motivational interview, (ii) one motivational interview plus vouchers for free use of local facilities, (iii) 6 motivational interviews over 12 weeks and (iv) 6 motivational interviews over 12 weeks plus vouchers.
Outcomes	0 Self reported physical activity
Notes	All intervention groups more active than control at 12 weeks, no differences at 12 months. Two approaches to recruitment used opportunistic and all potential participants who attended the health centre Self reported vigorously active excluded from study Moderate take up of motivational interviews amongst participants offered up to six - median 3
Allocation concealment	B – Unclear

**Study Hillsdon 2002**

Methods	Randomised controlled trial
Participants	Primary care patients
Interventions	Participants received brief negotiation plus follow up phone calls, or direct advice plus phone calls.
Outcomes	0 Self reported physical activity
Notes	
Allocation concealment	B – Unclear

**Characteristics of included studies (Continued)**

<b>Study</b>	<b>Inoue 2003</b>
Methods	Randomised controlled trial
Participants	Older Japanese women
Interventions	Participants received feedback on their baseline assessments of exercise behaviour and fitness in 30 minute group lectures. Three exercise goals were recommended to participants. Participants were allowed to use the local research centre exercise facilities during the study. Participants received an 8-week intensive programme that provided each week one two hour session made up of one hour of group work and one hour of exercise practice. The group work included behavioural management skills based on stages of change. After 8 week all participants received newsletters every two months.
Outcomes	0 Self reported physical activity
Notes	
Allocation concealment	B – Unclear

<b>Study</b>	<b>Juneau 1987</b>
Methods	Randomised controlled trial
Participants	Workplace employees
Interventions	Participants received a 30 minute consultation including watching a video, information on using a heart rate monitor and daily physical activity log. Participants were given a portable heart monitor, which warned the user if heart rate not in prescribed range. Participants were instructed to exercise at 65-77% peak baseline treadmill heart rate.
Outcomes	+ Cardio-respiratory fitness
Notes	Increase in VO <sub>2</sub> in intervention group improved over control group (approx 14% in males, 10% in female) Participants attended a screening session and a VO <sub>2</sub> max test prior to randomisation
Allocation concealment	B – Unclear

<b>Study</b>	<b>King 1988a</b>
Methods	Randomised controlled trial
Participants	Workplace employees
Interventions	Maintenance study participants received 30 minutes of baseline instruction (15 mins advice + 15 mins video), daily self monitoring of physical activity using exercise logs returned to staff every month.
Outcomes	+ Self reported physical activity
Notes	Significant difference in number of exercise sessions/month between groups Participants had previously taken part in an exercise RCT
Allocation concealment	B – Unclear

<b>Study</b>	<b>King 1988b</b>
Methods	Randomised controlled trial
Participants	Workplace employees
Interventions	Adoption study participants received 30 minutes of baseline instruction (15 mins advice + 15 mins video) plus 10 staff initiated phone calls and self-monitoring materials including pulse monitor.
Outcomes	0 Self reported physical activity

### Characteristics of included studies (Continued)

Notes No significant difference in number of exercise sessions/month between groups but both groups increased physical activity over baseline.  
Participants had previously taken part in an exercise RCT

Allocation concealment B – Unclear

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#### Study King 1991

Methods Randomised controlled trial

Participants Community older volunteers

Interventions Participants received baseline physiological assessments and then were prescribed either home or group based training at high or low intensity plus written information, physical activity logs and phone calls.

Outcomes +  
Cardio-respiratory fitness

Notes Increase in VO2 max (approx 5%) and treadmill duration (approx 14%). Adherence greater in home based arms  
Participants agreed to attend an extensive medical and physical assessment if they wished to participate in study

Allocation concealment B – Unclear

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#### Study Kriska 1986

Methods Randomised controlled trial

Participants Older women

Interventions Participants received a baseline physical assessment, 8 week walking training programme with organised walks, then choice of group or independent walking. Participants monitored their walking with monthly logs and also were offered social meetings. Participants also received follow up phone calls, cards, and incentives to maintain compliance.

Outcomes +  
Self reported physical activity

Notes Significant different between intervention and control groups on walking blocks per day.  
Frequency of follow up measures, meetings, mall walks and incentives not stated.

Allocation concealment B – Unclear

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#### Study Lamb 2002

Methods Randomised controlled trial

Participants Primary care patients

Interventions Participants received a 30 minute group seminar, advice to exercise plus opportunity to attend health walks programme and verbal and written information about groups. This group also received three phone calls to encourage attendance and bring friends and family.

Outcomes 0  
Self reported physical activity  
0  
Cardio-respiratory fitness

Notes

Allocation concealment B – Unclear

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#### Study Lombard 1995

Methods Randomised controlled trial

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Interventions for promoting physical activity (Review)

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**Characteristics of included studies (Continued)**

Participants	University staff & students
Interventions	Participants were encouraged to walk in groups or with a friend and also received different frequencies and intensities of follow up telephone calls plus written materials including walking maps
Outcomes	+ Self reported physical activity
Notes	Survival analysis showed that participants who received a high frequency of phone calls rather than a highly structured call were more successful in sustaining walking over control and other groups. Only 3 men in study (2.2%)
Allocation concealment	B – Unclear

**Study Marshall 2003a**

Methods	Randomised controlled trial
Participants	Adult participants of an evaluation cohort
Interventions	Participants received one of 4 stages of change matched booklets, plus a motivational letter plus next stage of change booklet.
Outcomes	0 Self reported physical activity
Notes	
Allocation concealment	B – Unclear

**Study Marshall 2004**

Methods	Randomised controlled trial
Participants	Community living adults
Interventions	Participants received a booklet that matched their stage of change plus the booklet for the following stage (same materials as Marshall et al 2003). Participants also received a motivational letter.
Outcomes	0 Self reported physical activity
Notes	
Allocation concealment	B – Unclear

**Study Norris 2000**

Methods	Randomised controlled trial
Participants	Health maintenance organisation members
Interventions	Stage matched strategies and written materials given to patient prior to counselling with physician. Physician delivered behavioural counselling appropriate to stages of change model, with goal setting, identifying barriers, problem solving and contracting techniques, plus a written prescription for exercise. Patients also received single follow up phone call.
Outcomes	0 Self reported physical activity
Notes	No significant differences between groups at 6 months High baseline physical activity levels - 1500+ kcals/week
Allocation concealment	B – Unclear

**Study Petrella 2003**

Methods	Randomised controlled trial
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**Characteristics of included studies (Continued)**

Participants	Primary health care patients
Interventions	Participants received a fitness assessment using a step test and counselling from physician. Each participant was given examples of exercise and the ACSM prescription of physical activity using heart rate reserve (HRR). Participants were asked to record their weekly exercise in a diary which was collected at 3, 6 and 12 months. Participants also received information about local exercise facilities and activities.
Outcomes	+ Cardio-respiratory fitness
Notes	
Allocation concealment	D – Not used

<b>Study</b>	<b>Pinto 2002</b>
Methods	Randomised controlled trial
Participants	Health maintenance organisation members
Interventions	Participants received computer-based telephone calls and wore a pedometer. Participants were asked to call every week for three months and at least twice a month for the next three months. The calls assessed present levels of moderate intensity physical activity, daily pedometer scores, motivation and provided stage matched advice. Monthly written reports were generated from calls and sent to participants.
Outcomes	0 Self reported physical activity
Notes	
Allocation concealment	B – Unclear

<b>Study</b>	<b>Reid 1979</b>
Methods	Randomised controlled trial
Participants	Male fire fighters
Interventions	Pre randomisation fitness assessment, feedback by physician of fitness results compared population levels, prescription for exercise appropriate for age. Group one received additional one hour of health education, film, written & verbal advice. Group two received self-monitoring materials and a weekly record, which were returned to research staff bi-weekly. All participants reported monthly on exercise programme.
Outcomes	0 Compliance index score
Notes	Short term significant improvement in compliance index (VO <sub>2</sub> +exercise freq.) not maintained at 6 months. Participants agreed to attend a screening session prior to randomisation Active fire fighters were excluded from study
Allocation concealment	B – Unclear

<b>Study</b>	<b>Resnick 2002a</b>
Methods	Randomised controlled trial
Participants	Adults from retirement community
Interventions	Participants received the WALC intervention. All participants were invited to join a walking group (meeting 6 times a week) or walk on their own 3 times a week. Pain was assessed by nurse once a week for four weeks then once a month for 5 months. Participants received written materials and these were used in a short review with their nurse. Participants received a calendar to remind them about walking goals and record walking frequency.
Outcomes	0 Self reported physical activity



## Characteristics of included studies (Continued)

Notes

Allocation concealment B – Unclear

<b>Study</b>	<b>SSCT 2000</b>
Methods	Randomised controlled trial
Participants	Older Japanese adults
Interventions	Participants were encouraged to attend at least 2 from 3 2-hour exercise classes per week, held at a local community centre. The class contained endurance and resistance training.
Outcomes	+ Self reported physical activity (Fujita 2003) + Cardio-respiratory fitness (Tsuji 2000)

Notes

Allocation concealment B – Unclear

<b>Study</b>	<b>Simons-Morton 2001a</b>
Methods	Randomised controlled trial
Participants	Primary care patients
Interventions	Participants were randomised to one of three groups, advice, assistance or counselling. The assistance group received the same advice as the advice for a physician but the health educator conducted a 30-40 minute counselling session, including a videotape and action planning. Participants then received follow up phone calls, interactive mail, an electronic step counter, and monthly monitoring cards, which were returned to the health educator. Follow up mail was returned plus incentive to all participants. The counselling group received all of components of the advice and assistance group with in addition telephone-counselling calls. Weekly behavioural classes were also offered to this group.
Outcomes	0 Self reported physical activity 0 Cardio-respiratory fitness
Notes	No differences in physical activity. No differences for either fitness or physical activity in any male group. Participants undertook three sessions of pre-screening before randomisation.
Allocation concealment	B – Unclear

<b>Study</b>	<b>Simons-Morton 2001b</b>
Methods	Randomised controlled trial
Participants	Primary care patients
Interventions	Participants were randomised to one of three groups, advice, assistance or counselling. The assistance group received the same advice as the advice for a physician but the health educator conducted a 30-40 minute counselling session, including a videotape and action planning. Participants then received follow up phone calls, interactive mail, an electronic step counter, and monthly monitoring cards, which were returned to the health educator. Follow up mail was returned plus incentive to all participants. The counselling group received all of components of the advice and assistance group with in addition telephone-counselling calls. Weekly behavioural classes were also offered to this group.
Outcomes	Self reported physical activity  Cardio-respiratory fitness

### Characteristics of included studies (Continued)

Notes Women's VO<sub>2</sub> increased in assistance group and counselling group compared to the advice group. No differences in physical activity.  
Participants undertook three sessions of pre-screening before randomisation.

Allocation concealment B – Unclear

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#### Study **Smith 2000**

Methods Randomised controlled trial

Participants Primary care patients

Interventions Participants received GP advice, or GP advice plus stage matched booklets via post

Outcomes 0  
Self reported physical activity

Notes Short-term (6-10 weeks) increase in physical activity for advice plus booklet group versus controls only for participants inactive at baseline .  
Potential participants with poor English were excluded. Active subjects included in study but final results adjusted for baseline physical activity status

Allocation concealment D – Not used

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#### Study **Stevens 1998**

Methods Randomised controlled trial

Participants Primary care patients

Interventions Participants were invited by their GP to attend a consultation with an exercise development officer. At this meeting they discussed their present physical activity and were encouraged to increase on their current physical activity choices rather than start anything new. A follow up appointment was made ten weeks later.

Outcomes +  
Self reported physical activity

Notes Significant increase in occasions of exercise in past 4 weeks in intervention v control groups  
Active participants at baseline were not randomised  
MH & MT were study authors

Allocation concealment B – Unclear

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#### Study **Stewart 2001**

Methods Randomised controlled trial

Participants Community dwelling older adults

Interventions SCT based face to face counseling, behavioural, cognitive techniques to use local exercise opportunities or develop own programs. Participants also attended informational meetings, individual planning sessions, monthly group workshops, received physical activity diaries, telephone calls, newsletters, and functional fitness assessments. Participants were strongly encouraged to attend first two of ten workshops where a walking clinic was offered.

Outcomes +  
Self reported physical activity

Notes Greater increase in moderate physical activity in intervention group versus control at 12 months  
High baseline levels of physical activity - 1052 kcals/week moderate LTPA, 1935 kcals/week for all physical activities

Allocation concealment B – Unclear

## Characteristics of excluded studies

Study	Reason for exclusion
Andersen 1999	Study aim irrelevant
Andersen 2002	Study aim irrelevant
Aoun 2002	Study aim irrelevant
Asikainen 2002	Review paper
Asikainen 2003	Study aim irrelevant
Atienza 2001	Review paper
Atlantis 2004	Study aim irrelevant
Ballantyne 1978	Study aim irrelevant
Baranowski 1990	Less than 6 months follow up
Baranowski 2003	Study aim irrelevant
Barnett 2003	Study aim irrelevant
Bauman 2001	Study aim irrelevant
Bell 2001	Study aim irrelevant
Blair 1986	Non-randomised study
Blumenthal 2000	Study aim irrelevant
Bonet 2003	Study aim irrelevant
Brownson 2004	Non-randomised study
Buijjs 2003	Study aim irrelevant
Bull 1998	Loss to follow up > 20%
Burke 2003	Study aim irrelevant
Calfas 2002	Study aim irrelevant
Campbell 1985	Non-randomised study
Cardinal 1996	Less than 6 months follow up
Carels 2004	Study aim irrelevant
Castro 2002	Review paper
Chang 2003	Non-randomised study
Clark 2003	Non-randomised study
Coleman 1999	No appropriate control group
Collins 2004	Study aim irrelevant
Conn 2002	Study aim irrelevant
Conn 2003	Less than 6 months follow up
Dallow 2003	No appropriate control group
De Jong 2004	Study aim irrelevant
Donnelly 2000	Study aim irrelevant
DuVall 2004	Less than 6 months follow up
Dunn 1997	No appropriate control group
Dunn 1998	No appropriate control group
Eakin 2000	Review paper

Eaton 1998	Review paper
Ebrahim 1997	Study aim irrelevant
Ebrahim 1998	Review paper
Elberson 2001	Study aim irrelevant
Elliot 2004	Study aim irrelevant
Emmons 1999	Multiple risk factor intervention
Eriksen 2002	Study aim irrelevant
Fahrenwald 2002	Study aim irrelevant
Fiatarone 1994	Study aim irrelevant
Focht 2004	Study aim irrelevant
Fody-Urias 2001	Study aim irrelevant
Fritz 2001	Study aim irrelevant
Froehlich-Grobe 2004	Study aim irrelevant
Furukawa 2003	Study aim irrelevant
Godin 1987	Less than 6 months follow up
Goldwater 1985	Less than 6 months follow up
Gossard 1986	Less than 6 months follow up
Graham-Clarke 1994	Multiple risk factor intervention
Granner 2001	Study aim irrelevant
Halbert 1999	Study aim irrelevant
Halbert 2000	Insufficient data, author uncontactable
Halbert 2001	Study aim irrelevant
Hamdorf 1999	Loss to follow up > 20%
Hamdorf 2002	Study aim irrelevant
Harrell 1996	No appropriate control group
Heinonen 1999	Study aim irrelevant
Hellenius 1995	Study aim irrelevant
Hellenius 1997	Study aim irrelevant
Hirvensalo 2003	Study aim irrelevant
Hopman-Rock 2002	Study aim irrelevant
Huang 2002	Study aim irrelevant
Humpel 2004	Less than 6 months follow up
Jakicic 1995	No appropriate control group
Jakicic 1999	No appropriate control group
Jette 1996	Less than 6 months follow up
Jobe 2001	Study aim irrelevant
Kaukiainen 2002	Study aim irrelevant
Keele-Smith 2003	Less than 6 months follow up
Kelley 2004	Study aim irrelevant
Kennedy 2003	Study aim irrelevant
Kerr 2000	No appropriate control group

Kim 2004	Study aim irrelevant
King 1984	Less than 6 months follow up
King 1995	Study aim irrelevant
King 1997	Study aim irrelevant
King 2000	Study aim irrelevant
King 2001	
Kinion 1993	Study aim irrelevant
Kirk 2001	Study aim irrelevant
Kirk 2004	Study aim irrelevant
Kirk-Gardner 2003	Study aim irrelevant
Koffman 2001	Non-randomised study
Kohno 2002	Non-randomised study
Kontulainen 2004	Study aim irrelevant
Kukkonen-H 1998	Study aim irrelevant
Lansdown 2002	Less than 6 months follow up
Lawlor 2001	Review paper
Leon 1996	Study aim irrelevant
Lewis 1993a	Under 16s included
Lewis 1993b	Less than 6 months follow up
Li 2001	Study aim irrelevant
Lindstrom 2003	Study aim irrelevant
Little 2004	Less than 6 months follow up
Lord 1995	Non-randomised study
Lupton 2002	Study aim irrelevant
MacKeen 1985	Loss to follow up > 20%
Manson 1999	Study aim irrelevant
Marcus 1992	Non-randomised study
Marcus 1993	Less than 6 months follow up
Marcus 1995	Study aim irrelevant
Marcus 1998a	Less than 6 months follow up
Marcus 1998b	Loss to follow up > 20%
Marshall 2003b	Less than 6 months follow up
Martin 2004	Study aim irrelevant
Mattila 2003	Study aim irrelevant
McAuley 1994	Less than 6 months follow up
McMahon 2002	Study aim irrelevant
McMurdo 1992	Study aim irrelevant
McMurdo 1995	Study aim irrelevant
Messier 2000	Study aim irrelevant
Miller 2002	Loss to follow up > 20%
Mills 1996	Study aim irrelevant

Milne 2002	Less than 6 months follow up
Mulder 1981	Study aim irrelevant
Munsch 2003	Study aim irrelevant
Napolitano 2003	Less than 6 months follow up
Naylor 1999	Non-randomised study
Newman 2002	Review paper
Nisbeth 2000	Study aim irrelevant
Noland 1989	Less than 6 months follow up
Nurminen 2002	Study aim irrelevant
Oexmann 2001	Study aim irrelevant
Oida 2003	Study aim irrelevant
Oman 2000	Study aim irrelevant
Ortega-Sanchez 2004	Under 16s included
Ostwald 1989	Study aim irrelevant
Parks 1997	Non-randomised study
Partonen 1998	Study aim irrelevant
Paschal 2004	Study aim irrelevant
Pereira 1998	Study aim irrelevant
Peterson 1999	Less than 6 months follow up
Peterson 2002	Study aim irrelevant
Petrella 2000	Study aim irrelevant
Petrella 2001	Study aim irrelevant
Pfeiffer 2001	Less than 6 months follow up
Philips 2004	Study aim irrelevant
Pinto 2001	Study aim irrelevant
Plotnikoff 2001	Study aim irrelevant
Pohjonen 2001	Non-randomised study
Poole 2001	Study aim irrelevant
Poston 2001	Loss to follow up > 20%
Proper 2003a	Study aim irrelevant
Proper 2003b	Review paper
Purath 2004	Less than 6 months follow up
Reijneveld 2003	Study aim irrelevant
Renger 2002	Non-randomised study
Resnick 2002b	Study aim irrelevant
Reynolds 2001	Review paper
Robison 1992	Under 16s included
Ruby 1993	Less than 6 months follow up
Samaras 1997	Subjects with chronic disease
Schoenfelder 2000	Study aim irrelevant
Schuler 2002	Study aim irrelevant

**Characteristics of excluded studies (Continued)**

Sciamanna 2002	Study aim irrelevant
Sevick 2000	No appropriate control group
Simmons 2003	Study aim irrelevant
Sims 2004	Study aim irrelevant
Singh 1997	Study aim irrelevant
Singh 1997a	Less than 6 months follow up
Smith 2003	Non-randomised study
Smolander 2000	No appropriate control group
Sorensen 1999	Study aim irrelevant
Step toe 1999	Multiple risk factor intervention
Step toe 2000	Study aim irrelevant
Step toe 2001	Study aim irrelevant
Stevens 1999	Non-randomised study
Stevens 2003	Non-randomised study
Stiggelbout 2004	Less than 6 months follow up
Swinburn 2003	Review paper
Taylor 1998	Loss to follow up > 20%
Twisk 2004	Study aim irrelevant
Veverka 2003	Study aim irrelevant
Votruba 1968	Review paper
Vuori 1994	Less than 6 months follow up
Wankel 1985	Less than 6 months follow up
Weinehall 2001	Study aim irrelevant
Wen 2002	Non-randomised study
Wilbur 2001	Study aim irrelevant
Wood 1983	Study aim irrelevant
Woods 2002	Study aim irrelevant
Yalden 2001	Study aim irrelevant
Yanek 2001	Study aim irrelevant
Young 1999	Study aim irrelevant
Zask 2001	Study aim irrelevant
van der Bij 2002	Review paper

## ADDITIONAL TABLES

**Table 01. Search Strategy for EMBASE**

**Dates 2000 to 2004**

- 1.(((health-education) or (health-education-research)) or ((patient-education) or (patient-education-and-counseling)) or ((health-promotion) or (health-promotion-international)) or (primary-health-care) or ((workplace) or (workplace-)) or (promot\*) or ((promot\*) or ((educat\*) or ((program\*) and (((exertion) or (fitness) or (fitness-) or ((fitness) or (fitness-)) or (exercise) or ((exercise) or (sport) or (walk\*))))))
- 2.((research) or (((random-controlled) or (random-sample) or (randomisation) or (randomised) or (randomised-controlled) or (randomization) or (randomization-) or (randomizd) or (randomize) or (randomized) or (randomized-block) or (randomized-controlled) or (randomized-controlled-trial) or (randomized-control)) or ((double-blind) or (double-blind-procedure)) or ((single-blind) or (single-blind-procedure))) and (ec=human)) or (clinical) or (clin\*) or (trial\*) or (((clin\* near trial\*) in ti) and (ec=human)) or (clin\*) or (trial\*) or (((clin\* near trial\*) in ab) and (ec=human)) or (sing\*) or (doubl\*) or (trebl\*) or (tripl\*) or (blind\*) or (mask\*) or (((sing\* or doubl\* or trebl\* or tripl\*) near (blind\* or mask\*)) and (ec=human)) or ((placebos) or (placebo-controlled)) or ((placebo\* in ti) and (ec=human)) or ((placebo\* in ab) and (ec=human)) or ((random\* in ti) and (ec=human)) or ((random in ab) and (ec=human)) or (research) ec=human
- 3.(((studies) or (prospective-study) or (follow-up) or (comparative) or (evaluation)) and (ec=human))

**Table 02. Search Strategy for CINAHL**

**Dates 2000 to 2004**

- 1.exact{controlled}
- 2.exact{randomized}
- 3.exact{random-assignment}
- 4.exact{double-blind}
- 5.exact{single-blind}
- 6.#1 or #2 or #3 or #4 or #5
- 7.exact{animal}
- 8.exact{human}
- 9.#6 not #7
- 10.exact{clinical}
- 11.(clin\* near trial\*) in ti
- 12.(clin\* near trial\*) in ab
- 13.(singl\* or doubl\* or trebl\* or tripl\*) near (blind\* or mask\*)
- 14.(#13 in ti) or (#13 in ab)
- 15.placebos
- 16.placebo\* in ti
- 17.placebo\* in ab
- 18.random\* in ti
- 19.random\* in ab
- 20.exact{research-methodology}
- 21.#10 or #11 or #12 or #13 or #14 or #15 or #16 or #17
- 22.#18 or #19 or #20
- 23.#21 or #22
- 24.animal
- 25.human
- 26.#23 not #24



**Table 02. Search Strategy for CINAHL (Continued)**

**Dates 2000 to 2004**

- 27.#26 or #9 or #8 or #25
- 28.exact{comparative}
- 29.study
- 30.#28 and #29
- 31.exact{evaluation}
- 32.studies
- 33.#31 and #32
- 34.exact{follow-up}
- 35.exact{prosecutive}
- 36.#35 and #32
- 37.control\* or prosectiv\* or volunteer\*
- 38.(#37 in ti) or (#37 in ab)
- 39.#38 or #36 or #33 or #30
- 40.#39 not #24
- 41.#39 or #27 or #9
- 42.explode "exertion"/ all subheadings
- 43."physical fitness"
- 44.explode "physical education and training"/ all subheadings
- 45.explode "sports"/ all subheadings
- 46.explode "dancing"/ all subheadings
- 47.explode "exercise therapy"/ all subheadings
- 48.(physical\$ adj5 (fit\$ or train\$ or activ\$ or endur\$)).tw.
- 49.(exercis\$ adj5 (train\$ or physical\$ or activ\$)).tw.
- 50.sport\$.tw.
- 51.walk\$.tw.
- 52.bicycle\$.tw
- 53.(exercise\$ adj aerobic\$).tw.
- 54.(("lifestyle" or life-style) adj5 activ\$).tw.
- 55.(("lifestyle" or life-style) adj5 physical\$).tw.
- 56.#42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or (exercise\$) or (aerobic\$) or ("lifestyle") or (activ\$) or ("lifestyle") or (life-style) or (physical\$)
- 57.health education
- 58.patient education
- 59.primary prevention
- 60.health promotion
- 61.behaviour therapy
- 62.cognitive therapy
- 63.primary health care
- 64.workplace
- 65.promot\$.tw.
- 66.educat\$.tw.
- 67.program\$.tw.
- 68.#57 or #58 or #59 or #60 or #61 or #62 or #63 or #64 or #65 or #66 or #67
- 69.#68 and #56
- 70.#69 and #41

**Table 03. Search Strategy for PsycLIT**

**Dates 2000 to 2004**

- 1.exertion
- 2.physical-fitness
- 3.exercise
- 4.explode exercise
- 5.sport
- 6.walk\*
- 7.cycle
- 8.#1 or #2 or #3 or #4 or #5 or #6 or #7
- 9.health education
- 10.patient education
- 11.primary prevention
- 12.health promotion
- 13.behaviour therapy
- 14.cognitive therapy
- 15.primary health care
- 16.workplace
- 17.promot\$.tw.
- 18.educat\$.tw.
- 19.program\$.tw.
- 20.#9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19
- 21.#8 and #20
- 22.controlle
- 23.randomized
- 24.random-assignment
- 25.double-blind
- 26.single-blind
- 27.#22 or #23 or #24 or #25 or #26
- 28.animal
- 29.human
- 30.#27 not #28
- 31.clinical
- 32.(clin\* near trial\*) in ti
- 33.clin\* near trial\*) in ab
- 34.(singl\* or doubl\* or trebl\* or tripl\*) near (blind\* or mask\*)
- 35.(#34 in ti) or (#34 in ab)
- 36.placebos
- 37.placebo\* in ti
- 38.placebo\* in ab
- 39.random\* in ti
- 40.random\* in ab
- 41.research-methodology}
- 42.#31 or #32 or #33 or #34 or #35 or #36 or #37 or #38
- 43.#39 or #40 or #41
- 44.#42 or #43
- 45.animal
- 46.human
- 47.#44 not #45

**Table 03. Search Strategy for PsycLIT (Continued)**

**Dates 2000 to 2004**

48.#47 or #30 or #29 or #46  
49.comparative  
50.study  
51.#49 and #50  
52.evaluation  
53.studies  
54.#52 and #53  
55.follow-up  
56.prospective  
57.#56 and #53  
58.control\* or prospective\* or volunteer\*  
59.(#58 in ti) or (#58 in ab)  
60.#59 or #57 or #54 or #51  
61.#60 not #45  
62.#60 or #48 or #30  
63.#62 and #21

**Table 04. Search Strategy SPORTSDISCUS**

**Dates 2000 to 2004**

1.'physical activity'  
2.exercise  
3.fitness  
4.sedentary  
5.housebound  
6.aerobics or circuits or swimming or aqua or jogging or running or cycling or fitness or yoga or walking or sport  
7.patient education  
8.primary prevention  
9.health promotion  
10.behaviour therapy  
11.cognitive therapy  
12.primary health care  
13.workplace  
14.controlled  
15.randomized  
16.random-assignment  
17.double-blind  
18.single-blind  
19.clinical  
20.placebos  
21.comparative  
22.evaluation  
23.study

## Table 05. Search Strategy SIGLE

### Dates 2000 to 2004

- 1.explode "Exertion"/ all subheadings
- 2."Physical fitness"
- 3.explode "Physical education and training"/ all subheadings
- 4.explode "Sports"/ all subheadings
- 5.explode "Dancing"/ all subheadings
- 6.explode "Exercise therapy"/ all subheadings
- 7.(physical\$ adj5 (fit\$ or train\$ or activ\$ or endur\$)).tw.
- 8.(exercis\$ adj5 (train\$ or physical\$ or activ\$)).tw.
- 9.sport\$.tw.
- 10.walk\$.tw.
- 11.bicycle\$.tw
- 12.(exercise\$ adj aerobic\$).tw.
- 13.(("lifestyle" or life-style) adj5 activ\$).tw.
- 14.(("lifestyle" or life-style) adj5 physical\$).tw.
- 15.#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or (exercise\$) or (aerobic\$) or ("lifestyle") or (activ\$) or ("lifestyle") or (life-style) or (physical\$)
- 16.Health Education
- 17.Patient education
- 18.Primary prevention
- 19.Health promotion
- 20.Behaviour therapy
- 21.Cognitive therapy
- 22.Primary health care
- 23.Workplace
- 24.promot\$.tw.
- 25.educat\$.tw.
- 26.program\$.tw.
- 27.#16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26
- 28.#15 and #27

## Table 06. Search Strategy SCISEARCH

### Dates 2000 to 2004

- 1.((promot\$ or uptake or encourag\$ or increas\$ or start) near (physical adj activity))
- 2.(promot\$ or uptake or encourag\$ or increas\$ or start) near exercise
- 3.(promot\$ or uptake or encourag\$ or increas\$ or start) near (aerobics or circuits or swimming or aqua\$)
- 4.(promot\$ or uptake or encourag\$ or increas\$ or start) near (jogging or running or cycling)
- 5.(promot\$ or uptake or encourag\$ or increas\$ or start) near ((keep adj fit) or (fitness adj class\$) or yoga)
- 6.(promot\$ or uptake or encourag\$ or increas\$ or start) near walking
- 7.(promot\$ or uptake or encourag\$ or increas\$ or start) near sport\$

**Table 07. Descriptive data for review studies**

<b>Author</b>	<b>Publication year</b>	<b>Setting</b>	<b>No. randomised</b>	<b>% Male</b>	<b>Age range</b>	<b>Authors' description</b>
Reid 1979	1979	Workplace	124	100	24 to 56	Endurance activities
Kriska 1986	1986	Community	229	0	50 to 65	Walking
Cunningham 1987	1987	Workplace / community	224	100	54 to 68	Walking, jogging or running
Juneau 1987	1987	Workplace	120	50	40 to 60	Walking or slow jogging
King 1988a	1988	Workplace	52	50	40 to 60	Walking and jogging
King 1988b	1988	Workplace	51	51	40 to 60	Walking and jogging
King 1991	1991	Community	357	55	50 to 65	Group or home based walking/jogging activities
Lombard 1995	1995	University	135	2.2	21 to 63	Walking
Stevens1998	1998	Primary Health Care	714	42	45 to 74	Build on present physical activities
Goldstein 1999	1999	Primary Health Care	355	35	50+	Choice of moderate or vigorous physical activity
Harland 1999	1999	Primary Health Care	520	41.5	40 to 64	Choice of safe and effective physical activity
Calfas 2000	2000	University	338	45.8	18 to 29	Moderate or vigorous physical activity plus strength and flexibility activities
Norris 2000	2000	Primary Health Care	847	47.9	30+	Moderate physical activity
Smith 2000	2000	Primary Health Care	1142	39.5	25 to 65	Physical activity prescribed by medical practitioner
Simons-Morton 2001a	2001	Primary Health Care	479	100	35 to 75	Choice of moderate or vigorous physical activity
Simons-Morton2001b	2001	Primary Health Care	395	0	35 to 75	Choice of moderate or vigorous physical activity

**Table 07. Descriptive data for review studies** (Continued)

<b>Author</b>	<b>Publication year</b>	<b>Setting</b>	<b>No. randomised</b>	<b>% Male</b>	<b>Age range</b>	<b>Authors' description</b>
Stewart 2001	2001	Primary Health Care	173	34	65 to 95	Moderate physical activity
SSCT 2000*	2000/2003	Community	65	46.1	60 to 81	Group based endurance and resistance training
Dubbert 2002	2002	Primary Health Care	212	99	60 to 80	Walking
Green 2002	2002	Primary Health Care	316	47.5	20 to 64	Moderate physical activity
Hillsdon 2002	2002	Primary Health Care	1658	48.9	45 to 64	Choice of physical activity or walking
Lamb 2002	2002	Primary Health Care	260	48.8	40 to 70	Moderate intensity physical activity and walking
Pinto 2002	2002	Primary Health Care	298	28	25+	Moderate physical activity
Resnick 2002	2002	Community	20	0	84 to 92	Group based or home based walking
Elley 2003	2003	Primary Health Care	878	33.5	40 to 79	Moderate physical activity or walking
Inoue 2003	2003	Community	86	0	47 to 68	Moderate physical activity after group programme
Marshall 2003	2003	Community	462	42.5	40 to 60	Moderate physical activity
Petrella 2003	2003	Primary Health Care	284	52	65+	Moderate physical activity
Marshall 2004	2004	Community	719	36	Mean 43	Moderate physical activity

\*Same study with different outcome data (Tsuji - VO2; Fujita - self reported physical activity)

**Table 08. Participation numbers in study recruitment, randomisation and follow up**

<b>Study ID</b>	<b>Potentially eligible</b>	<b>Eligible (b)</b>	<b>Randomised (c)</b>	<b>Complete (d)</b>	<b>% complete/eligible</b>	<b>% lost to follow up</b>
Reid 1979	Not stated	146	124	34	23.2	72.5
Kriska 1986	Not stated	229	229	229	100	8.7
Cunningham 1987	Not stated	224	224	200	89.2	10.7
Juneau 1987	Not stated	126	120	113	89.6	5.8
King 1988a	Not stated	Not stated	52	47	Not available	9.6
King 1988b	Not stated	Not stated	51	48	Not available	5.8
King 1991	3117	1755	357	300	17.1	15.9
Lombard 1995	Approximately 5000	135	135	135	100	0
Stevens 1998	2253	827	714	415	50.1	41.8
Goldstein 1999	2145	444	355	312	70.2	12.1
Harland 1999	2974	734	520	442	60.2	15.0
Calfas 2000	Not stated	Not stated	338	315 (data provided by study authors)	Not available	6.8
Norris 2000	1920	985	847	812	82.4	4.1
Smith 2000	2097	1214	1142	1101	90.6	17.1
Simons-Morton 2001a	3910	NS	479	451 - Self-reported physical activity, 396 - Cardiovascular fitness (data provided by study authors)	Not available	5.8 - Self-reported physical activity, 17.3 - Cardiovascular fitness
Simons-Morton 2001b	3910	NS	395	349 - Self-reported physical activity, 302 - Cardiovascular fitness (data provided by study authors)	Not available	11.6 - Self-reported physical activity, 23.5 - Cardiovascular fitness
Stewart 2001	1381	1053	173	164	15.5	5.0
SSCT 2000	322	209	65	64	30.6	1.5
Dubbart 2002	576	475	212	181	38.1	14.6

**Table 08. Participation numbers in study recruitment, randomisation and follow up** (Continued)

Study ID	Potentially eligible	Eligible (b)	Randomised (c)	Complete (d)	% complete/eligible	% lost to follow up
Green 2002	1330	361	316	256	70.9	18.9
Hillsdon 2002	5797	1658	1658	674	40.6	0.1
Lamb 2002	~2000	438	260	260	59.3	0
Pinto 2002	1738	609	298	238	39.0	18.4
Resnick 2002	120	Not stated	20	17	Not stated	15
Elley 2003	2984	1364	878	878	64.3	0
Inoue 2003	376	156	86	84	53.8	2.3
Marshall 2003	927	738	462	462	62.6	0
Petrella 2003	320	284	284	284	100	0
Marshall 2004	1185	719	719	622	86.5	0
	(a) Number of people contacted to determine potential eligibility	(b) Number identified as eligible for study - the number of participants who were assessed as eligible for randomisation into study	(c) Number of people randomised - Number eligible minus refusals, excluded on medical grounds or failed to attend for randomisation	(d) Number with complete data set at final outcome measure	(e) % Number of participants with final outcome measure / Numbers identified as eligible for study	

**Table 09. Characteristics of study type and intensity of intervention and follow up**

Study ID & Author	Programme direction	Supervision	Rate of intervention	Rate of Follow Up	Contact at Follow up
Reid 1979	P - prescribed by professional only	US - physical activity programme was unstructured and performed independently by the participant	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Kriska 1986	P - prescribed by professional only	Mixed - physical activity programme was structured (S) and unstructured (US)	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Cunningham 1987	P - prescribed by professional only	Mixed - physical activity programme was structured (S)	High - 3+ occasions	High 3+ occasions between week five and outcome	Face-to-face



**Table 09. Characteristics of study type and intensity of intervention and follow up** (Continued)

Study ID & Author	Programme direction	Supervision	Rate of intervention	Rate of Follow Up	Contact at Follow up
		and unstructured (US)		measure.	
Juneau 1987	P - prescribed by professional only	US - physical activity programme was unstructured and performed independently by the participant	Low - 0-1 occasions	Low - 0-1 occasions between week five and outcome measure.	None
King 1988 a	SD self directed only	US - physical activity programme was unstructured and performed independently by the participant	Med - 2 occasions	Low - 0-1 occasions between week five and outcome measure.	None
King 1988 b	SD self directed only	US - physical activity programme was unstructured and performed independently by the participant	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Telephone only
King 1991	P - prescribed by professional only	Mixed - physical activity programme was structured (S) and unstructured (US)	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Lombard 1995	P - prescribed by professional only	US - physical activity programme was unstructured and performed independently by the participant	Low - 0-1 occasions	High 3+ occasions between week five and outcome measure.	Telephone only
Stevens 1998	SD self directed only	US - physical activity programme was unstructured and performed independently by the participant	Low - 0-1 occasions	Low - 0-1 occasions between week five and outcome measure.	Face-to-face
Goldstein 1999	SD+ self directed plus professional guidance	US - physical activity programme was unstructured and performed independently by the participant	Med - 2 occasions	High 3+ occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Harland 1999	SD+ self directed	US - physical	High - 3+ occasions	High 3+ occasions	Face-to-face

**Table 09. Characteristics of study type and intensity of intervention and follow up** (Continued)

<b>Study ID &amp; Author</b>	<b>Programme direction</b>	<b>Supervision</b>	<b>Rate of intervention</b>	<b>Rate of Follow Up</b>	<b>Contact at Follow up</b>
	plus professional guidance	activity programme was unstructured and performed independently by the participant		between week five and outcome measure.	
Calfas 2000	SD+ self directed plus professional guidance	US - physical activity programme was unstructured and performed independently by the participant	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Norris 2000	SD+ self directed plus professional guidance	US - physical activity programme was unstructured and performed independently by the participant	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Smith 2000	P - prescribed by professional only	US - physical activity programme was unstructured and performed independently by the participant	Med - 2 occasions	Low - 0-1 occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Simons-Morton 2001a	SD+ self directed plus professional guidance	US - physical activity programme was unstructured and performed independently by the participant	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Simons-Morton 2001b	SD+ self directed plus professional guidance	US - physical activity programme was unstructured and performed independently by the participant	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Stewart 2001	SD+ self directed plus professional guidance	US - physical activity programme was unstructured and performed independently by the participant	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
SSCT 2000	P - prescribed by professional only	S - physical activity programme was structured and supervised by	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face

**Table 09. Characteristics of study type and intensity of intervention and follow up** (Continued)

Study ID & Author	Programme direction	Supervision	Rate of intervention	Rate of Follow Up	Contact at Follow up
Dubbert 2002	SD - self directed only	professional US - physical activity programme was unstructured and performed independently by the participant	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Green 2002	SD - self directed only	US - physical activity programme was unstructured and performed independently by the participant	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Telephone only
Hillsdon 2002	SD - self directed only	US - physical activity programme was unstructured and performed independently by the participant	Low - 0-1 occasions	High 3+ occasions between week five and outcome measure.	Telephone only
Lamb 2002	SD+ self directed plus professional guidance	Mixed - physical activity programme was structured (S) and unstructured (US)	Low - 0-1 occasions	Low - 0-1 occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Pinto 2002	SD - self directed only	US - physical activity programme was unstructured and performed independently by the participant	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Resnick 2002	P - prescribed by professional only	Mixed - physical activity programme was structured (S) and unstructured (US)	High - 3+ occasions	High 3+ occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Elley 2003	SD+ self directed plus professional guidance	US - physical activity programme was unstructured and performed independently by the participant	Low - 0-1 occasions	Low - 0-1 occasions between week five and outcome measure.	Mixture of postal, telephone or face-to-face
Inoue 2003	SD+ self directed plus professional guidance	Mixed - physical activity programme was structured (S)	High - 3+ occasions	Low - 0-1 occasions between week five and outcome	Postal only

**Table 09. Characteristics of study type and intensity of intervention and follow up** (Continued)

Study ID & Author	Programme direction	Supervision	Rate of intervention	Rate of Follow Up	Contact at Follow up
		and unstructured (US)		measure.	
Marshall 2003	SD - self directed only	US - physical activity programme was unstructured and performed independently by the participant	Low - 0-1 occasions	Low - 0-1 occasions between week five and outcome measure.	None
Petrella 2003	SD - self directed only	US - physical activity programme was unstructured and performed independently by the participant	Low - 0-1 occasions	Low - 0-1 occasions between week five and outcome measure.	Face-to-face
Marshall 2004	SD - self directed only	US - physical activity programme was unstructured and performed independently by the participant	Low - 0-1 occasions	Low - 0-1 occasions between week five and outcome measure.	None
	(a) Nature of direction of the intervention	(b) Degree of programme supervision - S - physical activity programme was structured and supervised by professional, US - physical activity programme was unstructured and performed independently by the participant	(c) Frequency of intervention occasions in first four weeks post baseline.	(d) Frequency of follow up contacts.	(e) Type of follow up contacts

**Table 10. Characteristics of study control groups and number of study arms**

Study ID	No. study arms (a)	Description (b)	Type of control (c)
Reid 1979	2	Written advice	Comparison control
Kriska 1986	2	Baseline assessment only	No contact
Cunningham 1987	2	Continue usual physical activity	No contact
Juneau 1987	2	Daily physical activity logs	Comparison control

**Table 10. Characteristics of study control groups and number of study arms** (Continued)

<b>Study ID</b>	<b>No. study arms (a)</b>	<b>Description (b)</b>	<b>Type of control (c)</b>
King 1988a	2	Weekly exercise monitoring	Comparison control
King 1988b	2	Self monitoring materials and pulse monitor	Comparison control
King 1991	4	Asked not to change physical activity	No contact
Lombard 1995	2	Written information	Comparison control
Stevens 1998	2	Written information	Comparison control
Goldstein 1999	2	Usual care	Attention control
Harland 1999	5	Health check	Attention control
Calfas 2000	2	General health lectures	Attention control
Norris 2000	3	Usual care	No contact
Smith 2000	3	Usual care	No contact
Simons-Morton 2001a	3	Advice to exercise from physician & health educator	Comparison control
Simons-Morton 2001b	3	Advice to exercise from physician & health educator	Comparison control
Stewart 2001	2	Wait list	No contact
SSCT 2000	2	Attend weekly lecture and indoor games	Attention control
Dubbert 2002	3	Wait list	Comparison control
Green 2002	2	Self help materials only	Comparison control
Hillsdon 2002	3	Wait list	Attention control
Lamb 2002	2	Group seminar and advice to exercise	Comparison control
Pinto 2002	2	Computer-based phone calls	Attention control
Resnick 2002	2	Routine care	Attention control
Elley 2003	2	Usual care and wait list	Attention control
Inoue 2003	2	Baseline assessments only	No contact
Marshall 2003	2	Assessments only	Attention control
Petrella 2003	2	Exercise counselling, advice and record their exercise weekly in a diary	Comparison control
Marshall 2004	2	Assessments only	Attention control
	(a) Number of study arms - This figure is a sum of the number of	(b) Description of control group	(c) Type of control group - No contact - Wait list, baseline

**Table 10. Characteristics of study control groups and number of study arms** (Continued)

Study ID	No. study arms (a)	Description (b)	Type of control (c)
	intervention arms plus control		assessment only, Attention control - Usual care, health check, health advice not physical activity specific, Comparison control - Written information, advice about physical activity, self monitoring materials

**Table 11. Outcome measure, SMD, 95% CI for studies with continuous self-reported PA**

Study ID	Outcome measure	SMD	95% CI	Outcome direction	Study quality score
Kriska 1986	Kcal/week	0.54	0.28 to 0.80	+ favours intervention	1
Cunningham 1987	Mins/day vigorous physical activity (>4.9 METS)	0.40	0.13 to 0.67	+ favours intervention	0
King 1998a	Exercise occasions per month (30 Mins. per session)	0.64	0.05 to 1.23	+ favours intervention	2
King 1988b	Exercise occasions per month (30 Mins. per session)	0.37	-0.21 to 0.94	0 no effect	2
Stevens 1998	Exercise occasions per month (greater than 20 Mins per session)	0.84	0.68 to 0.99	+ favours intervention	2
Goldstein 1999	Physical Activity Scale for Elderly (PASE Scale)	0.02	-0.20 to 0.24	0 no effect	0
Calfas 2000	Kcal/kg/week	0.12	-0.10 to 0.34	0 no effect	1
Smith 2000	Mins/week	0.08	-0.04 to 0.21	0 no effect	3
Simons-Morton 2001a	Kcal/kg/day	0.18	-0.02 to 0.38	0 no effect	4
Simons-Morton 2001a	Kcal/kg/day	0.08	-0.14 to 0.30	0 no effect	4
Stewart 2001	Kcal/day	0.32	0.02 to 0.63	+ favours intervention	3
SSCT 2000	Total daily energy expenditure (kcal/kg/day)	1.18	0.64 to 1.72	+ favours intervention	1
Green 2002	Self reported physical activity PACE score	0.24	0.00 to 0.49	0 no effect	3
Hillsdon 2002	Energy expenditure (kcal/kg/week)	0.06	-0.04 to 0.16	0 no effect	3
Pinto 2002	Moderate intensity physical activity (kcal/week)	0.06	-0.19 to 0.32	0 no effect	2

**Table 11. Outcome measure, SMD, 95% CI for studies with continuous self-reported PA** (Continued)

Study ID	Outcome measure	SMD	95% CI	Outcome direction	Study quality score
Resnick 2002	Energy expenditure	0.72	-0.29 to 1.72	0 no effect	0
Elley 2003	Energy expenditure (kcal/kg/week)	0.19	0.06 to 0.32	+ favours intervention	1
Inoue 2003	Moderate intensity physical activity (kcal/week)	0.24	-0.19 to 0.67	0 no effect	1
Marshall 2003	Total physical activity (hrs/week)  METS = Energy cost of physical activity measured at cost of basal metabolic rate.	0.06	-0.12 to 0.24	0 no effect	2

**Table 12. Outcome measure, OR, 95% CI for studies with dichotomous physical activity**

Study ID	Outcome measure	OR	95% CI	Outcome direction	Study quality score
Reid 1979	Improving physical activity compliance and fitness increase (OR for a participant achieving "prescribed compliance" if they reported exercising at least twice a week and increased their VO2 by +9.5% over baseline level)	1.68	0.72 to 3.92	0 no effect	1
Lombard 1995	Achieving at least 3 occasions of walking for at least 20 minutes per week (OR for a participant walking on least 3 occasions per week for at least 20 minutes per occasion)	10.95	1.42 to 84.15	+ favours treatment	1
Harland 1999	Improving physical activity index score by at least one level (OR for a participant increasing their number of sessions of moderate and vigorous physical activity lasting a minimum of 20 minutes in the previous four weeks, used in a physical	1.18	0.69 to 2.04	0 no effect	2

**Table 12. Outcome measure, OR, 95% CI for studies with dichotomous physical activity** (Continued)

Study ID	Outcome measure	OR	95% CI	Outcome direction	Study quality score
Norris 2000	activity index score) Increasing physical activity by at least 30 minutes per week (OR for a participant increasing their level of any type of physical activity by at least 30 minutes per week compared to their baseline level)	0.79	0.60 to 1.04	0 no effect	2
Simons-Morton 2001a	Meeting CDC recommendation for physical activity (Odds ratio for a participant meeting 30 minutes of moderate to vigorous intensity physical activity (at least 3 METS) at least 5 days a week, 30 minutes of vigorous physical activity (at least 5 METS) at least 3 days a week, or at least 2 kcal·kg <sup>-1</sup> ·day <sup>-1</sup> in moderate to vigorous physical activity)	1.63	0.98 to 2.71	0 no effect	4
Simons-Morton 2001b	Meeting CDC recommendation for physical activity (Odds ratio for a participant meeting 30 minutes of moderate to vigorous intensity physical activity (at least 3 METS) at least 5 days a week, 30 minutes of vigorous physical activity (at least 5 METS) at least 3 days a week, or at least 2 kcal·kg <sup>-1</sup> ·day <sup>-1</sup> in moderate to vigorous physical activity)	1.26	0.68 to 2.34	0 no effect	4
Dubbert 2002	Achieving exercise adherence goal of walking 20 min 3 days/week	2.31	1.15 to 4.66	+ favours treatment	1



**Table 12. Outcome measure, OR, 95% CI for studies with dichotomous physical activity** (Continued)

Study ID	Outcome measure	OR	95% CI	Outcome direction	Study quality score
Lamb 2002	Achieving more than 120 minutes per week moderate physical activity	1.51	0.84 to 2.74	0 no effect	3
Pinto 2002	Meeting CDC/ACSM recommendation for moderate physical activity	1.24	0.64 to 2.38	0 no effect	2
Marshall 2004	Achieving a sufficient level of physical activity CDC = Centre for disease control	1.22	0.89 to 1.69	0 no effect	1

**Table 13. Outcome measure, SMD, 95% CI for studies with continuous cardio-respir fitness**

Study ID	Outcome measure	SMD	95% CI	Outcome direction	Study quality score
Cunningham 1987	VO2	0.44	0.16 to 0.72	+ favours treatment	0
Juneau 1987	VO2	1.49	1.07 to 1.91	+ favours treatment	0
King 1988a	VO2	-0.16	-0.74 to 0.42	0 no effect	2
King 1988b	VO2	0.15	-0.42 to 0.72	0 no effect	2
King 1991	VO2	0.17	-0.09 to 0.43	0 no effect	3
Simons-Morton 2001a	VO2	0.14	-0.07 to 0.35	0 no effect	4
Simons-Morton 2001b	VO2	0.47	0.23 to 0.71	+ favours treatment	4
SSCT 2000	VO2	1.14	0.61 to 1.68	+ favours treatment	1
Dubbert 2002	VO2	-0.06	-0.37 to 0.25	0 no effect	1
Lamb 2002	VO2	0.05	-0.20 to 0.29	0 no effect	3
Petrella 2003	VO2	1.87	1.59 to 2.15	+ favours treatment	3

## ANALYSES

### Comparison 01. Pooled effects

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Studies with continuous data for self-reported physical activity	19	7598	Standardised Mean Difference (Random) 95% CI	0.28 [0.15, 0.41]
02 Studies with dichotomous data for self-reported physical activity	10	3595	Odds Ratio (Random) 95% CI	1.33 [1.03, 1.72]

03 Studies with continuous data for cardio-respiratory fitness	11	2195	Standardised Mean Difference (Random) 95% CI	0.52 [0.14, 0.90]
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### Comparison 02. Sensitivity analysis

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Study quality - continuous data for self-reported physical activity	19	7598	Standardised Mean Difference (Random) 95% CI	0.28 [0.15, 0.41]
02 Study quality - dichotomous data for self-reported physical activity	10	3595	Odds Ratio (Random) 95% CI	1.33 [1.03, 1.72]
03 Study quality - continuous data for cardio-respiratory fitness	11	2195	Standardised Mean Difference (Random) 95% CI	0.52 [0.14, 0.90]

### Comparison 03. Sub group analysis

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Nature of direction - self-reported physical activity			Standardised Mean Difference (Random) 95% CI	Totals not selected
02 Nature of direction - cardio-respiratory fitness			Standardised Mean Difference (Random) 95% CI	Totals not selected
03 Frequency of intervention occasions - self-reported physical activity			Standardised Mean Difference (Random) 95% CI	Totals not selected
04 Frequency of intervention occasions - dichotomous data			Odds Ratio (Random) 95% CI	Totals not selected
05 Frequency of intervention occasions - cardio-respiratory fitness			Standardised Mean Difference (Random) 95% CI	Totals not selected
06 Frequency of follow-up - self-reported physical activity			Standardised Mean Difference (Random) 95% CI	Totals not selected
07 Frequency of follow-up - cardio-respiratory fitness			Standardised Mean Difference (Random) 95% CI	Totals not selected
08 Frequency of follow-up - dichotomous data			Odds Ratio (Random) 95% CI	Totals not selected
09 Degree of supervision - self-reported physical activity			Standardised Mean Difference (Random) 95% CI	Totals not selected
10 Degree of supervision - cardio-respiratory fitness			Standardised Mean Difference (Random) 95% CI	Totals not selected

## INDEX TERMS

### Medical Subject Headings (MeSH)

\*Exercise; Health Promotion [\*methods]; Physical Fitness; Randomized Controlled Trials as Topic

### MeSH check words

Humans

## COVER SHEET

<b>Title</b>	Interventions for promoting physical activity
<b>Authors</b>	Foster C, Hillsdon M, Thorogood M
<b>Contribution of author(s)</b>	<p>Dr Foster was involved in:</p> <ul style="list-style-type: none"><li>Conceiving the review</li><li>Designing the review</li><li>Coordinating the review</li><li>Screening search results</li><li>Screening retrieved papers against inclusion criteria</li><li>Appraising quality of papers</li><li>Abstracting data from papers</li><li>Data management for the review</li><li>Entering data into RevMan</li><li>Analysis of data</li><li>Interpretation of data</li><li>Providing a methodological perspective</li><li>Providing a clinical perspective</li><li>Providing a policy perspective</li><li>Writing the review</li><li>Providing general advice on the review</li><li>Securing funding for the review</li><li>Performing previous work that was the foundation of current study.</li></ul> <p>Dr Hillsdon was involved in:</p> <ul style="list-style-type: none"><li>Conceiving the review</li><li>Designing the review</li><li>Coordinating the review</li><li>Data collection for the review</li><li>Developing search strategy</li><li>Undertaking searches</li><li>Screening search results</li><li>Organising retrieval of papers</li><li>Screening retrieved papers against inclusion criteria</li><li>Appraising quality of papers</li><li>Abstracting data from papers</li><li>Writing to authors of papers for additional information</li><li>Providing additional data about papers</li><li>Obtaining and screening data on unpublished studies</li><li>Data management for the review</li><li>Entering data into RevMan</li><li>Analysis of data</li><li>Interpretation of data</li><li>Providing a methodological perspective</li><li>Providing a clinical perspective</li><li>Providing a policy perspective</li><li>Writing the review</li><li>Providing general advice on the review</li><li>Securing funding for the review</li><li>Performing previous work that was the foundation of current study</li></ul> <p>Professor Thorogood was involved with:</p> <ul style="list-style-type: none"><li>Conceiving the review</li><li>Designing the review</li></ul>

Coordinating the review  
 Screening search results  
 Screening retrieved papers against inclusion criteria  
 Appraising quality of papers  
 Abstracting data from papers  
 Data management for the review  
 Entering data into RevMan  
 Analysis of data  
 Interpretation of data  
 Providing a methodological perspective  
 Providing a clinical perspective  
 Providing a policy perspective  
 Writing the review  
 Providing general advice on the review  
 Securing funding for the review  
 Performing previous work that was the foundation of current study

<b>Issue protocol first published</b>	2001/3
<b>Review first published</b>	2005/1
<b>Date of most recent amendment</b>	14 November 2007
<b>Date of most recent SUBSTANTIVE amendment</b>	26 April 2005
<b>What's New</b>	Update October 2007: The searches were updated from the date of the original searches to December 2004. Twelve new studies meeting the inclusion criteria were identified and added to those in the original review. The conclusions of the original review are unchanged.
<b>Date new studies sought but none found</b>	Information not supplied by author
<b>Date new studies found but not yet included/excluded</b>	Information not supplied by author
<b>Date new studies found and included/excluded</b>	01 December 2004
<b>Date authors' conclusions section amended</b>	Information not supplied by author
<b>Contact address</b>	Mr Charles Foster Research Officer: Physical Activity BHF Health Promotion Reserach Group University of Oxford IHS Old Road Headington, Oxford OX3 7LF UK E-mail: charlie.foster@dphpc.ox.ac.uk Tel: +44 18 6522 7156 Fax: +44 18 6522 6720
<b>DOI</b>	10.1002/14651858.CD003180.pub2
<b>Cochrane Library number</b>	CD003180

**Editorial group**

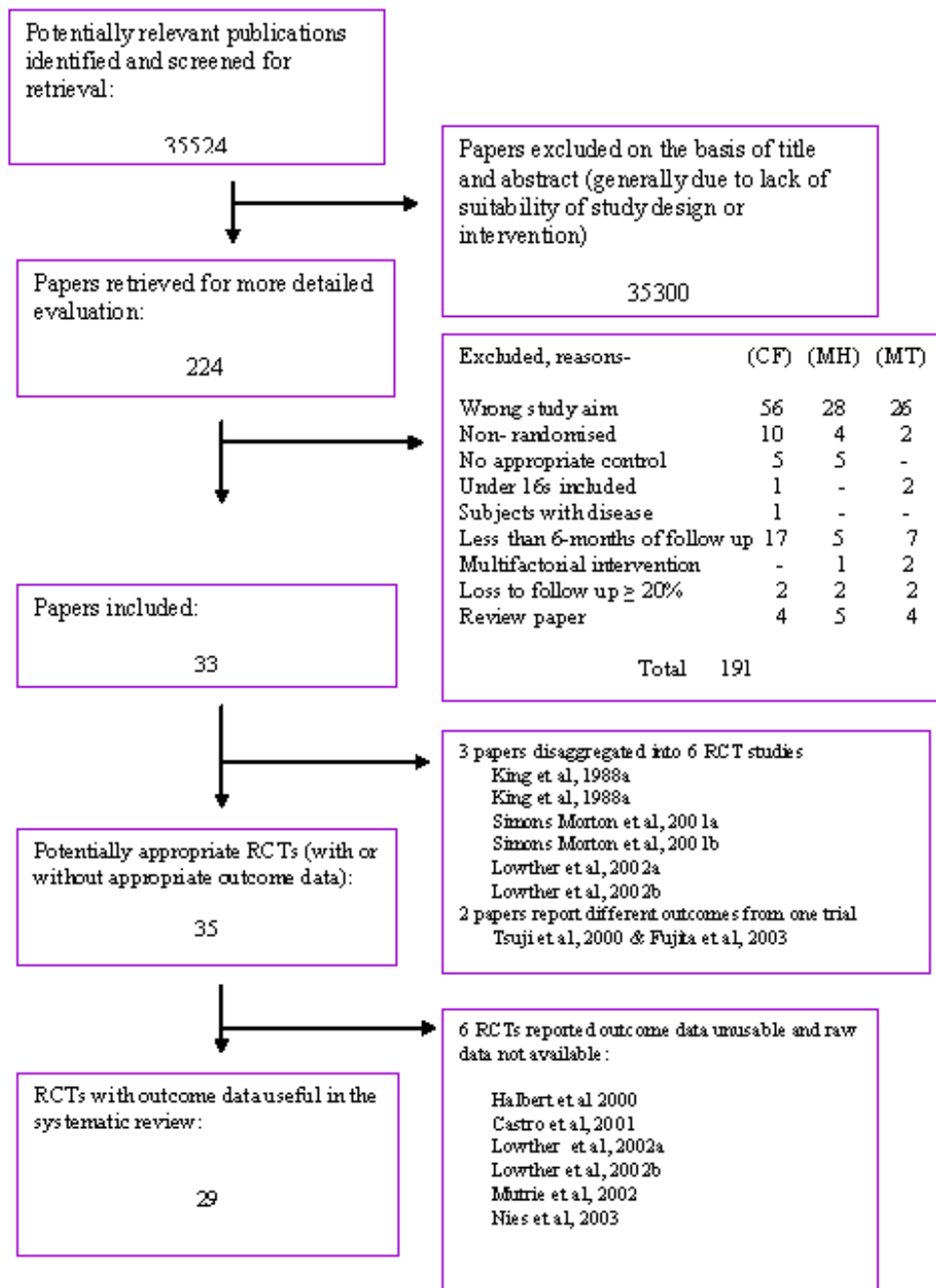
Cochrane Heart Group

**Editorial group code**

HM-VASC

GRAPHS AND OTHER TABLES

Figure 01. QUOROM statement

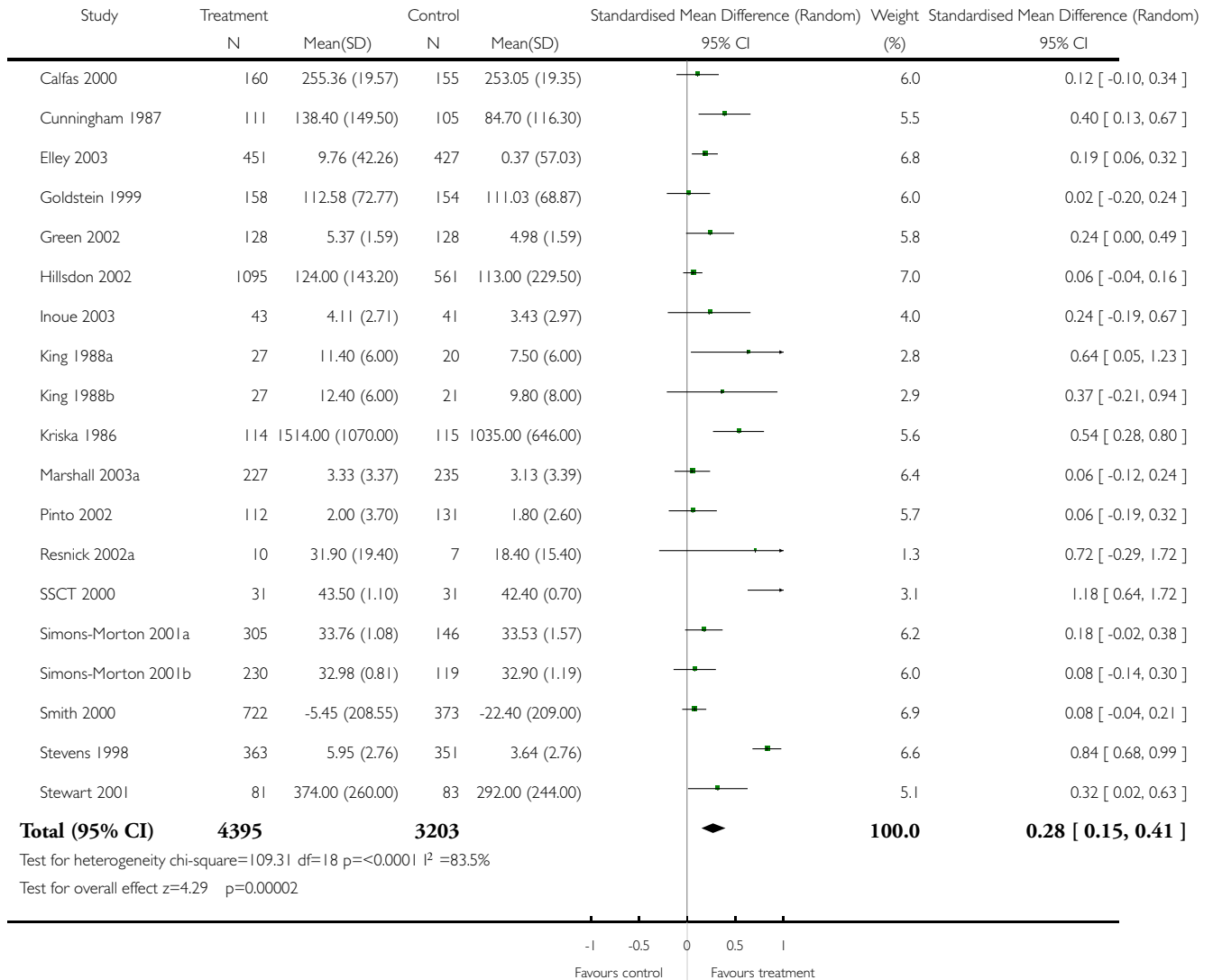


**Analysis 01.01. Comparison 01 Pooled effects, Outcome 01 Studies with continuous data for self-reported physical activity**

Review: Interventions for promoting physical activity

Comparison: 01 Pooled effects

Outcome: 01 Studies with continuous data for self-reported physical activity

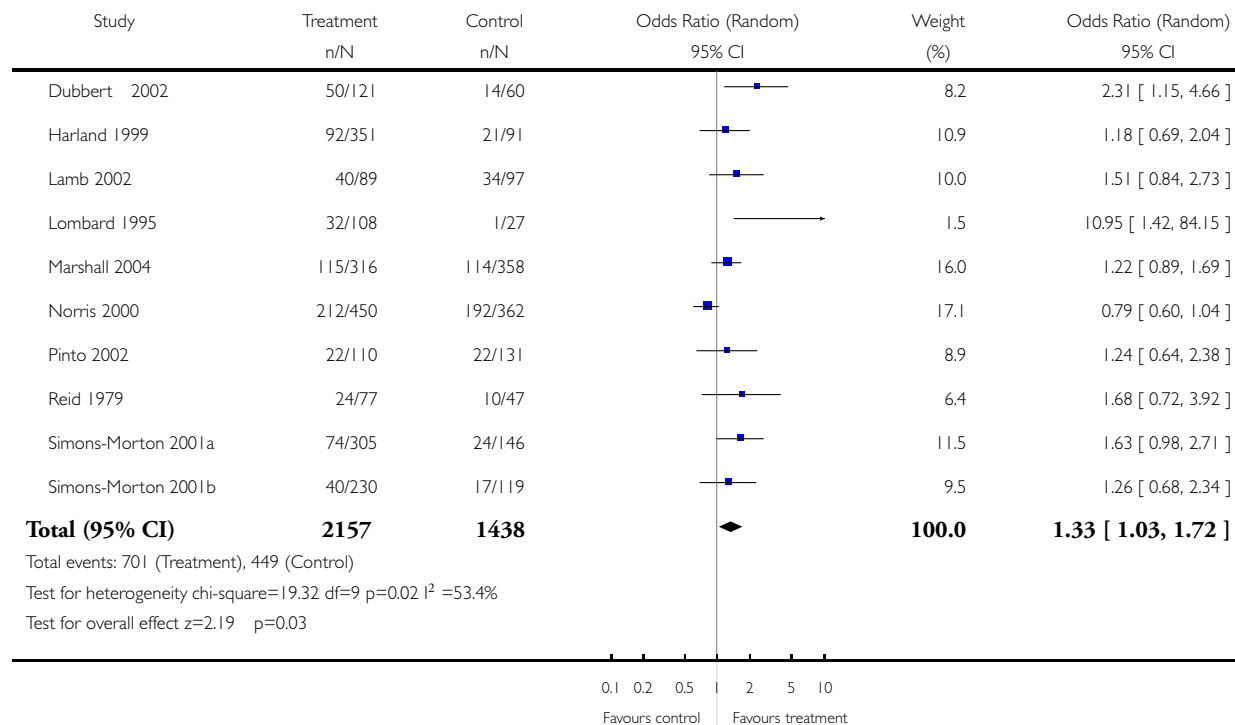


## Analysis 01.02. Comparison 01 Pooled effects, Outcome 02 Studies with dichotomous data for self-reported physical activity

Review: Interventions for promoting physical activity

Comparison: 01 Pooled effects

Outcome: 02 Studies with dichotomous data for self-reported physical activity



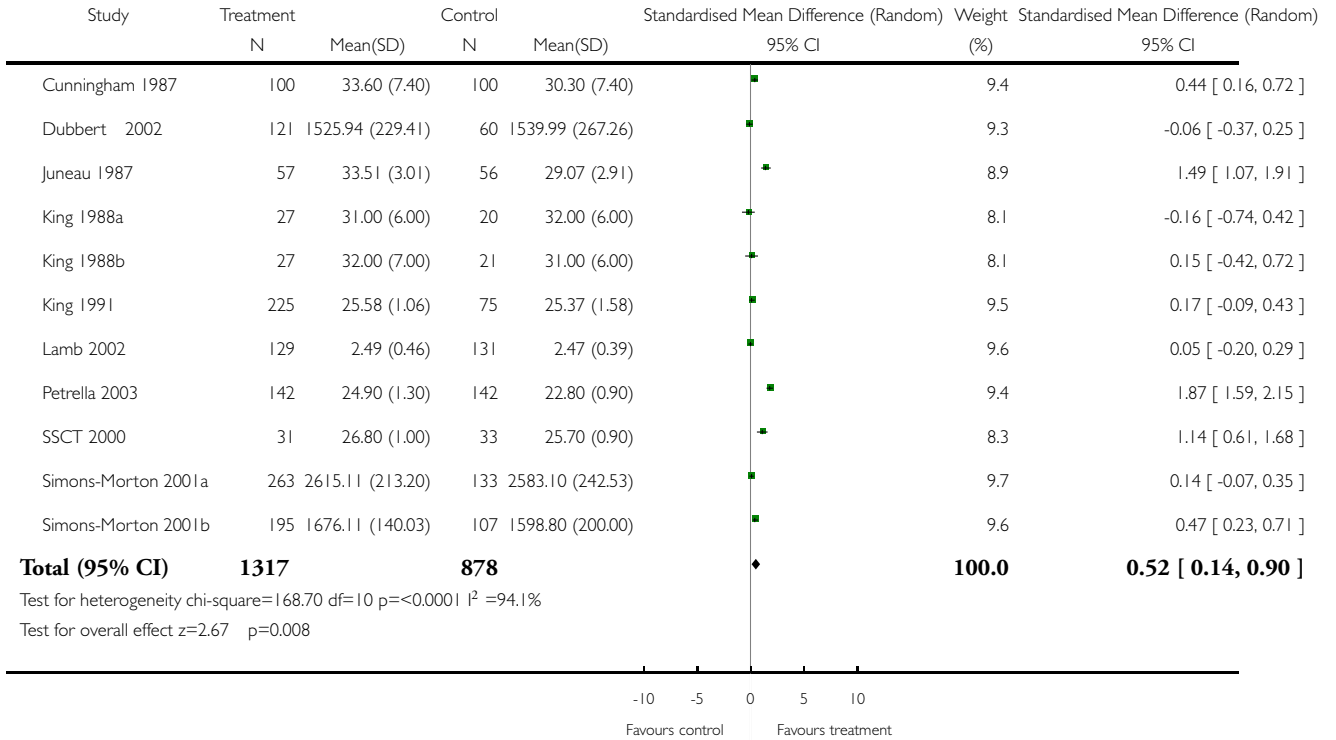


**Analysis 01.03. Comparison 01 Pooled effects, Outcome 03 Studies with continuous data for cardio-respiratory fitness**

Review: Interventions for promoting physical activity

Comparison: 01 Pooled effects

Outcome: 03 Studies with continuous data for cardio-respiratory fitness

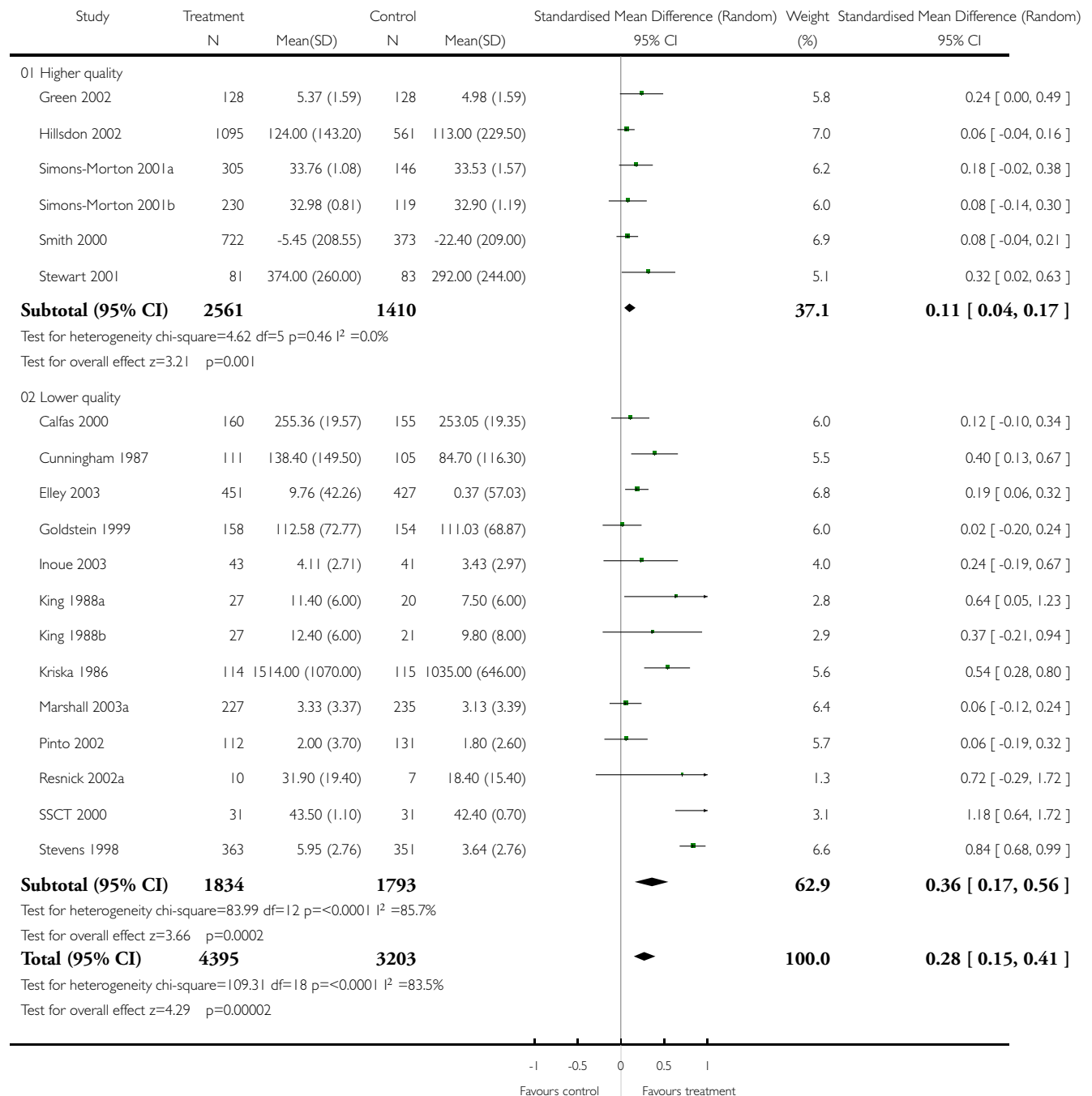


## Analysis 02.01. Comparison 02 Sensitivity analysis, Outcome 01 Study quality - continuous data for self-reported physical activity

Review: Interventions for promoting physical activity

Comparison: 02 Sensitivity analysis

Outcome: 01 Study quality - continuous data for self-reported physical activity

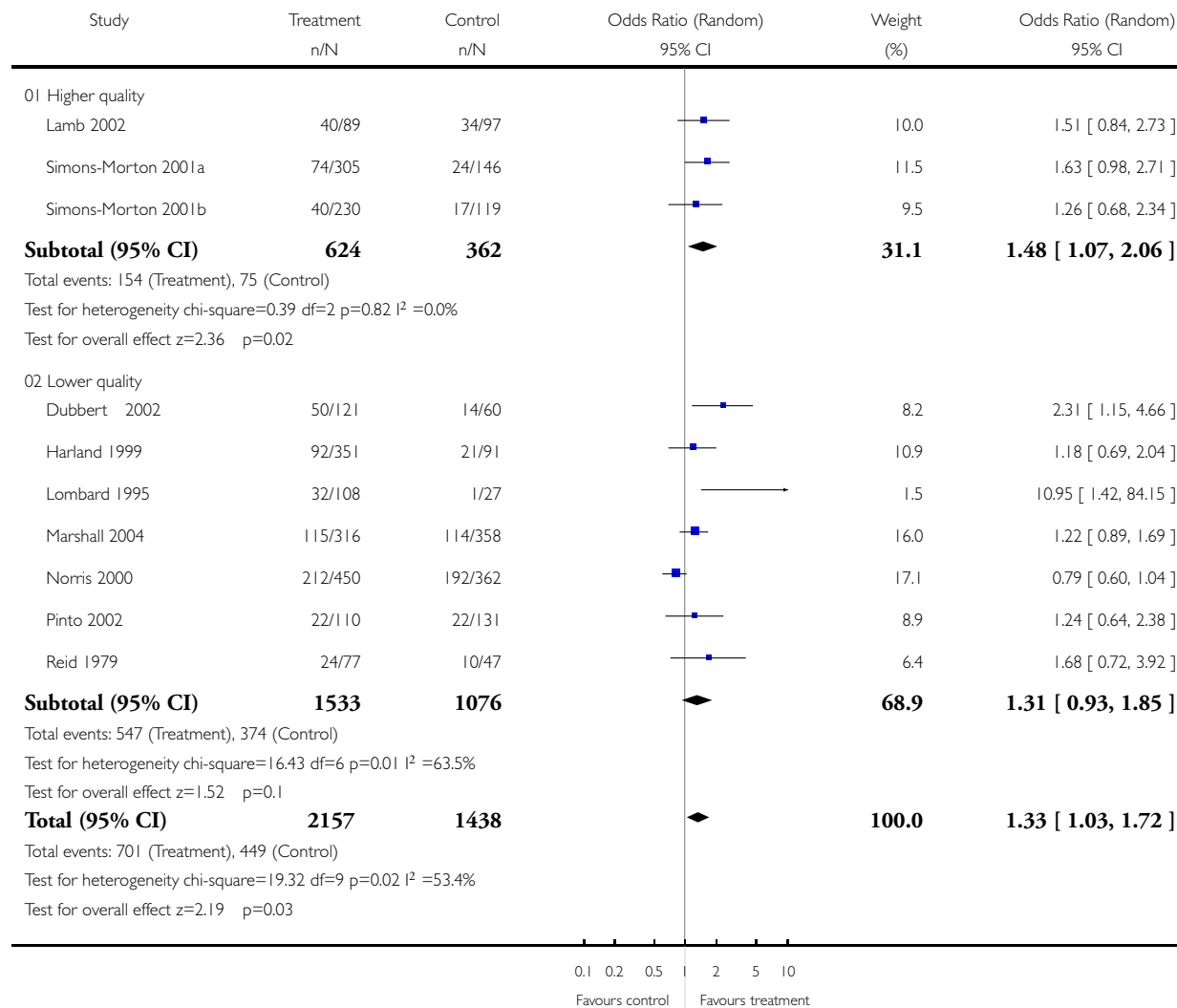


## Analysis 02.02. Comparison 02 Sensitivity analysis, Outcome 02 Study quality - dichotomous data for self-reported physical activity

Review: Interventions for promoting physical activity

Comparison: 02 Sensitivity analysis

Outcome: 02 Study quality - dichotomous data for self-reported physical activity

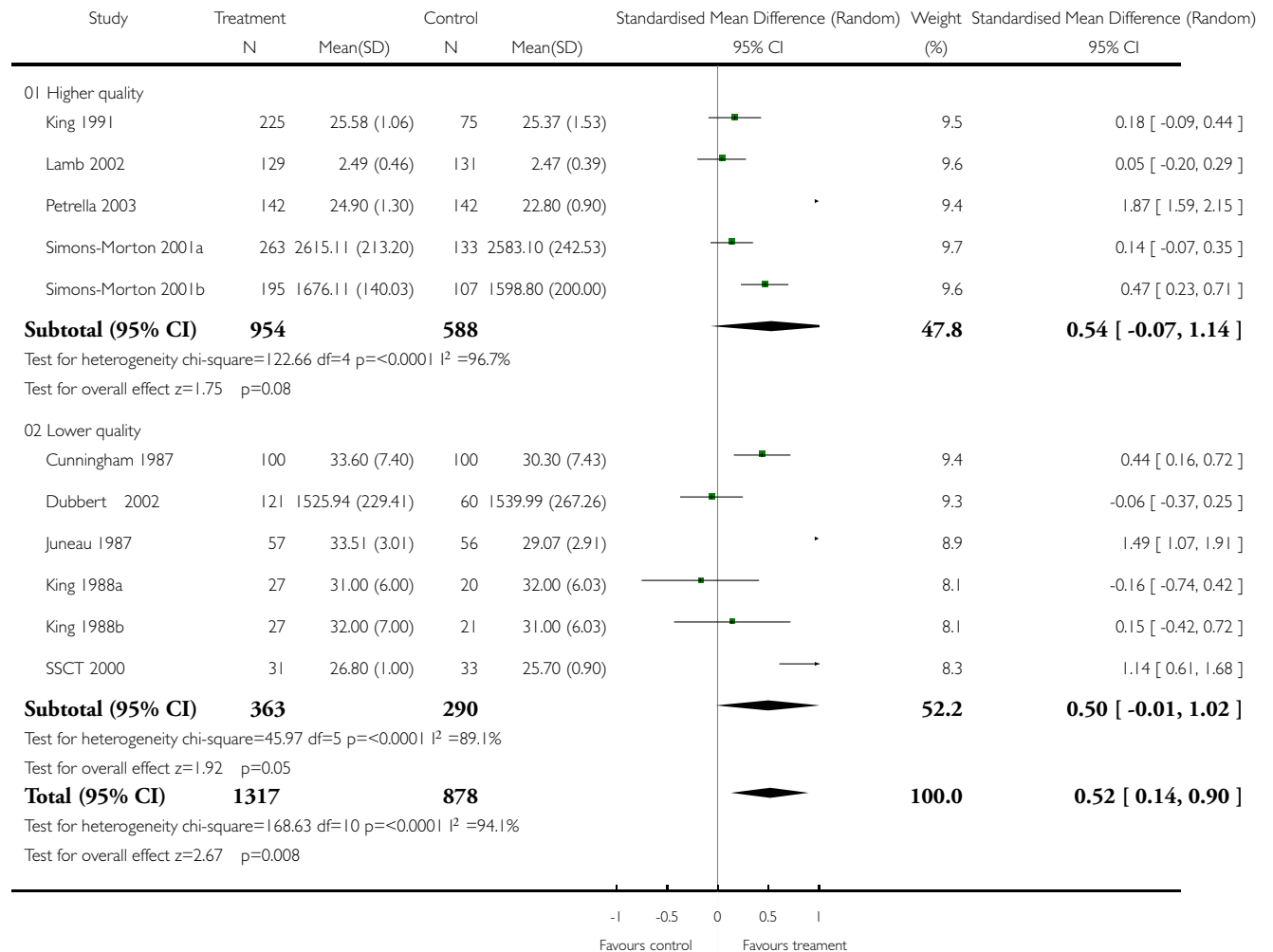


### Analysis 02.03. Comparison 02 Sensitivity analysis, Outcome 03 Study quality - continuous data for cardio-respiratory fitness

Review: Interventions for promoting physical activity

Comparison: 02 Sensitivity analysis

Outcome: 03 Study quality - continuous data for cardio-respiratory fitness

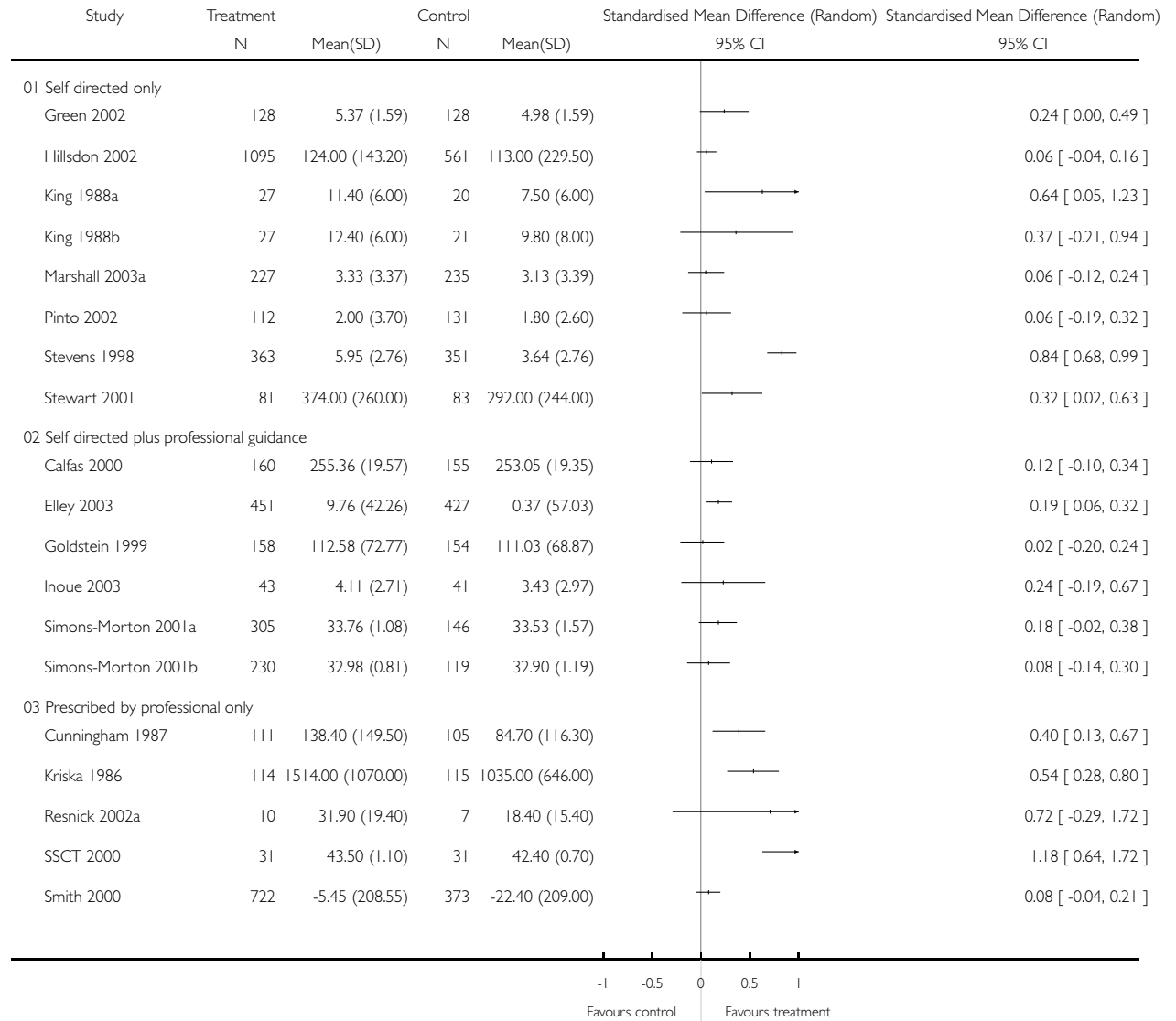


**Analysis 03.01. Comparison 03 Sub group analysis, Outcome 01 Nature of direction - self-reported physical activity**

Review: Interventions for promoting physical activity

Comparison: 03 Sub group analysis

Outcome: 01 Nature of direction - self-reported physical activity

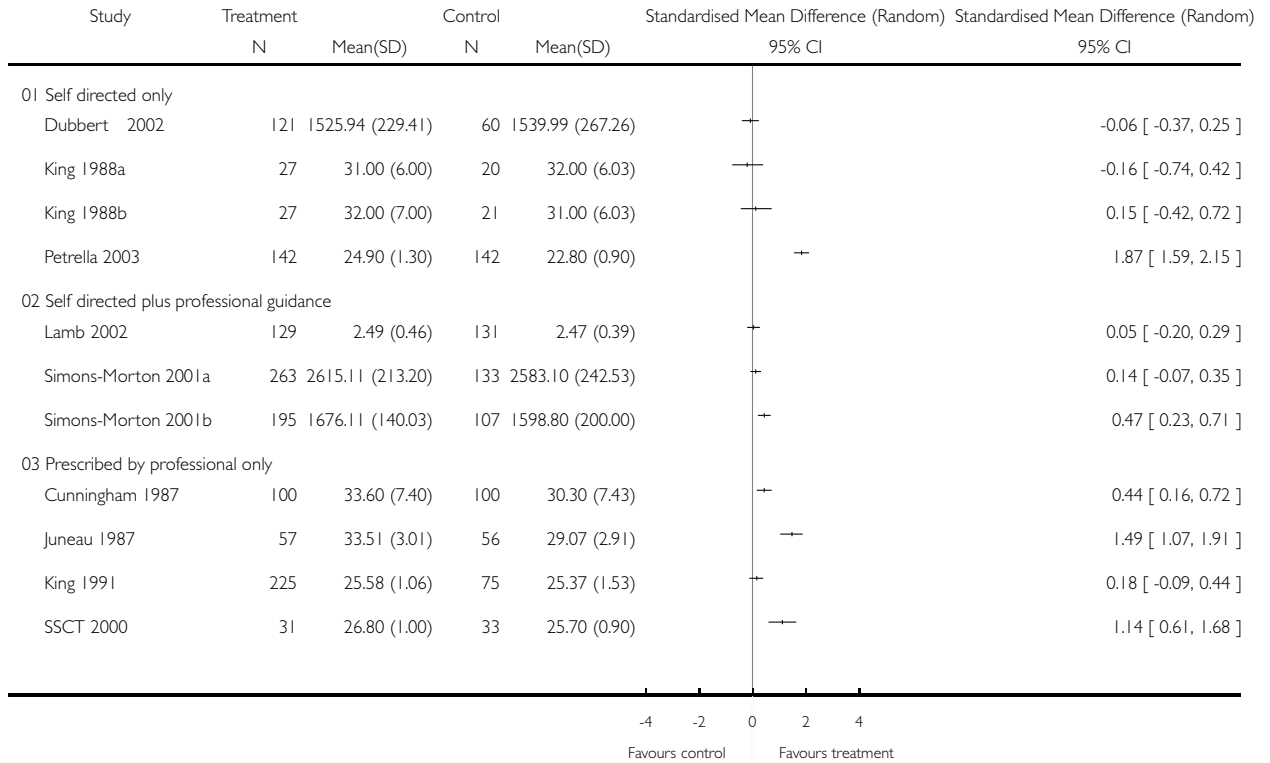


**Analysis 03.02. Comparison 03 Sub group analysis, Outcome 02 Nature of direction - cardio-respiratory fitness**

Review: Interventions for promoting physical activity

Comparison: 03 Sub group analysis

Outcome: 02 Nature of direction - cardio-respiratory fitness

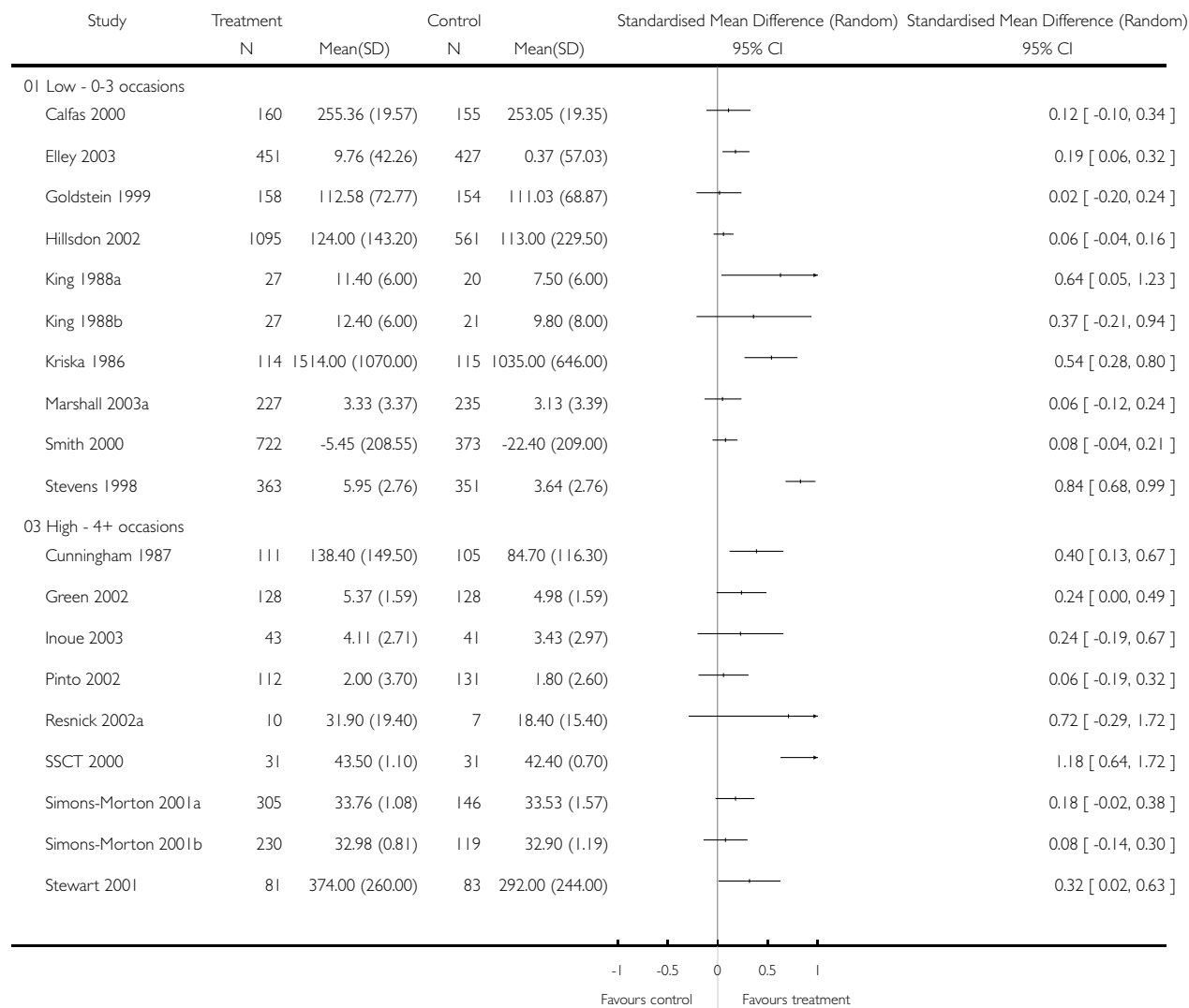


**Analysis 03.03. Comparison 03 Sub group analysis, Outcome 03 Frequency of intervention occasions - self-reported physical activity**

Review: Interventions for promoting physical activity

Comparison: 03 Sub group analysis

Outcome: 03 Frequency of intervention occasions - self-reported physical activity

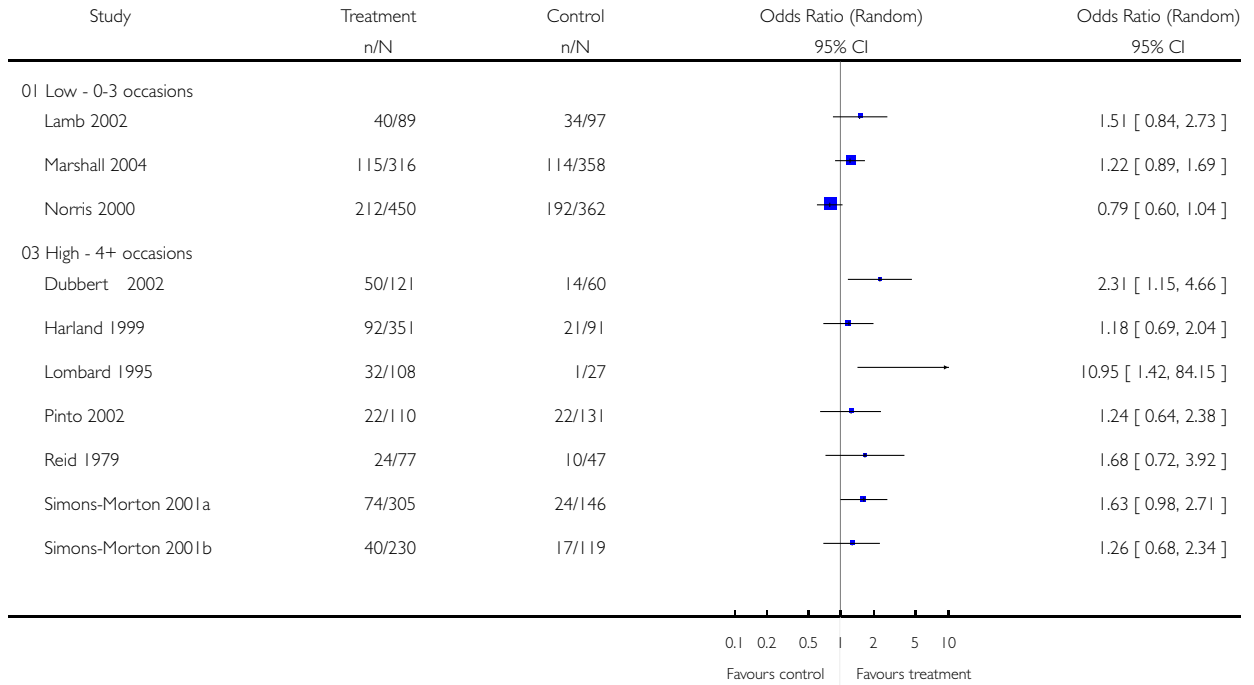


**Analysis 03.04. Comparison 03 Sub group analysis, Outcome 04 Frequency of intervention occasions - dichotomous data**

Review: Interventions for promoting physical activity

Comparison: 03 Sub group analysis

Outcome: 04 Frequency of intervention occasions - dichotomous data



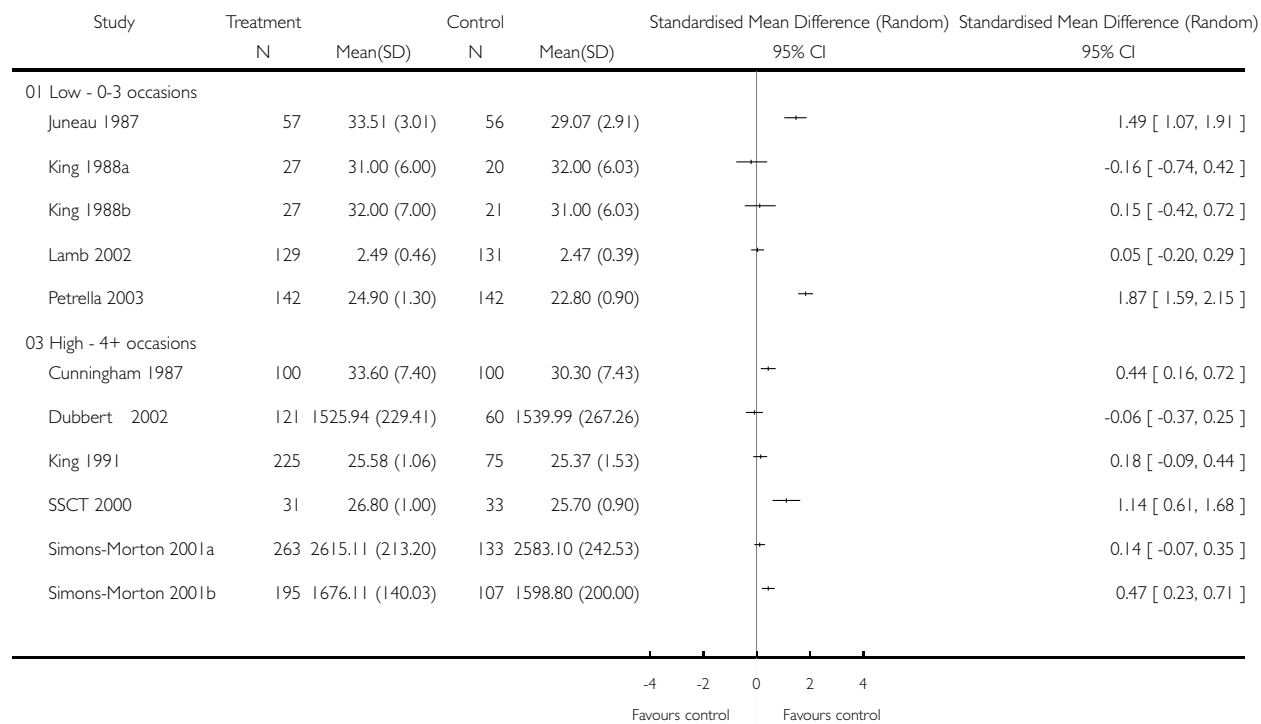


**Analysis 03.05. Comparison 03 Sub group analysis, Outcome 05 Frequency of intervention occasions - cardio-respiratory fitness**

Review: Interventions for promoting physical activity

Comparison: 03 Sub group analysis

Outcome: 05 Frequency of intervention occasions - cardio-respiratory fitness

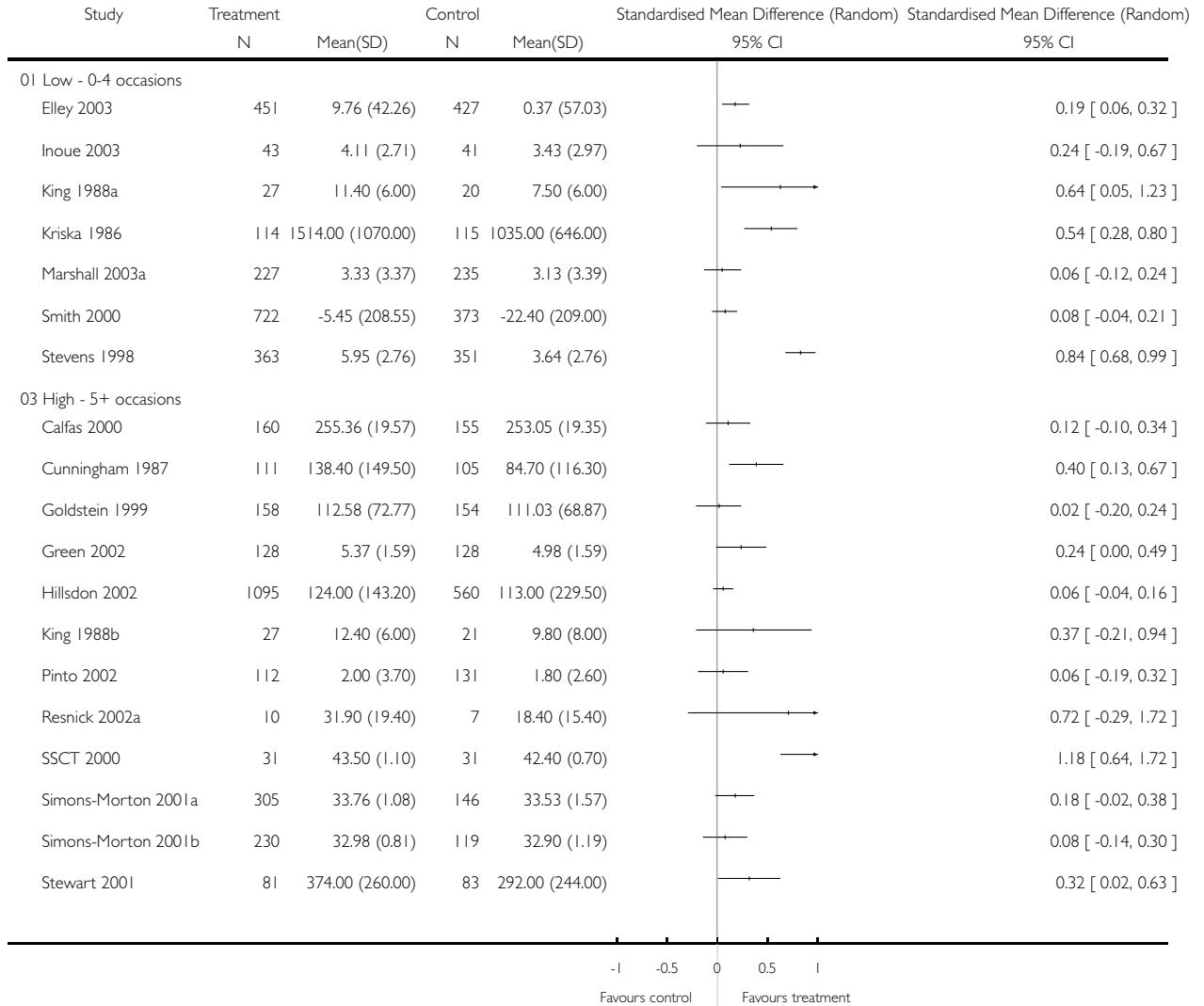


**Analysis 03.06. Comparison 03 Sub group analysis, Outcome 06 Frequency of follow-up - self-reported physical activity**

Review: Interventions for promoting physical activity

Comparison: 03 Sub group analysis

Outcome: 06 Frequency of follow-up - self-reported physical activity

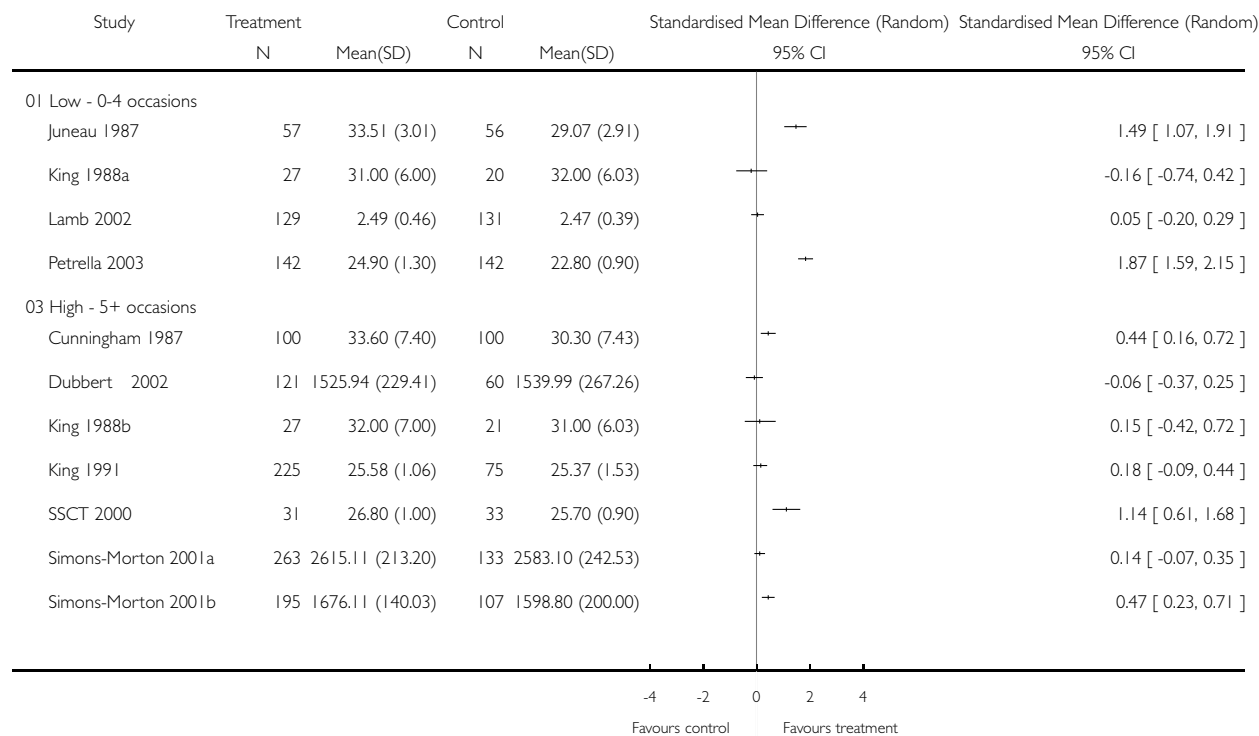


**Analysis 03.07. Comparison 03 Sub group analysis, Outcome 07 Frequency of follow-up - cardio-respiratory fitness**

Review: Interventions for promoting physical activity

Comparison: 03 Sub group analysis

Outcome: 07 Frequency of follow-up - cardio-respiratory fitness

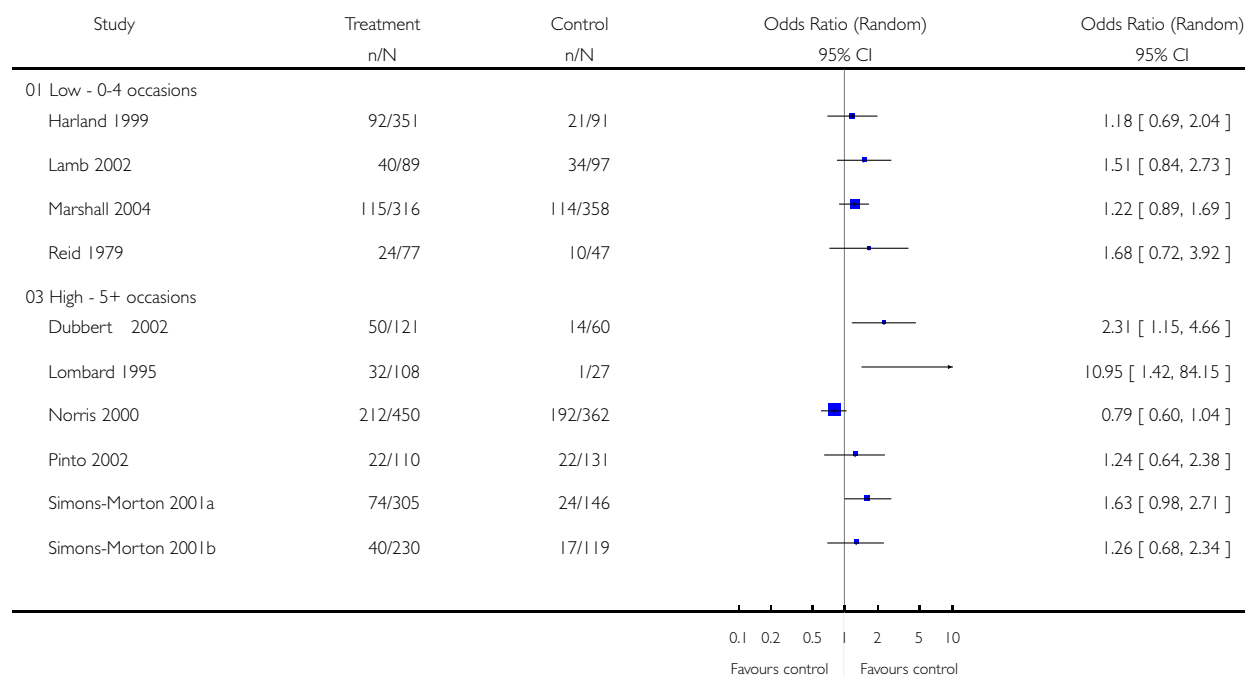


### Analysis 03.08. Comparison 03 Sub group analysis, Outcome 08 Frequency of follow-up - dichotomous data

Review: Interventions for promoting physical activity

Comparison: 03 Sub group analysis

Outcome: 08 Frequency of follow-up - dichotomous data

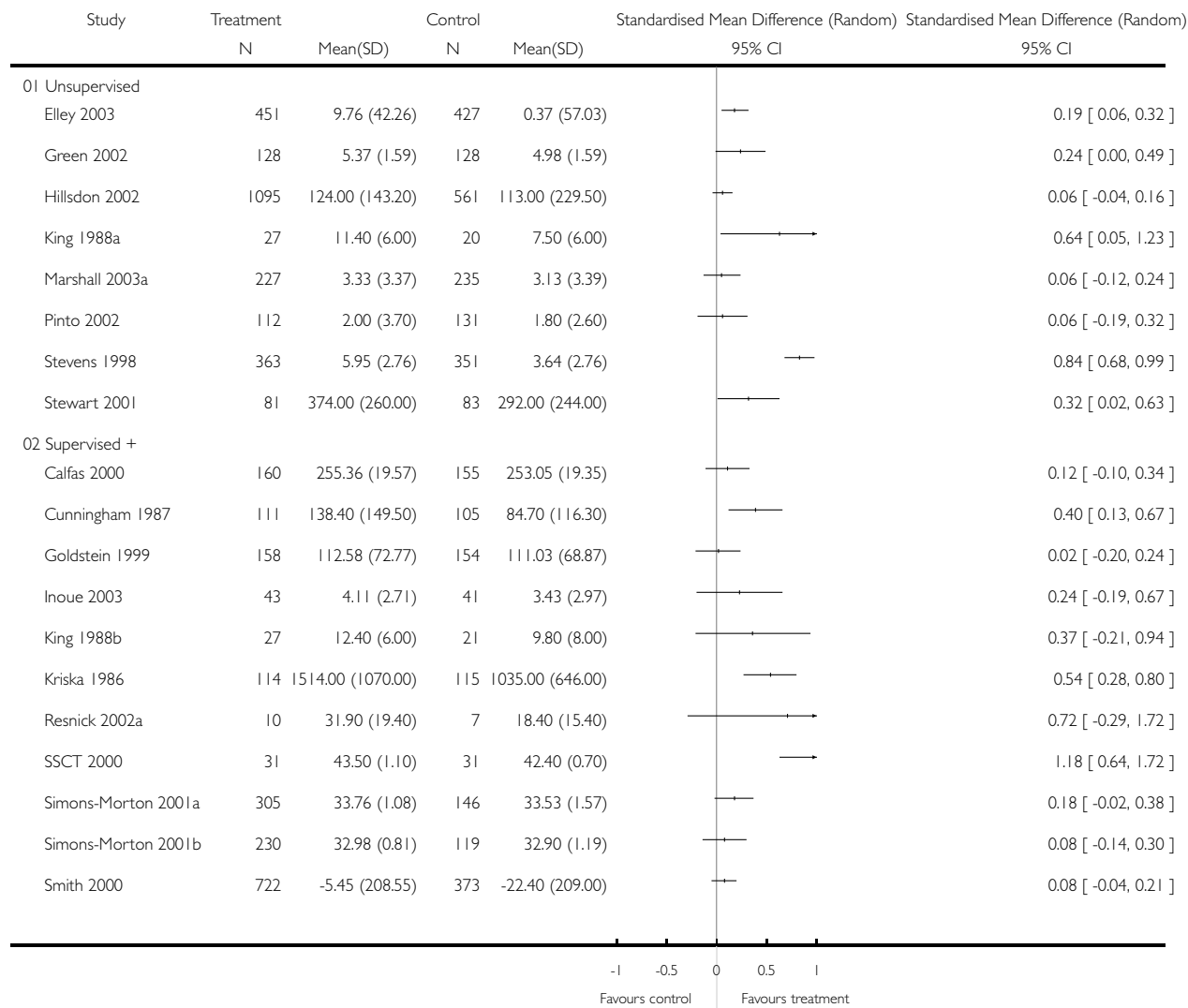


**Analysis 03.09. Comparison 03 Sub group analysis, Outcome 09 Degree of supervision - self-reported physical activity**

Review: Interventions for promoting physical activity

Comparison: 03 Sub group analysis

Outcome: 09 Degree of supervision - self-reported physical activity



**Analysis 03.10. Comparison 03 Sub group analysis, Outcome 10 Degree of supervision - cardio-respiratory fitness**

Review: Interventions for promoting physical activity

Comparison: 03 Sub group analysis

Outcome: 10 Degree of supervision - cardio-respiratory fitness

