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Review

The effect of walking on risk factors for cardiovascular disease: An updated systematic review and meta-analysis of randomised control trials

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ABSTRACT

Objective. To conduct a systematic review and meta-analysis of randomised control trials that examined the effect of walking on risk factors for cardiovascular disease.

Methods. Four electronic databases and reference lists were searched (Jan 1971–June 2012). Two authors identified randomised control trials of interventions ≥4 weeks in duration that included at least one group with walking as the only treatment and a no-exercise comparator group. Participants were inactive at baseline. Pooled results were reported as weighted mean treatment effects and 95% confidence intervals using a random effects model.

Results. 32 articles reported the effects of walking interventions on cardiovascular disease risk factors. Walking increased aerobic capacity (3.04 mL/kg/min, 95% CI 2.48 to 3.60) and reduced systolic (−3.58 mm Hg, 95% CI −5.19 to −1.97) and diastolic (−1.54 mm Hg, 95% CI −2.83 to −0.26) blood pressure, waist circumference (−1.51 cm, 95% CI −2.34 to −0.68), weight (−1.37 kg, 95% CI −1.75 to −1.00), percentage body fat (−1.22%, 95% CI −1.70 to −0.73) and body mass index (−0.53 kg/m^2, 95% CI −0.72 to −0.35) but failed to alter blood lipids.

Conclusions. Walking interventions improve many risk factors for cardiovascular disease.
This underscores the central role of walking in physical activity for health promotion.

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Contents

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Introduction

Physical inactivity is the fourth leading cause of global mortality (World Health Organisation, 2009) responsible for 6–10% of the major non-communicable diseases of coronary heart disease, type 2 diabetes, and breast and colon cancers (Lee et al., 2012). Whilst sport, running and vigorous gym based exercise are often seen as counter measures, walking offers a natural, widely accepted, low cost, low injury risk (Hootman et al., 2001) and environmentally friendly approach to physical activity which can be incorporated into activities of daily living and/or undertaken recreationally. Walking is also likely to be more accessible and suitable to a considerable portion of the higher-risk population who may be obese, sedentary, at high risk of cardiovascular disease and for whom strenuous forms of exercise may be unsuitable. Walking at a self-selected pace is moderate intensity for most adults (Ainsworth et al., 2000; Murtagh et al., 2002). Indeed it is estimated that walking at 3 mph would be vigorous intensity for approximately 20% of the population (Kelly et al., 2011). Systematic reviews have indicated that inactive people can be encouraged to walk more by tailored interventions (Ogilvie et al., 2007) and the National Institute for Health and Clinical Excellence has recently produced guidelines to promote walking for travel and recreational purposes (National Institute for Health and Clinical Excellence, 2012).

Whilst it is unsurprising that walking has become a cornerstone of physical activity promotion strategies, a challenge faced by healthcare professionals and patients is knowing the effects of walking on health, especially as many published walking interventions employ relatively small samples and findings are often inconsistent between studies. Conversely, the use of meta-analysis increases the precision and accuracy of the estimates of the effects of walking, quantifies the inconsistency between studies and enhances generalizability to a larger population. We previously reported a meta-analysis of walking interventions published up to 2004, that included aerobic fitness, blood pressure, and body composition (Murphy et al., 2007). Since then there has been an increase in the number of published interventions examining the effects of walking on risk factors for cardiovascular disease. In addition, an increased range of outcome measures have been included in these studies, such as blood lipids and several measures of adiposity. Whilst there is now greater evidence of the concomitant dangers of these factors to public health (Physical Activity Guidelines Advisory Committee, 2008) a recent comprehensive synthesis of evidence from randomised control trials on the effect of walking on health is lacking. This updated meta-analysis therefore expands our understanding of the treatment–effect relationship between walking and health.

The objective of this study was to assess the effect of walking interventions on risk factors for cardiovascular disease in previously inactive adults. This updates our previous review and provides healthcare professionals with a synthesis of the effects accruing when inactive adults undertake a walking programme.

Methods

We followed the PRISMA statement (preferred reporting items for systemic reviews and meta-analyses) in conducting and reporting the meta-analysis (Moher et al., 2009). A review protocol has not been published separately.

Data sources and searches

The following electronic databases were searched: PubMed, Web of Science, ScienceDirect and the Cochrane Central Register of Controlled Trials. In addition, we hand-searched reference lists from review and original articles. Authors were contacted, if necessary, to confirm eligibility criteria. The following search terms were used: walking, exercise, health, and cardiovascular risk. Date limits of Sept 2004–Sept 2012 were applied.

Study selection

The study selection process is summarised in Fig. 1. Initial eligibility assessment was performed by one author by reviewing the title and abstracts. The full text versions of 48 articles were then reviewed independently by two authors. Disagreements between reviewers were resolved by consensus by reassessing each of the eligibility criteria for the study.

The following eligibility criteria were used: randomised, controlled trials studying the effect of walking on one or more cardiovascular risk factors; trials with at least one group who completed walking as the only intervention; training for a minimum of four weeks; no-exercise control group; participants aged 18 years or older who were reported as being apparently sedentary but otherwise healthy at baseline; selected cardiovascular disease risk factors assessed pre- and post-intervention (or change from pre- to post-intervention reported); and English language articles published in peer-reviewed journals between January 1971 and June 2012.

Data extraction and quality assessment

We used a modified version of the data extraction sheet developed for the previous meta-analysis. Two individuals extracted the data from included studies and a second author checked the extracted data. Disagreements were resolved by consensus. Two of the selected studies were suspected to be reports from the same participants — this was confirmed by contacting the authors. The authors of eight articles were contacted for further information (Aldred and Rohalu, 2011; Baker et al., 2008; Osei-Tutu and Campagna, 2005; Stensel et al., 1993, 1994; Tully et al., 2005, 2007; Woolf-May et al., 2011). All responded and provided numerical data (Aldred and Rohalu, 2011; Osei-Tutu and Campagna, 2005; Tully et al., 2005, 2007) or clarifications regarding the study protocol (Aldred and Rohalu, 2011; Baker et al., 2008; Stensel et al., 1993, 1994) that were not detailed in the published paper. Previously unpublished numerical data was obtained from the original researchers of three articles (Osei-Tutu and Campagna, 2005; Tully et al., 2005, 2007).

The previous meta-analysis extracted data on:

1) Participant characteristics (age, sex, number of men and women)
2) Intervention characteristics (duration, frequency, intensity of walking, duration of the intervention)
3) Outcome measures (aerobic fitness, body weight, body fat percentage, body mass index, systolic blood pressure and diastolic blood pressure).
4) Study design.

In addition to the above items, the following outcome measures were extracted from all included studies: total cholesterol, HDL cholesterol, LDL cholesterol, waist circumference, and waist-to-hip ratio.

The Cochrane Collaboration 'risk of bias' assessment tool was employed. Two authors, with adequate reliability, evaluated studies for sequence generation, allocation concealment, blinding, incomplete outcome data, selective outcome reporting and other potential threats to validity (Higgins et al., 2011a).

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