The effect of walking on fitness, fatness and resting blood pressure: a meta-analysis of randomised, controlled trials

Murphy M H, Nevill A M, Murtagh E M, Holder R L

CRD summary
This review assessed whether walking interventions alter cardiovascular risk factors. The authors concluded that healthy but sedentary individuals who take up a programme of brisk walking improve their cardiovascular fitness and reduce their body weight, body mass index, body fat and diastolic blood-pressure. These conclusions are likely to be reliable but, owing to limitations in the search, should be interpreted with some degree of caution.

Authors' objectives
To determine whether walking interventions alter cardiovascular risk factors.

Searching
MEDLINE and Web of Science were searched for articles published in the English language between 1971 and September 2004; the search terms were reported. The authors also handsearched and checked the reference lists of original and review articles.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were eligible for inclusion.

Specific interventions included in the review
Studies that evaluated walking as the only intervention, lasting at least 4 weeks, were eligible for inclusion. The included studies compared a control group with between one and four intervention groups assessing different volumes, intensities or patterns of walking undertaken predominantly for 3 to 5 days per week. The mean length of the walking programme was 34.9 weeks and the mean total duration of walking was 188.8 minutes per week.

Participants included in the review
Participants aged at least 18 years who were apparently sedentary but otherwise healthy were eligible for inclusion. The estimated average age of the participants was 51.6 years; the average age across studies ranged from 30 to 83.1 years. Most of the included studies recruited exclusively women; a small number recruited exclusively men and the remainder used a mixed sex sample.

Outcomes assessed in the review
Studies that assessed selected cardiovascular risk factors pre- and post-intervention were eligible for inclusion. The outcomes assessed were aerobic fitness, body mass index (BMI), body fat, and resting systolic and diastolic blood-pressure.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
Two authors independently assessed methodological quality according to a scheme in the Cochrane Collaboration Handbook. The scheme uses a 3-point rating scale and is based on the quality of allocation: A denotes maximum effort to minimise bias, B denotes some effort to minimise bias, and C denotes little or no effort to minimise bias. Any disagreements were resolved by consensus.
Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. Treatment effects (TEs) for each study were calculated by subtracting the difference between the pre- and post-exercise values for the control group from the difference between the pre- and post-exercise values for the intervention group.

Methods of synthesis
How were the studies combined?
Overall weighted baseline means for the intervention and control groups, weighted by sample size, were calculated. The overall unadjusted TE was calculated based on the unadjusted mean TE across all studies. The control and intervention variances for the difference between pre- and post-exercise values were used inversely as the weights for the individual TEs in order to calculate the overall weighted TE. The standard deviation (SD) of the weighted mean TE was calculated using a random-effects model to estimate between-study variances. Publication bias was assessed using funnel plots.

How were differences between studies investigated?
Heterogeneity was assessed using the Q statistic. Subgroup analysis by study quality and exercise volume was performed.

Results of the review
Twenty-four RCTs (n=1,128) were included.

No study was categorised as quality A; 9 studies were categorised as quality B and 15 studies as quality C.

Compared with participants in the control groups, participants in the intervention groups reported:

- a significant increase in cardiovascular fitness (weighted mean TE 2.73 mL/kg, SD=0.35, p<0.001; 13 studies with 24 intervention groups),
- a reduction in body weight (weighted mean TE -0.95 kg, SD=0.25, p<0.001; 18 studies with 27 intervention groups),
- a reduction in body fat (weighted mean TE -0.63%, SD=0.35, p=0.035; 12 studies with 18 intervention groups),
- a reduction in BMI (weighted mean TE -0.28 kg/m2, SD=0.13, p=0.015; 16 studies with 16 intervention groups), and
- a reduction in diastolic blood-pressure (weighted mean TE -1.54 mmHg, SD=0.79, p=0.026; 6 studies with 12 intervention groups).

There was no evidence for a change in systolic blood-pressure between the control and intervention groups (weighted mean TE -1.54 mmHg, SD=2.23, p=0.316).

Significant heterogeneity (p<0.01) was identified for all outcome measures.

There was no significant difference between outcomes when comparing studies based on study quality or volume of walking (less than 150 minutes compared with at least 150 minutes).

Funnel plots showed no evidence of publication bias for any of the six outcome variables.

Authors' conclusions
Healthy but sedentary individuals who take up a programme of brisk walking improve their cardiovascular fitness and reduce their body weight, BMI, body fat and diastolic blood-pressure.

CRD commentary
The review question was clear in terms of the study design, participants, interventions and outcomes of interest. The search strategy was limited, and the authors did not state how papers were selected for inclusion or how the data were extracted; it is therefore unclear whether there was the potential for bias in the review process. In addition only papers written in English were selected and there was no attempt to retrieve unpublished papers, which could lead to language and publication bias. The validity of the studies was assessed appropriately by two reviewers using defined criteria, and the results were summarised and included in the analysis.

There was adequate information on the included studies. Statistical heterogeneity was assessed and the data were combined using random-effects models. Significant heterogeneity was present in all pooled analyses, so the pooled values should be interpreted with caution. The authors' conclusions are supported by the data presented and are likely to be reliable, although they should be interpreted with some degree of caution because of limitations in the search.

**Implications of the review for practice and research**

Practice: The authors stated that their results reinforce the centrality of walking in health promotion and for enhancing health among the sedentary majority.

Research: The authors did not state any implications for further research.

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**Other publications of related interest**


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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on
the reliability of the review and the conclusions drawn.