A meta-analysis of pedometer-based walking interventions and weight loss
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CRD summary
The authors concluded that pedometer-based walking programmes without a dietary intervention resulted in a modest weight loss. Longer programmes resulted in greater weight loss than shorter programmes. The pooling of heterogeneous data, together with other methodological flaws in the review, casts some doubt upon the reliability of the author’s conclusions.

Authors' objectives
To evaluate the effects of pedometer-based walking programmes on weight loss.

Searching
Databases searched: CINAHL, MEDLINE, PsycINFO, SPORTDiscus, Web of Science (to September 2006) and EMBASE (to July 2005). Search terms were reported. The reviewers also consulted experts in the field. The search was restricted to articles in English or Japanese published since January 1995.

Study selection
Controlled trials and prospective pre/post intervention cohort studies were eligible for the review provided they evaluated the use of pedometers as motivational tools to increase walking in at least one study cohort. Studies were required to include at least five adult participants who were sedentary and either overweight or obese (body mass index over 25 kg/m\(^2\)). Interventions were required to be at least four weeks’ duration, to include step-count goal setting and continuous self-monitoring, and to have no concurrent dietary component. The primary outcome was within-participant weight change from pre- to post-intervention.

In the included studies the mean participant age ranged from 43 to 60.5 years (where stated) and mean baseline BMI ranged from over 25 kg/m\(^2\) to 35 kg/m\(^2\). Participants in most studies were described as sedentary; some also had type 2 diabetes, a history of breast cancer, or hypertension. The majority (73 per cent) were female. Step-counting goals (for example, 10,000 steps a day) were self-chosen or assigned; participants monitored their activity with written or electronic logs. The intervention in some studies also involved coaching, counselling and/or educational sessions. The median duration of the intervention was 16 weeks (range four weeks to one year).

A single author screened abstracts for selection. Potentially eligible studies were reviewed for inclusion by three authors.

Assessment of study quality
Validity assessment was conducted using a modified version of the Downs and Black scoring system to rate the following factors: sample size and selection, quality of outcome assessment, dropout rate, quality of statistical analysis, adjustment for confounders and quality of reporting.

Two reviewers conducted the validity assessment, with disagreements resolved by consensus.

Data extraction
Only data relating to the (pedometer) intervention arms of randomised controlled trials (RCTs) were extracted and only study completers were included in analysis. Mean weight changes (in kg) and their standard deviations (SDs) were calculated from pre- and post-intervention data. The SDs were calculated (if necessary) from p values or t statistics, or were imputed from other available data. Within-participant correlation of 0.98 was assumed for studies of up to 12 weeks and 0.95 for longer studies (values estimated from studies of similar duration).

The authors did not state how the data were extracted for the review or how many reviewers performed the data extraction.
Methods of synthesis
A random-effects model was used to calculate a pooled estimate of mean weight change from baseline and 95% confidence interval (CI). Individual studies were weighted by the inverse of their variance. The significance of the findings was also tested with the Fisher log-likelihood ratio statistic. The Q statistic was used to check for statistical heterogeneity and publication bias was assessed using a funnel plot, Begg and Mazumdar’s rank correlation test and the Egger test. Meta-regression was used to check whether intervention duration or study quality influenced the results.

Results of the review
Nine cohorts were included in the review, comprising 307 participants from the pedometer intervention arm of four RCTs (n=92) and five pre/post cohorts (n=215). All cohorts were small, with dropout rates varying from 0 per cent to 40 per cent (where reported).

Weight change: there was statistically significant evidence of heterogeneity between the studies (p=0.01), so a random-effects model was used. The pooled estimate for mean weight change from baseline was -1.27 kg (95% CI -1.85, -0.70 kg, p<0.001, nine cohorts). The Fisher statistic for this outcome was also significant (p<0.001). There was no evidence of significant publication bias.

Meta-regression showed a significant association between magnitude of weight change and duration of intervention (p=0.003). Study quality was not significantly associated with the outcome.

Authors’ conclusions
Pedometer-based walking programmes without a dietary intervention result in a modest weight loss. Longer programmes result in greater weight loss than shorter programmes.

CRD commentary
The objectives and inclusion criteria were clear. Relevant sources were searched for studies, although the restriction by language and publication status means that the review was prone to publication and language biases. However, publication bias was assessed formally and none was detected. More than one reviewer was involved in validity assessment, but it was not clear whether this also applied to data extraction. The initial screening of studies for selection was conducted by a single reviewer, which increases the risk of bias and error. Appropriate criteria were used to assess study validity, but the results were not summarised in the publication. Only participants who completed the intervention were included in analysis in the review: as dropout rates ranged from 20 per cent to 40 per cent in three of the seven studies that reported the information, this appears a likely source of bias. Most of the studies had small sample sizes and there was marked clinical and methodological diversity among them. It is, therefore, unclear whether it was appropriate to pool the studies statistically and the legitimacy of the pooled results is questionable. Statistically significant heterogeneity was detected. It was addressed only by using a random effects model; possible explanations for the variation between studies (which remained evident in the forest plot) were not explored in the text, though the potential for confounding associated with the pre/post design of the included cohorts was acknowledged. The pooling of such heterogeneous data, together with other methodological flaws in the review, casts some doubt upon the reliability of the author’s conclusions.

Implications of the review for practice and research
Practice: the authors did not state any implications for practice.

Research: the authors stated that studies are needed to determine the long-term effects on weight and the sustainability of pedometer-based walking programmes; they recommended a large RCT comparing a walking programme with no-walking programme controls.

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