Long-term effectiveness of diet-plus-exercise interventions vs. diet-only interventions for weight loss: a meta-analysis

Wu T, Gao X, Chen M, van Dam RM

CRD summary
This review concluded that combined exercise and diet interventions were better than diet-only interventions for long-term weight loss in adults. The results appear to support the authors’ conclusions, but reliability of the data is unclear.

Authors’ objectives
The review abstract stated the aim was to compare the effects of diet plus exercise interventions versus diet-only interventions on short- and long-term weight loss. However, the aim stated in the main text and conclusions related only to long-term effects on weight loss.

Searching
MEDLINE via PubMed and The Cochrane Library were searched from 1966 to the end of June 2007; search terms were reported. Reference lists of retrieved papers were examined for further studies. Only studies published in English were eligible for inclusion in the review.

Study selection
Randomised controlled trials (RCTs) that compared diet plus exercise interventions with diet-only interventions in obese or overweight adults were eligible for inclusion in the review. Eligible studies had to have a duration of at least six months and report changes in weight and/or body mass index (BMI). All weight-loss diets and exercise programmes were included.

Diet interventions included in the review were low calorie diets, low glycaemic index (GI) diets, low fat diets and diets that were rich in certain foods (such as fish). Exercise interventions included components such as aerobic exercise (walking, jogging), strength and resistance training and were often carried out in supervised groups. Duration of interventions ranged from three months to six years (most were less than a year). Cessation of follow-up ranged from 0 to 2.5 years after the intervention. Mean age of participants ranged from 36 to 55 years, mean weight from 70kg to 100kg and mean body mass index from 25kg/m$^2$ to 38kg/m$^2$. Most studies included mixed populations of both men and women; other studies included only single-sex populations. Most studies were conducted in USA; the rest were in Scandinavian countries and (one study) China.

Two reviewers independently selected the studies for inclusion in the review; discrepancies were resolved through consensus.

Assessment of study quality
Study quality was assessed according to the following criteria: randomisation, allocation concealment, blinding, dropout and use of an intention-to-treat analysis. The authors did not state how many reviewers performed the validity assessment.

Data extraction
Two reviewers extracted mean baseline and post-intervention weights (kg) and/or body mass indexes (kg/m$^2$), with standard deviations (SDs). Discrepancies were resolved through consensus.

Methods of synthesis
Data were pooled using a random-effects analysis. Single pooled standardised mean differences were calculated from weight or body mass index data using the Cohen’s d method. Weight and body mass index were analysed separately. Further subgroup and univariate meta-regression analyses were performed according to baseline age, body mass index, gender, intervention length, follow-up duration and comorbidities. Sensitivity analyses were carried out by excluding studies with high dropout rates (>20% in both intervention groups) and studies with dropout rates that differed between
intervention groups by more than 10%. Statistical heterogeneity was assessed using the X² statistic. Publication bias was assessed using funnel plots and the Begg and Egger Test.

**Results of the review**

Eighteen RCTs (n=1,636) were included in the review. Sample size ranged from 28 to 177. Only three studies reported the randomisation procedure used. None reported allocation concealment. Only two studies had a dropout rate of 0% and conducted an ITT analysis.

Diet-plus-exercise interventions were associated with significantly greater loss in weight or body mass index than diet-only interventions at the end of follow-up (difference in Cohen's d -0.25, 95% CI -0.36 to -0.14; 18 RCTs). Diet plus exercise interventions in comparison with diet-only interventions were associated with a significantly greater pooled weight loss (1.14kg, 95% CI 0.21 to 2.07; 10 RCTs) and a significant reduction in body mass index (0.50kg/m², 95% CI 0.21 to 0.79; seven RCTs). The percentage of body fat loss was also significantly greater for the combined diet and exercise intervention as compared with the diet-only intervention (2%, 95% CI 0.65% to 3.5%; six RCTs). No significant statistical heterogeneity was found.

Meta-regression did not show statistical significant differences in results by baseline age, obesity, sex, population, comorbidities and duration of follow-up. However, there was a significantly greater loss in weight between the diet plus intervention group and the diet-only group in studies with longer intervention periods (p=0.03).

Results of other analyses were presented in the paper. There was no evidence of publication bias.

**Authors’ conclusions**

Evidence suggested that combined exercise and diet interventions were better than diet-only interventions for long-term weight loss in adults. Both interventions were associated with partial weight regain.

**CRD commentary**

This review reported clear inclusion criteria for participants, interventions, outcomes and study designs, although it was unclear whether the authors’ aim was to assess purely long-term effects or both short- and long-term effects. The literature search was adequate, but the inclusion of only published English-language studies risked language and publication biases; the authors reported no evidence of publication bias. Attempts were made to reduce the risk of reviewer error and bias when selecting studies and extracting data; it was unclear whether similar precautions were taken when assessing the validity of the studies. Study quality was assessed using appropriate criteria, although in many cases the quality of the studies was unclear due to poor reporting in the original studies. Appropriate methods were used to pool studies and statistical heterogeneity was assessed. Further analyses were performed to examine the influence of intervention and population characteristics; given the number of included studies the reliability of these analyses was unclear. Overall, the data appeared to support the authors’ conclusions, but the quality of the data were unclear and no evidence about weight regain was evaluated.

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

**Practice**: The authors did not state any implications for practice.

**Research**: The authors stated that studies were required that assessed improved strategies to limit weight regain and so achieve greater long-term weight loss. Such studies should clearly report their methods of randomisation, allocation concealment, blinding and use of intent-to-treat analysis.

**Funding**

None reported.

**Bibliographic details**

Record Status
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.