Does physical activity prevent weight gain: a systematic review
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Authors' objectives
To assess the effectiveness of physical activity on weight change and weight regain.

Searching
MEDLINE was searched from 1980 to early 2000. The keywords used in the search were stated in the review. The reference lists from recent reviews and consensus meetings were checked for additional relevant studies. The list of key terms appeared to indicate that only articles published in the English language were included.

Study selection
Study designs of evaluations included in the review
Observational and randomised controlled trials (RCTs) were eligible. Prospective observational studies had to have no intervention and a follow-up of at least 2 years.

Studies with a non-randomised weight reduction phase and a prospective, observational follow-up had to have a follow-up of at least one year after the end of weight reduction, and could have a randomised intervention that did not appear to influence physical activity.

Studies with a randomised weight reduction phase and passive follow-up had to be randomised before weight reduction and have a follow-up of at least one year.

Studies of a non-randomised weight reduction intervention with a randomised weight maintenance phase and a passive follow-up had to be randomised to exercise versus no exercise after weight reduction, before the weight maintenance phase. The follow-up had to be more than one year after the end of weight reduction and more than 6 months after the end of the weight maintenance period.

Specific interventions included in the review
The eligible interventions varied according to study design. The included studies used weight reduction regimens (exercise with no exercise controls) or no intervention.

Participants included in the review
Studies of Caucasian (white) adults with a mean age of 18 to 50 years were eligible for inclusion. Studies solely of patients with chronic disease were excluded. Studies of weight reduction interventions had to include overweight (body mass index, BMI, greater than 25) or obese (BMI greater than 30) people and a weight reduction of at least 5% of the baseline body weight.

Outcomes assessed in the review
Observational studies that reported data on physical activity and weight (or BMI) change were eligible for inclusion. Intervention studies that reported physical activity and weight (or BMI) change during or after weight reduction were also eligible for inclusion. Physical activity was assessed using retrospective questionnaires (most studies used this method) and a prospective activity record. Some studies assessed television and video use.

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

Assessment of study quality
Validity was not formally assessed. The authors mentioned aspects of validity, such as drop-out rates and the extent of
adjustment for confounding factors, in the text.

**Data extraction**
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction. The tabulated information included the following: characteristics of the patients such as age and gender; duration of follow-up; physical activity that was assessed; factors adjusted for in the statistical analysis; pain effects of physical activity; and description of the results.

**Methods of synthesis**
How were the studies combined?
The studies were grouped according to study design and a narrative synthesis was undertaken. For RCTs, the mean weight regain (weighted by sample size) was calculated separately for exercise and non-exercise groups. The longitudinal, observational studies were not treated quantitatively.

How were differences between studies investigated?
Observational studies were grouped according to when the physical activity data were collected (baseline, follow-up or change from baseline to follow-up).

**Results of the review**
The review included 8 RCTs with a passive follow-up, 3 non-randomised studies with a randomised weight maintenance period, 16 prospective observational studies and 19 non-randomised studies with observational follow-up.

Prospective, observational studies (16 studies).
The mean follow-up was 7 years (range: 2 to 21). Most of the studies were adjusted for age, smoking and baseline BMI.

Studies that collected baseline physical activity data found different results. Three studies found that increased physical activity was associated with a smaller weight change; 2 studies found that vigorous physical activity was associated with a larger weight gain; and 3 studies found no significant relationship between physical activity and weight change. Four of the 5 studies that collected physical activity data at follow-up found that increased exercise or physical activity was associated with a smaller weight gain; the fifth study did not find this association. Seven of the 11 studies that used baseline to follow-up data found that increased activity was associated with a smaller weight gain.

Non-randomised weight reduction studies with observational follow-up (19 studies).
Patients were contacted after weight loss in 7 studies, while 13 studies recruited patients before the weight reduction intervention. The average rate of study completion was 70% (range: 47 to 100). The duration of follow-up ranged from one to more than 7 years (usually one to 3 years). Only around 50% of the studies were adjusted for potential confounders. Twelve studies found that increased physical activity at follow-up was associated with a smaller weight gain after weight reduction. Only one study found no association.

Randomised weight reduction interventions with passive follow-up (8 RCTs). The review reported data from an intention-to-treat analysis. The duration of the weight reduction interventions ranged from 8 weeks to 12 months. All of the studies used aerobic exercise. One RCT found that exercise training during weight reduction was associated with less weight gain during follow-up than a non-exercise intervention.

Non-randomised weight reduction interventions with a randomised weight maintenance phase and a passive follow-up (3 studies).
The results were inconsistent. One study found no significant difference in weight regain between exercise and control; one study found that exercise increased weight regain; and one study found that moderate walking reduced weight regain compared with control, but that heavy walking did not reduce weight regain.
All RCTs.

The mean follow-up was 20 months. There was a trend towards less weight regain with exercise compared with control: the mean weight regain was 0.28 kg/month with exercise versus 0.33 kg/month without exercise. In RCTs of weight maintenance, there was a trend towards better weight maintenance with control than with exercise; the difference was 0.6 kg/month.

Authors' conclusions
High physical activity is associated with improved maintenance of body weight, but exercise programmes have a very limited effect.

CRD commentary
The review question was clear in terms of the study design, intervention, participants and outcome. The database search was restricted to English publications listed in only one database, but it was supplemented by searches of consensus meetings. However, other relevant studies may have been missed. The methods used to select the studies, assess validity and extract the data were not described. Hence, the adequacy of the methods used cannot be judged. Validity was not formally assessed though some aspects of validity were mentioned in the text. The lack of a comprehensive quality assessment means that the quality of the evidence cannot be assessed.

Relevant data were extracted and tabulated, and characteristics of the studies were summarised in the text of the review. The studies were appropriately grouped by study design and a narrative synthesis was undertaken. Statistical heterogeneity was not assessed in the meta-analysis of RCTs (weight regain for exercise versus no exercise). However, for other results, potential reasons for inconsistent results between the studies were discussed. The inconsistency among studies of unknown validity makes reaching any conclusion of associations problematic.

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

Research: The authors state that controlled trials with adequate follow-up (greater than 2 years) are required. Studies should use objective measures of physical activity and assess body composition; compare the effects of physical activity in men and women; compare the effects of physical activity on weight change after very low energy diets compared with conventional diets; assess the effects of physical activity and weight maintenance during and after long-term weight-reducing drug treatment; and assess adherence to increased physical activity.

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