Physical activity for obese individuals: a systematic review of effects on chronic disease risk factors

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CRD summary
The authors concluded that physical activity produced a modest benefit for common chronic disease risk factors in obese individuals. There were limitations in the methods of synthesis; several trials were small and lacked power; and the magnitude of the effect and its clinical significance were not described. The conclusions may not be reliable.

Authors’ objectives
To assess the effectiveness of physical activity for improving risk factors for chronic disease in obese individuals.

Searching
MEDLINE, CINAHL, PsycINFO, SPORTDiscus and Evidence-Based Medicine Reviews were searched for English-language studies included up to February 2010; search terms were reported. Reference lists of retrieved articles were checked for additional studies.

Study selection
Randomised controlled trials (RCTs) of physical activity interventions that lasted 10 weeks or longer, for adults with a mean body mass index (BMI) of 30kg per m² or more, were eligible for inclusion. Trials had to report one of the following chronic disease risk factors as an outcome: blood pressure, blood lipids, glucose or insulin, or C-reactive protein. Those that assessed physical activity interventions as part of general lifestyle interventions; that included both physical activity and dietary changes; or for which the effects of physical activity alone could not be assessed, were not eligible for inclusion.

Most of the included trials were conducted in the USA. In most of them, the interventions consisted of 30 to 60 minutes of daily moderate-to-vigorous physical activity, over three-to-five days a week; there were major differences between the interventions in their duration, modes, and intensity of physical activity. Some trials only included obese individuals, while others included both overweight and obese individuals. Some included individuals with raised risk factors, such as high blood pressure, and some only included post-menopausal women; patients with type 2 diabetes, coronary heart disease, or osteoarthritis; or frail elderly individuals. Most trials included men and women, whose average age ranged from 34 to 68 years.

One reviewer assessed titles for inclusion, then two reviewers independently assessed the abstracts and full papers.

Assessment of study quality
Two reviewers assessed trial quality, using the Downs and Black checklist, which gives a score between zero and 32; disagreements were resolved through consensus.

Data extraction
Mean or median (and variance) data on disease risk factor outcomes were extracted for before and after the intervention or changes from baseline. The statistical significance of the difference between the intervention and control groups, or between the before and after results, for each of the outcomes, was extracted.

Methods of synthesis
A narrative synthesis was presented for each of the disease risk factor outcomes. The number of trials with statistically significant results for each outcome was presented in a table.

Results of the review
Forty-four trials were included in the review, with 3,973 participants (range 16 to 464). Quality scores ranged from 17.5 to 27 (out of 32). The main quality issues were failure to report adverse events, lack of description of participants lost to follow-up, lack of description of how representative the participants were, lack of blinding, and inadequate sample
sizes.

**Resting blood pressure:** Eight trials compared blood pressure between an exercise-only group and a control group. Two reported a significant reduction in systolic blood pressure, one of which also reported a significant reduction in diastolic blood pressure. Eight trials compared different levels or types of exercise and one found a significant effect, showing a reduction in systolic blood pressure in post-menopausal women who exercised at 12 kcal per kg per week, compared with women exercising at four kcal per kg per week. None of the 12 trials that compared diet and exercise to diet alone found a significant difference in blood pressure between groups.

**Blood lipids:** Eight trials compared blood lipid concentration between an exercise-only group and a control group. One of these reported a significant difference favouring exercise in low-density lipoprotein cholesterol; none reported a significant difference in high-density lipoprotein cholesterol. None of the trials comparing different levels or types of exercise reported a significant difference between groups in either low-density lipoprotein cholesterol or high-density lipoprotein cholesterol. One of 11 trials comparing diet and exercise to diet alone reported a significant difference in low-density lipoprotein cholesterol and one of 15 trials reported a significant difference in high-density lipoprotein cholesterol.

**Blood glucose/insulin metabolism:** Fourteen trials compared diet and exercise to diet alone and one reported a significant difference in fasting blood glucose levels. None of the trials comparing exercise-only with control or different levels or types of exercise reported a significant difference. One trial out of eight comparing exercise-only with control reported a significant difference in fasting insulin. None of the trials comparing different levels or types of exercise, or diet and exercise with diet alone reported a significant difference in fasting insulin.

**C-reactive protein:** One of four trials comparing C-reactive protein levels between an exercise-only group and a control group reported a significant difference between groups favouring exercise. None of the trials comparing different levels or types of exercise, or diet and exercise with diet alone reported a significant difference.

Before-and-after changes in exercise-only groups were reported.

**Authors’ conclusions**
Physical activity produced a modest benefit for common chronic disease risk factors in obese individuals.

**CRD commentary**
The review question and inclusion criteria were clear. Several relevant sources were searched, for publications in English, with limited attempts to identify unpublished trials; some relevant trials might have been missed. Two reviewers assessed abstracts and full articles for inclusion and assessed their quality, reducing the potential for reviewer bias and error. It was unclear whether such measures were taken for data extraction.

The trial details were reported and their quality was assessed using appropriate criteria, but the results of the quality assessment were not used in the synthesis of the results. A narrative synthesis appears to have been appropriate, given the differences between the trial participants and interventions. But this synthesis merely stated the number of trials that reported a statistically significant difference between intervention groups or between before and after the intervention, which might not have been appropriate. Many of the trials were not sufficiently powered to detect a statistically significant difference (as acknowledged by the authors). The authors did not describe and interpret the size of the effect and the clinical significance of the results.

The conclusions were not fully supported by the evidence presented and may not be reliable.

**Implications of the review for practice and research**
**Practice:** The authors stated that obese people should be encouraged to undertake regular physical activity as part of a programme to maintain their health.

**Research:** They stated that future research should assess the dose of physical activity required to modify chronic disease risk factors in obese individuals. Adequately powered studies with new research designs were required to assess the separate effects of physical activity from those of weight loss in obese individuals. The authors stated that future studies of the effects of physical activity interventions on glucose and insulin metabolism, should use more informative...
markers of insulin resistance, such as insulin-stimulated glucose disposal from clamp procedures.

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