Aerobic exercise and lipids and lipoproteins in patients with cardiovascular disease: a meta-analysis of randomized controlled trials
Kelley G A, Kelley K S, Franklin B

CRD summary
This review assessed the effects of aerobic exercise on lipids and lipoproteins in adults with cardiovascular disease. Exercise increased high-density lipoprotein cholesterol and decreased triglycerides, but not total cholesterol or low-density lipoprotein cholesterol. This was a well-conducted review, however, the conclusions should have been more cautious given that the included studies appear to be of a poor quality.

Authors' objectives
To assess the effects of aerobic exercise on lipids and lipoproteins in adults with cardiovascular disease (CVD).

Searching
MEDLINE, EMBASE, Current Contents and Dissertation Abstracts International were searched. The authors also handsearched and reviewed reference lists from retrieved papers. Studies reported in English journals, dissertations and masters theses between 1955 and January 2005 were eligible for inclusion.

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 aerobic exercise with a non-exercise control for 4 weeks or longer were eligible. Exercise programmes included the Canadian Air Force 5BX plan, cycle ergometry, stationary wheelchair ergometry, walking or non-specific aerobic exercise. The programmes ranged from 8 to 72 weeks, and were conducted 2 to 5 times a week for a duration of 20 to 60 minutes.

Participants included in the review
Adults aged 18 years or older and diagnosed with CVD were eligible for inclusion. The majority of studies included only men. The mean age of the participants ranged from 50 to 67 years, and the mean body mass index was 25 kg/m². Participants included those who had experienced myocardial infarction, intermittent claudication, or who had undergone coronary angioplasty or coronary artery bypass surgery. In 4 studies the participants were also taking medication that could affect lipid metabolism. In 8 studies the participants smoked, and in 6 studies some of the participants had type 1 and/or type 2 diabetes. Three studies included participants who were overweight and/or obese.

Outcomes assessed in the review
Studies that evaluated pre- and post-total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and/or triglycerides (TG) were eligible for inclusion. The secondary outcomes were body weight, body mass index and maximum oxygen consumption.

How were decisions on the relevance of primary studies made?
Two authors independently selected the studies. A third author examined the reference list and any discrepancies were resolved by consensus.

Assessment of study quality
Validity was assessed and scored from 0 to 5 using the Jadad scale. The authors did not state how many reviewers performed the validity assessment.
Data extraction
Two authors independently extracted the data and any discrepancies were resolved by consensus. The authors calculated the change score difference between the exercise and control groups.

Methods of synthesis
How were the studies combined?
A pooled weighted mean difference (WMD) with 95% confidence intervals (CIs) was calculated using a random-effects model. Publication bias was assessed using a linear regression test.

How were differences between studies investigated?
Sensitivity analysis was conducted by repeating the meta-analysis, excluding each study in turn. Analysis of variance-like models were used to compare differences in outcomes according to whether the intention-to-treat or analysis-by-protocol method was used in each study. Meta-regression was also used to examine possible reasons for heterogeneity.

Results of the review
Ten studies (n=1,260) were included.

The median study quality was low (2).

There were no significant relationships between exercise and control for TC (-8.8 mg/dL, 95% CI: -22.3, 4.7) or LDL-C (-7.7 mg/dL, 95% CI: -19.5, 4.2). Compared with control, there was a significant increase in HDL-C with exercise (WMD 3.7 mg/dL, 95% CI: 1.2, 6.1) and a significant decrease in TG with exercise (WMD -19.3 mg/dL, 95% CI: -30.1, -8.5). No significant publication bias was found.

Authors’ conclusions
In adults with CVD, particularly men, chronic aerobic exercise increases HDL-C and decreases TG.

CRD commentary
The review addressed a clear question and undertook a comprehensive search for published trials, although no search terms were provided. The authors restricted the inclusion criteria to English language publications, thus potentially introducing language and publication bias. They did, however, assess publication bias in their analyses. Steps were also taken to minimise reviewer bias and errors in the study selection and data extraction processes. Quality was assessed and appears to have been considered in the sensitivity analyses. Although some details of the included studies were provided, the quality of each study was not reported. Standard statistical methods were used to pool the data and potential sources of heterogeneity were explored. The conclusions seem reliable, but should have been more cautiously made given that the quality of the included studies appears to be poor.

Implications of the review for practice and research
Practice: The authors stated that aggressive lifestyle alterations (diet and/or exercise) should not be abandoned to improve lipid and lipoprotein profiles.

Research: The authors stated that future trials examining the effects of aerobic exercise on lipids and lipoproteins should enrol more women. They also stated that associations between lipids and lipoproteins and selected variables that were found to be significant (e.g. compliance, decreased body mass index) need further testing in well-designed RCTs. Future studies should also estimate energy expenditure, or provide complete data so that it can be calculated.

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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.