A meta-analytic review of the effect of exercise on smoking cessation
Nishi N, Jenicek M, Tatara K

Authors' objectives
To assess the effect of group exercise programmes on smoking cessation.

Searching
Intervention studies published before April 1995 were considered.

MEDLINE and Dissertation Abstracts International were searched. In the MEDLINE search, literature which contained at least one MeSH subject heading in each of the following groups was retrieved:

1. Exercise, exercise therapy, exertion, and physical fitness.
2. Clinical trials, intervention studies, evaluation studies, program evaluation, random allocation, randomised controlled studies, research design, follow-up studies and comparative study.
3. Smoking, smoking cessation, and tobacco use disorder.

All volumes of the following three journals were reviewed manually: American Journal of Preventative Medicine, Preventative Medicine, and Medicine and Science in Sports and Exercise (formerly Medicine and Science in Sports). References of review articles and retrieved articles were examined and researchers in the field were also contacted.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs). The frequency of treatment ranged from 2 to 5 treatments per week, and the duration of treatment ranged from 4 weeks to 12 months. Studies were only included if they reported numbers of smokers of both exercise and control groups at baseline and at 6 to 24 months later.

Three studies had smoking cessation as their main aim, where as in two studies, smoking cessation was not the main aim.

Specific interventions included in the review
Studies were included if exercise was provided in a group programme. Exercise group treatments were: group counselling and aerobic exercise, smoking cessation programme and use of ergometer, running, and exercise classes for the elderly. Control groups were: group counselling, smoking cessation programme, health education, and no programme.

Participants included in the review
Characteristics of participants ranged from: smokers interested in quitting, female healthy smokers, male employees to elderly healthy volunteers. The age of participants in studies with smoking cessation as the main aim ranged from 20-56 and from 30 to 81 in studies in which smoking cessation was not the main aim. Studies were excluded if they contained participants who had suffered from chronic diseases such as cardiovascular diseases.

Outcomes assessed in the review
Smoking cessation rate. Smoking was verified biochemically only in two studies.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for review, or how many of the authors performed the selection.
Assessment of study quality
The quality of each study was assessed with a set of 13 criteria based on those established by DerSimonian et al. These included: eligibility criteria defined, admission before allocation, random allocation, method of randomisation reported, treatment complications reported, and loss to follow up reported. The authors do not state how the papers were assessed for quality, or how many of the authors performed the quality assessment.

To reduce bias in the assessment of trials, information on the authors and their institutions, the journal, and the funding source was deleted, while the methods and results sections were assessed separately.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the authors performed the data extraction.

Data were extracted in the same way as quality assessment:

1. Information on the authors and their institutions, the journal, and the funding source was deleted.
2. The methods and results sections were abstracted independently.

Methods of synthesis
How were the studies combined?
The DerSimonian and Laird random-effects method was employed to estimate a summary odds ratio. If any one of the four cell frequencies was equal to zero, 0.5 was added to each cell.

How were differences between studies investigated?
Tests for heterogeneity were performed, although the test used was not stated.

Results of the review
Five studies were included in the review, comprising a total of 101 participants.

The quality scores of the studies ranged from 7 to 9 points (out of a total of 13), with a mean of 8. Thus no study was excluded from further analysis and no stratification was performed on the basis of quality score. No heterogeneity was present.

The summary odds ratio of the three studies which primarily aimed at smoking cessation was 2.35 (95% CI: 0.75, 7.31). When the two other studies were added, the summary odds ratio dropped to 1.85 (95% CI: 0.65, 5.24).

Authors' conclusions
Although the results of this meta-analysis seem to demonstrate a positive effect of exercise on smoking cessation, due to the small number of studies and the small sample size for each study, the effect remains unclear. Methods of intervention like those offered by the three studies with higher odds ratios might be effective. Further analysis, both qualitative and quantitative, is necessary to clarify these issues.

CRD commentary
The review focuses on a well defined question. Inclusion and exclusion criteria were reported. The quality of the included studies was assessed, although there is no indication that the assessment took place independently by two or more reviewers. Sufficient details of the individual studies were presented, and the studies were combined appropriately.

A reasonable effort was made to search for all the relevant literature. However, the search could have been extended to include other databases, such as EMBASE.
This is a fairly thorough review, but due to the small number of studies and small sample size for each study, the effect remains unclear.

A large controlled trial examining the effect of group exercise on smoking cessation has since been undertaken by Marcus et al (1997; see Other Publications of Related Interest).

**Implications of the review for practice and research**
The authors state that as the meta-analysis is inconclusive, further analysis, both qualitative and quantitative, is necessary to clarify these issues.

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