Exercise training in high-risk ethnic populations with type 2 diabetes: a systematic review of clinical trials
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CRD summary
The authors concluded that randomised controlled trials that prescribed appropriate targeted interventions and investigated relevant outcomes may be required to stimulate greater advocacy for exercise as a therapeutic adjunct for management of type 2 diabetes mellitus. The reliability of the authors’ conclusion is limited by possible publication bias, poor reporting of the review processes and unclear quality of included studies.

Authors’ objectives
To assess the effectiveness of exercise training and summarise metabolic adaptations to exercise in high-risk ethnic populations with type 2 diabetes mellitus.

Searching
MEDLINE, EMBASE, CINAHL, SPORTDiscus and Web of Science were searched for studies published from 1966 up to 2011. Only studies published in English language were considered. Search terms were reported. Bibliographies of retrieved papers were handsearched.

Study selection
Randomised controlled trials (RCTs) and non-controlled trials that prescribed aerobic and/or resistance training of at least eight weeks and enrolled patients (aged at least 18 years) with type 2 diabetes mellitus were eligible for inclusion. Studies that assessed the effects of multi-disciplinary lifestyle interventions, and those published in abstract form only were excluded. Measures of the effects of training were physical fitness and functional tests (changes in measures of functional capacity, cardiorespiratory fitness and muscular strength). Other outcomes assessed were glycated haemoglobin (HbA1c) and insulin action, anthropometrics (body mass index, body composition), blood lipids, and blood pressure.

Most included studies prescribed 12 to 24 weeks of exercise. Exercise types included aerobic training, resistance training, or both. Included patients were of African, Indian, Polynesian, Hispanic, Arabian and Chinese origins; most were women. The mean age of participants ranged from 41 to 66 years (where reported). Duration of diagnosis of type 2 diabetes mellitus ranged from three to 11 years in six studies; the minimum entry criteria was type 2 diabetes mellitus duration of at least six months to longer than three years in three studies. Most patients on pharmacotherapy received oral hypoglycaemic agents; other patients received insulin injection. Only 5% of patients on non-pharmacotherapy were on dietary management. The occurrence of hypertension and ischaemic heart disease were varied: hypertension (range 23.8% to 62.4%); ischaemic heart disease (6% to 59.7%).

The authors did not state how many reviewers assessed study eligibility for inclusion.

Assessment of study quality
Study quality was assessed using the Delphi List. Key domains assessed included the adequacy of randomisation, allocation concealment, similarity of groups at baseline for important prognostic factors, blinding of outcome assessors, reporting of drop-outs and use of intention-to-treat analysis.

The authors did not state how many reviewers assessed study quality.

Data extraction
Data on the pre-specified outcomes were extracted.

The authors did not state how many reviewers extracted data.

Methods of synthesis
Results were presented as a narrative synthesis.

**Results of the review**

Nine studies were included in the review (521 participants; range 18 to 149) comprising five RCTs (382 patients) and four non-controlled trials (139 patients). Only RCT fulfilled all of the Delphi quality criteria. Randomisation was adequate in all the RCTs. Allocation concealment was adequate in two trials and was not reported in three trials. Blinding was considered adequate in two trials and was not reported in three trials. Intention-to-treat analysis was used in only one trial. Further results were presented in the paper.

Functional capacity (assessed by the six-minute walking test) was improved following exercise training in two studies in Swedish patients. Ventilation threshold was improved following 24-weeks exercise training in one study of Swedish patients, but no effect was observed in another study of Arabian patients.

Resistance training alone (one study) and resistance training in combination with aerobic training (one study) resulted in improved measures of muscular strength. Adverse events for exercise participation (reported in four studies) included hypoglycaemic events, chest pain, and uncomplicated syncope. Two studies attributed no adverse events to the exercise participation; five trials did not report data on adverse events.

Exercise training was associated with improvements in the following outcomes in most studies: glycated haemoglobin, insulin action, body composition, blood lipids, and systolic and diastolic blood pressure (further details were reported in the paper). A longer duration and greater frequency of training was associated with greater adaptation in general. Findings from two studies suggested differences in training effects between African and Arabian participants.

**Authors’ conclusions**

Robust RCTs that prescribed appropriate, targeted interventions and investigated relevant outcomes may be required to stimulate greater advocacy for exercise as a therapeutic adjunct for management of high-risk ethnic populations with type 2 diabetes mellitus.

**CRD commentary**

The review question was broadly defined; inclusion and exclusion criteria were adequately pre-specified. Relevant databases were searched, but for English only publications, so a number of relevant papers could have been missed. It was unclear whether steps were taken to minimise likely reviewer error and bias in the conduct of review processes (study selection, data extraction and quality assessment).

The quality assessment criteria appeared appropriate; studies were of variable quality (poor, moderate, high). Results were summarised narratively, due to the differences between studies in designs, interventions and outcome measures. A number of results on adverse events were unclear. Few studies with small sample sizes were included in the review.

The reliability of the authors’ conclusions is limited by possible publication bias, unclear risk of error and bias in the conduct of review processes and the unclear quality of the included studies.

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

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

**Research:** The authors stated that future RCTs should assess the effects of different doses of exercise training across ethnic groups (Polynesian versus other ethnic groups) with type 2 diabetes mellitus. Future trials should also evaluate exercise stimulus with appropriate physical fitness and functional testing in high-risk populations.

**Funding**

Not stated.

**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.