
Community-based physical activity interventions for treatment of type 2 diabetes: a systematic review with meta-analysis

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CRD summary

The authors investigated the effectiveness of community-based physical activity interventions for the treatment of type 2 diabetes in adults and concluded that these interventions can be effective in decreasing HbA1c levels, reducing weight and increasing physical activity levels. Potential for missed data and small statistical benefits reported for some outcomes mean the authors' conclusions may be overstated.

Authors' objectives

To assess the effectiveness of community-based physical activity interventions in the treatment of adults with type 2 diabetes.

Searching

MEDLINE, CINAHL, Scopus and Web of Science were searched from 2002 to June 2012 for peer-reviewed articles in English. Search terms were reported. Articles known to the authors were assessed for inclusion. Reference lists of retrieved articles were searched manually.

Study selection

Quantitative studies that assessed the effectiveness of community-based physical activity interventions (as defined in the review) for the treatment of type 2 diabetes in adults aged at least 18 years were eligible for inclusion.

More than half of the included studies were conducted in the USA. Others were conducted in the UK (two studies), Canada, Australia, Costa Rica or Jamaica. Most studies recruited participants from clinics or GP (general practitioner) visits. Interventions varied in terms of community-based components and physical activity aspects. These included phone calls, group sessions or use of community facilities (community components) and resistance training, walking and yoga (physical activity aspects). Intervention durations ranged from four weeks to 24 months. Most studies reported haemoglobin A1c (HbA1c) levels as the primary outcome. Other primary outcomes included physical activity levels and other body measurements; 10 studies used self-report measures and 12 studies used objective measures to assess physical activity levels.

Two reviewers independently screened studies for inclusion; discrepancies were resolved by consensus or referral to a third reviewer.

Assessment of study quality

Study risk of bias was assessed using a nine-item checklist with criteria on randomisation, drop-outs, assessor blinding and intention to treat (ITT) analysis. Each criterion was scored as 1 or 0. Studies that scored 8 or 9 were considered low risk of bias, studies that scored between 4 and 7 were at moderate risk of bias and studies that scored between 0 and 3 were considered high risk of bias.

The authors did not state how many reviewers performed the assessment for risk of bias.

Data extraction

Two reviewers extracted post-test means or mean changes from baseline along with their standard deviations to calculate mean differences and their 95% confidence intervals. Where studies included multiple treatment groups, the control group was divided between the two to avoid double counting.

Methods of synthesis

Study outcome data were pooled using a random-effects model or presented as a narrative synthesis. Statistical heterogeneity was assessed using the X^2 test and I^2 statistic ($I^2=0\%$ to 40% may not be important; 30% to 60% moderate heterogeneity; 50% to 90% substantial heterogeneity; 75% to 100% considerable heterogeneity).

Results of the review

Twenty-two studies (3,112 participants; range 19 to 652) were included in the review: 16 were randomised controlled trials (RCTs), one was a prospective cohort study, four were pre-/post-test designs and one had a convenience sample. One RCT was considered to be at low risk of bias, 15 studies were at moderate risk of bias and six studies were at high risk of bias (full results were reported in the review).

HbA1c: Meta-analysis suggested that the interventions reduced HbA1c levels but the results were not statistically significant (MD -0.32, 95% CI -0.65 to 0.01; 12 study arms; $I^2=88%$).

Weight: Three of four studies that assessed the effects of community-based physical activity interventions on weight outcomes reported a reduction in weight and body mass index.

Physical activity: Seven studies reported increases in overall physical activity and others reported improvements in specific measurements such as muscle strength (results fully reported in the review).

Results for other outcomes were reported in the review.

Authors' conclusions

Community-based interventions utilising a large physical activity component can be effective in treating type 2 diabetes in terms of decreasing HbA1c levels, reducing weight and increasing physical activity levels.

CRD commentary

The review question and inclusion criteria were broadly stated. Four electronic databases were searched. The search was limited by language and publication status so relevant articles may have been missed. Study selection and data extraction were performed in duplicate; it was unclear whether this was also true for quality assessment so reviewer error and bias could not be ruled out. Study quality was assessed and indicated that most studies were at some risk of bias.

Few study and participant details were provided but what was reported indicated variability between studies. Variability was also reflected in the significant statistical heterogeneity reported for the meta-analysis. It appeared that RCTs and a cohort study were pooled in the meta-analysis, which may not have been appropriate.

The authors stated a number of limitations that included bias from use of advertising in participant recruitment methods, low adherence to interventions and potential for other factors besides physical activity having influenced the results. Approximately half of the studies used subjective measures to assess outcomes and this may have inflated the results.

Given the potential for missed data, heterogeneity between studies and small statistical benefit reported for some outcomes, the authors' conclusions may be overstated.

Implications of the review for practice and research

Practice: The authors stated that the change in HbA1c was clinically significant in the meta-analysis.

Research: The authors stated that future high quality studies should include strategies to promote the reduction of sedentary activity (given its negative impact on metabolic health) and investigate how effectiveness for change in physical activity levels could be sustained in the long term. Studies should aim to isolate the impact of specific intervention features on physical activity change and should consider combining clinical- and community-based approaches to maximise treatment effects.

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