

## Interventions promoting physical activity among obese populations: a meta-analysis considering global effect, long-term maintenance, physical activity indicators and dose characteristics

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### CRD summary

The authors concluded that despite global positive effects, further research was needed to determine the optimal dose for interventions that promote physical activity among obese populations and to evaluate the maintenance of intervention effects. The authors' cautious conclusions reflect the evidence presented, but potential limitations in review methods and differences between studies should be considered when interpreting the results.

### Authors' objectives

To evaluate the global effect that interventions promoting physical activity among obese populations have on physical activity behaviour and to consider long-term maintenance, physical activity indicators and dose characteristics.

### Searching

PubMed, SPORTDiscus, Current Contents and PsycINFO databases were searched for articles in English; search terms were reported. Reference lists of included articles, reviews and meta-analyses of physical activity promotion and obesity interventions were searched for additional articles.

### Study selection

Randomised controlled trials (RCTs) or quasi experimental studies (pre- and post-test) that evaluated interventions that promoted physical activity in participants who had a body mass index (BMI) of  $25\text{kgm}^{-2}$  or more were eligible for inclusion. Physical outcome measures such as duration or energy expenditure or physical fitness outcomes such as cardiovascular fitness had to be reported. Studies were excluded if they included participants with diagnosed complications linked to obesity, drug-induced obesity treatment, interventions solely composed of supervised exercise sessions to assess the effect of physical activity on weight evolution or did not report physical activity indicators other than participants rate in organised sessions.

Interventions in the included studies were multi-component; information transmission and cognitive-behaviour techniques, such as goal setting and self monitoring were the main components. Other components included exercise sessions, calorie restriction, use of pedometers and invitations to sports centres for participants and family. Some interventions were delivered face-to face or in groups; some also included telephone calls or web use. Duration of intervention varied from three weeks to 24 months. The number of sessions ranged from one to 75 and frequency from one to 9.33 months. Follow-up ranged from three months to 18 months.

The authors did not state how many reviewers selected studies for inclusion.

### Assessment of study quality

The authors did not state that they conducted a validity assessment.

### Data extraction

Data on type of physical activity measure, duration of intervention, number and frequency of sessions and length of follow-up were extracted and used to calculate effect sizes (ES) using Cohen's D, together with corresponding 95% confidence intervals (CI). Where there was insufficient data to calculate an effect size, t or f values were used to make estimations. Effect sizes of 0.2, 0.5 and 0.8 represented small, medium and large effects.

The authors did not state how many reviewers extracted data.

### Methods of synthesis

Pooled estimates were combined using the fixed-effect model (where heterogeneity was absent) or a random-effects model. Heterogeneity was assessed using the Q test and  $I^2$  index. Publication bias was assessed by visual inspection of funnel plots. Moderator analyses were conducted to examine variation in effect size depending on physical activity indicator, intervention duration and frequency and total number of sessions. A univariate meta-regression was conducted using continuous moderators. Analyses of variance was conducted to assess dichotomous moderators.

### Results of the review

Forty-six studies (4,765 participants) were included in the review.

There was a statistically significant positive effect of interventions on physical activity behaviour (ES 0.54, 95% CI 0.39 to 0.69; 46 studies). There was significant heterogeneity ( $I^2=83\%$ ) and evidence of publication bias for this analysis. When the two studies contributing to publication bias were removed from the analysis, the result remained statistically significant and heterogeneity remained significant ( $I^2=76\%$ ).

Moderator analyses indicated that the number of steps (nine comparisons) and "other PA indexes" (six comparisons) showed larger effect sizes than energy expenditure (14 comparisons), cardiovascular health (seven comparisons), length of physical activity (15 comparisons) and physical test performance (11 comparisons).

Analyses indicated that shorter intervention periods (less than six months) had greater effects than longer periods. Neither the number nor frequency of sessions (each 37 comparisons) had any significant effect on the results. Analysis also showed that there were no significant changes in the level of physical

activity of participants from the end of the intervention to the follow-up assessment (nine studies).

### **Authors' conclusions**

Despite global positive effects, further research was needed to determine the optimal dose for interventions and evaluate maintenance of intervention effects.

### **CRD commentary**

The research question was clear with appropriate inclusion criteria. Some relevant sources were searched. The restriction to studies published in English risked language bias. Search dates were not reported, but studies published up to 2009 were included. There was evidence of publication bias for one analysis and exploration of this did not significantly alter the results. Validity was not assessed and so it was difficult to determine the reliability of the evidence presented. The authors did not report whether efforts to reduce reviewer error and bias were used to select studies or extract data. Some study characteristics were reported. Few details of participants were stated.

A meta-analysis may not have been appropriate given the differences between studies in terms of study design (RCTs and apparently uncontrolled studies), interventions and outcome measures.

The authors' conclusions reflect the evidence presented and are suitably cautious. However, potential for language bias, lack of validity assessment, lack of reporting of review methods and the differences between studies should be considered when interpreting the results.

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

**Practice:** The authors stated that future interventions in obesity treatment should incorporate physical activity promotion components to maximise their impact on health indicators. Educators should implement interventions with regular assessments throughout the programme and follow up patients after the programme.

**Research:** The authors stated that future research should standardise the methods used to calculate a physical activity index and include a direct and indirect measurement in order to assess intervention efficacy on behaviour evolution as well as a consequence of behaviour evolution to determine intervention effects on physical activity. Researchers should implement interventions with regular assessments throughout the programme and follow up patients after the programme. Future research should also integrate multiple regular assessments to determine the physical activity evolution of obese participants during long interventions. Additional types of indicators other than frequency and number of sessions with intervention duration should be considered to enhance knowledge regarding the most suitable dose rate for the intervention. More studies were needed to confirm the findings that there were no significant changes in level of physical activity from end of intervention to follow-up assessment.

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