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## Effectiveness of lifestyle interventions in child obesity: systematic review with meta-analysis

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### CRD summary

The authors concluded that lifestyle interventions incorporating dietary, exercise and/or behavioural therapy components were effective in treating childhood obesity under various conditions at least up to one year. This was a generally well-conducted review but variations in intervention durations, settings and components precluded identification of the format likely to work best in practice and in the long-term.

### Authors' objectives

To assess the effectiveness of lifestyle interventions on weight change and cardio-metabolic risks in overweight/obese children.

### Searching

A previous review covered 1975 to 2003. This review updated the search using five databases (including EMBASE and DARE) to look for studies from 2003 to 2010. Search terms were reported. The search was restricted to articles in English. Reference lists of retrieved articles and systematic reviews were searched manually.

### Study selection

Randomised controlled trials (RCTs) were eligible for inclusion if they compared the effectiveness of lifestyle intervention programmes (with a nutrition or dietary component) versus no treatment or waiting-list control, usual care/minimal advice or written education materials. Eligible participants were overweight and obese participants aged 18 years or younger or parents and families of overweight/obese children and adolescents. Eligible trials had to follow-up participants for at least two months and report measures of body weight or body composition. Trials in children with obesity attributable to a secondary or syndromal cause were excluded.

Approximately half of the included studies were conducted in USA and were published between 1979 and 2010. Most studies were in a hospital setting. Interventions included combinations of dietary advice, physical activity, behavioural modification, cognitive-behavioural therapy and sedentary behaviour at varying intensities and with differing components. Intervention duration ranged from four weeks to two years. Overweight and obesity were measured using various criteria and reported as change in body mass index (BMI) or BMI z-score or change in body fat percentage. Change in total cholesterol concentrations and mean fasting glucose were reported.

Two reviewers independently screened studies for inclusion. Discrepancies were resolved through referral to a third reviewer.

### Assessment of study quality

Two reviewers independently assessed trial quality according to the Joanna Briggs Institute critical appraisal of study quality tool. Discrepancies were resolved through discussion or referral to a third reviewer.

Studies were assessed in response to 10 criteria based on: randomisation; allocation concealment; comparable participants, treatment and measurement of outcomes between groups; blinding; use of appropriate statistical methods; and adequate follow-up. Trials were rated as positive, negative or neutral.

### Data extraction

One reviewer extracted mean differences for continuous outcomes and this was checked for accuracy by a second reviewer. Discrepancies were resolved through consensus. Authors were contacted for missing data or data were imputed using methods described in the Cochrane Handbook.

### Methods of synthesis

Where appropriate, a fixed-effect or random-effects model was used to pool mean differences and 95% confidence intervals (CI). Weighted mean differences (WMD) were calculated where similar measurement scales were used. Standardised mean differences (SMD) were calculated where different scales were used. Results were reported

according to type of control group.

Statistical heterogeneity was assessed using the  $I^2$  statistic ( $I^2 \leq 40\%$  was low heterogeneity and  $I^2 \geq 75\%$  was high heterogeneity). Subgroup analyses were performed by age group (child aged  $\leq 12$  years at baseline versus adolescent  $>12$  years) and length of follow-up ( $\leq 6$  months versus  $>6$  months).

Where meta-analyses were not appropriate, data were presented as a narrative synthesis. Where more than 10 studies reported an outcome, funnel plots were examined to assess for publication bias.

### Results of the review

Thirty-eight RCTs (mean number of participants 72, range 16 to 258) were included in the review. Eight trials met eight of the 10 quality criteria; results were fully reported in the review. Some trials did not follow participants after the intervention ended; other studies had follow-up in the range one month to four years.

Meta-analysis indicated a statistically significantly larger beneficial effect on weight and body composition for lifestyle compared to no treatment or a wait-list control over two years (SMD -0.97, 95% CI -1.39 to -0.55;  $I^2=90\%$ ; 19 trials, 23 comparisons, 1,234 participants). There was no evidence of publication bias.

Change in BMI at the end of active treatment showed a statistically significant reduction in the lifestyle intervention group compared with usual care or minimal intervention (SMD -1.30kg/m<sup>2</sup>, 95% CI -1.58 to -1.03;  $I^2=75\%$ ; seven trials, 586 participants). Four trials that assessed longer follow-up (seven months to one year after programme completion) indicated that weight loss was sustained.

Lifestyle interventions showed a statistically significantly greater reduction in BMI z-score over one year when compared with written educational materials (SMD -0.06, 95% CI -0.10 to -0.02;  $I^2=99\%$ ; three trials, 354 participants) but no differences for change in BMI (two trials).

Results from subgroup analyses and other findings were reported in the review.

### Authors' conclusions

The evidence suggested that lifestyle interventions incorporating a dietary component along with an exercise and/or behavioural therapy component were effective in treating childhood obesity and improving cardio-metabolic outcomes under a wide range of conditions at least up to one year.

### CRD commentary

The review question and supporting inclusion criteria were stated clearly. The literature search was limited to studies in English and this may have introduced language bias. Each stage of the review process was performed in duplicate and this minimised potential for reviewer error and bias. Appropriate criteria were used to assess study quality and most studies were not of high quality.

There was a large number of studies in the review but most studies included fewer than 100 participants and most outcomes included only a small proportion of studies. The authors used appropriate methods to investigate heterogeneity and found this to be statistically significant for most outcomes. The authors acknowledged some of the limitations of the review (such as high levels of heterogeneity and less than optimal methodological quality).

This was a generally well-conducted review and the authors appropriately concluded that these interventions can be effective. However, variations in intervention durations, settings and constituent components meant that the evidence did not provide a clear indication of which format was likely to work best in practice and in the long-term.

### Implications of the review for practice and research

**Practice:** The authors stated that the heterogeneity of the included studies made it difficult to give definitive recommendations for practice. However, the evidence supported a variety of dietary and lifestyle components in treating childhood obesity across a wide range of treatment settings, age groups and severity of obesity.

**Research:** The authors stated that future research should provide details on study and participant characteristics. Further research was needed to explore the optimal long-term effective lifestyle intervention and determine the how much

weight loss was required in the paediatric population to be of clinical significance.

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### **Bibliographic details**

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### **Other publications of related interest**

Collins CE, Warren JM, Neve M, McCoy P, Stokes B. Systematic review of interventions in the management of overweight and obese children which include a dietary component. *International Journal of Evidence-Based Healthcare* 2007; 5(1): 2-53

### **Indexing Status**

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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.