Effectiveness of weight management programs in children and adolescents  

CRD summary
This review concluded that behavioural interventions have modest beneficial effects on weight in the short to medium term (6-12 months). Behavioural interventions are more effective when combined with pharmacological interventions. Surgical interventions for morbidly obese adolescents are associated with greater weight loss, but also more adverse effects. The review was well conducted and the conclusions are likely to be reliable.

Authors' objectives
To assess behavioural, pharmacological and surgical weight management interventions for overweight and/or obese children and adolescents.

Searching
MEDLINE, PsycINFO, DARE, the Cochrane Database of Systematic Reviews, the Cochrane Central Register of Controlled Trials and Education Resources Information Center were searched from 2003 for pharmacological studies, and from 2005 for behavioural and surgical studies, to December 2007. Search terms were reported. Earlier trials included in two previous systematic reviews were also included in the review. Reference lists of the included studies and good quality systematic reviews were searched and experts contacted for additional studies.

Study selection
Randomised controlled trials (RCTs) that assessed pharmacological interventions, controlled trials that assessed behavioural interventions, and controlled trials, cohort studies or case series that assessed bariatric surgical interventions, for weight reduction or stabilisation in overweight and obese children and adolescents (two to 18 years old) were eligible for inclusion in the review. In addition, large observational studies were eligible for inclusion to assess adverse events. Studies had to report weight outcomes at least six months after the start of treatment. Studies of children with idiosyncratic weight management issues, such as genetic conditions that affect weight or eating disorders, were excluded from the review. Trials of behavioural interventions had to have a minimal intervention or placebo control and a minimum of 10 participants per treatment group. Trials of pharmacological interventions had to have a minimum of 10 participants per treatment group and include a pill placebo as the control arm.

Included studies of behavioural interventions were in obese children aged five to 18 years, with an average body mass index (BMI) between 20 to 24 kg/m\(^2\) in trials of children aged 12 or younger, and between 31 to 35 kg/m\(^2\) in trials of children aged over 12. Most behavioural interventions included physical activity sessions and were conducted in a variety of different settings. Control groups received either no treatment or minimal treatment. Included studies of pharmacological interventions were in obese children aged 12 to 18 years, with an average BMI between 35 to 38 kg/m\(^2\). The pharmacological interventions assessed were sibutramine or orlistat and all of the studies also included a behavioural component in both treatment arms. Control groups received a placebo pill. Included studies of surgical interventions were in obese children aged 12 to 18 years, most of whom had failed previous weight management approaches. Surgical interventions assessed were laparoscopic adjustable gastric banding (LAGB) or gastric bypass procedures. The average BMI was between 43 and 48 kg/m\(^2\) in LAGB studies and in the high 40s to mid 50s in gastric bypass studies.

Two reviewers independently assessed studies for inclusion in the review, disagreements were resolved through consensus.

Assessment of study quality
Two reviewers assessed the quality of the studies based on criteria from the United States Preventive Task Force and National Institute for Health and Clinical Excellence quality checklists (full details provided in the report). Disagreements were resolved through consensus. Poor quality studies of behavioural or pharmacological interventions were excluded from the review.
Data extraction
Data on weight-related outcomes, weight-related co-morbidities and adverse effects of treatment were extracted into standard evidence tables by one reviewer and checked by another. Mean change scores from baseline, along with standard deviations, were extracted for each treatment group, or calculated when not reported. Where necessary, authors of primary studies were contacted for additional data.

Methods of synthesis
A narrative synthesis was presented. Where studies were deemed sufficiently homogeneous to conduct statistical meta-analysis, a random-effects model was used to calculate the weighted mean difference. Statistical heterogeneity was assessed using the $I^2$ statistic.

Results of the review
Eighteen fair- or good-quality controlled trials of behavioural interventions (n=1,794), seven fair- or good-quality controlled trials of pharmacological interventions (n=1,294) and 18 case series of surgical interventions (n=612) were included in the review.

Behavioural interventions in school or specialty health care settings were associated with modest weight loss and/or weight gain prevention in the short-term (up to one year after enrolment); most participants remained at or above the 95th BMI percentile after completing the intervention. In a school setting, the intervention was associated with a statistically significant reduction in weight of -0.82 kg/m$^2$ (95% CI: -0.46, -1.18, $I^2 = 47.2%$; five trials). Studies conducted in a specialty health care setting reported between 1.9 and 3.3 kg/m$^2$ difference in mean BMI change. In an intensive 10 month residential programme, children dropped from 75% overweight to 25% overweight, compared with a slight increase in overweight in children in a waiting list control group. Four of five trials reported modest weight loss and/or weight gain prevention in the medium term (one to five years after enrolment). No adverse effects of behavioural interventions were reported. The intensity and setting of the intervention appeared to have an impact on effectiveness; the greatest treatment effects were seen in higher intensity programmes in a residential setting or specialty health care setting.

A pharmacological intervention alongside a behavioural intervention was associated with a reduction in BMI compared with placebo alongside the behavioural intervention; BMI was reduced by 1.6 to 2.7 kg/m$^2$ more in participants who received sibutramine and by 0.5 to 0.85 kg/m$^2$ more in participants who received orlistat in the short term (up to one year after enrolment) compared with the control group. None of the trials assessed outcomes beyond one year. No severe adverse effects were reported, however adolescents taking sibutramine were more likely to develop small increases in heart rate and, in some cases, blood pressure. Nine percent of adolescents taking orlistat reported faecal incontinence and 20-30% reported mild to moderate gastrointestinal side effects, such as abdominal pain, oily spotting or faecal urgency.

LAGB was associated with an average reduction in BMI of between 9.4 to 10.2 kg/m$^2$ one year after surgery. Bypass procedures were associated with an average reduction in BMI of between 15 to 20 kg/m$^2$ one year after surgery. No serious adverse events were reported for LAGB, however 10-15% of adolescents required additional surgery for repositioning or removal of the band. Roux-en-Y gastric bypass was associated with higher rates of adverse events, with serious adverse events occurring in 5% of patients whilst in the hospital.

Further results were reported.

Authors' conclusions
Behavioural interventions across a range of settings and ages have demonstrated small to moderate beneficial effects on weight compared with minimal intervention or no treatment, in the short to medium term (six to 12 months). Sibutramine plus a behavioural intervention was associated with moderate weight loss in very obese adolescents in the short to medium term; orlistat was associated with smaller treatment effects. Surgical interventions in highly selected morbidly obese adolescents are associated with a moderate to substantial weight loss in the short to medium term; but also short term adverse effects or complications in more than 30% of patients, depending on the type of surgery.

CRD commentary
This review addressed a clear question and was supported by well defined inclusion criteria. The search strategy was adequate and included some attempts to identify unpublished data, reducing the potential for publication bias. The authors did not state whether any language restrictions were applied, so it is not possible to assess the potential for language bias. Validity was assessed using standard checklists and poor quality studies of behavioural and/or pharmacological interventions were excluded, but only minimal details were reported, which makes it difficult for the reader to form their own assessment. Study selection and quality assessment were conducted independently by two reviewers, and data extraction was performed by one reviewer and checked by another, reducing the potential for reviewer bias and error. Adequate details of the included studies were presented. Statistical pooling was only performed when studies were deemed sufficiently clinically homogenous, otherwise a narrative synthesis was presented, which was appropriate. The authors highlighted limitations of the evidence, namely that only short to medium term results were reported and adverse effects of treatment were rarely reported. Overall, this was a well conducted systematic review and the authors’ conclusions are likely to be reliable.

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

**Practice:** The authors stated that owing to safety concerns and possibly the growing use of bariatric surgery and pharmacological interventions, careful monitoring is required.

**Research:** The authors stated that further research is required to determine the most effective elements of behavioural interventions and whether effectiveness is affected by patient characteristics, such as age and degree of overweight. In addition, studies with longer term follow-up are required, particularly for pharmacological and surgical interventions. Future studies should also investigate adverse effects of treatment and cost-effectiveness. Detailed recommendations for future research were presented.

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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.