Effective management of obesity

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Introduction

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People who are obese or overweight have a higher risk of disease including coronary heart disease, diabetes, hypercholesterolaemia, hypertension, gall stones, degenerative joint disease, and obstructive sleep apnoea, and thereby reduced life expectancy.¹ Even modest weight loss of around 5 kg may produce important health benefits and reduce the costs associated with treating some of these conditions.

Recent epidemiological surveys in Britain indicate that the prevalence of obesity in men and women aged 16 to 64 is about 13% and 16% respectively²⁻³ (double the rates in 1980)⁴ and increasing.⁵⁻⁶ This trend is likely to be due to a combination of increased dietary fat and decreased levels of physical activity.⁷

Health professionals may have a negative attitude to people who are obese; they may lack interest in the condition and feel frustrated because successful treatment is often long term or elusive⁸⁻⁹ and primary healthcare teams are not always adequately trained in the prevention and treatment of obesity so they may not take positive action to help patients lose weight.¹

This paper summarises the results of a systematic review of evaluations of interventions to reduce obesity and overweight presented in a recent *Effective Health Care* Vol 3, No 2, and published in full elsewhere.¹⁰⁻¹¹

Methods

The relevant literature was identified by a search of computerised databases (including MEDLINE, EMBASE, BIDS, and PSYCHLIT), citations in identified reviews, and consulting experts. Only the results from randomised controlled trials with at least a one year period of observation (including both treatment and follow up) were included (in the case of prevention of obesity, or the use of alternative treatments, non-randomised controlled trials with a concurrent control group were also included). Data at each stage of the review were checked by two reviewers.

Results

Ninety nine studies contained in 96 full articles and one abstract¹²⁻¹⁰⁸ met the review criteria. Many had methodological problems, such as small sample sizes and high rates of attrition,

leading to low power and potential bias, and only 6% carried out analysis on an intention to treat basis. Furthermore, studies recruiting participants by methods such as advertisements may not be generalisable to less motivated people seen routinely in primary care. The table summarises the studies on which some of the key conclusions of this paper are based, and full details are available elsewhere.¹¹

No studies of alternative treatments and none evaluating the effectiveness of commercial weight loss programmes—such as those provided by *Weight Watchers* or *Slimming World*—met the inclusion criteria and few economic evaluations have been published.¹⁰⁹ Long term decreases in body weight in the general population may need national or local initiatives aimed at the social and environmental conditions that contribute to increasing levels of obesity.¹¹⁰ However, no reliable studies of such policies were identified.

PREVENTION

Only one preventive trial in children¹² and three in adults were found (table).¹³⁻¹⁵ Family treatment (defined as a model of treatment aimed at involving the family) was shown to be more effective in preventing the progression of obesity in 10-11 year olds than conventional dietary and exercise treatments or no intervention.¹²

The prevention of adult obesity was considered by three community studies which made comparisons with no-intervention control groups. Both those using an educational programme alone¹³ and those with added financial incentives¹⁴ resulted in reduced average weight gain. The trial of social learning and communication skills, however,¹⁵ failed to show any benefit.

TREATING CHILDHOOD OBESITY

Eleven trials evaluating treatments of children with obesity were found.¹⁶⁻²⁶ All had fewer than 40 participants in each group, and six were carried out by a single research group.^{18-20 23 24 26}

Two trials, both of good quality, suggest that an effective strategy is to use interventions designed to reduce sedentary behaviour (table).^{21 26} The "Shapedown" programme consisted of various cognitive, behavioural, and affective techniques adapted to make successive small sustainable modifications in diet, exercise, and communication; restrictive diets

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Table 1 Summary of key studies in selected areas*

Author (year), design	Participants, interventions, sample size	Key long term results
The prevention of childhood obesity:		
Flodmark <i>et al</i> (1993) ¹² Sweden, RCT, 14-18 month intervention	Swedish children (10-11 years old) identified in a school screening programme for obesity (BMI >23 kg/m ² , mean = 25.1 kg/m ²). Group 1 family treatment - conventional treatment (diet counselling + encouragement to exercise) and family treatment (n=25). Group 2 conventional treatment (n=19). Group 3 untreated control group (n=50). Groups' BMI comparable at baseline	At 1 year postintervention follow up. Family treatment group showed smaller increase in BMI than control group (5.1% v 12.0%, P=0.02) and fewer children with severe obesity (5% v 29%, P=0.02). No differences between conventional and control groups were significant. Attrition. No data on dropouts recorded. Analysis carried out on an intention to treat basis
The prevention of obesity in adults:		
Forster <i>et al</i> (1988) ¹⁴ USA, RCT, 1 year community based intervention	Participants < 115% of ideal weight from the Minnesota Heart Health Programme. Group 1 monthly newsletter including information relevant to weight control, participants recorded weight each month, financial incentive. Optional education course (n=108). Group 2 no treatment control (n=111), groups comparable at baseline except for the proportion involved in previous weight control programmes (18% in treatment group and 30% in control group)	Mean weight change adjusted for height (SE) 1 year posttreatment. Group 1 -0.95 (0.27) kg. Group 2 -0.14 (0.27) kg (P=0.03). 82% of the treatment group and 56% of the controls maintained or lost weight over the 1 year intervention (P< 0.0001). Estimated annual net cost of the programme was \$35 per participant. Attrition. Group 1 6.5%. Group 2 2%, dropouts were excluded from the analysis
Taylor <i>et al</i> (1991) ¹³ USA, 4 surveys of random households and a cohort in reference and intervention cities, 6 year intervention	Participants in the Stanford 5 cities project aged 12-74 years. Group 1 two intervention cities - an extensive education programme using mass media, direct mailing, classes, seminars, and school curricula. Mean BMI=25.2 kg/m ² (n=885). Group 2 two control cities - no intervention. Mean BMI=24.8 kg/m ² (n=784), mean baseline BMI significantly lower in the control cities (P=0.03). Groups also differ with regard to ethnicity	Survey results. BMI change (SE), baseline to year 6. Group 1 = 0.57 (0.22). Group 2 = 1.25 (0.23) (P<0.05). Cohort results. No significant effects of treatment on BMI. All groups gained weight, cohort response rates 56-70%
Treating childhood obesity - reducing sedentary behaviour:		
Mellin <i>et al</i> (1987) ²¹ USA, RCT, 3 month intervention, 1 year follow up	12-18 year olds (15.6 years mean) recruited through local papers and notices to physicians and schools. Group 1 Shapedown programme: Self directed change format encouraging adolescents to make sustainable small modifications in diet, exercise, lifestyle, and attitudes (n=37, relative weight 136.5%). Group 2 no treatment control (n=29, relative weight 129.5%), groups comparable at baseline	Relative weight loss (SD) at 1 year follow up compared with baseline. Group 1 -9.9 (14.98)% (P<0.01). Group 2 -0.1 (13.2)% (NS). Attrition. Overall rate was 16%, data were analysed on an intention to treat basis
Epstein <i>et al</i> (1995) ²⁶ USA, RCT, 4 months of weekly treatment, followed by bimonthly meetings up to 1 year	Obese 8-12 year olds (10.1 years mean age) recruited through radio announcements, TV commercials, and direct referrals who were 20-100% overweight (mean = 52%), neither parent greater than 100% overweight, one parent willing to attend meetings. A traffic light diet was used with children and parents (1000-1200 kcal/day). 61 families entered treatment, group size not reported. Group 1 sedentary group: reinforced decreasing the amount of time they engaged in certain sedentary activities. Group 2 exercise group: reinforced increasing physical activities. Group 3 combined group: both of the above. Groups comparable at baseline	Mean change in % overweight at 1 year. Group 1 -18.7%. Group 2 -10.3%. Group 3 -8.7%, significant reductions in body fat between the sedentary (-4.7%) and exercise groups (-1.3%) at 1 year (P<0.05). Attrition. Overall rate was 9.8%, dropouts were excluded from the analysis
Behavioural interventions with a dietary component:		
Wadden <i>et al</i> (1986) ³² USA, 6 months intervention, 12 months follow up	Subjects at least 25 kg overweight recruited by newspaper ads (mean baseline weight around 109 kg). Group 1 very low calorie diet alone. Month 1 1000-1200 kcal, months 2 and 3 400-500 kcal, month 4 return to conventional foods (n=15). Group 2 standard behavioural treatment alone. 1000-1200 kcal diet throughout. Taught traditional behaviour methods of weight control (n=16). Group 3 very low calorie diet + standard behaviour treatment. As for Group 1 plus extra two months 1000-1200 kcal diet. Extensive behaviour treatment (n=19). Groups comparable at baseline for age, height, weight and percentage overweight	Mean weight change (SD) at 1 year follow up. Group 1 -4.7 (7.3) kg. Group 2 -9.5 (6.7) kg. Group 3 -12.9 (9.3) kg, weight loss for the combined treatment was significantly greater than that for diet alone (P<0.05). Men lost more than women both at posttreatment and at one year follow up. Attrition. Group 1 0%. Group 2 0%. Group 3 10.5%, dropouts were excluded from the analysis
Wadden <i>et al</i> (1989) ³³ USA, 6 months intervention, 1 and 5 years follow up	Adult women, screened to eliminate any contraindications to VLCD (mean baseline BMI (SD) = 39.4 (0.8) kg/m ²). Group 1 very low calorie diet alone (n=23). Group 2 behaviour treatment alone (n=22). Group 3 very low calorie diet plus behaviour (n=31). Groups 1 and 3 were given a 400 - 500 kcal/day diet for 2 months and 1000 - 1200 kcal for the remainder of treatment. Group 2 received 1200 kcal diet for the entire 6 months. No data on group comparability	Mean (SD) weight change at 1 and 5 years. Group 1 -4.7 (1.0) kg. Group 2 -6.6 (2.7) kg. Group 3 -10.6 (2.9) kg, effect significant (P<0.05) at 1 year, with the two behavioural treatments superior to diet alone. No significant differences between groups at 5 years. 64% regained all weight lost. 5% maintained all weight loss. Attrition. Overall rate was 14.6%, evenly distributed across the conditions
Wing <i>et al</i> (1996) ⁵⁸ USA, 26 week intervention, 1 year follow up	Healthy women, 15-55 years, not pregnant, were recruited (mean baseline BMI = 32 kg/m ²). Group 1 standard behavioural treatment only (n=40). Group 2 standard behavioural treatment plus written meal plans and weekly grocery list (n=41). Group 3 as for group 2 plus food provision. Cost of food shared by participants (n=41). Group 4 as for Group 3 except that food provided free of charge (n=41). Groups were comparable at baseline	Mean weight change at 1 year follow up compared to baseline. Group 1 -3.3 kg. Group 2 -6.9 kg. Group 3 -7.5 kg. Group 4 -6.6 kg. Weight loss for group 1 was significantly smaller than those in groups 2-4 (P<0.02). Attrition. 12% by the 1 year follow up. No significant differences in dropout rates between groups
Maintenance of weight loss:		
Perri <i>et al</i> (1984) ⁹³ USA, 14 weeks weight loss programme, 21 month maintenance intervention	Healthy adults, aged 21-60 years receiving an initial behavioural weight loss programme. Maintenance interventions. Group 1 standard behavioural treatment plus booster sessions with therapist (n=26). Group 2 standard behavioural treatment plus multicomponent programme, including the formation of peer groups (n=30). Groups were comparable at baseline for weight and percentage overweight	Mean (SD) weight change at 21 months. Group 1 -0.4 (3.6) kg. Group 2 -4.5 (7.0) kg, significant between group difference in maintenance of weight loss (P<0.01). Attrition. 23% by the end of the 21 month maintenance programme (all dropouts were from group 1, significant between group difference, P<0.05). Dropouts excluded from analysis
Perri <i>et al</i> (1988) ⁹⁴ USA, 20 weeks weight loss programme, 26 weeks maintenance programme, 12 month follow up (from end of maintenance programme)	Healthy adults, 22-59 years, who received an initial 20 week behavioural weight loss programme (mean baseline weight of treatment groups around 97 kg) Maintenance interventions. Group 1 control: no further contact with therapists (n=21, mean baseline weight 89 kg). Group 2 continued contact: fortnightly behavioural sessions focusing on a problem solving approach (n=25). Group 3 social influence maintenance: as for group 2 with addition of monetary group contingencies for programme adherence, participant led lectures, and peer support (n=25). Group 4 exercise: as for group 2 plus an aerobic exercise maintenance regime (n=26). Group 5 combined: combination of continued contact, social influence and exercise as described above (n=26). Comparability of groups at entry to maintenance programme was not reported	Mean (SD) weight change at end of 18 month follow up. Group 1 -3.6 (6.2) kg. Group 2 -11.4 (12.1) kg. Group 3 -8.4 (7.5) kg. Group 4 -9.1 (6.4) kg. Group 5 -13.5 (15.2) kg, significant by better maintenance of weight loss when groups 2-5 were compared with group 1 (P<0.01). Attrition. 23% during initial weight loss intervention. No significant differences in attrition rates. Dropouts not included in the data analysis
Kramer <i>et al</i> (1986) ⁹⁵ USA, 1 year maintenance programme following a 15 week weight loss programme	Healthy adult participants who had lost at least 10% of their body weight after a 15 week behavioural weight loss programme Maintenance interventions. Group 1 control: no contact with therapists except for assessment at 1 year and an interim reminder letter (n=28). Group 2 skills focus: attended monthly meetings for 1 year, during which subjects were trained in dietary and exercise behaviours to produce weight loss maintenance (n=28). Group 3 weight focus: attended monthly meetings for 1 year, during which subjects were trained in the use of problem solving strategies (n=29), financial incentive contracts were used in all groups, both during the weight loss and maintenance phases, whereby money was refunded at different stages in accordance with successful weight related outcomes. Groups were reported to be comparable at baseline and at the start of the maintenance programme	Mean (SD) weight change at end of 1 year maintenance programme. Group 1 -8.0 (8.2) kg. Group 2 -7.0 (5.9) kg. Group 3 -8.5 (7.0) kg, all groups had regained about 40% of initial weight loss by the end of the maintenance intervention. No significant differences. Percentage of subjects maintaining original weight loss. Group 1 18%. Group 2 14%. Group 3 32%. Attrition. 2 dropped out, excluded from the analysis
Perri <i>et al</i> (1984) ¹⁰⁰ USA, 15 week intervention, 1 year follow up	129 participants (numbers per group not given). Group 1 non-behavioural treatment plus no further contact. Group 2 behaviour treatment plus no further contact. Group 3 behaviour treatment plus relapse prevention training plus no further contact. Group 4 non-behavioural treatment plus post-treatment contact by mail and phone. Group 5 behaviour treatment plus post-treatment contact by mail and phone. Group 6 behaviour treatment plus relapse prevention training plus post-treatment contact by mail and phone. Groups' weight and percentage overweight comparable at baseline	Weight change (SD) at 1 year follow up. Group 1 -3.15 (4.76) kg. Group 2 -6.27 (6.1) kg. Group 3 -2.96 (3.60) kg. Group 4 -6.15 (5.00) kg. Group 5 -5.76 (4.16) kg. Group 6 -10.3 (11.39) kg. Attrition. 22% attrition rates did not differ significantly between groups. Subjects who dropped out did not differ from subjects who completed treatment
Stevens <i>et al</i> (1993) ¹⁰⁴ USA, 18 month intervention/maintenance	Adult participants, 30 to 54 years, with diastolic blood pressure of 80-89 mm Hg (mean BMI (SD) 29.5 (2.8)). Group 1 intervention consisted of 14 weekly group meetings followed by monthly maintenance sessions giving training in behavioural self-management techniques (n=308). Group 2 controls, received usual care (n=256). Groups were comparable at baseline	After 18 months, 45% of the men and 26% of women in the intervention group had met their weight loss goal of 4.5 kg, compared with 12% and 18% of the control group. The difference in weight loss between the intervention and control groups (mean(SE)) at 18 months was 3.9 (0.4) kg overall (P<0.001), 4.7 (0.5) kg for men, and 1.8 (0.8) kg for women (P<0.01). Attrition. overall 7.1%

* Details of all trials included in the review are available.¹¹

RCT = randomised control trial; VLCD = very low calorie diet.

were avoided, and parents were trained to support their children's weight loss efforts.²¹ Epstein *et al*²⁶ found that behaviour modification based on reinforcement (using rewards), aimed at reducing sedentary activity—for example, watching television, playing computer games—was more effective than reinforcing increased physical exercise, or a combination of these interventions.

No long term benefit for weight loss in children was found by the addition of controlled exercise to diet.²⁰ There is conflicting evidence over the effectiveness of treating obese parents and children together, and the involvement of parents in children's treatment programmes. The value of parental involvement may be greater for the treatment of younger children (5–8 year olds).¹⁹

TREATING ADULT OBESITY

Reliable evaluations of dietary, exercise, or behavioural approaches, either alone or in combination, and pharmacological and surgical treatments were found.

Behavioural interventions alone

Behavioural techniques such as conditioning and managed reinforcement, based on the idea that much behaviour is learned and reinforced by particular social circumstances, are commonly used for the management of obesity.¹¹¹ Thirteen randomised controlled trials evaluated various behavioural approaches to the treatment of obesity in adults,^{27–38 40} five of them examined cognitive treatment.^{31–35} Overall, there is little reliable evidence that behavioural treatments by themselves are effective.

One study provided evidence that cue avoidance (of situations that provide the temptation to overeat) is more effective than cognitive approaches involving role play to rehearse resisting overeating, or social pressure.³² One study showed that daily weight charting increased the effectiveness of a behavioural programme.³⁸ There is no evidence of a difference between long term effects of individual and group treatment.³⁶

Behavioural interventions with an exercise component

Four trials evaluated exercise in conjunction with behavioural weight loss programmes.^{41–44} Supervised aerobic exercise sessions resulted in more sustained weight loss than the provision of exercise education,⁴³ although light exercise, such as callisthenics and stretching, was shown to be just as effective as moderate aerobic exercise and the combination of diet and exercise may be more beneficial for weight loss than diet alone.⁴⁴

Dietary interventions alone

Only two studies assessed diet alone. These indicate that fibre supplements were more effective than placebo at increasing weight loss when given in conjunction with a 1200–1600 kcal/day diet,⁴⁶ although this does not seem to lead to a greater mean weight loss than a low fibre and low calorie diet.⁴⁵

Dietary interventions with a behavioural component

Most studies of diet (12 randomised controlled trials) included a behavioural component.^{47–56 58 59} Two trials assessing very low calorie diets and standard behavioural treatment showed that these combined strategies were more effective than diet alone (table).^{52 53} Standard behavioural treatment combined with the provision of meal plans and grocery lists produced significantly greater weight loss than standard behavioural treatment alone (table).⁵⁸

Pharmacological interventions

Fourteen studies examining pharmacological interventions were included in the review,^{60–73} most studies evaluating drugs which aim to reduce energy intake, in particular the selective serotonin agonist dextfenfluramine. Pooling the results of four randomised placebo controlled trials (including a 24 site multicentre randomised controlled trial)⁶⁰ shows a significantly greater reduction in weight loss at one year in those receiving dextfenfluramine (–2.6 kg, 95% confidence interval (95% CI) –3.8 to –1.3).^{60–63} However, a three group randomised controlled trial found no significant difference between a group receiving dextfenfluramine (15 mg twice a day for three months) combined with one year of nutritionist consultations and groups receiving nutritionist consultations alone (either at home or in a clinic) and behavioural treatment.⁷²

The combination of fenfluramine (a variant of dextfenfluramine) and a sympathomimetic drug (phentermine) has only been evaluated in placebo controlled trials of short duration.^{69 112}

Side effects, such as gastrointestinal disturbances, have been found in those taking centrally acting appetite suppressants; however, these effects are usually not severe and are transient. The risk of pulmonary hypertension has been shown to increase when such treatment is used for a total period of more than three months.¹¹³ However, the absolute risk is still very low.¹¹⁰ The availability of appetite suppressants has led to a “drug frenzy” in the United States.¹¹⁰ It is important that antiobesity medication is used cautiously in carefully selected obese patients, and only as an adjunct to diet and lifestyle management.^{3 110}

Two new drugs in this area, sibutramine and orlistat, are presently under study. Sibutramine is a serotonin and noradrenergic reuptake inhibitor, whereas orlistat works by reducing the absorption of dietary fat through the inhibition of triglyceride hydrolysis. A multicentre double blind randomised controlled trial of sibutramine showed weight loss during the first six months, with weight remaining stable for the next six months but with only around 1.5–2.5 kg extra weight loss compared with placebo at 12 months.⁷³

Surgical interventions

Surgical treatment is normally considered only in people with morbid obesity (body mass index >40) because it is associated with a higher risk of premature death and when less

invasive methods of weight loss have failed.¹¹⁴⁻¹¹⁶

Fifteen studies of surgery met the inclusion criteria, examining gastric bypass, gastroplasty, jejunoileal bypass, gastrogastrostomy, and the gastric balloon.⁷⁴⁻⁸⁸ Jejunoileal bypass, vertical banded gastroplasty, and gastric bypass have all been found to produce a significant weight loss. However, the jejunoileal bypass procedure is associated with long term complications, arising as long as 10 or 15 years after surgery, and is no longer recommended. Six out of the seven randomised controlled trials showed gastric bypass to result in low early postoperative mortality and more weight loss one year postoperatively (about 45–65 kg) than gastroplasty (about 30–35 kg).^{75 76 78 79 83 85 86}

In general the weight loss associated with surgical interventions is greater and more sustained than that achieved by non-surgical methods. Surgery for obesity, however, is associated with complications and morbidity—such as revision of the initial surgery, vitamin and mineral deficiencies due to the modification in gut absorption processes, associated mortality, feeling of fullness, dizziness, and a desire to lie down after eating (dumping syndrome), and faintness, nausea, and vomiting. Due to the complexity of the techniques used only surgical teams which can show experience and a good record (using data from long term follow up) should be allowed to conduct this type of surgery. A large non-randomised matched controlled trial is being undertaken in Sweden that will compare the effect of different surgical and non-surgical interventions on long term weight loss, comorbidity, quality of life, and costs.¹¹⁷

MAINTENANCE OF WEIGHT LOSS

Despite the effectiveness of several interventions in promoting short term loss, weight regain is common. It is important therefore, to assess the effectiveness of strategies for the maintenance of weight loss. These may be in the form of interventions specifically for maintenance or comprehensive integrated treatment and maintenance regimes.

Ten trials were identified that specifically evaluated interventions to maintain weight loss. Seven of these were concerned with behavioural programmes, mainly looking at continued contact.⁸⁹⁻⁹⁵ The evidence from these trials is conflicting.

One of these studies found that a combination of maintenance interventions led to a significantly greater amount of sustained weight loss when compared with a no maintenance control (table).⁹⁴ Another showed that adding self help peer groups to therapist led maintenance programmes improved maintenance over a 21 month period (table).⁹³ More people maintained initial weight loss when participating in a weight focus group (32%), compared with skills focus training (14%), and no treatment (18%) (table).⁹⁵

Only one study investigated the role of pharmacological interventions in the maintenance of weight loss.⁷¹ The drug, sertraline (a selective serotonin reuptake inhibitor), did no

better than placebo in terms of weight loss or fat free mass, when given alongside relapse prevention training for a period of 54 weeks.

Combined treatment and maintenance programmes were evaluated in 11 trials.⁹⁸⁻¹⁰⁸ The combination of behavioural treatment, relapse prevention training, and continued therapist contact by post and telephone was shown to be one of the most effective with patients maintaining their original weight loss (10 kg) throughout the 12 month maintenance period (table).¹⁰⁰

In people who were both overweight and hypertensive, self management techniques and lifestyle changes followed by continued therapist contact during the maintenance phase resulted in greater sustained weight loss than a “usual care” control treatment (table).^{104 108}

Conclusions

Primary healthcare teams need to be more active in developing coordinated programmes of identification and active long term management of high risk and overweight people.

Several preventive and treatment strategies have been shown to be effective in reducing levels of obesity. Progression of obesity in high risk children may be prevented by family treatment and in adults by community based education linked with financial incentives. Interventions to reduce sedentary behaviour in children can also reduce overweight.

Behavioural, dietary, exercise, and drug treatments have all been shown to be effective to some extent in treating adult obesity, especially when used in combination. Because most people begin to regain weight lost a few months after treatment, longer follow up and use of maintenance strategies (such as self help groups) should be an integral part of any weight loss programme. Surgery may have a role in the treatment of morbidly obese people.

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