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Psychological interventions for overweight or obesity — Source link

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Published on: 06 May 2014 - Cochrane Database of Systematic Reviews (John Wiley & Sons, Ltd)

Topics: Weight loss, Behaviour therapy, Cognitive therapy, Relaxation Therapy and Cognitive behavioral therapy

Psychological interventions for overweight or obesity (Review)

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This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2005, Issue 2

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[Intervention Review]

Psychological interventions for overweight or obesity

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Editorial group: Cochrane Metabolic and Endocrine Disorders Group.
Publication status and date: Edited (no change to conclusions), published in Issue 1, 2009.
Review content assessed as up-to-date: 29 June 2003.

Citation: Shaw KA, O'Rourke P, Del Mar C, Kenardy J. Psychological interventions for overweight or obesity. *Cochrane Database of Systematic Reviews* 2005, Issue 2. Art. No.: CD003818. DOI: 10.1002/14651858.CD003818.pub2.

ABSTRACT

Background

Overweight and obesity are global health problems which are increasing throughout the industrialised world. If left unchecked, they will continue to contribute to the ever increasing non communicable disease burden.

Objectives

To assess the effects of psychological interventions for overweight or obesity as a means of achieving sustained weight loss.

Search methods

Studies were obtained from searches of multiple electronic bibliographic databases.

Selection criteria

Trials were included if the fulfilled the following criteria: 1) they were randomised controlled clinical trials of a psychological intervention versus a comparison intervention, 2) one of the outcome measures of the study was weight change measured by any method, 3) participants were followed for at least three months, 4) the study participants were adults (18 years or older) who were overweight or obese (BMI > 25 kg/m^2) at baseline.

Data collection and analysis

Two people independently applied the inclusion criteria to the studies identified and assessed study quality. Disagreement was resolved by discussion or by intervention of a third party. Meta-analyses were performed using a fixed effect model.

Main results

A total of 36 studies met the inclusion criteria and were included in the review. Overall, 3495 participants were evaluated. The majority of studies assessed behavioural and cognitive-behavioural weight reduction strategies. Cognitive therapy, psychotherapy, relaxation therapy and hypnotherapy were assessed in a small number of studies. Behaviour therapy was found to result in significantly greater weight reductions than placebo when assessed as a stand-alone weight loss strategy (WMD -2.5 kg; 95% CI -1.7 to -3.3). When behaviour therapy was combined with a diet / exercise approach and compared with diet / exercise alone, the combined intervention resulted in a greater weight reduction. Studies were heterogeneous however the majority of studies favoured combining behaviour therapy with dietary and exercise interventions to improve weight loss. Increasing the intensity of the behavioural intervention significantly increased

the weight reduction (WMD -2.3 kg; 95% CI -1.4 to - 3.3). Cognitive-behaviour therapy, when combined with a diet / exercise intervention, was found to increase weight loss compared with diet / exercise alone (WMD -4.9 kg; 95% CI -7.3 to - 2.4). No data on mortality, morbidity or quality of life were found.

Authors' conclusions

People who are overweight or obese benefit from psychological interventions, particularly behavioural and cognitive-behavioural strategies, to enhance weight reduction. They are predominantly useful when combined with dietary and exercise strategies. The bulk of the evidence supports the use of behavioural and cognitive-behavioural strategies. Other psychological interventions are less rigorously evaluated for their efficacy as weight loss treatments.

PLAIN LANGUAGE SUMMARY

Psychological interventions for overweight or obesity

Several psychological methods are used to try and help people who are overweight or obese to lose weight. This review found that cognitive behaviour therapy and behaviour therapy significantly improved the success of weight loss for these people. Cognitive therapy was not effective as a weight loss treatment. There was not enough evidence to reach a conclusion about other psychological forms of therapy, such as relaxation therapy and hypnotherapy, however the evidence that is available suggests that these therapies may also be successful in improving weight loss. No data on mortality, morbidity or quality of life were found.

BACKGROUND

Description of the condition

Obesity

Obesity is a condition of excess body fat (NHMRC 1997). It has been variously defined. Using body mass index (BMI = weight (kg) / height $(m)^2$) as a measure of adiposity, in most countries obesity is defined as a BMI more than 30, and overweight as a BMI of 25 to 30. However, measures of obesity and overweight do vary according to country and ethnic group (NHMRC 1997). The prevalence of obesity continues to increase in Western countries where approximately half of the population is currently overweight (Birmingham 1999). Both environmental and biological factors have been identified which predispose individuals to becoming obese.

Obesity and the environment

There is no doubt that obesity is strongly influenced by environmental factors. The prevalence of obesity has increased rapidly in Western countries - too rapidly for this to be due to biological factors alone (WHO 1998). Environmental factors which influence development of overweight and obesity are both macro-environmental (affecting the whole population) and micro-environmental (affecting the individual). Social and cultural factors also play a part. Anthropological studies have identified numerous changing factors which affect the prevalence of obesity in different cultures. Throughout history humans have been active in the process of survival - hunter gathering, farming food, collecting fuel and participating in manufacture and commerce. The technology of today has reduced much of the need for human movement. These changes have occurred gradually and have occurred as the prevalence of obesity has increased worldwide (DHAC 2001).

Population activity levels have been affected by social policy and government (NHS 1993). As a result of increased use of motor vehicles, pedestrian safety has been compromised, reducing the use of walking and cycling as alternative forms of transportation (NHS 1993). Fewer 'green' areas (e.g. parks and fields) within high density urban populations reduces the available facilities for recreational activities such as walking, ball games, skating, and cycling (WHO 1998). Modernisation has resulted in a proliferation of our food supply as well as changing our levels of physical activity. Food supply, storage, availability, and price all determine the eating patterns of populations (Lester 1994). The industrialization of food production, improvements in food preservation techniques and the development of supermarkets, snack and ready-to-eat foods and fast foods, have altered and expanded the range of foods avail-

able in many countries. There has also been an increase in supply of foods that are high in fat (Lester 1994). High fat food consumption has increased dramatically as these foods are often cheaper and more readily available than healthier alternatives. Similarly, high fat 'junk' foods are supplied in a wider variety of settings e.g. school canteens and workplaces, increasing levels of consumption compared to nutritious low-fat alternatives (NHS 1993).

Socio-cultural factors affect food consumption. Advertising of processed, higher fat foods is more common than advertising for nutritious foods. This negative health message encourages the consumption of unhealthy foods thereby negatively influencing population eating habits (Dietz 1985). Customs particular to different cultures also affect eating habits. Celebrations often centre around the consumption of excess quantities of high-calorie, low nutritional value foods (Egger 1997). Easter tide, thanksgiving, birthday parties, weddings and Christmas celebrations are examples of such celebrations involving food in many countries. Social trends towards families where parents are in the workplace rather than in the home have resulted in a reduction in time available for meal preparation with a corresponding increased consumption of convenience food and take-away food (Bryce 2001; Schneider 1997).

Biological determinants of obesity

In contrast to the environmental determinants of obesity, the biological determinants of obesity are still incompletely understood. The pattern of inheritance of obesity strongly suggests it is a polygenic condition, with many different genes making a small difference in effect on weight (Ravussin 2000). As a phenotype obesity is heterogeneous, with two distinct but overlapping subtypes: general obesity and abdominal obesity, each with different physiological, clinical and prognostic implications. Abdominal obesity is associated with greater health risk than general obesity (Sørensen 2001). Gender also influences development of obesity. In the majority of prevalence studies obesity is found to be more common in women than in men. There are numerous social and biological theories as to why this is the case. Men have higher metabolic rates and larger ratios of lean body mass, which is more metabolically active, than women. Also, males are more likely to be physically active than women. This means that men burn more calories per kilogram than women, reducing their rate of weight gain if they overeat. Binge eating and compulsive overeating, both of which contribute to the development of obesity in certain individuals, are more common in women than in men (French 1994). The age at which excess bodyweight develops also influences the pattern of obesity throughout the life of the individual. If obesity develops in childhood, the risk of obesity into adulthood is increased compared to people of normal weight. Social and cultural norms regarding dietary restraint and attitudes towards overweight, acquired in childhood, influence adult behaviours and contribute to development of obesity (Power 2000). Also, because of the relative increase in the number of fat cells that occurs when weight is gained in childhood compared to adulthood, the obese child is predisposed to continuing obesity throughout life. In contrast, when weight is gained in adulthood the first adaptive change in fat cells is increase in cell lipid stores as opposed to increases in cell numbers. However, as weight continues to increase, cell numbers will increase as well as cell size (Brownell 1986b).

Health effects of obesity

Obesity contributes to the development of a number of diseases, including hypertension, hyperlipidemia, diabetes mellitus, osteoarthritis, and psychological problems (Karlsson 1997; Narbro 1997). There is also an increase in all-cause mortality in obese people. The relationship between excess mortality and obesity is not straightforward. It varies with factors such as age (smaller excess mortality with increasing age) (Bender 1999), gender (smaller excess mortality in women than men) (Bender 1999) and level of physical fitness (Lee 1999). A number of large longitudinal studies have examined the relationship between obesity, disease and mortality. In 1979, Lew and Garfinkel published the American Cancer Society study (Lew 1979). This study followed 340,000 men and 420,000 women aged between 38 and 89 years for an average of 13 years. Mortality ratios (MR) were calculated for a number of conditions. Mortality ratios for obese people compared to people of normal weight were demonstrated to be increased for diabetes (MR 25.0), coronary disease (MR 4.0), cerebrovascular disease (MR 5.0), colon cancer (MR 1.7), prostate cancer (MR 1.3), gall bladder cancer (MR 3.6), breast cancer (MR 1.5), cervical cancer (MR 2.4), endometrial cancer (MR 5.4) and ovarian cancer (MR 1.6). In the Framingham study, obesity was demonstrated to be related to increased mortality and morbidity even after controlling for diabetes, hypertension, and lipids (Hubert 1983). Hoffmans and colleagues demonstrated a U-shaped relationship between mortality and body mass index in 78,000 Dutch men undergoing compulsory military examination at age 18 years and followed for 32 years. This relationship was demonstrated after 20 years of follow-up. The all-cause mortality ratio between obese people and controls was 1.95 in this study. Smoking was not controlled for Hoffmans' trial (Hoffmans 1988). Rissanen and colleagues also observed a U-shaped relationship between mortality and body mass index in their Finnish study of 23,000 men aged over 25 years followed for 12 years. Smoking was controlled for in this study. The all-cause mortality ratio in obese people compared to controls was 1.5 (Rissanen 1989). Manson and colleagues reported on 116,000 United States nurses followed for eight years. The endpoints in this study were myocardial infarction and fatal coronary events. The mortality ratio among obese women was 2.5 without controlling for smoking, and 3.5 after adjusting for smoking (Manson 1990). Perhaps the largest study of the relationship between obesity and mortality was the Norwegian Experience. This was a compulsory x-ray examination of all of the citizens of Norway over 15 years of age. The study, conducted

between 1967 and 1975 was designed to detect tuberculosis in citizens, but weight and height were also registered. All counties except for two in Norway were examined. Approximately 85% of the countries population were included, a sample of 816,000 men and 902,000 women. People were followed for 10 years. During this time there were 177,000 deaths. Results demonstrated an exponential increase in all-cause mortality as body mass index increased. All-cause mortality was doubled in people aged 40-50 years with a body mass index of 34 (male) and 38 (female) compared to normal weight controls (Waaler 1984).

Description of the intervention

Weight loss in obese people

Diet, exercise and psychological strategies are potentially effective weight loss interventions in adults (NHLBI 1998). Weight loss studies generally demonstrate short term weight loss (several months) only with these strategies, with most of the weight initially lost regained within a few years. The benefits of weight loss in obese people have been demonstrated in short-term studies, which show reduction in cardiovascular risk factors and improved psychological outcomes (Garrow 1988). Modest weight loss of about 10% results in improvement in blood glucose and triglycerides as well as improved physical performance and well-being. Greater loss of weight gives greater benefit (Wilding 1997). Evidence suggests that weight loss reduces blood pressure in both overweight hypertensive and normotensive individuals, reduces serum triglycerides and increases high-density lipoprotein (HDL)-cholesterol, and produces some reduction in total serum cholesterol and low-density lipoprotein (LDL)-cholesterol. Weight loss reduces blood glucose levels in overweight and obese persons with and without diabetes (Despres 1994). In obese people regular physical activity reduces rates of coronary heart disease, hypertension, non-insulin dependent diabetes mellitus even if no weight is lost (Powell 1996). Controlled studies assessing the effect of sustained weight loss on mortality are lacking. However, some indicative information is available. Analysis of insurance data regarding individuals who had initially received sub-standard insurance because of obesity but who subsequently issued policies when they had reduced weight demonstrates a mortality of weight-reduced people approaching the standard risk (Marks 1960; Metropolitan 1980). Although there have been no prospective trials to show changes in mortality with weight loss in obese patients, reductions in risk factors may imply that development of type 2 diabetes mellitus and cardiovascular disease would be reduced with weight loss. From risk factor changes induced by spontaneous weight reductions in the Framingham study, it has been estimated that a 10% reduction in body weight would correspond to a 20% reduction in the risk of developing coronary artery disease (Ashley 1974).

Psychological aspects of obesity

There has been considerable effort to find personality variables associated with obesity, however there is no evidence that obese people differ psychologically from non-obese people. There is no difference between obese and non-obese people in the following characteristics: degree of depression (Stewart 1983), the incidence of psychopathology (Friedman 1995; Stunkard 1992), social adjustment (Sallade 1973), 'traits' of masculinity-femininity, locus of control, assertiveness and self-consciousness (Klesges 1984) and personality type (Blackmeyer 1990). However, obese people in general do not find their state desirable. For example, in a sample of formerly obese people who had undergone gastric surgery, Rand and MacGregor (Rand 1991) found that all of the 47 participants who were interviewed would rather be deaf, dyslexic, diabetic, or suffer bad heart disease or acne than return to being morbidly overweight. Forty-two percent preferred blindness to obesity, and 43 participants would rather have a leg amputated. This dislike of obesity felt by sufferers may reflect stigmatisation by others in the population. Diverse groups hold negative stereotypes of obese people. Boys between six and ten years old rate silhouettes of obese boys as someone who would fight, cheat, get teased and lie, and who was lazy, sloppy, naughty, mean, ugly, dirty and stupid (Staffieri 1967). Studies of adult attitudes similarly demonstrate negative attitudes. Adult hospital outpatients rate silhouettes of an overweight child as less likeable than a child with a deformed leg, with a missing hand, with a facial deformity, or who was confined to a wheelchair (Maddox 1968). Similarly, doctors and medical students hold negative views of people who are obese. Medical students rate overweight women as less likeable, more emotional, and less likely to benefit from treatment. Doctors rate overweight patients as weak-willed, ugly and awkward (Bretyspraak 1977; Maddox 1969). Job prospects are also affected. Larkin and Pines (Larkin 1979) showed that overweight candidates were less likely to be hired, even though equally competent on job-related tests. Given these negative attitudes, it is surprising that obese people are not more likely to be depressed or to have psychopathology. Because studies comparing obese and non obese persons have generally failed to find differences in global aspects of psychological functioning, the resulting conclusion has been that obesity is not a risk factor for psychological problems. This is at odds with clinical impression, reports from overweight people, and a consistent literature showing strong cultural bias and negative attitudes toward obese people (Friedman 1995). It is clear that obesity confers negative consequences on both the physical and psychosocial aspects of quality of life, especially among the severely obese. Therefore the lack of evidence supporting the existence of psychological morbidity in obese people is likely to be a reflection of the limitations of studies performed to date rather than an accurate reflection of the psychological well-being of individuals who are obese. Also, studies which demonstrate that the effects of weight loss appear to be psychologically favourable with improved self-esteem, social functioning and sense of wellness support the notion that excess

weight is associated with higher levels of psychological morbidity than normal weight (Kushner 2000).

Psychological interventions

A variety of individual and group psychological therapies have been used in weight loss treatments. These are briefly outlined below. Behavioural and cognitive behavioral therapies are the most commonly used psychological therapies for weight loss. Attitude and relationship techniques are also often utilized in designing comprehensive psychological interventions for individualized weight loss programs. Psychotherapy is less commonly used (Brownell 1984).

Behaviour therapy and cognitive behaviour therapy appear to be the psychological treatments of choice inasmuch as they have been demonstrated to facilitate better maintenance of weight loss than other therapies. Behavioural treatments appear to work primarily by enhancing dietary restraint by providing adaptive dietary strategies and by discouraging maladaptive dietary practices, and by increasing motivation to be more physically active. Therapy aims to provide the individual with coping skills to handle various cues to overeat and to manage lapses in diet and physical activity when they occur. Treatment also provides motivation essential to maintain adherence to a healthier lifestyle once the initial enthusiasm for the program has waned (Wing 1994). Therapeutic techniques derived from behavioural psychology include stimulus control, goal setting, and self-monitoring. They have been used for some time as adjuncts to the treatment of weight problems.

When cognitive techniques are added to behaviour therapy they appear to improve program success and reduce weight regain (Cooper 2001). These strategies are aimed at identifying and modifying aversive thinking patterns and mood states to facilitate weight loss (Wilson 1999). Interest in using cognitive behaviour therapy to achieve more modest and sustainable weight loss and improved psychological well-being is increasing.

Psychodynamic therapies (therapies based on the idea that problems stem from hidden inner conflicts, e.g. psychoanalysis), humanistic therapies (therapies that focus on helping clients to find meaning in their lives and live in ways consistent with their own values and traits, e.g. person-centred therapy) and group therapies have also been trialled in obesity management with mixed success (Baron 1998).

Group treatments for obesity combine therapy and education. They are widely used in commercial programmes and in self-help programs. Group treatments do not generally promote deep exploration of psychological issues. Instead they utilize social support, problem solving, and imparting information and encouragement to facilitate weight loss (Hayaki 1996). There has been limited research into group processes and testing whether group interventions are more or less effective than individual treatment (Hayaki 1996).

There are a limited number of systematic reviews examining the effectiveness of psychological interventions for overweight or obesity. Four systematic review examining the effectiveness of behavioural therapy have demonstrated that behavioural therapy techniques, in combination with other weight loss approaches (diet and / or exercise) improve weight loss (Douketis 1999, NHMRC 2003; NIH 1998; NHS CRD 1997). Systematic reviews of other forms of psychological interventions are lacking.

Why it is important to do this review

Psychological interventions ideally should be used in the context of a multi-component weight loss programme to gain their maximum benefit. Diet and exercise combined with psychological interventions comprise an intuitively powerful weight loss program (NHLBI 1998). However, in spite of the increased comprehensiveness of weight loss programs and improvements in patient education, understanding of the role of diet and exercise in weight loss, psychological interventions, and improved pharmacotherapies for weight reduction, results of weight loss trials have continued to remain disappointing (Liao 2000). There are still major gaps in our understanding of the roles of diet, exercise, and psychological therapies in weight reduction. Also, achieving long-term modification of food intake and food type by the obese individual without creating decreases in energy expenditure associated with dieting, and dealing with relapse to pre-intervention diet and exercise behaviours are ongoing challenges (Brownell 1986). This review aimed to clarify some of these issues, using high quality criteria to assess and summarise the evidence.

OBJECTIVES

To assess the effects of psychological interventions for overweight or obesity as a means of achieving sustained weight loss.

METHODS

Criteria for considering studies for this review

Types of studies

All randomised controlled clinical trials of psychological interventions for weight loss in overweight or obese people were considered for inclusion. Quasi-randomised trials were also considered.

With psychological interventions it makes more sense to define duration in terms of minimum number of sessions rather than number of months. However, most studies report duration in terms of months. Therefore we defined trial duration according

to the number of months over which they have been conducted and only included trials with interventions that lasted longer than three months (including follow-up). Trials with a drop-out rate of greater than 15% were excluded.

Types of participants

Studies were limited to adult participants only (aged over 18 years). Studies included adults with overweight or obesity at study baseline according to any parameter (e.g. body mass index, waist measurement, waist-to-hip ratio). Over the years, the diagnostic criteria and classification of obesity have changed several times (NHMRC 1997). To be consistent with changes in classification and diagnostic criteria of obesity through the years, the diagnosis needed to have been established using the standard criteria valid at the time of the beginning of the trial. Changes in diagnostic criteria were considered for exploration in sensitivity analyses.

Types of interventions

Studies that stated they included a psychological intervention were not included within the analyses unless the type of psychological intervention was able to be identified. Individual and group therapies were included. All types of psychological interventions were considered for inclusion.
It is common for psychological interventions to be prescribed in conjunction with dietary and exercise interventions. The analysis included the following subcategories:

- psychological intervention versus no treatment;
- psychological intervention versus different type of psychological intervention;
- psychological intervention plus diet and / or exercise versus control plus diet and/ or exercise.

Studies which combined a pharmacological intervention with a psychological intervention were excluded from analysis as the effect of the pharmacological intervention on weight could outweigh the effect of the psychological intervention.

Types of outcome measures

Primary outcomes

- weight or another indicator of body mass (e.g. body mass index, waist measurement, waist-to-hip ratio);
- morbidity (e.g. diabetes, cardiovascular disease, osteoarthritis) and mortality (e.g. death from myocardial infarction, stroke);
- well-being and quality of life measures (ideally, measured using a validated instrument, e.g. SF36 Quality of Life Measure).

Secondary outcomes

- cost of implementing the psychological intervention;
- measured psychological functioning (ideally, measured using a validated instrument e.g. Hamilton Depression Rating Scale);
- fasting plasma glucose and HbA1c;
- plasma triglycerides, high-density lipoprotein, low-density lipoprotein and very-low-density lipoprotein ;
- adverse effects.

Spedific effect modifiers

- compliance.

Timing of outcome measurement

Weight loss or change in an outcome measure of weight was assessed in studies less than 12 months duration and studies greater than 12 months duration.

Search methods for identification of studies

Electronic searches

The following electronic databases were searched:

- *The Cochrane Library - Issue 1 2003* (including the Cochrane Controlled Trials Register (CCTR));
- MEDLINE (June 2003);
- PsychInfo (June 2003);
- PsychLit (June 2003);
- Embase (June 2003).

Databases of ongoing trials were searched, including Current Controlled Trials (www.controlled-trials.com) and the National Research Register (www.update-software.com/National/nrr-frame.html).
For a detailed search strategy see Appendix 1.

Additional key words of relevance were sought during the electronic or other searches. None were identified. Publications in all languages were sought.

Searching other resources

The reference list of review articles and of all included studies were searched in order to find other potentially eligible studies. Potential missing and unpublished studies were planned to be sought by contacting experts in the field. This was not necessary.

Data collection and analysis

Selection of studies

Assessment of quality and results data were undertaken by three reviewers (KS, POR and JK). Full articles were retrieved for further assessment if the information given suggested that the study: 1. Included people who were overweight or obese; 2. Compared a psychological intervention with placebo or another psychological intervention; 3. Assessed one or more relevant clinical outcome measures;
4. Used random allocation to the comparison groups. When a title / abstract could not be rejected with certainty, the full text of the article was obtained for further evaluation. Interrater agreement for study selection was measured using the kappa statistic (Cohen 1960). Where differences in opinion existed, these were resolved by a third party (CDM).

Data extraction and management

Data extracted included the following:

- general information: Published/unpublished, title, authors, source, contact address, country, language of publication, year of publication, duplicate publications;
- trial characteristics: Design, duration, randomisation (and method), allocation concealment (and method), blinding (outcome assessors), check of blinding;
- intervention: Psychological prescription, comparison interventions (method, timing);
- patients: Sampling (random/convenience), exclusion criteria, total number and number in comparison groups, gender, age, diagnostic criteria of overweight/obesity, similarity of groups at baseline, assessment of compliance/relapse, withdrawals/losses to follow-up (reasons/description), subgroups;
- outcomes: Outcomes specified above, what was the main outcome assessed in the study, other events, length of follow-up.
- results: For outcomes and times of assessment, intention-to-treat analysis.

A template data extraction form was developed and sent to the Metabolic and Endocrine Disorders Group Editorial Base for approval. Study authors were not contacted for further information.

Assessment of risk of bias in included studies

The methodological quality of reporting each trial was be assessed based largely on the quality criteria specified by Schulz and by Jadad (Jadad 1996; Schulz 1995). In particular, the following factors was studied:
1. Minimisation of selection bias - a) was the randomisation procedure adequate? b) was the allocation concealment adequate?
2. Minimisation of attrition bias - a) were withdrawals and dropouts completely described? b) was analysis by intention-to-treat?
3. Minimisation of detection bias - were outcome assessors blind to the intervention?
Based on these criteria, studies were subdivided into the following three categories (see Cochrane Handbook):
A - all quality criteria met: low risk of bias.
B - one or more of the quality criteria only partly met: moderate risk of bias.
C - one or more criteria not met: high risk of bias.
This classification was planned to be used as the basis of a sensitivity analysis.
Each trial was assessed for quality assessment independently by two reviewers (KS, JK). Interrater agreement was calculated using the kappa statistic.

Data synthesis

Data were entered into the Cochrane Review Manager (RevMan) software. Both random and fixed effects models were used to pool data. Effect sizes are presented as weighted mean differences with 95% confidence intervals. We had planned to express results of dichotomous variables as Mantel Haenszel odds ratios (OR) with 95% confidence intervals. The chi-square method was used to assess heterogeneity with the significance set at P <0.1. Quantification of the effect of heterogeniety was assessed by means of I^2, ranging from 0% to 100% including its 95% confidence interval (Higgins 2002). I^2 demonstrates the percentage of total variation across studies due to heterogeneity and is used to judge the consistency of evidence.

Subgroup analysis and investigation of heterogeneity

Subgroup analyses were planned if the results of at least one of the main outcomes were significant, in order to explore effect size differences. Analyses planned were:

- type, intensity and duration of the psychological intervention;
- age (18-39 years, 40-69 years, 70 years and older);
- gender;
- smoking status;
- different comparison interventions;
- comorbidity (patients with diabetes, hypertension or other conditions).

Sensitivity analysis

Planned sensitivity analyses (to assess the influence of the following factors on effect size) were as follows:

- repeating the analysis excluding unpublished studies (if there were any);
- repeating the analysis taking account of study quality, as specified above;
- repeating the analysis excluding any very long or large studies to establish how much they dominate the results;

- repeating the analysis excluding studies using the following filters: diagnostic criteria, language of publication, source of funding (industry versus other), country.

Testing of the robustness of the results by repeating the analysis using different measures of effects size (risk difference, odds ratio etc.) and different statistic models (fixed and random effects models) was planned.

RESULTS

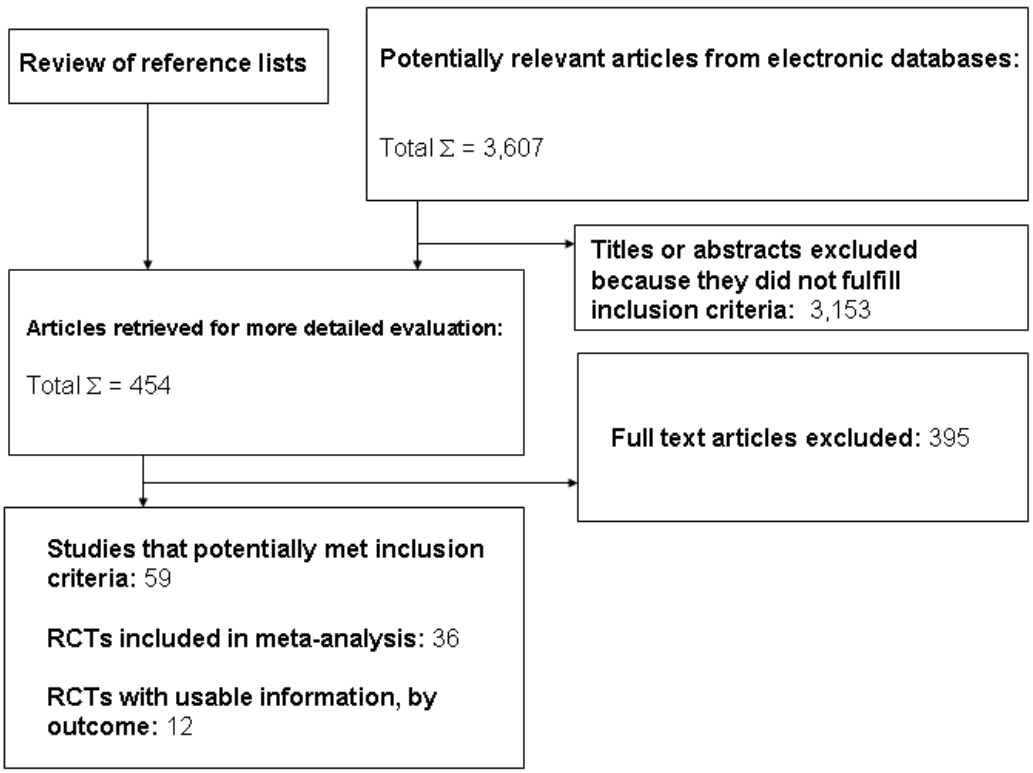
Description of studies

See: Characteristics of included studies; Characteristics of excluded studies.

Results of the search

The search strategy identified 3607 abstracts for perusal. On review of the abstracts, 454 articles were retrieved for perusal. Of these, 56 potentially relevant trials were located. Three further trials were found through handsearching of reference lists, yielding 59 potentially relevant trials (Figure 1).

Figure 1. Study flow diagram



A total of 36 studies met the inclusion criteria and were included in the review. The kappa statistic for trial selection was 0.75; confidence bounds 0.63 to 0.88.

Included studies

The details of these studies are described in the table Characteristics of included studies.

A number of trials did not present results in a manner that enabled variance data for change in outcome measures to be extracted.

However, the studies met all of the inclusion criteria outlined above. Therefore these studies, identified in the 'Notes' section of the Characteristics of included studies table, are included in the results but are reported narratively (Agras 1995; Block 1980; Calle-Pascual 1992; Castro 1983; Chapman 1978; Foreyt 1973; Goodrick 1998; Hagen 1974; Jeffery 1983; Kirschenbaum 1985; Stuart 1971; Wollersheim 1970). The data from this group of studies are not included in the analyses.

The trials were conducted between 1970 and 2001 and varied in size from 6 to 1191 participants. Overall, 3495 participants were evaluated. The trials varied in length (including follow-up) from 12 weeks to 156 weeks. Thirty of the 36 trials were longer than 16 weeks duration.

All included studies were randomized controlled trials. Two studies were factorial in design (Burnett 1985; Jeffery 1983), and the remaining 34 were parallel. Randomization was from stratified blocks, mainly according to percentage overweight, in 13 studies.

Participants and setting

There were a total of 3495 participants in the 36 trials. All trials were conducted in adults. The weighted mean age of participants was 43.1 years for the 18 trials that reported age as a mean value. The remaining 18 trials, which reported age as a range, included participants aged between 16 and 75 years. Two trials included men only, 14 included women only, and 20 included both men and women. Across these 20 trials, 25% of participants were male. Twenty-nine studies were conducted in the United States of America, and one was conducted in The Netherlands (Nauta 2000), Canada (Cochrane 1985), Spain (Calle-Pascual 1992), Colombia (Castro 1983), the United Kingdom (Oldroyd 2001), Sweden (Lindahl 1999) and Switzerland (Painot 2001) respectively. All studies were outpatient community studies except for one study which was an inpatient hospital study (Lindahl 1999). The range of outpatient settings in which trials were conducted included general medical clinics, hospital obesity outpatient clinics, primary care, university campuses and workplace settings. Most participants were recruited by local news media (e.g. local newspaper, radio announcements, bulletin boards) and physician referrals. One study recruited their sample from a database of participants rejected from participating in a cohort study (Jeffery 1983), one from a group of US Navy personnel deployed on a combatant ship of the US Navy (Dennis 1999), and one from a database of respondents to a community survey questionnaire (Lindahl 1999).

Interventions

The psychological interventions that were evaluated are listed below and discussed in more detail in the results section. Twenty-five trials evaluated multiple psychological interventions within their design, and 11 trials evaluated a single psychological intervention. Thirty studies evaluated a behavioral intervention, four evaluated a cognitive behavioral intervention, four evaluated a relaxation intervention, two evaluated a cognitive intervention, one evaluated a psychotherapeutic intervention, and one evaluated a hypnotherapy intervention.

Studies did differ in the types of interventions evaluated:

- Ten trials evaluated behaviour therapy compared with no treatment for weight loss (Foreyt 1973; Goodrick 1998; Hagen 1974; Israel 1979; Jeffery 1995; Oldroyd 2001; Rozensky 1976; Saccone 1978; Stevens 2001; Wollersheim 1970),
- Seventeen trials compared more intensive with less intensive behaviour therapy (Black 1983; Black 1984; Brownell 1978a; Burnett 1985; Carroll 1981; Castro 1983; Chapman 1978; Hagen 1974; Israel 1979; Jeffery 1983; Jeffery 1995; Johnson 1979; Kirschenbaum 1985; Rozensky 1976; Saccone 1978; Wing 1991; Wing 1996),
- Eight trials compared behaviour therapy in combination with diet / exercise with diet / exercise alone (Black 1984; Calle-Pascual 1992; Gormally 1981; Jeffery 1985; Lindahl 1999; Stuart 1971; Wing 1984; Wing 1985),
- Three trials compared behaviour therapy with cognitive therapy (Goodrick 1998; Nauta 2000; Wollersheim 1970),
- Two trials compared cognitive behaviour therapy + diet / exercise with diet / exercise alone (Block 1980; Dennis 1999), and
- One trial each compared:

- hypnotherapy with no treatment (Cochrane 1985);
- relaxation therapy with no treatment (Block 1980);
- cognitive behaviour therapy with no treatment (Agras 1995), and behaviour therapy (Sbrocco 1999);
- cognitive therapy with no treatment (Goodrick 1998);
- cognitive behaviour therapy and diet / exercise with diet / exercise (Painot 2001) respectively.

Ootcome measures

The degree of overweight in the patient groups and the types of outcome measures reported did not differ markedly between groups. Most reported weight change as kilograms or pounds lost. Studies also reported weight loss according to change in BMI, change in waist circumference or waist-hip ratio, or change in percentage overweight.

Weight entry criteria for most studies included participants who were overweight as well as participants with obesity. Four studies specified weight entry criteria according to BMI (in excess of 27 for three studies and BMI more than 30 for one study). Nineteen studies specified weight entry criteria according to percentage overweight according to Metropolitan Life Insurance Tables. The weighted mean % overweight of participants in these studies was 43.3% (range 27 to 75%). Six studies specified weight entry according to pounds / kilograms overweight. The weighted mean kilograms overweight of participants in these studies was 11.6 kg

(range = 11.4 to 18.8 kg). Six studies did not specify weight entry criteria but did specify baseline weight data for participants.

Two trials were weight loss interventions in participants with non-insulin dependent diabetes mellitus (Calle-Pascual 1992; Wing 1985), two trials were interventions in participants with impaired glucose tolerance (Lindahl 1999; Oldroyd 2001), two were interventions in participants with binge eating disorder (Agras 1995; Goodrick 1998), one was an intervention in US Naval personnel on deployment (Dennis 1999), and one was an intervention in participants with mild hypertension (Stevens 2001).

Frequency of sessions ranged from daily to monthly. The duration of the interventions ranged from four weeks to 12 months. The median duration of the interventions was 12 weeks. Follow-up time post intervention ranged from three months to 36 months. The weighted mean total trial length was 18.6 months (range 3 to 36 months).

Secondary outcome measures recorded included haematological measures e.g. serum glucose, lipids, HbA1c, blood pressure and measures of dietary intake and exercise performance.

None of the trials included the main outcomes of mortality (total or specific), morbidity, quality of life measures, well-being or the additional outcome costs of implementing the intervention.

Excluded studies

Following an evaluation of the methods section of the trials, 23 trials were excluded from the review. These studies and their reasons for exclusion are presented in Characteristics of excluded studies.

Risk of bias in included studies

The methodological quality of included studies is described in the Characteristics of included studies table. The kappa statistic and confidence intervals for methodological quality of included studies was 0.88 (0.80 to 0.95). All 36 of the reported studies had some methodological weaknesses according to the quality criteria applied. Only two studies (Black 1983; Oldroyd 2001) reported the method of randomization. For the remaining 34 studies it was not possible to tell whether allocation to groups was concealed. All included studies had a loss to follow-up of 15% or less, as specified in the inclusion criteria for the review. In all but one study (Oldroyd 2001), blinding of investigators to outcomes was not clear or not done. The duration of all included studies, including follow-up, was three months or more, as specified in the inclusion criteria for the review. Six of the 36 trials were 16 weeks or less in duration.

The results of three studies could not be extrapolated to other populations due to substantial selection bias (Dennis 1999; Jeffery 1983; Lindahl 1999).

Many studies had small sample sizes, meaning that it would have been difficult to detect small but potentially significant differences across groups. Three studies were analysed by intention to treat (Nauta 2000; Oldroyd 2001; Stuart 1971). All other studies were analysed by treatment received.

One study was categorised as 'A', indicating that all criteria were met (Oldroyd 2001). All other studies were categorised as 'B', indicating that one or more criteria were not met. All studies had a drop-out rate of 15% or less, as specified in the inclusion criteria for study selection.

Effects of interventions

The studies included in this review evaluate a number of psychological interventions in participants with overweight and obesity. The only outcome measured and used in the analyses was weight. BMI, blood pressure, serum cholesterol, serum triglycerides, fasting serum glucose and serum high density lipoprotein cholesterol (HDL) data were insufficient for analyses to be performed. Quantification of the effect of heterogeneity was assessed by means of I^2, ranging from 0 to 100% including its 95% confidence interval (Higgins 2002). I squared demonstrates the percentage of total variation across studies due to heterogeneity and is used to judge the consistency of evidence.

Behaviour therapy versus no treatment control

Ten studies contained groups that compared behaviour therapy to control as a weight loss intervention in participants with overweight or obesity (Foreyt 1973; Goodrick 1998; Hagen 1974; Israel 1979; Jeffery 1995; Oldroyd 2001; Rozensky 1976; Saccone 1978; Stevens 2001; Wollersheim 1970). Behavioral therapies evaluated included self-control and therapist-controlled contingencies (Israel 1979; Jeffery 1995; Rozensky 1976), stimulus control (Goodrick 1998; Israel 1979; Saccone 1978; Stevens 2001), reinforcement (Israel 1979; Saccone 1978), stages of change model of behaviour therapy (Oldroyd 2001), self-monitoring (Goodrick 1998; Jeffery 1995), problem solving and goal setting (Goodrick 1998), covert sensitization (Foreyt 1973) and behaviour modification (Hagen 1974; Wollersheim 1970). The frequency of clinical contact ranged from weekly to monthly sessions lasting 15 to 90 minutes. The median frequency of clinical contact was fortnightly sessions lasting 60 minutes. The duration of intervention ranged from 7 to 78 weeks. Median duration of intervention was 12 weeks.

Category 1: Weight change in kilograms

Four studies included data comparing behaviour therapy with control for weight loss that were not suitable for meta-analysis (Foreyt 1973; Goodrick 1998; Hagen 1974; Wollersheim 1970). These studies reported weight loss before versus after psychological intervention. Mean weight losses were reported for each study however no variance data were available for these studies. The range of weight change in participants who participated in behavioral

interventions was -0.6 kg to -5.5 kg after the behavioral intervention. The range in participants who acted as no treatment controls was -2.8 kg to + 1.8 kg. In all studies, participants who participated in the behavioral intervention lost more weight than no treatment controls.

Six studies, involving 1458 participants, included data regarding weight loss that were suitable for meta-analysis (Israel 1979; Jeffery 1995; Oldroyd 2001; Rozensky 1976; Saccone 1978; Stevens 2001). Data were analysed according to two time frames, studies with a duration of 12 months or less and studies with a duration of more than 12 months.

Five studies included data for duration of less than 12 months. All studies favoured behaviour therapy against no treatment control for weight loss. Significant heterogeneity between studies was present (P < 0.00001). When heterogeneity was re-assessed excluding data from Stevens 2001, which had much smaller variance than the other studies, the results of the Chi-squared test were P > 0.06. Participants who participated in behavioral weight loss programmes lost 2.5 kg (95% confidence interval 1.7 to 3.3) more weight than no treatment controls (P < 0.01).

Two studies included data for duration of greater than 12 months (Jeffery 1995; Stevens 2001). Data from Jeffery, 1995 were collected at 30 months and data from Stevens, 2001 were collected at 36 months. Both studies favoured behaviour therapy against no treatment control for weight loss. Studies were homogeneous for the outcome of interest (P = 0.81). Participants who participated in behavioral weight loss programs lost 2 kg (95% confidence interval 2.7 to 1.3) more than no treatment controls (P < 0.01).

Category 2: Additional outcome measures

Two studies (Oldroyd 2001; Stevens 2001) reported change in blood pressure data at conclusion of the study. Data were unable to be compared statistically therefore analysis was not performed. Both studies demonstrated a fall in systolic and diastolic blood pressure with weight loss. The study by Oldroyd 2001 found no significant change in fasting serum glucose or fasting serum cholesterol between intervention and control groups however fasting serum insulin was improved in the intervention compared with control group.

Behaviour therapy with diet / exercise versus diet / exercise

Eight studies contained groups that compared behaviour therapy in combination with diet / exercise with diet / exercise alone as a weight loss intervention in participants with overweight or obesity (Black 1984; Calle-Pascual 1992; Gormally 1981; Jeffery 1985; Lindahl 1999; Stuart 1971; Wing 1984; Wing 1985). Three studies reported significant improvement in weight loss with the addition of behaviour therapy to the diet / exercise intervention (Gormally 1981, Wing 1985, Lindahl 1999). Behavioral therapies evaluated included self-control and therapist-controlled contingencies (Black 1984; Jeffery 1985; Wing 1985), stimulus control (Calle-Pascual 1992; Gormally 1981; Stuart 1971; Wing 1985), reinforcement (Gormally 1981; Wing 1984), self-monitoring (Black 1984; Gormally 1981), problem solving and goal setting (Gormally 1981; Jeffery 1985; Lindahl 1999), and behaviour modification (Calle-Pascual 1992; Gormally 1981). The frequency of clinical contact ranged from second daily to monthly sessions lasting 40 to 180 minutes. The median frequency of clinical contact was fortnightly sessions lasting 60 minutes. The duration of intervention ranged from 1 to 26 weeks. Median duration of intervention was 12 weeks. The concomitant interventions were low calorie diet (Calle-Pascual 1992; Gormally 1981; Jeffery 1985; Lindahl 1999; Stuart 1971; Wing 1984; Wing 1985), nutritious balanced diet (Black 1984), instructions to gradually increase levels of physical activity (Black 1984; Gormally 1981; Jeffery 1985), daily low to moderate physical activity for 2.5 hours (Lindahl 1999), and individualised aerobics exercise programme based upon walking further during daily activities (Stuart 1971).

Category 1: Weight change in kilograms

Two studies included data comparing behaviour therapy in combination with diet / exercise with diet / exercise alone for weight loss that were not suitable for meta-analysis (Calle-Pascual 1992; Stuart 1971). These studies reported weight loss before versus after psychological intervention. Mean weight loss was reported however no variance data were available for the studies. The mean weight change in participants who participated in the behavioral intervention was a loss of 10 kg after the behavioral intervention. The change in participants who acted as no treatment controls was a mean gain of 0.5 kg.

Six studies, involving 467 participants, included data regarding weight loss that were suitable for meta-analysis (Black 1984; Gormally 1981; Jeffery 1985; Lindahl 1999; Wing 1984; Wing 1985). Data were analysed according to time frame. No study included data with a duration of more than 12 months.

Five studies favoured behaviour therapy in combination with diet and exercise and one study favoured diet and exercise alone for weight loss. Significant heterogeneity between studies was present (P < 0.01). These data come from multiple studies and different populations which may be the factors contributing to the significant statistical heterogeneity present, and limit the reliability of the results.

Category 2: Additional outcome measures

The study by Lindahl 1999 reported change in blood pressure data at conclusion of the study. Results demonstrated a fall in systolic and diastolic blood pressure with weight loss in both intervention and control groups. Total serum cholesterol, triglycerides and

fasting plasma glucose also fell in both intervention and control groups. In the study by Wing 1985, participants in both the intervention and control groups experienced non-significant improvements in fasting blood sugar, serum triglycerides, serum cholesterol, and systolic blood pressure, and significant improvement in HDL cholesterol. The study by Calle-Pascual 1992 demonstrated a significant improvement in fasting serum glucose, systolic blood pressure, diastolic blood pressure, serum triglyceride level, and HDL cholesterol level in the intervention group compared with the control group.

More intensive versus less intensive behaviour therapy

Seventeen studies contained groups that compared more intensive with less intensive behaviour therapies as a weight loss intervention in participants with overweight or obesity (Black 1983; Black 1984; Brownell 1978a; Burnett 1985; Carroll 1981; Castro 1983; Chapman 1978; Hagen 1974; Israel 1979; Jeffery 1983; Jeffery 1995; Johnson 1979; Kirschenbaum 1985; Rozensky 1976; Saccone 1978; Wing 1991; Wing 1996). Behavioral therapies evaluated included attention prompting (Kirschenbaum 1985), self-control and therapist-controlled contingencies (Black 1984; Chapman 1978; Castro 1983; Jeffery 1983; Jeffery 1995; Kirschenbaum 1985), stimulus control (Black 1983; Black 1984; Brownell 1978a; Carroll 1981; Castro 1983; Chapman 1978; Israel 1979; Johnson 1979; Kirschenbaum 1985; Saccone 1978; Wing 1991; Wing 1996), reinforcement and social support (Black 1983; Brownell 1978a; Burnett 1985; Israel 1979; Johnson 1979; Rozensky 1976; Saccone 1978; Wing 1991; Wing 1996), self-monitoring (Black 1983; Black 1984; Brownell 1978a; Burnett 1985; Chapman 1978; Johnson 1979; Saccone 1978; Wing 1991; Wing 1996), problem solving and goal setting (Black 1983; Burnett 1985; Jeffery 1995; Wing 1991; Wing 1996), and behaviour modification (Hagen 1974; Jeffery 1995; Wing 1991; Wing 1996). The frequency of clinical contact ranged from weekly to monthly sessions lasting 60 to 150 minutes. The median frequency of clinical contact was weekly and the median session duration was 60 minutes. The duration of intervention ranged from 6 to 78 weeks. Median duration of intervention was 10 weeks.

Category 1: Weight change in kilograms

Six studies included data comparing high versus low intensity behaviour therapies for weight loss that were not suitable for meta-analysis (Castro 1983; Chapman 1978; Hagen 1974; Israel 1979; Jeffery 1983; Kirschenbaum 1985). These studies reported weight loss before versus after psychological intervention. Mean weight losses were reported however no variance data were available for the studies. The weight loss in participants who participated in the high intensity behavioral intervention was between 1.4 kg and 8.4 kg after intervention. The low intensity behavioral intervention resulted in weight loss between 0.9 kg and 10.5 kg. In four studies, high intensity behavioral intervention resulted in greater weight loss and in two studies low intensity behavioral intervention resulted in greater weight loss. In all studies in both high and low intensity groups, participants lost weight overall.

Eleven studies included data regarding weight loss that were suitable for meta-analysis (Black 1983; Black 1984; Brownell 1978a; Burnett 1985; Carroll 1981; Jeffery 1995; Johnson 1979; Rozensky 1976; Saccone 1978; Wing 1991; Wing 1996). Data were analysed according to two time frames, studies with a duration of 12 months or less and studies with a duration of more than 12 months.

Ten studies, involving 306 participants, included data for duration of less than 12 months. Eight studies favoured more intensive behaviour therapy and two studies favoured less intensive behaviour therapy for weight loss. Studies were homogeneous for the outcome of interest (P = 0.18). Participants participating in the more intensive intervention lost 2.3 kg more weight than those participating in the less intensive intervention (95% confidence interval 1.4 - 3.3).

One study, involving 58 participants, included data for study duration of greater than 12 months (Jeffery 1995). Participants were followed for 36 months. Participants participating in the more intensive intervention lost 1.6 kg and those in the less intensive intervention lost 1.4 kg (P = 0.45).

Category 2: Additional outcome measures

The study by Wing 1991 demonstrated a significant improvement in glycosylated haemoglobin and fasting blood sugar as a result of both interventions.

Cognitive behaviour therapy with diet / exercise versus diet / exercise

Two studies contained groups that compared cognitive behavior therapy with diet / exercise versus diet / exercise alone in participants with overweight or obesity (Block 1980; Dennis 1999).

Category 1: Weight change in kilograms

The two studies, involving 63 participants, included data regarding weight loss that were suitable for meta-analysis (Block 1980; Dennis 1999). Studies were homogeneous for the outcome of interest (P = 0.09). Participants in both groups lost weight overall. Participants in the cognitive behaviour therapy group lost 4.9 kg more than participants in the comparison group (95% confidence interval 7.3 to 2.4).

Category 2: Additional Outcome Measures

The study by Dennis 1999 recorded changes in serum triglycerides for both groups. Triglycerides decreased significantly more in the treatment group compared to the control group (P < 0.05).

Cognitive behaviour therapy versus placebo

One study contained groups that compared cognitive therapy with placebo as a weight loss intervention in participants with overweight or obesity (Agras 1995).

Category 1: Weight change in kilograms

This study included data comparing cognitive behaviour therapy with placebo for weight loss that were not suitable for meta-analysis. Mean weight loss was reported however no variance data were available for the study. In the Agras 1995 study of 50 participants in the cognitive behaviour therapy group lost 0.6 kg compared to participants in the placebo group who gained 4.1 kg by six months.

Cognitive behaviour therapy versus behaviour therapy

One study contained groups that compared cognitive behaviour therapy with behaviour therapy as a weight loss intervention in participants with overweight or obesity (Sbrocco 1999).

Category 1: Weight change in kilograms

This study included data comparing cognitive behaviour therapy with placebo for weight loss (Sbrocco 1999). In this study of 24 participants, participants in the cognitive behaviour therapy group lost 7 kg by six months (SD 1.96 kg) and 10 kg by 12 months (SD 3.4 kg), compared to participants in the behaviour therapy group who lost 4.5 kg by six months (SD 2.6 kg) and 4.3 kg by 12 months (SD 2.5 kg) ($P < 0.01$).

Cognitive behaviour therapy with diet / exercise versus cognitive behaviour therapy

One study contained groups that compared cognitive behaviour therapy with diet / exercise versus cognitive behaviour therapy as a weight loss intervention in participants with overweight or obesity (Painot 2001).

Category 1: Weight change in kilograms

The study by Painot 2001 included data that were suitable for meta-analysis. In this study of 70 participants, subjects in the cognitive behaviour therapy and diet / exercise lost 1.9 kg (SD 0.6 kg) compared with participants in the cognitive behaviour therapy alone group who gained 0.5 kg (SD 0.6 kg) by three months follow-up.

Cognitive therapy versus placebo

One study contained groups that compared cognitive therapy with placebo as a weight loss intervention in participants with overweight or obesity (Goodrick 1998).

Category 1: Weight change in kilograms

One study included data comparing cognitive therapy with placebo for weight loss that was not suitable for meta-analysis (Goodrick 1998). Mean weight loss was reported, however, no variance data were available for the study. In this study of 120 participants the cognitive therapy group gained 1.35 kg compared to participants in the placebo group who gained 0.6 kg by six months.

Cognitive therapy versus behaviour therapy

Three studies contained groups that compared cognitive with behaviour therapies as a weight loss intervention in participants with overweight or obesity (Goodrick 1998; Nauta 2000; Wollersheim 1970).

Category 1: Weight change in kilograms

One study included data suitable for meta-analysis (Nauta 2000) and two studies included data that were not suitable for meta-analysis (mean weight loss was reported however no variance data were available for the studies) (Goodrick 1998; Wollersheim 1970). In all three studies, participants in the behaviour therapy group lost more weight than participants in the cognitive therapy group. The Nauta study included 74 participants. Participants in the behaviour therapy group lost 5.5 kg compared with participants in the cognitive therapy group who lost 0.8 kg ($P < 0.01$). In the Goodrick study of 127 participants, participants in the behaviour therapy group lost 0.6 kg compared to participants in the cognitive therapy group who gained 1.4 kg by six months. In the Woollersheim study of 36 participants, participants in the behaviour therapy group lost 4.1 kg by three months, compared to participants in the cognitive therapy group who lost 0.5 kg.

Comparison 10: Relaxation therapy versus placebo

One study contained groups that compared relaxation therapy with placebo as a weight loss intervention in participants with overweight or obesity (Block 1980).

Category 1: Weight change in kilograms

This study included data comparing relaxation therapy with placebo for weight loss that was not suitable for meta-analysis. Mean weight loss was reported however no variance data were available for the study. In this study of 24 participants in the relaxation therapy group lost 2.1 kg compared to participants in the placebo group who lost 0.2 kg by five months.

Comparison 11: Hypnotherapy versus placebo

One study contained groups that compared hypnotherapy with placebo as a weight loss intervention in participants with overweight or obesity (Cochrane 1985).

Category 1: Weight change in kilograms

This study included data comparing hypnotherapy with placebo that were not suitable for meta-analysis. Mean weight loss was reported however no variance data were available for the study. In this study of 54 participants in the hypnotherapy group lost 7.9 kg compared with participants in the placebo group who lost 0.2 kg by six months follow-up.

DISCUSSION

Summary of main results

The studies identified for this review were heterogeneous in terms of participants, interventions, outcomes, and settings. A broad number of psychological interventions were evaluated in a range of settings. Most studies had methodological shortcomings, however, loss to follow-up of participants was 15% or less across studies, and study duration was in excess of three months for all studies. The majority of studies assessed behavioural interventions. However, two studies assessing cognitive and four studies assessing cognitive-behavioural therapy were also located.

The behavioural treatments evaluated generally included a combination of different strategies. Strategies evaluated commonly included components of stimulus control, reinforcement, self-monitoring, problem solving and goal setting.

Studies comparing behaviour therapy with no treatment demonstrated a beneficial effect of behavioural strategies in inducing weight loss. There was a highly variable range of frequency of clinical contact, duration of clinical contact at each session, and duration of intervention across studies. In spite of this variation, behavioural interventions resulted in reduction in body weight in all studies identified for meta-analysis. This result was apparent for studies less than 12 months duration and for studies greater than 12 months duration (outlined in the comparisons 1 to 3 in the comparisons and data tables section).

Studies combining behavioural interventions with dietary and exercise interventions generally demonstrated that behavioural interventions were helpful. Studies were heterogeneous, however the majority of studies favoured combining behaviour therapy with dietary and exercise interventions to improve weight loss. There were no studies of greater than 12 months duration.

The intensity of the behavioural intervention significantly altered the effects of the intervention. When the behaviour therapy utilized more behavioural strategies, more frequent clinical contact, or a longer duration of intervention, the effectiveness of the intervention was increased. There was one study of greater than 12 months duration. This study demonstrated that a more intensive behavioural treatment resulted in only a marginal improvement in long-term weight loss.

Cognitive-behavioural treatments were also assessed in a number of studies. The pool of studies included was smaller than for behavioural therapies. The only study assessing the effectiveness of cognitive-behaviour therapy against placebo demonstrated that participants treated with cognitive-behaviour therapy lost more weight than participants who were not. However, the magnitude of this weight loss was small.

Two studies, involving 63 participants, assessed whether cognitive-behaviour therapy, combined with diet and exercise, was more effective than diet and exercise alone as a weight loss strategy. Weight loss was enhanced significantly by the addition of the cognitive-behavioural component to the intervention.

One study, involving 24 participants, assessed whether cognitive-behaviour therapy was more effective than behaviour therapy as a weight loss strategy. This study found that weight loss was enhanced by the addition of the cognitive component. Another study involving 70 participants compared cognitive-behaviour therapy combined with diet and exercise with cognitive-behaviour therapy without diet or exercise. This study found that participants who received cognitive-behaviour therapy alone gained weight.

Cognitive treatments were assessed in a small number of studies. The results of these studies were disappointing. One study, assessing cognitive therapy compared with no treatment in 120 participants found that participants in both groups gained weight. Participants in the cognitive therapy group gained more weight than participants in the no treatment group. Three studies compared cognitive therapy with behaviour therapy. In all studies, participants using behavioural strategies lost more weight than participants using cognitive strategies.

Only one study assessed relaxation therapy as a stand-alone weight loss therapy. This study, involving 24 participants, found that participants in the relaxation therapy group lost more weight than those in the no treatment group. One study assessed hypnotherapy as a stand-alone weight loss therapy in 54 participants. This study found that participants in the hypnotherapy group lost significantly more weight than participants in the no treatment group.

The effects of psychological interventions on secondary outcome measures were reported for a small number of studies. Reported measures included systolic and diastolic blood pressure, serum cholesterol, triglycerides and high-density lipoproteins (HDL), and fasting serum glucose. Results were inconsistent across studies, and were not reported in a manner that allowed quantitative comparisons to be made. However, reductions in systolic and diastolic blood pressure, serum cholesterol, triglycerides, and fasting plasma glucose were found to be associated with weight loss in a number of studies. Quality of life and well-being were not

reported in studies, hence were not evaluated in this review.

Potential biases in the review process

A problem associated with the assessment of psychological interventions in people who are overweight or obese is the paucity of long-term studies. Most people lose weight initially and then regain it over time. Thus, without longer term studies, the true effect of psychological interventions on weight is difficult to determine. Also, without long-term studies, the effects of psychological interventions on mortality are difficult to determine. If psychological interventions result in sustained long-term weight loss they may also have a positive impact on mortality.

A large number of studies were excluded from analysis due to the relatively large losses to follow-up. This was done because if studies with large losses to follow-up were included in the analyses, valid conclusions about the relative effects of psychological interventions could not be drawn. Although this is a valid justification to exclude studies with large losses to follow-up, the negative effect of doing so is to reduce the power of the meta-analysis.

This review suggests that behavioural and cognitive-behavioural strategies are effective weight loss therapies. Cognitive therapies do not appear to be as effective, however a much smaller body of evidence exists for these strategies. When even modest weight loss results from a psychological intervention, a number of disease measures might also improve. The clinical relevance of these improvements and effects on mortality cannot be established from this group of studies as the length of follow-up of participants was too short.

AUTHORS' CONCLUSIONS

Implications for practice

People who are overweight or obese benefit from psychological interventions, particularly behavioural and cognitive-behavioural strategies, to enhance weight reduction. They are predominantly useful when combined with dietary and exercise strategies. The bulk of the evidence supports the use of behavioural and cognitive-behavioural strategies. Other psychological interventions are less rigorously evaluated for their efficacy as weight loss treatments.

Implications for research

A large body of research has been undertaken to assess the effects of psychological interventions on weight loss in people who are overweight or obese. Strategies that have been studied are predominantly behavioural and cognitive-behavioural in nature. Cognitive strategies alone appear to be less effective, however the body of evidence assessing efficacy is small.

Every effort should be made to maintain high retention rates in studies, and reasons for withdrawal should be ascertained so that factors affecting program adherence can be further explored. Studies with longer duration of follow-up would provide further information regarding the efficacy of psychological interventions in maintaining positive lifestyle changes in people who are overweight or obese.

ACKNOWLEDGEMENTS

We also acknowledge the advice of Ms Sandi Pirozzo and Professor Paul Glaziou regarding the methods of this review.

REFERENCES

References to studies included in this review

Agras 1995 *{published data only}*
Agras W, Telch C, Arnow B, Eldredge K, Detzer M, Henderson J, et al.Does interpersonal therapy help patients with binge eating disorder who fail to respond to cognitive-behavioral therapy?. *Journal of Consulting and Clinical Psychology* 1995;**63**(3):356–360.

Black 1983 *{published data only}*
Black D, Scherba D. Contracting to problem solve versus contracting to practice behavioral weight loss skills. *Behavior Therapy* 1983;**14**:100–109.

Black 1984 *{published data only}*
Black D, Coe W, Friesen J, Wurzmann A. Minimal interventions for weight control: a cost-effective alternative. *Addictive Behaviors* 1984;**9**:279–285.

Block 1980 *{published data only}*
Block J. Effects of rational emotive therapy on overweight adults. *Psychotherapy: Theory, Research and Practice* 1980;**17**(3):277–280.

Brownell 1978a *{published data only}*
Brownell K, Heckerman C, Westlake R, Hayes S, Monti P. The effect of couples training and partner co-operativeness in the behavioral treatment of obesity. *Behavior Research and Therapy* 1978;**16**:323–333.

Burnett 1985 *{published data only}*
Burnett K, Barr Taylor C, Agras W. Ambulatory computer-assisted therapy for obesity: a new fronteir for behavior therapy. *Journal of Consulting and Clinical Psychology* 1985;**53**(5):698–703.

Calle-Pascual 1992 *{published data only}*
Calle-Pascual A, Rodriquez C, Camacho F, Sanchez R,

Martin-Alvarez P, Yuste E, et al.Behaviour modification in obese subjects with type 2 diabetes mellitus. *Diabetes Research and Clinical Practice* 1992;**15**:157–162.

Carroll 1981 ***{published data only}***
Carroll L, Yates B. Further evidence for the role of stimulus control training in facilitating weight reduction after behavioral therapy. *Behavior Therapy* 1981;**12**:287–291.

Castro 1983 ***{published data only}***
Castro L, de Perez G, Albanchez D, de Leon E. Feedback properties of 'self-reinforcement': further evidence. *Behavior Therapy* 1983;**14**:672–681.

Chapman 1978 ***{published data only}***
Chapman S, Jefferey D. Situational management, standard setting, and self-reward in a behavior modification weight loss program. *Journal of Consulting and Clinical Psychology* 1978;**46**(6):1588–1589.

Cochrane 1985 ***{published data only}***
Cochrane G, Friesen J. Hypnotherapy in weight loss treatment. *Journal of Consulting and Clinical Psychology* 1985;**54**(4):489–492.

Dennis 1999 ***{published data only}***
Dennis K, Pane K, Adams B, Bing Bing Q. The impact of a shipboard weight control program. *Obesity Research* 1999;**7** (1):60–67.

Foreyt 1973 ***{published data only}***
Foreyt J, Hagen R. Covert sensitization: conditioning or suggestion?. *Journal of Abnormal Psychology* 1973;**82**(1): 17–23.

Goodrick 1998 ***{published data only}***
* Goodrick G, Poston W, Kimball K, Reeves R, Foreyt J. Nondieting versus dieting treatment for overweight binge-eating women. *Journal of Consulting and Clinical Psychology* 1998;**66**(2):363–368.

Gormally 1981 ***{published data only}***
Gormally J, Rardin D. Weight loss and maintenance and changes in diet and exercise for behavioral counseling and nutrition education. *Journal of Counseling Psychology* 1981; **28**(4):295–304.

Hagen 1974 ***{published data only}***
Hagen R. Group therapy versus bibliotherapy in weight reduction. *Behavior Therapy* 1974;**5**:222–234.

Israel 1979 ***{published data only}***
Israel A, Saccone A. Follow-up of effects of choice of mediator and target of reinforcement on weight loss. *Behavior Therapy* 10:260–265.

Jeffery 1983 ***{published data only}***
Jeffery R, Gerber W, Rosenthal B, Lindquist R. Monetary contracts in weight control: Effectiveness of group and individual contracts of varying size. *Journal of Consulting and Clinical Psychology* 1983;**51**(2):242–248.

Jeffery 1985 ***{published data only}***
Jeffery R, Forster J, Snell M. Promoting weight control at the worksite: A pilot program of self-motivation using payroll-based incentives. *Preventive Medicine* 1985;**14**: 187–194.

Jeffery 1995 ***{published data only}***
Jeffery R, Wing R. Long-term effects of interventions for weight loss using food provision and monetary incentives. *Journal of Consulting and Clinical Psychology* 1995;**63**(5): 793–796.

Johnson 1979 ***{published data only}***
Johnson W, Stalonas P, Christ M, Pock S. The development and evaluation of a behavioral weight-reduction program. *International Journal of Obesity* 1979;**3**:229–238.

Kirschenbaum 1985 ***{published data only}***
Kirschenbaum D, Stalonas P, Zastowny T, Tomarken A. Behavioral treatment of adult obesity: Attentional controls and a 2-year follow-up. *Behavior Research and Therapy* 1985;**23**(6):675–682.

Lindahl 1999 ***{published data only}***
Lindahl B, Nilsson T, Jansson J, Asplund K, Hallmans G. Improved fibrinolysis by intense lifestyle intervention. A randomized trial in subjects with impaired glucose tolerance. *Journal of Internal Medicine* 1999;**246**:105–112.

Nauta 2000 ***{published data only}***
Nauta H, Hospers H, Kok G, Jansen A. A comparison between a cognitive and a behavioral treatment for obese binge eaters and obese non-binge eaters. *Behavior Therapy* 2000;**31**:441–461.

Oldroyd 2001 ***{published data only}***
Oldroyd J, Unwin N, White M, Imrie K, Mathers J, Alberti K. Randomised controlled trial evaluating the effectiveness of behavioural interventions to modify cardiovascular risk factors in men and women with impaired glucose tolerance: outcomes at 6 months. *Diabetes Research and Clinical Practice* 2001;**52**:29–43.

Painot 2001 ***{published data only}***
Painot D, Jotterand S, Kammer A, Fossati M, Golay A. Simultaneous nutritional cognitive-behavioural therapy in obese patients. *Patient Education and Counseling* 2001;**42**: 47–52.

Rozensky 1976 ***{published data only}***
Rozensky R, Bellack A. Individual differences in self-reinforcement style and performance in self- and therapist-controlled weight reduction programs. *Behaviour Research and Therapy* 1976;**14**:357–364.

Saccone 1978 ***{published data only}***
Saccone A, Israel A. Effects of experimenter versus significant other-controlled reinforcement and choice of target behavior on weight loss. *Behavior Therapy* 1978;**9**: 271–278.

Sbrocco 1999 ***{published data only}***
Sbrocco T, Nedegaard R, Stone J, Lewis E. Behavioral choice treatment promotes continuing weight loss: preliminary results of a cognitive-behavioral decision-based treatment for obesity. *Journal of Consulting and Clinical Psychology* 1999;**67**:260–266.

Stevens 2001 ***{published data only}***
Stevens V, Obarzanek E, Cook N, Lee I, Appel L, West D, et al.Long-term weight loss and changes in blood pressure:

results of the trials of hypertension prevention, phase II. *Annals of Internal Medicine* 2001;**134**:1–11.

Stuart 1971 *{published data only}*
Stuart R. A three-dimensional program for the treatment of obesity. *Behaviour Research and Therapy* 1971;**9**:177–186.

Wing 1984 *{published data only}*
Wing R, Epstein L, Marcus M, Koeske R. Intermittent low-calorie regimen and booster sessions in the treatment of obesity. *Behaviour Research and Therapy* 1984;**22**(4): 445–449.

Wing 1985 *{published data only}*
Wing R, Epstein L, Nowalk M, Koeske R, Hagg S. Behavior change, weight loss, and physiological improvements in type II diabetic patients. *Journal of Consulting and Clinical Psychology* 1985;**53**(1):111–122.

Wing 1991 *{published data only}*
Wing R, Marcus M, Epstein L, Jawad A. A 'family-based' approach to the treatment of obese type II diabetic patients. *Journal of Counseling and Clinical Psychology* 1991;**59**(1): 156–162.

Wing 1996 *{published data only}*
Wing R, Jeffery R, Burton L, Thorson C, Sperber Nissinoff K, Baxter J. Food provision vs structured meal plans in the behavioral treatment of obesity. *International Journal of Obesity* 1996;**20**:56–62.

Wollersheim 1970 *{published data only}*
Wollersheim J. Effectiveness of group therapy based upon learning principles in the treatment of overweight women. *Journal of Abnormal Psychology* 1970;**76**(3):462–474.

References to studies excluded from this review

Aldarondo 1998 *{published data only}*
Aldarondo F. Adherence among individuals in an exercise, nutrition and weight loss program. Thesis - Indiana University 1998.

Alexy 1985 *{published data only}*
Alexy B. Goal setting and health risk reduction. *Nursing Research* 1985;**34**:283–288.

Ashby 1977 *{published data only}*
Ashby W, Wilson G. Behavior therapy for obesity: booster sessions and long-term maintenance of weight loss. *Behaviour Research and Therapy* 1977;**15**:451–463.

Boehm 1993 *{published data only}*
Boehm S, Schlenk E, Raleigh E, Ronis D. Behavioral analysis and behavioral strategies to improve self-management of type II diabetes. *Clinical Nursing Research* 1993;**2**(3):327–344.

Brownell 1978b *{published data only}*
Brownell K, Heckerman C, Westlake R. Therapist and group contact as variables in the behavioral treatment of obesity. *Journal of Consulting and Clinical Psychology* 1978; **46**(3):593–594.

Brownell 1981 *{published data only}*
Brownell K, Stunkard A. Couples training, pharmacotherapy and behavior therapy in the treatment of obesity. *Archives of General Psychiatry* 1981;**38**:1224–1229.

DeLucia 1989 *{published data only}*
DeLucia J, Kalodner C, Horan J. The effect of two nutritional software programs used as adjuncts to the behavioral treatment of obesity. *Journal of Substance Abuse* 1989;**1**:203–208.

DeLucia 1990 *{published data only}*
DeLucia J, Kalodner C. An individualized cognitive intervention: does it increase the efficacy of behavioral interventions for obesity?. *Addictive Behaviors* 1990;**15**: 473–479.

Fisher 1986 *{published data only}*
Fisher E. Behavioral weight reduction program for mentally retarded adult females. *Perceptual and Motor Skills* 1986;**62**: 359–362.

French 1994 *{published data only}*
French S, Jeffery R, Wing R. Sex differences among participants in a weight-control program. *Addictive Behaviors* 1994;**19**(2):147–158.

Jefferey 1974 *{published data only}*
Jefferey D. A comparison of the effects of external control and self-control on the modification and maintenance of weight. *Journal of Abnormal Psychology* 1974;**83**(4): 404–410.

Jefferey 1993 *{published data only}*
Jefferey R, Forster J, Baxter J, French S, Kelder S. [An empirical evaluation of the effectiveness of tangible incentives in increasing participation and behavior change in a worksite health promotion program]. *American Journal of Health Promotion* 1993;**8**(2):98–100.

Mahoney 1974 *{published data only}*
Mahoney M. Self-reward and self-monitoring techniques for weight control. *Behavior Therapy* 1974;**5**:48–57.

Miura 1989 *{published data only}*
Miura J, Arai K, Tsukahara S, Ohno M, Ikeda Y. The long term effectiveness of combined therapy by behavior modification and very low calorie diet: 2 years follow-up. *International JOurnal of Obesity* 1989;**13**(s2):73–77.

Pekkarinen 1996 *{published data only}*
Pekkarinen T, Takala I, Mustajoki P. Two year maintenance of weight loss after a VLCD and behavioural therapy for obesity: correlation to the scores of questionnaires measuring eating behaviour. *International Journal of Obesity* 1996;**20**:332–337.

Penick 1971 *{published data only}*
Penick S, Filion R, Fox S, Stunkard A. Behavior modification in the treatment of obesity. *Psychosomatic Medicine* 1971;**33** (1):49–55.

Rabkin 1983 *{published data only}*
Rabkin S, Boyko E, Wilson A, Streja D. A randomized clinical trial comparing behavior modification and individual counseling in the nutritional therapy of non-

insulin-dependent diabetes mellitus: comparison of the effect on blood sugar, body weight and serum lipids. *Diabetes Care* 1983;**6**(1):50–56.

Raeburn 1986 ***{published data only}***
Raeburn J, Atkinson J. A low-cost community approach to weight control: initial results from an evaluated trial. *Preventive Medicine* 1986;**15**:391–402.

Rapoport 2000 ***{published data only}***
Rapoport L, Clark M, Wardle J. Evaluation of a modified cognitive-behavioural programme for weight management. *International Journal of Obesity* 2000;**24**:1726–1737.

TOHP 1992 ***{published data only}***
The Trials of Hypertension Prevention, Phase I. [The effects of nonpharmacologic interventions on blood pressure of persons with high normal levels: results of the Trials of Hypertension Prevention, phase I]. *Journal of the American Medical Association* 1992;**267**(9):1213.

Wing 1990 ***{published data only}***
Wing R, Shoemaker M, Marcus M, McDermott M, Gooding W. Variables associated with weight loss and improvements in glycemic control in type II diabetic patients in behavioral weight control programs. *International Journal of Obesity* 1990;**14**:495–503.

Wing 2001 ***{published data only}***
Wing R, Jeffery R. Food provision as a strategy to promote weight loss. *Obesity Research* 2001;**9**(4):271–275.

Wollersheim 1977 ***{published data only}***
Wollersheim J. Follow-up of behavioral group therapy for obesity. *Behavior Therapy* 1977;**8**:996–998.

Additional references

Ashley 1974
Ashley F, Kannel W. Relation of weight change to changes in atherogenic traits: the Framingham study. *Journal of Chronic Diseases* 1974;**27**:103–14.

Baron 1998
Baron R. *Psychology*. 4. Boston: Allyn and Bacon, 1998.

Bender 1999
Bender R, Jockel K, Trautner C, Spraul M, Berger M. Effect of age on excess mortality in obesity. *Journal of the American Medical Association* 1999, (281):1498–504.

Birmingham 1999
Birmingham C, Muller J, Palepu A, Spinelli J, Anis A. The cost of obesity in Canada. *Canadian Medical Association Journal* 1999;**160**(4):483–8.

Blackmeyer 1990
Blackmeyer B, Smyllie K, Price F. A replicated 5 cluster MMPI typology of morbidly obese female candidates for gastric surgery. *International Journal of Obesity* 1990;**14**: 235–47.

Bretyspraak 1977
Breytspraak L, McGee J, Conger J. Sensitizing medical students to impression formation processes in the patient interview. *Journal of Medical Education* 1977;**52**:47–54.

Brownell 1984
Brownell K. The psychology and physiology of obesity: implications for screening and treatment. *Journal of the American Dietetic Association* 1984;**84**:406–13.

Brownell 1986
Brownell K, Marlatt G, Lichtenstein E, Wilson G. Understanding and preventing relapse. *American Psychologist* 1986;**41**(7):765–82.

Brownell 1986b
Brownell K. Public health approaches to obesity and its management. *Annual Review of Public Health* 1986;**7**: 521–33.

Bryce 2001
Bryce J. The technological transformation of leisure. *Social Sciences Comprehensive Review* 2001;**19**(1):7–16.

Cohen 1960
Cohen J. A coefficient of agreement for nominal scales. *Educational and Psychological Measurement* 1960;**20**:37–46.

Cooper 2001
Cooper Z, Fairburn C. A new cognitive behavioural approach to the treatment of obesity. *Behavioural Research and Therapy* 2001;**39**(5):499–511.

Despres 1994
Despres J. Dyslipidaemia and obesity. *Ballieres Clinical Endocrinology and Metabolism* 1994;**8**:629–36.

DHAC 2001
Department of Health and Aged Care. *National Physical Activity Guidelines for Australians*. Perth: DHAC, 2001.

Dietz 1985
Dietz W, Gortmaker S. Do we fatten our children at the television set? Obesity and television viewing in children and adolescents. *Pediatrics* 1985;**75**:807–12.

Douketis 1999
Douketis J, Feightner J, Attia J, Feldman W. Periodic health examination, 1999 update: 1. Detection, prevention and treatment of obesity. *Canadian Medical Association Journal* 1999;**160**:513–25.

Egger 1997
Egger G, Swinburn B. An 'ecological' approach to the obesity pandemic. *British Medical Journal* 1997;**315**(7106): 477–80.

French 1994
French S, Jeffery R, Wing R. Sex differences among participants in a weight-control program. *Addictive Behaviors* 1994;**19**(2):147–58.

Friedman 1995
Friedman M, Brownell K. Psychological correlates of obesity - Moving to the next research generation. *Psychological Bulletin* 1995;**117**(1):3–20.

Garrow 1988
Garrow J. *Obesity and related diseases*. 1st Edition. Edinburgh: Churchill Livingstone, 1988.

Hayaki 1996
Hayaki J, Brownell K. Behaviour change in practice: group approaches. *International Journal of Obesity* 1996;**20**(1): s27–30.

Higgins 2002
Higgins J, Thompson S. Quantifying heterogeneity in a meta-analysis. *Statistics in Medicine* 2002;**21**:1539–58.

Hoffmans 1988
Hoffmans M, Kromhout D, de Lezenne Coulander C. The impact of body mass index of 78 612 18-year old Dutch men on 32-year mortality from all causes. *Journal of Clinical Epidemiology* 1988;**41**:749–56.

Hubert 1983
Hubert H, Feinleib M, McNamara R. Obesity as an independent risk factor for cardiovascular disease: a 26-year follow up of participants in the Framingham Heart Study. *Circulation* 1983;**67**:968–77.

Jadad 1996
Jadad A, Moore A, Carrol D, Jenkinson C, Reynolds D, Gavaghan D, et al.Assessing the quality of reports of randomized clinical trials: is blinding necessary?. *Controlled Clinical Trials* 1996;**17**:1–12.

Karlsson 1997
Karlsson J, Sullivan M, Sjostrom L. Swedish Obese Subjects (SOS): An intervention study of obesity. Four year follow-up of weight loss and quality of life. *International Journal of Obesity* 1997;**21**:s122–23.

Klesges 1984
Klesges R. Personality and obesity: global versus specific measures. *Behaviour Therapy* 1984;**6**:319–24.

Kushner 2000
Kushner R, Foster G. Obesity and quality of life. *Nutrition* 2000;**16**(10):947–52.

Larkin 1979
Larkin J, Pines H. No fat persons need apply. *Sociology of Work and Occupation* 1979;**6**:312–27.

Lee 1999
Lee C, Blair S, Jackson A. Cardio-respiratory fitness, body composition, and all-cause and cardiovascular disease mortality in men. *American Journal of Clinical Nutrition* 1999;**69**:373–4.

Lester 1994
Lester I. *Australia's Food and Nutrition*. Canberra: Australian Government Publishing Services, 1994.

Lew 1979
Lew E, Garfinkel L. Variations in mortality by weight among 750 000 men and women. *Journal of Chronic Disease* 1979:563–76.

Liao 2000
Liao K. Cognitive-behavioural approaches and weight management: an overview. *Journal of the Royal Society of Health* 2000;**120**(1):27–30.

Maddox 1968
Maddox G, Back K, Liederman V. Overweight as social deviance and disability. *Journal of Health, Society and Behavior* 1968;**9**:287–98.

Maddox 1969
Maddox G, Liederman V. Overweight as a social disability with medical implications. *Journal of Medical Education* 1969;**44**:214–20.

Manson 1990
Manson J, Colditz G, Stampfer M. A prospective study of obesity and risk of coronary heart disease in women. *New England Journal of Medicine* 1990;**322**:882–9.

Marks 1960
Marks H. Influence of obesity on morbidity and mortality. *Bulletin of the New York Academy of Sciences* 1960;**36**: 296–312.

Metropolitan 1980
Metropolitan Life Insurance Company. *1979 Build Society*. Chicago: Society of Actuaries and Association of Life Insurance Medical Directors of America, 1980.

Narbro 1997
Narbro K, Agren G, Jonsson E, Larsson B, Naslund I, Sjostrom L, et al.Sick-leave and disability pension before and after treatment of obesity. *International Journal of Obesity* 1997;**21**:s24.

NHLBI 1998
National Heart, Lung and Blood Institute. *Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: The evidence report*. National Institutes of Health, 1998.

NHMRC 1997
National Health and Medical Research Council. *Acting on Australia's Weight: a strategic plan for the prevention of overweight and obesity*. Springfield: Australian Government Publishing Services, 1997.

NHMRC 2003
National Health and Medical Research Council. Clinical Practice Guidelines for the Management of Overweight and Obesity in Adults. Commonwealth of Australia 2003.

NHS 1993
National Health Survey. *National Health Survey*. Singapore: Ministry of Health, 1993.

NHS CRD 1997
National Health Service Centre for Reviews and Dissemination. A systematic review of the interventions for the prevention and treatment of obesity, and the maintenance of weight loss.. *Cochrane Database of Systematic Reviews* 1997.

NIH 1998
National Institutes of Health. Clinical guidelines on the identification, evaluation and treatment of overweight and obesity in adults - The evidence report. 1998.

Powell 1996
Powell K, Pratt M. Physical activity and health. *British Medical Journal* 1996;**313**(7050):126–7.

Power 2000
Power C, Parsons T. Nutritional and other influences in childhood as predictors of adult obesity. *The Proceedings of the Nutrition Society* 2000;**59**(2):267–72.

Rand 1991
Rand D, Macgregor A. Successful weight loss following obesity surgery and the perceived liability of morbid obesity. *International Journal of Obesity* 1991;**15**:577–9.

Ravussin 2000
Ravussin E, Bouchard C. Human genomics and obesity: finding appropriate drug targets. *European Journal of Pharmacology* 2000;**410**:131–45.

Rissanen 1989
Rissanen A, Heliovaara M, Knekt P, Aromaa A, Reunanen A, Maatela J. Weight and mortality in Finnish men. *Journal of Clinical Epidemiology* 1989;**42**:781–9.

Sallade 1973
Sallade J. A comparison of the psychological adjustment of obese vs non-obese children. *Journal of Psychosomatic Research* 1973;**17**:89–96.

Schneider 1997
Schneider S. Tempo diet: A consideration of food and the quality of life. *Time and Society* 1997;**6**(1):85–98.

Schulz 1995
Schulz K, Chalmers I, Hayes R, Altman D. Empirical evidence of bias: dimensions of methodological quality associated with estimates of treatment effects in controlled trials. *Journal of the American Medical Association* 1995;**273**: 408–12.

Staffieri 1967
Staffieri J. A study of social stereotype of body image in children. *Journal of Personality and Social Psychology* 1967;**7**: 101–4.

Stewart 1983
Stewart A, Brooks R. Effects of being overweight. *American Journal of Public Health* 1983;**73**:171–8.

Stunkard 1992
Stunkard A, Wadden T. Psychological aspects of severe obesity. *American Journal of Clinical Nutrition* 1992;**55**: 524–32.

Sørensen 2001
Sørensen T, Echwald S. Obesity genes. *British Medical Journal* 2001;**322**(7287):630.

Waaler 1984
Waaler J. Height, weight and mortality: the Norwegian experience. *Acta Medica Scandanavica* 1984;**679**:1–56.

WHO 1998
World Health Organisation. *Obesity: Preventing and Managing the Global Epidemic: Report of a WHO Expert Committee*. Geneva: WHO, 1998.

Wilding 1997
Wilding J. Obesity treatment. *British Medical Journal* 1997; **315**(7114):997.

Wilson 1999
Wilson G. Cognitive behavior therapy for eating disorders: progress and problems. *Behaviour Research and Therapy* 1999;**37**:s79–95.

Wing 1994
Wing R, Greeno C. Behavioural and psychosocial aspects of obesity and its treatment. *Balliere's Clinical Endocrinology and Metabolism* 1994;**8**(3):689–703.

* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Agras 1995

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 12 weeks DROPOUTS: 14% Analysis by treatment received
Participants	COUNTRY: USA N: 50 AGE: N=47.6 years MALES=7 WEIGHT ENTRY CRITERIA: BMI > 27 EXCLUSION CRITERIA: concurrent participation in another weight loss program, concurrent use of weight loss medications, alcohol or drug abuse, major psychiatric condition such as a psychosis, history of purging in the previous 6 months
Interventions	INTERVENTION 1 (n=39): CBT + written information regarding low fat diet and exercise CONTROL (n=11): waiting list FOLLOW-UP: 6 months
Outcomes	BODY MEASURES: weight loss (kg) OTHER: binge eating scale, Beck depression inventory, self-esteem measures, hunger measures
Notes	All had binge eating disorder

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Black 1983

Methods	DESIGN: Parallel; Randomisation method - coin toss BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 7 weeks DROPOUTS: none Analysis by treatment received
Participants	COUNTRY: USA N: 14 AGE: N=43 years MALES=2 WEIGHT ENTRY CRITERIA: at least 25% overweight - measure not stated EXCLUSION CRITERIA: concurrent participation in another weight loss program, concurrent use of weight loss medications, medical problems prohibiting weight loss
Interventions	INTERVENTION 1 (n=7): fixed sequence behaviour therapy INTERVENTION 2 (n=7): problem solving and motivational techniques BOTH GROUPS: monetary contingency, dietary advice, encouragement to increase physical activity FOLLOW-UP: 3 months and 6 months
Outcomes	BODY MEASURES: weight loss (lb)
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Black 1984

Methods	DESIGN: Stratified according to percentage overweight; Randomisation method -not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 10 weeks DROPOUTS: 15% Analysis by treatment received
Participants	COUNTRY: USA N: 66 AGE: 18-52 years MALES=19.7% WEIGHT ENTRY CRITERIA: > 20% overweight according to Metropolitan Life Insurance Tables EXCLUSION CRITERIA: not stated

Black 1984 (*Continued*)

Interventions	INTERVENTION 1 (n=22): minimal intervention (patients told to eat a nutritious diet, increase levels of physical activity and lose weight slowly) INTERVENTION 2 (n=22): group reliance behaviour therapy INTERVENTION 3 (n=22): self-reliance behaviour therapy FOLLOW-UP: 6 months
Outcomes	BODY MEASURES: weight loss (lb)
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Block 1980

Methods	DESIGN: Stratified according to percentage overweight; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 10 weeks DROPOUTS: none Analysis by treatment received
Participants	COUNTRY: USA N: 40 AGE: N=37.7 years MALES=12 WEIGHT ENTRY CRITERIA: at least 15 pounds overweight by Metropolitan Life Insurance Tables EXCLUSION CRITERIA: concurrent participation in another weight loss program, medical problems prohibiting weight loss
Interventions	INTERVENTION 1 (n=16): rational emotive therapy INTERVENTION 2 (n=16): relaxation training and group discussion CONTROL (n=8): waiting list ALL GROUPS: written low calorie diet information FOLLOW-UP: 4.5 months
Outcomes	BODY MEASURES: weight loss (lb)
Notes	

Risk of bias

Item	Authors' judgement	Description

Block 1980 (*Continued*)

Allocation concealment?	Unclear	B - Unclear

Brownell 1978a

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 6 months DROPOUTS: none Analysis by treatment received
Participants	COUNTRY: USA N: 29 AGE: N=45.3 years MALES=10 WEIGHT ENTRY CRITERIA: at least 15% overweight by Metropolitan Life Insurance Tables EXCLUSION CRITERIA: concurrent participation in another weight loss program or concurrent use of weight loss medications, medical problems prohibiting weight loss
Interventions	INTERVENTION 1 (n=9): couples therapy with co-operative spouse INTERVENTION 2 (n=9): therapy with subject alone, spouse co-operative INTERVENTION 3 (n=11): therapy with subject alone, spouse unco-operative BOTH GROUPS: behaviour therapy and low fat diet and advice regarding need for exercise FOLLOW-UP: 3 months and 6 months
Outcomes	BODY MEASURES: weight loss (lb), weight reduction quotient, mean percentage change in body weight OTHER: daily log of behaviour change, assessment of behavioral weight control knowledge
Notes	

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Burnett 1985

Methods	DESIGN: Factorial; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 10 weeks DROPOUTS: none Analysis by treatment received
Participants	COUNTRY: USA N: 12 AGE: 30-50 years MALE: none WEIGHT ENTRY CRITERIA: >35% overweight (measure not stated) EXCLUSION CRITERIA: not stated
Interventions	INTERVENTION 1 (n=6): computer administered behaviour therapy INTERVENTION 2 (n=6): therapist admininstered behaviour therapy FOLLOW-UP: 6 months and 10 months
Outcomes	BODY MEASURES: weight loss (kg) OTHER: self-reported calorie intake, self reported physical activity levels, measure of treatment acceptability
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Calle-Pascual 1992

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 55 weeks DROPOUTS: none Analysis by treatment received
Participants	COUNTRY: Spain N: 74 AGE: N=54 years MALE: 17 WEIGHT ENTRY CRITERIA:BMI > 30 EXCLUSION CRITERIA: not stated

Calle-Pascual 1992 (*Continued*)

Interventions	INTERVENTION 1 (n=46): Behaviour therapy INTERVENTION 2 (n=28): no behaviour therapy BOTH GROUPS: low calorie diet and information regarding physical activity FOLLOW-UP: 35 weeks and 12 months
Outcomes	BODY MEASURES: weight loss (kg), BMI change OTHER: fasting serum glucose, 2 hour oral glucose tolerance test, systolic and diastolic blood pressure, fasting triglycerides and cholesterol (HDL and total)
Notes	All patients had non insulin dependent diabetes mellitus

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Carroll 1981

Methods	DESIGN: Parallel; Randomisation method not described BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 2.5 months DROPOUTS: <15% Analysis by treatment received
Participants	COUNTRY: USA N: 24 AGE: 19-34 MALES: 0 WEIGHT ENTRY CRITERIA: 14- 60% by Metropolitan Life Insurance Tables EXCLUSION CRITERIA: Not stated
Interventions	INTERVENTION 1(n=12): Behaviour therapy INTERVENTION 2 (n=12): Behaviour therapy and stimulus control BOTH GROUPS: general dietary and exercise advice FOLLOW-UP: 8 months
Outcomes	BODY MEASURES: weight loss (kg) and weight reduction index
Notes	

Risk of bias

Item	Authors' judgement	Description

Carroll 1981 (*Continued*)

Allocation concealment?	Unclear	B - Unclear

Castro 1983

Methods	DESIGN: Stratified according to percentage overweight; Randomisation method not described; BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 3 months DROPOUTS <15 % Analysis by treatment received
Participants	COUNTRY: South America N: 40 AGE: 18 - 48 years. MALE: 5 WEIGHT ENTRY CRITERIA: At least 15 % overweight by Fogarty International Table EXCLUSION CRITERIA: Taking medications for weight loss, having physical condition resulting in weight changes, participating in other weight loss programs
Interventions	INTERVENTION 1 (n=13): Positive monetary reinforcement of weight loss INTERVENTION 2 (n=14): negative monetary reinforcement CONTROL (n=13): no monetary reinforcement. Both groups also received low calorie diet information, stimulus control information and general behavioral advice. FOLLOW-UP: 4 months
Outcomes	BODY MEASURES: weight loss (lb)
Notes	Variance data unable to be extracted from results. Results reported narratively

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Chapman 1978

Methods	DESIGN: Stratified according to percentage overweight; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 2 months DROPOUTS: <15% Analysis by treatment received
Participants	COUNTRY: USA N: 57 AGE: 17-65 MALES: 0 WEIGHT ENTRY CRITERIA: 17-85% above ideal body weight on insurance tables EXCLUSION CRITERIA: Not stated
Interventions	INTERVENTION 1 (n=19): Situational management of environmental stimuli to overeating INTERVENTION 2 (n=18): Self-standard setting for goal changes in weight and eating behaviours INTERVENTION 3 (n=17): Self reward contingent on successful weight loss ALL GROUPS: Monetary rewards for improvement + general dietary and exercise advice FOLLOW-UP: 4 months
Outcomes	BODY MEASURES: weight loss (kg and lb)
Notes	Variance data unable to be extracted from results. Results reported narratively

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Cochrane 1985

Methods	DESIGN: Parallel; Randomisation method not described BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 4 weeks DROPOUTS: 10% Analysis by treatment received
Participants	COUNTRY: Canada N: 54 AGE: 20-65 MALES: 0 WEIGHT ENTRY CRITERIA: >20% overweight by Metropolitan Life Insurance Tables EXCLUSION CRITERIA: medical problems contraindicating weight loss, enrolment in another weight loss program simultaneously

Cochrane 1985 (*Continued*)

Interventions	INTERVENTION 1 (n=17): Hypnotherapy using audiotape INTERVENTION 2 (n=17): Hypnotherapy using voice CONTROL (n=20): Waiting list FOLLOW-UP: 6 months
Outcomes	BODY MEASURES: weight loss (lb)
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Dennis 1999

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 4 months DROPOUTS: 15% Analysis by treatment received
Participants	COUNTRY: USA N: 39 AGE: N=31 MALES: All WEIGHT ENTRY CRITERIA: Overweight according to US Navy Physical Readiness testing EXCLUSION CRITERIA: not stated
Interventions	INTERVENTION (N=21): Low calorie diet advice + exercise advice + CBT CONTROL (n=18): exercise and low calorie diet advice FOLLOW-UP: 6 months
Outcomes	BODY MEASURES: weight loss (lb), BMI, WHR OTHER: fasting serum glucose and lipoprotein levels, mood questionnaire, diet questionnaire
Notes	All subjects Naval personnel on deployment

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Foreyt 1973

Methods	DESIGN: Stratified according to percentage overweight; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 9 weeks DROPOUTS: 13% Analysis by treatment received
Participants	COUNTRY: USA N: 39 AGE: 18-24 MALES: None WEIGHT ENTRY CRITERIA: > 10% overweight according to Metropolitan Life Insurance Tables EXCLUSION CRITERIA: not stated
Interventions	INTERVENTION 1 (N=12): Relaxation training + covert sensitization INTERVENTION 2 (n=13): Relaxation training + aversive conditioning CONTROL (n=13): waiting list FOLLOW-UP: 4.5 months
Outcomes	BODY MEASURES: weight loss (lb), % overweight OTHER: food palatability scoring
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Goodrick 1998

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 6 months DROPOUTS: 15% Analysis by treatment received
Participants	COUNTRY: USA N: 219 AGE: N=40 years MALES: None WEIGHT ENTRY CRITERIA: 14-41 kg overweight according to Metropolitan Life Insurance Tables EXCLUSION CRITERIA: medical history of diabetes, cardiovascular or gastrointestinal disease, purging

Goodrick 1998 (*Continued*)

	behavior in the previous 6 months, pregnancy, unable to exercise, enrolled in another weight program, smokers
Interventions	INTERVENTION 1 (N=79): Low-fat diet + behavior therapy INTERVENTION 2 (n=78): psychotherapy CONTROL (n=62): waiting list FOLLOW-UP: 6 months
Outcomes	BODY MEASURES: weight loss (kg), BMI OTHER: binge eating scale, exercise estimate, class attendance
Notes	Subjects in active treatment continued to 18 months however control data is to 6 months only; all subjects had binge-eating disorder

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Gormally 1981

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 16 weeks DROPOUTS: 11% Analysis by treatment received
Participants	COUNTRY: USA N: 100 AGE: N=39.4 years MALES: None WEIGHT ENTRY CRITERIA: at least 9.1 kg overweight and not weighing more than 100.1 kg EXCLUSION CRITERIA: not between 25 and 55 years old, taking medications that affect body weight, involved in other weight loss treatments
Interventions	INTERVENTION 1 (N=53): nutritional advice + behaviour therapy manual (Learning to Eat) teaching self monitoring, stimulus control, self reinforcement, increasing activity levels and pre planning meals INTERVENTION 2 (n=46): nutritional advice + calorie counting FOLLOW-UP: 30 weeks
Outcomes	BODY MEASURES: weight loss (lb) OTHER: calorie intake, activity level, ratings of treatment
Notes	

Gormally 1981 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Hagen 1974

Methods	DESIGN: Stratified according to percentage overweight; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 10 weeks DROPOUTS: 1% Analysis by treatment received
Participants	COUNTRY: USA N: 90 AGE: 17-22 years MALES: None WEIGHT ENTRY CRITERIA: > 10% overweight according to Metropolitan Life Insurance Tables EXCLUSION CRITERIA: not stated
Interventions	INTERVENTION 1 (N=18): Group behavior therapy based on learning principles + relaxation training INTERVENTION 2 (n=18): Behavior therapy based on learning theory delivered by manual + group behavior therapy INTERVENTION 3 (n=18): Behavior therapy based on learning theory delivered by manual only CONTROL (n=35): waiting list FOLLOW-UP: 4 months
Outcomes	BODY MEASURES: weight loss (lb) OTHER: eating patterns questionnaire, physical activity scale, subject evaluation, social measures
Notes	

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Israel 1979

Methods	DESIGN: Stratified according to percentage overweight; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 9 weeks DROPOUTS: 14% Analysis by treatment received
Participants	COUNTRY: USA N: 49 AGE: not stated MALES: 1 WEIGHT ENTRY CRITERIA: not stated EXCLUSION CRITERIA: not stated
Interventions	INTERVENTION 1 (n=5): behavior therapy + weight monitoring INTERVENTION 2 (n=6): behavior therapy + monitoring of eating behavior INTERVENTION 3 (n=7): behavior therapy + therapist reinforcement of weight loss INTERVENTION 4 (n=5): behavior therapy + therapist reinforcement of eating behavior change INTERVENTION 5 (n=7): behavior therapy + reinforcement of weight loss by significant other INTERVENTION 6 (n=6): behavior therapy + reinforcement of behavior therapy by significant other CONTROL (n=7): waiting list FOLLOW-UP: 3 and 12 months
Outcomes	BODY MEASURES: weight loss (lb) OTHER: none
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Jeffery 1983

Methods	DESIGN: Factorial; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 15 weeks DROPOUTS: 0% Analysis by treatment received

Jeffery 1983 (*Continued*)

Participants	COUNTRY: USA N: 89 AGE: 35-57 MALES: all WEIGHT ENTRY CRITERIA: > 30 lb overweight according to Metropolitan Life Insurance criteria EXCLUSION CRITERIA: uncontrolled diabetes or heart disease, concurrent dietary or psychological treatment, greater than 6 alcoholic drinks per day
Interventions	INTERVENTION 1 (n=16): individual contingency contracting $30 INTERVENTION 2 (n=15): individual contingency contracting $150 INTERVENTION 3 (n=14): individual contingency contracting $300 INTERVENTION 4 (n=17): group contingency contracting $30 INTERVENTION 5 (n=14): group contingency contracting $150 INTERVENTION 6 (n=13): group contingency contracting $300 ALL GROUPS: written material explaining self-monitoring, diet and exercise, self-motivation, crisis management and maintenance FOLLOW-UP: 12 months
Outcomes	BODY MEASURES: weight loss (lb) OTHER: knowledge of calorie content of foods, eating habits, feelings of well-being, weight history
Notes	Variance data unable to be extracted from results. Results reported narratively

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Jeffery 1985

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 6 months DROPOUTS: 6% Analysis by treatment received
Participants	COUNTRY: USA N: 36 AGE: N=42.4 MALES: 14% WEIGHT ENTRY CRITERIA: not stated EXCLUSION CRITERIA: not stated

Jeffery 1985 (*Continued*)

Interventions	INTERVENTION 1 (n=16): low calorie diet + exercise + monetary incentive to lose weight INTERVENTION 2 (n=15): low calorie diet + exercise FOLLOW-UP: 6 months
Outcomes	BODY MEASURES: weight loss (lb) OTHER: none
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Jeffery 1995

Methods	DESIGN: Randomised according to gender and geographical location; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 5 months DROPOUTS: 12% Analysis by treatment received
Participants	COUNTRY: USA N: 177 AGE: N=25-45 years MALES: 50% WEIGHT ENTRY CRITERIA: 14 to 32 kg overweight (Metropolitan Life Insurance Company) EXCLUSION CRITERIA: smokers, excess alcohol consumption, already on diet, taking prescription medications, presence of serious medical problems
Interventions	INTERVENTION 1 (n=24): standard behavior therapy INTERVENTION 2 (n=34): standard behavior therapy + provision of food INTERVENTION 3 (n=34): standard behavior therapy + financial incentive to lose weight INTERVENTION 4 (n=34): standard behavior therapy + provision of food + financial incentive to lose weight CONTROL (n=27): no intervention FOLLOW-UP: 30 months
Outcomes	BODY MEASURES: weight loss (kg) OTHER: none
Notes	

Risk of bias

Jeffery 1995 (*Continued*)

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Johnson 1979

Methods	DESIGN: Stratified according to percentage overweight and levels of baseline exercise; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 10 weeks DROPOUTS: 2% Analysis by treatment received
Participants	COUNTRY: USA N: 44 AGE: not stated MALES: 7 WEIGHT ENTRY CRITERIA: >40% overweight (measure not stated) EXCLUSION CRITERIA: not stated
Interventions	INTERVENTION 1(n=12): training in stimulus control INTERVENTION 2 (n=9): training in stimulus control + exercise INTERVENTION 3 (n=12): training in stimulus control + contingency management INTERVENTION 4 (n=10): training in stimulus control + contingency management + exercise FOLLOW-UP: 3 and 12 months
Outcomes	BODY MEASURES: weight loss (kg) OTHER: none
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Kirschenbaum 1985

Methods	DESIGN: Stratified according to gender and percentage overweight; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 12 weeks DROPOUTS: 9.5% Analysis by treatment received
Participants	COUNTRY: USA N: 65 AGE: N=38.2 MALES: 7 WEIGHT ENTRY CRITERIA: >15% overweight (Metropolitan Life Insurance Criteria) EXCLUSION CRITERIA: not stated
Interventions	INTERVENTION 1(n=16): diet + exercise + regular weigh-in + weekly nutrition lecture + attention prompting INTERVENTION 2 (n=16): behavior therapy INTERVENTION 3 (n=16): behavior therapy + pretherapy induction CONTROL (n=17): diet + exercise + weigh in + weekly nutrition lecture FOLLOW-UP: 6 and 24 months
Outcomes	BODY MEASURES: change in percentage overweight OTHER: eating habits, expectancy ratings and therapist assessments
Notes	Data presented subgrouped according to the therapist conducting the sessions (A and B)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Lindahl 1999

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 4 weeks DROPOUTS: 7% Analysis by treatment received
Participants	COUNTRY: Sweden N: 186 AGE: N=55 years MALES: 69

Lindahl 1999 (*Continued*)

	WEIGHT ENTRY CRITERIA: BMI in excess of 27 EXCLUSION CRITERIA: participation in an alternative wellness program, too physically ill to participate
Interventions	INTERVENTION 1(n=93): behavior therapy CONTROL (n=93): usual care (single counseling session with trained nurse) BOTH GROUPS: general lifestyle advice FOLLOW-UP: 12 months
Outcomes	BODY MEASURES: weight loss (kg), BMI, waist hip ratio OTHER: blood pressure, cholesterol and triglycerides, serum glucose, serum insulin, serum fibrinogen, physical fitness, oxygen consumption
Notes	All subjects had impaired glucose tolerance

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Nauta 2000

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 15 weeks DROPOUTS: 13.5% Analysis by intention to treat
Participants	COUNTRY: The Netherlands N: 74 AGE: 21-49 years MALES: 0 WEIGHT ENTRY CRITERIA: BMI in excess of 27 EXCLUSION CRITERIA:participation in a concurrent weight loss program, physical dependence on alcohol or drugs, psychosis, pregnancy
Interventions	INTERVENTION 1(n=37): behavior therapy in binge and non-binge eaters INTERVENTION 2 (n=37): cognitive therapy in binge and non-binge eaters FOLLOW-UP: 6 months
Outcomes	BODY MEASURES: weight loss (kg) OTHER: expectations of treatment, cognitive and behavioral checklists, eating pathology questionnaires, depression measures, self-esteem measures

Nauta 2000 (*Continued*)

Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Oldroyd 2001

Methods	DESIGN: Parallel; Randomisation by random number table BLINDING: patients - no caregivers - no outcome assessors - yes DURATION OF INTERVENTION: 6 months DROPOUTS: 10% Analysis by intention to treat
Participants	COUNTRY: UK N: 67 AGE: 24-75 years MALES: 38 WEIGHT ENTRY CRITERIA: not stated EXCLUSION CRITERIA: not stated
Interventions	INTERVENTION 1(n=39): low fat diet and exercise advice + behavior therapy CONTROL (n=39): no intervention FOLLOW-UP: 6 months
Outcomes	BODY MEASURES: weight loss (kg), change in BMI / waist circumference / waist hip ratio OTHER: blood pressure, fasting glucose, HbA1c, fasting and 2 hour insulin levels, cholesterol, triglycerides and apolipoprotein levels, fibrinogen levels, resting pulse, lifestyle activity levels, daily energy and nutrient intake
Notes	All subjects had impaired glucose tolerance

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Painot 2001

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 12 weeks DROPOUTS: 5% Analysis by treatment received
Participants	COUNTRY: Switzerland N: 62 AGE: N=42 years MALES: 0 WEIGHT ENTRY CRITERIA: not stated EXCLUSION CRITERIA: not stated
Interventions	INTERVENTION 1(n=35): cognitive behavior therapy INTERVENTION 2 (n=25): cognitive behavior therapy + dietary fat restriction FOLLOW-UP: 3 months
Outcomes	BODY MEASURES: weight loss (kg) OTHER: Beck Depression Inventory, Hospital Anxiety Depression Scale, Eating Disorders Inventory
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Rozensky 1976

Methods	DESIGN: Stratified according to level of self reinforcement; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 7 weeks DROPOUTS: <10% Analysis by treatment received
Participants	COUNTRY: USA N: 37 AGE: N=35.7 years MALES: 5 WEIGHT ENTRY CRITERIA: not stated EXCLUSION CRITERIA: not stated

Rozensky 1976 (*Continued*)

Interventions	INTERVENTION 1(n=14): behavior therapy focusing on self- control INTERVENTION 2 (n=15): therapist-driven monetary contingency for weight loss CONTROL (n=11): minimal contact FOLLOW-UP: 3.5 months
Outcomes	BODY MEASURES: weight loss (lb), percentage body weight change OTHER:
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Saccone 1978

Methods	DESIGN: Stratified according to percentage overweight; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 9 weeks DROPOUTS: 6% Analysis by treatment received
Participants	COUNTRY: USA N: 49 AGE: 16-56 years MALES: 1 WEIGHT ENTRY CRITERIA: >15% overweight according to Fogarty Conference on Obesity Recommended Weight in Relation to Height (1975) EXCLUSION CRITERIA: no significant other available daily in the client's home, additional treatment for weight reduction being administered, inability to provide monetary deposit for the study
Interventions	INTERVENTION 1(n=6): weight monitoring INTERVENTION 2 (n=8): behavioral monitoring INTERVENTION 3 (n=8): reinforcement of weight loss by therapist INTERVENTION 4 (n=8): reinforcement of weight loss by significant other INTERVENTION 5 (n=7): reinforcement of behavior change by therapist INTERVENTION 6 (n=7): reinforcement of behavior change by significant other CONTROL (n=8): waiting list ALL ACTIVE TREATMENT GROUPS: behavior modification program FOLLOW-UP: 12 months
Outcomes	BODY MEASURES: weight loss (lb) OTHER: none

Saccone 1978 (*Continued*)

Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Sbrocco 1999

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 12 weeks DROPOUTS: 12.5% Analysis by treatment received
Participants	COUNTRY: USA N: 24 AGE: 18-55 years MALES: none WEIGHT ENTRY CRITERIA: 30-60 % overweight according to Metropolitan Life Insurance Tables EXCLUSION CRITERIA: smokers, poor physical health, weight loss of more tha 10 lb in the past month or 20 lb in the past 6 months
Interventions	INTERVENTION 1(n=12): traditional behaviour therapy INTERVENTION 2 (n=12): behavioral choice treatment ALL ACTIVE TREATMENT GROUPS: low fat diet FOLLOW-UP: 26 and 52 weeks
Outcomes	BODY MEASURES: weight loss (kg) OTHER: eating inventory, drive for thinness subscale, body dissatisfaction subscale, bulimia subscale, self-esteem scale, Beck depression inventory
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Stevens 2001

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 18 months DROPOUTS: 7.5% Analysis by treatment received
Participants	COUNTRY: USA N: 1191 AGE: N=43.4 years MALES: 66% WEIGHT ENTRY CRITERIA: 110% to 165% above ideal weight at baseline EXCLUSION CRITERIA: current treatment with medications for blood pressure, clinical or laboratory evidence of cardiovascular disease, diabetes mellitus, renal insufficiency and current / planned pregnancy
Interventions	INTERVENTION 1(n=547): behavior therapy + low calorie diet /encouragement to exercise CONTROL (n=554): usual blood pressure care FOLLOW-UP: 6, 18 and 36 months
Outcomes	BODY MEASURES: weight loss (kg), BMI OTHER: blood pressure, exercise frequency, energy intake
Notes	Primary focus of study to test efficacy of lifestyle interventions for reducing blood pressure

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Stuart 1971

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 15 weeks DROPOUTS: none Analysis by intention to treat
Participants	COUNTRY: USA N: 6 AGE: 27-41 years MALES: 0 WEIGHT ENTRY CRITERIA: not stated EXCLUSION CRITERIA: not stated

Stuart 1971 (*Continued*)

Interventions	INTERVENTION 1(n=3): behavior therapy + written diet and exercise information INTERVENTION 2 (n=3): written diet and exercise information FOLLOW-UP: 5, 10 and 12 months
Outcomes	BODY MEASURES: weight loss (lb) OTHER: none
Notes	Variance data unable to be extracted from results. Results reported narratively

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Wing 1984

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 10 weeks DROPOUTS: 5% Analysis by intention to treat
Participants	COUNTRY: USA N: 48 AGE: N=44.8 years MALES: 6 WEIGHT ENTRY CRITERIA: >20% overweight according to Metropolitan Life Insurance Tables EXCLUSION CRITERIA: involved in concurrent weight loss program, unwillingness to participate for 15 months, unable to supply monetary deposit
Interventions	INTERVENTION 1(n=23): low calorie diet INTERVENTION 2 (n=21): standard behavior therapy FOLLOW-UP: 6 months
Outcomes	BODY MEASURES: weight loss (lb) OTHER: diet diary, eating behavior inventory, cupboard survey
Notes	

Risk of bias

Item	Authors' judgement	Description

Wing 1984 (*Continued*)

Allocation concealment?	Unclear	B - Unclear

Wing 1985

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 16 weeks DROPOUTS: 6% Analysis by treatment received
Participants	COUNTRY: USA N: 53 AGE: N=55 years MALES: 20 WEIGHT ENTRY CRITERIA: >20% overweight according to Metropolitan Life Insurance Tables EXCLUSION CRITERIA: non-diabetic subjects excluded
Interventions	INTERVENTION 1(n=18): diet + exercise + contingency contracts + changing the environment and act of eating + changing cognitions INTERVENTION 2 (n=18): diet + exercise + contingency contracts + nutrition education INTERVENTION 3 (n=17): diet + exercise + contingency contracting FOLLOW-UP: 4 and 16 months
Outcomes	BODY MEASURES: weight loss (kg) OTHER: HbA1c, blood sugar, insulin, triglycerides and cholesterol, blood pressure
Notes	All subjects had type II diabetes mellitus

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Wing 1991

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 20 weeks DROPOUTS: 13% Analysis by treatment received
Participants	COUNTRY: USA N: 49 AGE: N=52 years MALES: 42% WEIGHT ENTRY CRITERIA: >20% overweight according to Metropolitan Life Insurance Tables EXCLUSION CRITERIA: non-diabetic subjects excluded, spouse not > 15% above ideal weight and aged between 30-70 years
Interventions	INTERVENTION 1(n=23): behaviour therapy without spouse involvement + contingency contracting INTERVENTION 2 (n=20): group behaviour therapy with spouse involved + contingency contracting FOLLOW-UP: 52 weeks
Outcomes	BODY MEASURES: weight loss (lb) OTHER: HbA1c, blood sugar, insulin, % overweight, BMI, calorie intake, eating behavior inventory, exercise levels
Notes	All subjects had type II diabetes mellitus

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Wing 1996

Methods	DESIGN: Parallel; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 26 weeks DROPOUTS: 9% Analysis by treatment received
Participants	COUNTRY: USA N: 163 AGE: N=41.2 years MALES: none WEIGHT ENTRY CRITERIA: 30 - 70 lb overweight according to Metropolitan Life Insurance Tables

Wing 1996 (*Continued*)

	EXCLUSION CRITERIA: pregnancy, planning pregnancy in the next 18 months, medical illnesses that would preclude participation in a diet / exercise program
Interventions	INTERVENTION 1(n=40): standard behaviour therapy INTERVENTION 2 (n=41): standard behaviour therapy + written meal plans INTERVENTION 3 (n=41): standard behaviour therapy + written meal plans + food provision INTERVENTION 4 (n=41): standard behaviour therapy + written meal plans + food provision for free FOLLOW-UP: 26 weeks
Outcomes	BODY MEASURES: weight loss (kg) OTHER: BMI, barriers to adherence, dietary intake, food stored in home, eating patterns, knowledge, physical activity
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Wollersheim 1970

Methods	DESIGN: Stratified according to percentage overweight; Randomisation method not stated BLINDING: patients - not stated caregivers - not stated outcome assessors - not stated DURATION OF INTERVENTION: 12 weeks DROPOUTS: 4% Analysis by treatment received
Participants	COUNTRY: USA N: 79 AGE: 18-36 years MALES: 0 WEIGHT ENTRY CRITERIA: >10% overweight according to Metropolitan Life Insurance Tables EXCLUSION CRITERIA: not stated
Interventions	INTERVENTION 1(n=20): positive expectation and social pressure therapy INTERVENTION 2 (n=20): group discussion and relaxation therapy INTERVENTION 3 (n=20): focal learned behavior therapy CONTROL (n=19): waiting list FOLLOW-UP: 3 months
Outcomes	BODY MEASURES: weight loss (lb) OTHER: eating patterns questionnaire, physical activity scale, introversion - extroversion scale, anxiety scale, therapist competence and likability ratings

Wollersheim 1970 (*Continued*)

Notes	Duplicate publication found - Wollersheim 1977	
Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Aldarondo 1998	There was no clear difference in intervention between the active treatment group and the control group
Alexy 1985	Insufficient description of behavioral intervention.
Ashby 1977	Behavioral treatment aimed at weight maintenance, not loss.
Boehm 1993	Medication compliance, not weight loss, the goal of the behavioral intervention
Brownell 1978b	No post-treatment control group data supplied. Loss to follow-up data not reported
Brownell 1981	Unable to extract results of psychological intervention independent of medication effect
DeLucia 1989	All participants received the same psychological intervention
DeLucia 1990	Loss to follow-up not reported.
Fisher 1986	Exercise the dependent variable under investigation.
French 1994	Comparison data of intervention versus control not supplied.
Jefferey 1974	Loss to follow-up not reported.
Jefferey 1993	Raw mean data not supplied.
Mahoney 1974	Median weight loss data only supplied.
Miura 1989	Method of randomisation / treatment allocation not reported.
Pekkarinen 1996	Method of randomisation / treatment allocation not reported.
Penick 1971	Raw mean data not supplied.

(*Continued*)

Rabkin 1983	Weight loss not the goal of the behavioral intervention.
Raeburn 1986	Loss to follow-up 50% in the no treatment control group.
Rapoport 2000	> 15% of subjects dropped out of the study.
TOHP 1992	Unable to extract weight loss data for overweight participants from normal weight participants
Wing 1990	No control group / comparison group.
Wing 2001	No data regarding variance / standard deviations supplied. High losses to follow-up in control group and one of the three intervention groups
Wollersheim 1977	Duplicate publication of previously published results (Wollersheim 1970)

DATA AND ANALYSES

Comparison 1. Behaviour therapy versus control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mean change in weight - studies 12 months or less duration	5	1305	Mean Difference (IV, Fixed, 95% CI)	-4.46 [-4.57, -4.34]
2 Mean change in weight - studies > 12 months duration	2	1254	Mean Difference (IV, Fixed, 95% CI)	-2.00 [-2.03, -1.97]

Comparison 2. Behaviour therapy plus diet / exercise versus diet / exercise

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mean change in weight - studies 12 months or less duration	6	467	Mean Difference (IV, Fixed, 95% CI)	-4.71 [-4.97, -4.45]

Comparison 3. More intensive versus less intensive behaviour therapy

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mean change in weight - studies with a duration of 12 months or less	10	306	Mean Difference (IV, Fixed, 95% CI)	-2.34 [-3.27, -1.41]
2 Mean change in weight - studies > 12 months duration	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 4. Cognitive behaviour therapy plus diet / exercise versus diet / exercise

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Mean change in weight - studies 6 months duration or less	2	63	Mean Difference (IV, Fixed, 95% CI)	-4.85 [-7.31, -2.38]

Analysis 1.1. Comparison 1 Behaviour therapy versus control, Outcome 1 Mean change in weight - studies 12 months or less duration.

Review: Psychological interventions for overweight or obesity

Comparison: 1 Behaviour therapy versus control

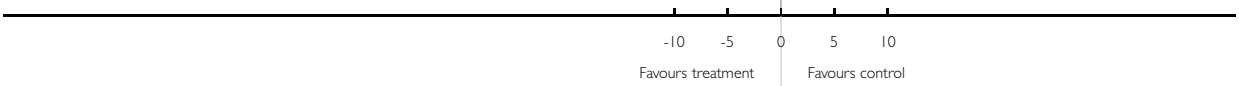
Outcome: 1 Mean change in weight - studies 12 months or less duration

Study or subgroup	Behaviour therapy N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Israel 1979	36	-1 (2.2)	7	1.8 (2.2)		0.4 %	-2.80 [-4.58, -1.02]
Oldroyd 2001	39	-1.5 (2.6)	39	0.5 (2.2)		1.2 %	-2.00 [-3.07, -0.93]
Rozensky 1976	14	-2.7 (3.2)	11	-1.8 (3.2)		0.2 %	-0.90 [-3.43, 1.63]
Saccone 1978	50	-3.1 (2.6)	8	1.8 (2.9)		0.3 %	-4.90 [-7.03, -2.77]
Stevens 2001	547	-4.4 (1)	554	0.1 (1)		97.9 %	-4.50 [-4.62, -4.38]
Total (95% CI)	**686**		**619**			**100.0 %**	**-4.46 [-4.57, -4.34]**

Heterogeneity: Chi^2 = 31.91, df = 4 (P<0.00001); I^2 =87%

Test for overall effect: Z = 74.74 (P < 0.00001)

Test for subgroup differences: Not applicable



Analysis 1.2. Comparison 1 Behaviour therapy versus control, Outcome 2 Mean change in weight - studies > 12 months duration.

Review: Psychological interventions for overweight or obesity

Comparison: 1 Behaviour therapy versus control

Outcome: 2 Mean change in weight - studies > 12 months duration

Study or subgroup	Behaviour therapy N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Jeffery 1995	126	-1.7 (6.4)	27	0.6 (5.3)		0.0 %	-2.30 [-4.59, -0.01]
Stevens 2001	547	-0.2 (0.11)	554	1.8 (0.3)		100.0 %	-2.00 [-2.03, -1.97]
Total (95% CI)	**673**		**581**			**100.0 %**	**-2.00 [-2.03, -1.97]**

Heterogeneity: $Chi^2 = 0.07$, df = 1 (P = 0.80); $I^2 = 0.0\%$

Test for overall effect: Z = 147.22 (P < 0.00001)

Test for subgroup differences: Not applicable

Analysis 2.1. Comparison 2 Behaviour therapy plus diet / exercise versus diet / exercise, Outcome 1 Mean change in weight - studies 12 months or less duration.

Review: Psychological interventions for overweight or obesity

Comparison: 2 Behaviour therapy plus diet / exercise versus diet / exercise

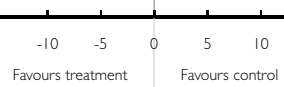
Outcome: 1 Mean change in weight - studies 12 months or less duration

Study or subgroup	Behaviour therapy +		Diet + / - exercise		Mean Difference	Weight	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI		IV,Fixed,95% CI
Black 1984	32	-4.4 (3.9)	17	-2.5 (4.35)		1.1 %	-1.90 [-4.37, 0.57]
Gormally 1981	53	-5.5 (6.4)	46	-3 (5.3)		1.3 %	-2.50 [-4.81, -0.19]
Jeffery 1985	18	-3.7 (6.4)	18	-7.7 (5.3)		0.5 %	4.00 [0.16, 7.84]
Lindahl 1999	93	-5.4 (1.3)	93	-0.5 (0.3)		93.2 %	-4.90 [-5.17, -4.63]
Wing 1984	21	-3 (7.5)	23	-2.7 (10.9)		0.2 %	-0.30 [-5.79, 5.19]
Wing 1985	18	-6.3 (2.1)	35	-3.4 (2.9)		3.7 %	-2.90 [-4.27, -1.53]
Total (95% CI)	**235**		**232**			**100.0 %**	**-4.71 [-4.97, -4.45]**

Heterogeneity: Chi^2 = 39.39, df = 5 (P<0.00001); I^2 =87%

Test for overall effect: Z = 35.26 (P < 0.00001)

Test for subgroup differences: Not applicable



Analysis 3.1. Comparison 3 More intensive versus less intensive behaviour therapy, Outcome 1 Mean change in weight - studies with a duration of 12 months or less.

Review: Psychological interventions for overweight or obesity

Comparison: 3 More intensive versus less intensive behaviour therapy

Outcome: 1 Mean change in weight - studies with a duration of 12 months or less

Study or subgroup	More intensive group N	Mean(SD)	Less intensive group N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Black 1983	7	-7.1 (2.7)	7	-3 (2.1)		13.4 %	-4.10 [-6.63, -1.57]
Black 1984	12	-2.9 (5.8)	13	-3.3 (3.7)		5.8 %	0.40 [-3.45, 4.25]
Brownell 1978a	5	-13.4 (6.6)	11	-6.9 (5.5)		2.0 %	-6.50 [-13.14, 0.14]
Burnett 1985	6	-8 (6.3)	6	-1 (3.3)		2.7 %	-7.00 [-12.69, -1.31]
Carroll 1981	10	-4.5 (5.3)	11	-3.2 (3.8)		5.4 %	-1.30 [-5.28, 2.68]
Johnson 1979	10	-5.9 (5.35)	12	-2.4 (5.35)		4.3 %	-3.50 [-7.99, 0.99]
Rozensky 1976	14	-3.7 (3.2)	14	-1.6 (3.2)		15.3 %	-2.10 [-4.47, 0.27]
Saccone 1978	30	-3.7 (2.7)	14	-1.9 (2.3)		36.1 %	-1.80 [-3.34, -0.26]
Wing 1991	20	-3.2 (5.3)	23	-5.3 (10.4)		3.7 %	2.10 [-2.74, 6.94]
Wing 1996	41	-11.4 (6.5)	40	-8 (6.2)		11.3 %	-3.40 [-6.17, -0.63]
Total (95% CI)	**155**		**151**			**100.0 %**	**-2.34 [-3.27, -1.41]**

Heterogeneity: Chi² = 12.71, df = 9 (P = 0.18); I² =29%

Test for overall effect: Z = 4.94 (P < 0.00001)

Test for subgroup differences: Not applicable

Analysis 3.2. Comparison 3 More intensive versus less intensive behaviour therapy, Outcome 2 Mean change in weight - studies > 12 months duration.

Review: Psychological interventions for overweight or obesity

Comparison: 3 More intensive versus less intensive behaviour therapy

Outcome: 2 Mean change in weight - studies > 12 months duration

Study or subgroup	More intensive N	Mean(SD)	Less intensive N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Jeffery 1995	34	-1.6 (6.3)	24	-1.4 (7.2)		-0.20 [-3.78, 3.38]

Analysis 4.1. Comparison 4 Cognitive behaviour therapy plus diet / exercise versus diet / exercise, Outcome 1 Mean change in weight - studies 6 months duration or less.

Review: Psychological interventions for overweight or obesity

Comparison: 4 Cognitive behaviour therapy plus diet / exercise versus diet / exercise

Outcome: 1 Mean change in weight - studies 6 months duration or less

Study or subgroup	Cognitive behaviour N	Mean(SD)	Diet +/- exercise N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Block 1980	16	-8.7 (4.5)	8	-0.2 (6.3)		25.4 %	-8.50 [-13.39, -3.61]
Dennis 1999	21	-8.6 (5)	18	-5 (4.1)		74.6 %	-3.60 [-6.46, -0.74]
Total (95% CI)	**37**		**26**			**100.0 %**	**-4.85 [-7.31, -2.38]**

Heterogeneity: Chi² = 2.88, df = 1 (P = 0.09); I² =65%

Test for overall effect: Z = 3.85 (P = 0.00012)

Test for subgroup differences: Not applicable

APPENDICES

Appendix 1. Search strategy

NOTES: unless stated otherwise, search terms are free text terms; MeSH: Medical subject heading (Medline medical index term); an asterisk (*) stands for 'any character(s)', a question mark stands for 'one or no character'.

OBESITY OR WEIGHT LOSS
1. Obesity/ [MeSH term, all subtrees and subheadings included
2. Bulimia/ [MeSH term, all subheadings included]
3. Hyperphagia/ [MeSH term, all subheadings included]
4. Anti-Obesity-Agents/ [MeSH term, all subheadings included]
5. (Pickwick* syndrom* or Prader willi syndrom*) [in abstract or title]
6. (obes* or adipos* or overweight* or over weight*) [in abstract or title]
7. (overeat*, over eat*, over feed* or overfeed*) [in abstract or title]
8. (binge eating disorder* or fat overload syndrom*) [in abstract or title]
9. Weight-gain/ [MeSH term, all subheadings included]
10. Weight-loss/ [MeSH term, all subheadings included]
11. Body-Mass-Index/ [MeSH term]
12. weight gain [in abstract or title]
13. weight cycling [in abstract or title]
14. (weight adj (reduc* or loss losing or maint* or decreas* or watch* or diet* or control*)) [in abstract or title]
15. or/1-14

PSYCHOLOGICAL THERAPIES
1. PSYCHOTHERAPY [MeSH term, all subheadings and subtrees included]
2. MOOD-DISORDERS [MeSH term, all subheadings and subtrees included]
3. psycho* [in title or abstract]
4. counsel* [in title or abstract]
5. (depression or depressiv*) [in title or abstract]
6. (interpersonal near therap*) [in title or abstract]
7. art therap* [in title or abstract]
8. aversion therap* [in title or abstract]
9. balint [in title or abstract]
10. behavio?r therap* [in title or abstract]
11. behavio?r modific* [in title or abstract]
12. colo?r therap* [in title or abstract]
13. (cognitiv* near therap*) [in title or abstract]
14. crisis intervention* [in title or abstract]
15. dance therap* [in title or abstract]
16. gestalt therap* [in title or abstract]
17. music therap* [in title or abstract]
18. milieu therap* [in title or abstract]
19. (assert* near training) [in title or abstract]
20. (nondirectiv* therap* or non directiv* therap*) [in title or abstract]
21. ((problem solving or problemsolving) near therap*) [in title or abstract]
22. ((self control or selfcontrol) near therap*) [in title or abstract]
23. (person cent*) [in title or abstract]

(*Continued*)

24. (client cent*) [in title or abstract]
25. (psychodrama* or psycho drama*) [in title or abstract]
26. paradoxic* techni* [in title or abstract]
27. play therap* [in title or abstract]
28. rational emoti* [in title or abstract]
29. reality therap* [in title or abstract]
30. role play* [in title or abstract]
31. (relax* near train*) [in title or abstract]
32. (sociotherap* or socio therap*) [in title or abstract]
33. (socioenvironment* or socio environment*) [in title or abstract]
34. (supportiv* therap*) [in title or abstract]
35. transactional [in title or abstract]
36. OR/1-35

This was combined with the following two search strategies:

RANDOMISED CONTROLLED TRIALS
1. RANDOMIZED-CONTROLLED-TRIAL in PT
2. "RANDOMIZED-CONTROLLED-TRIALS"/ all subheadings
3. "RANDOM-ALLOCATION" in MIME, MJME
4. random* or alloc* or assign*
5. (#4 in TI) or (#4 in AB)
6. #1 or #2 or #3 or #5
7. CONTROLLED-CLINICAL-TRIAL in PT
8. CLINICAL-TRIAL in PT
9. explode "CLINICAL-TRIALS"/ all subheadings
10. (CLIN* near TRIAL*)
11. (#10 in TI) or (#10 in AB)
12. "CROSS-OVER-STUDIES" in MIME, MJME
13. cross-over near (stud* or trial* or design*)
14. crossover near (stud* or trial* or design*)
15. #7 or #8 or #9 or #11 or #12 or #13 or 14
16. "DOUBLE-BLIND-METHOD" in MIME, MJME
17. "SINGLE-BLIND-METHOD" in MIME, MJME
18. (singl* or doubl* or trebl* or tripl*) near (blind* or mask*)
19. (#18 in TI) or (#18 in AB)
20. #16 or #17 or #19
21. "PLACEBOS"/ all subheadings
22. placebo* in TI
23. placebo* in AB
24. #21 or #22 or #23
25. explode "RESEARCH-DESIGN"/ all subheadings
26. TG=COMPARATIVE-STUDY
27. explode "EVALUATION-STUDIES"/ all subheadings
28. "FOLLOW-UP-STUDIES" in MIME, MJME
29. "PROSPECTIVE-STUDIES" in MIME, MJME
30. control* or prospectiv* or volunteer*
31. (#30 in TI) or (#30 in AB)
32. #25 or #26 or #27 or #28 or #29 or #31

(*Continued*)

33. #6 or #15 or #20 or #24 or #32
34. (TG=ANIMAL) not ((TG=HUMAN) and (TG=ANIMAL))
35. #33 not #34

SYSTEMATIC REVIEWS AND META-ANALYSES
1. "META-ANALYSIS" in MIME,MJME
2. explode "REVIEW-LITERATURE"/ all subheadings
3. META-ANALYSIS in PT
4. REVIEW in PT
5. REVIEW-ACADEMIC in PT
6. REVIEW-LITERATURE in PT
7. REVIEW-TUTORIAL in PT
8. GUIDELINE in PT
9. PRACTICE-GUIDELINE in PT
10. #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9
11. REVIEW-OF-REPORTED-CASES in PT
12. REVIEW-MULTICASE in PT
13. LETTER in PT
14. COMMENT in PT
15. EDITORIAL in PT
16. HISTORICAL-ARTICLE in PT
17. #11 or #12 or #13 or #14 or #15 or #16
18. #10 not #17
19. ((systematic* or quantitativ* or methodologic*) near (review* or overview*)) in TI,AB
20. (meta anal* or metaanal*) in TI,AB
21. (integrativ* research review* or research integration) in TI,AB
22. (quantitativ* synthes*) in TI,AB
23. (pooling* or (pooled analys*) or (mantel* haenszel*)) in TI,AB
24. (peto* or der simonian* or dersimonian* or fixed effect* or random effect*) in TI,AB
25. #19 or #20 or #21 or #22 or #23 or #24
26. #18 or #25
27. (TG=ANIMAL) not ((TG=HUMAN) and (TG=ANIMAL))
28. #26 not #27

Appendix 2. Original data for all main outcomes

Study ID	Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5	Outcome 6	Outcome 7
Agras 1995	Weight (pre and post intervention) (kg) at 6 months: Intervention: pre = 108 (+/- 26.7) kg, post = 107.4 (+/-	Binge Eating Scale (pre and post intervention) at 6 months: Intervention group: pre = 29.4 (+/- 6.7),	Inventory of Interpersonal Problems (pre and post intervention) at 6 months: Intervention	Symptom Checklist - 90 (pre and post intervention) at 6 months: Intervention group: pre =	Beck Depression Inventory (pre and post intervention) at 6 months: Intervention group: pre =		

(*Continued*)

	28) kg; comparison group: pre = 106.1 (+/- 20.3) kg, post = 110.2 (+/- 22.8) kg	post = 17.7 (+/- 7.1); comparison group: pre = 25.2 (+/- 7.9), post = 24.9 (+/- 10.4)	group: pre = 1.5 (+/- 0.6), post = 1.2 (+/- 0.6); comparison group: pre = 1.5 (+/- 0.5), post = 1.3 (+/- 0.6)	0.9 (+/- 0.7), post = 0.6 (+/- 0.4); comparison group: pre = 0.8 (+/- 0.5), post = 0.7 (+/- 0.7)	14.6 (+/- 9.7), post = 10.5 (+/- 8.2); comparison group: pre = 11.2 (+/- 6.8), post = 11.0 (+/- 8.3)		
Black 1983	Weight change (lb) at 6 months: Intervention group = -15.7 (+/- 6.0) lb; comparison group = -6.5 (+/- 4.5) lb						
Black 1984	Study 1: Weight change (lb) at 7 months: Behaviour therapy and cognitive restructuring = -6.31 (SD 9.38); Behaviour therapy and stimulus control = -6.45 (SD 12.86); Behaviour therapy = -7.83 (SD8.18); Minimal intervention = -11.07 (SD 13.21)	Study 2: Weight change (lb) at 6 months: Self-reliance = -11.05 (SD 9.83); Group reliance = -8.11 (7.3); Minimal intervention = -5.52 (SD 9.58)					
Block 1980	Weight change (lb) at 4 1/2 months: Rational Emotive Therapy group = -19.2 (SD 4.5)						

(*Continued*)

	lb; Relaxation - discussion placebo group = - 4.5 (4.6) lb; No treatment control = - 0.4 (SD 6.3) lb						
Brownell 1978a	Weight change (lb) at 6 months: couples training, co-operative spouse = -29.6 (SD 14. 6); co-operative spouse, subject alone = -19.4 (SD 10. 2); Non-cooperative spouse = - 15.1 (SD 12.2)						
Burnett 1985	Weight change (kg) at 10 months: Intervention group = -8.0 (SD 5. 3) kg, Comparison group = -1.0 (SD 3. 3) kg	Self-reported calorie intake change (intervention versus comparison group): 1942 cal (pre) to 1142 cal (post) versus 2076 cal (pre) to 1462 cal (post)	Self-reported physical activity change (intervention versus comparison group) : 172 (pre) to 372 (post) activity units per day versus 77 (pre) versus 206 (post) activity units per day				
Calle-Pascual 1992	Weight change (kg) at 12 months: Intervention group = -9.3 (range -0.5 to - 17. 5) kg; comparison group = 0.	Fasting serum glucose change at 12 months: Intervention group = 7.9 +/- 0.4 to 6.1 +/- 0.5 mM; comparison group = 7.	Systolic blood pressure change at 12 months: Intervention group = 145.7 +/- 3. 0 to 126.4 +/ - 5.1 mmHg; com-	Cholesterol change at 12 months: Intervention group = 6.1 +/- 0.1 to 6.2 +/- 0. 3 mM; Comparison group = 6.3 +/- 0.1			

(*Continued*)

	1kg	8 +/- 0.7 to 7.75 +/-0.5 mM	parison group = 148.0 +/- 3.7 to 145.4 +/- 3.4 mmHg;; Diastolic blood pressure change at 12 months: Intervention group = 83.5 +/- 2.5 to 65 +/- 2.6 mmHg; Comparison group = 85.4 +/- 2.1 to 86.1 +/- 2.0 mmHg	to 6.2 +/- 1.0 mM;; Fasting triglycerides change at 12 months: Intervention group = 164.5 +/- 12.0 to 109.7 +/- 10.0 mg/dl; Comparison group = 166.5 +/- 9.1 to 163.3 +/- 7.8 mg/dl			
Carrol 1981	Weight change (kg) at 8 months: Behaviour therapy without stimulus control training = - 3.2 (SD 3.9) kg; Behavioral therapy with stimulus control training = -4.5 (SD 5.4) kg						
Castro 1983	Weight change (lb) at 4 months: Behavioral intervention = - 10 lb, Comparison behavioral intervention = - 10.5 lb, control group = -15 lb						
Chapman 1978	Weight change (kg & lb) at 4 months: Situational man-						

(*Continued*)

	agement = - 2.33 kg, self-standard setting = - 4.28 kg, self-reward = - 2.8 kg						
Cochrane 1985	Weight change (lb) at 6 months: Hypnosis + audiotapes = -17.8 (SD 2.7), hypnosis = -17.1 (SD 2.5), control = -0.5 (SD 2.5)	Barber Suggestibility Scale at 6 months: Hypnosis + audiotapes = 14.8 (SD 7.8), hypnosis = 11.7 (SD 7.2), control = 16.4 (SD 5.3)	Family History of Distress Scale at 6 months: Hypnosis + audiotapes = 44.3 (SD 12.6), hypnosis = 51.1 (SD 11.4), control = 48.6 (SD 12.8)	Tennessee Self Concept Scale at 6 months: Hypnosis + audiotapes = 322.0 (SD 38.6), hypnosis = 325.5 (SD 34.3), control = 356.0 (SD 39.5)	Representational Systems Inventory at 6 months: Hypnosis + audiotapes = 92.7 (SD 19.6), hypnosis = 90.8 (SD 22.1), control = not performed		
Dennis 1999	Weight change (kg) at 6 months: Cognitive behavior therapy + exercise = - 8.6 (+/- 5) kg, exercise control = - 5.0 (+/- 4.1) kg	% body fat (CBT/ exercise versus exercise alone) : 32.7 (+/- 3.2) % (pre) to 25.9 (+/- 3.9) % (post) versus 33.5 (+/- 4.7) % (pre) to 28.6 (+/- 4.7) % (post)	Serum triglycerides (CBT/ exercise versus exercise) = 145 mg/dL (pre) to 109 mg/dL (post) versus 146 mg/dL (pre) to 145 mg/dL (post) (P<0.05)	Serum cholesterol (CBT/ exercise versus exercise) = 190 mg/dL (pre) to 194 mg/dL (post) versus 180 mg/dL (pre) to 195 mg/dL (post) (P>0.05) ; Serum LDL-C (CBT/exercise versus exercise) = 126 mg/dL (pre) to 134 mg/dL (post) versus 122 mg/dL (pre) to 127 mg/dL (post) (P>0.05) ; Serum HDL-C (CBT/exercise versus exer-	Systolic blood pressure (CBT/ exercise versus exercise) = 138 mmHg (pre) to 141 mmHg (post) versus 133 mmHg (pre) to 139 mmHg (post) (P>0.05); Diastolic blood pressure (CBT/ exercise versus exercise) = 87 mmHg (pre) to 84 mmHg (post) versus 85 mmHg (pre) to 88 mmHg (post) (P>0.05)	Center of Epidemiologic Studies Depression Scale (CES-D) (CBT/ exercise versus exercise) = 20.1 (pre) to 11.4 (post) versus 17.8 (pre) to 15.3 (post) (P>0.05) ; Binge Eating Scale (CBT/ exercise versus exercise) = 18.0 (pre) to 8.2 (post) versus 12.5 (pre) to 11.5 (post) (P>0.05)	Eating Behavior Inventory (CBT/ exercise versus exercise) = 65.3 (pre) to 81.3 (post) versus 71.4 (pre) to 71.9 (post) (P<0.05)

(*Continued*)

				cise) = 35 mg/dL (pre) to 37 mg/dL (post) versus 35 mg/dL (pre) to 37 mg/dL (post) (P>0.05)			
Foreyt 1973	Weight (pre and post intervention) to 4 1/2 months: Covert sensitization: pre = 161.7 (SD 26.1) lb, post = 160.5 (SD 24.0) lb; placebo control (suggestion) group - pre = 159.5 (SD 24.7) lb, post = 152.4 (SD 25.2) lb; no treatment control group - pre = 158.3 (SD 29.8) lb, post = 152.2 (SD 28.0) lb	Rating of program likability and helpfulness - covert sensitization = 4.12, covert sensitization placebo (suggestion) = 3.62					
Goodrick 1998	Weight change (pre and post intervention) at 6 months: Intervention group = 89.0 (SD 10.2) to 90.5 (SD 12.4); Comparison intervention group = 87.7 (SD 9.6) to 89.1 (SD 10.6) kg; Control group = 86.5 (SD 9.8) to 87.1 (SD 10.6) kg	Binge eating scale (pre and post intervention) at 6 months: Intervention group = 27.8 (SD 6.1) to 15.5 (SD 7.5); Comparison intervention group = 27.6 (SD 5.1) to 17.3 (SD 7.8) kg; Control group = 27.9 (SD 5.3) to 24.2 (SD 8.6) kg	Exercise (pre and post intervention) at 6 months: Intervention group = 34.4 (SD 3.0) kcal/kg/day to 34.8 (SD 2.7) kcal/kg/day; Comparison intervention group = 34.3 (SD 2.2) kcal/kg/day to 34.9 (SD 2.8) kcal/kg/day; Control group = 34.3			

(*Continued*)

			(SD 2.7) kcal/kg/day to 35.6 (SD 5.7) kcal/kg/day				
Gormally 1981	Weight change (lb) at 7 months: Behavioral = -12.05 (SD 14.11); Nutrition = -6.72 (SD 11.68)	Caloric intake: Behavioral = 1129.6 calories (SD 247.1); Nutrition = 1254.1 calories (SD 215.5)	Physical activity self-report (Behavioral): Daily miles walked - pre = 2.8 (SD 1.2), post = 3.5 (SD 1.3); Weekly miles jogged - pre = 0.3 (SD 1.6), post = 1.1 (SD 2.9); Weekly calisthenics - pre = 14.6 (SD 29.2), post = 49.2 (SD 63.5); weekly participation in sports - pre = 0.2 (SD 0.6), post = 0.5 (SD 0.8);; Physical activity self-report (Nutrition): Daily miles walked - pre = 3.1 (SD 1.2), post = 3.2 (SD 1.3); Weekly miles jogged - pre = 0.5 (SD 2.8), post = 1.0 (SD 2.8); Weekly calisthenics - pre = 26.4 (SD 47.1), post = 62.3 (SD 81.4); weekly participa-				

(*Continued*)

			tion in sports - pre = 0.4 (SD 0.8), post = 0. 4 (SD 1.0)				
Hagen 1974	Weight (pre and post intervention) to 3 1/2 months: Group contact = 153.94 (SD 21. 20) lb to 141. 67 (SD 21. 42) lb; manual and group contact = 153. 06 (SD 21. 42) to 139. 72 (SD 18. 72) lb; manual only = 152. 83 (SD 17. 97) to 142.33 (SD 18.36) lb; no treatment control = 153. 20 (SD 20.38) to 153.09 (SD 21.66) lb						
Israel 1979	Weight change (pre and post intervention) at 12 months (lb): Significant other - behavior therapy group = 175.4 (SD 26.7) to 165. 0 (SD 32.5) lb; Significant other - weight loss reinforcement group = 180.8 (SD 28. 3) to 182.5						

(*Continued*)

	(SD 39.1) lb; Therapist - behavior therapy group = 170.9 (SD 24.3) to 162.9 (SD 22.2) lb; Therapist - weight loss reinforcement group = 174.4 (SD 29.7) to 188.0 (SD 21.8) lb; Program - behavior therapy group = 185.6 (SD 29.1) to 184.3 (SD 28.6) lb; Therapist - weight loss reinforcement group = 162.5 (SD 26.7) to 160.0 (SD 32.6) lb						
Jeffery 1983	Weight change (lb) at 12 months: Individual contingency contracting - $30 = -11.8 lb, $150 = -16.3 lb, $300 = -13.8 lb; Group contingency contracting - $30 = - 18.8 lb, $150 = - 22.1 lb, $300 = -14.6 lb						
Jeffery 1985	Weight change (lb) at 6 months: treatment group =						

(*Continued*)

	8.1 (SD 14) , no treatment group = 17 (SD 11.7)						
Jeffery 1995	Weight change (kg) at 30 months: standard behavior therapy (SBT) = -1.4 (SD 7. 2) kg; SBT + food group = -2.2 (SD 6.6) kg; SBT + incentives = -1. 6 (SD 5.5) kg; SBT + food + incentives = -1.6 (SD 6.3) kg; control = 0.6 (SD 5.3) kg						
Johnson 1979	Weight change (kg) at 12 months: stimulus control = -2.4 kg, stimulus control and contingency management = -5. 2 kg, stimulus control and exercise = -7.4 kg, stimulus control, exercise and contingency managment = -5.9 kg						
Kirschenbaum 1985	Weight (pre and post intervention) to 24 months: Behavior ther-						

(*Continued*)

	apy induction - (Therapist A): pre = 45.9 (SD 27.8) %, post = 32.5 (SD 16.7)%; - (Therapist B) pre = 45.7 (SD 27.8) %, post = 37.3 (SD 26.9)%; Behavior therapy - (Therapist A): pre = 44.3 (SD 28.8)%, post = 36.9 (SD 26.6)%; - (Therapist B) pre = 57.5 (SD 36.2)%, post = 58.6 (SD 37.4)%; Nonspecific and attention prompting - (Therapist A): pre = 42.7 (SD 14.3)%, post = 34.4 (SD 19.4)%; - (Therapist B) pre = 63.5 (SD 43.6)%, post = 59.7 (SD 40.3)%; Nonspecific - (Therapist A): pre = 54.3 (SD 25.2)%, post = 43.8 (SD 26.8)%; - (Therapist B) pre = 59.5 (SD 23.2)%, post = 54.6 (SD 20.0)%						

(*Continued*)

Lindahl 1999	Weight change (kg) at 12 months: treatment group = -5.4 (-6.5 to -4.4) kg, control group = -0.5 (-1.1 to 0.2) kg	Oxygen consumption at 12 months: treatment group = 0.21 (0.03 to 0.39) L/min, control group = -0.02 (-0.15 to 0.10) L/min	PAI-1 activity at 12 months: treatment group = -10.1 (-15.3 to -4.8) U/mL, control group = -3.0 (-8.0 to 2.0) U/mL	tPA antigen at 12 months: treatment group = -1.65 (-2.15 to-1.16) micrograms/L, control group = -0.69 (-1.13 to -0.25) micrograms/L			
Nauta 2000	Weight change (kg) at 6 months (Subjects with Binge Eating Disorder): Behaviour therapy - pre = 96.6 (+/- 16.4), post = 94.6 (+/- 16.8); Cognitive therapy - pre = 95.5 (+/- 15.5), post = 95.4 (+/- 16.7); Weight change (kg) at 6 months (Subjects with no Binge Eating Disorder): Behaviour therapy - pre = 92.6 (+/- 9.7), post = 89.8 (+/- 9.4); Cognitive therapy - pre = 88.8 (+/- 11.1), post = 89.1 (+/- 13.1)	Beck Depression Inventory at 6 months (Subjects with Binge Eating Disorder): Behaviour therapy - pre = 19.3 (+/- 8.5), post = 9.0 (+/- 5.4); Cognitive therapy - pre = 19.2 (+/- 6.5), post = 10.9 (+/- 11.0); Beck Depression Inventory at 6 months (Subjects with no Binge Eating Disorder): Behaviour therapy - pre = 8.4 (+/- 5.0), post = 9.2 (+/- 8.5); Cognitive therapy - pre = 7.3 (+/- 5.1), post = 5.6 (+/- 5.4)	Rosenberg Self-Esteem Scale at 6 months (Subjects with Binge Eating Disorder): Behaviour therapy - pre = 27.5 (+/- 5.7), post = 21.5 (+/- 5.3); Cognitive therapy - pre = 27.8 (+/- 4.2), post = 22.7 (+/- 7.2); Rosenberg Self-Esteem Scale at 6 months (Subjects with no Binge Eating Disorder): Behaviour therapy - pre = 20.3 (+/- 5.4), post = 20.2 (+/- 6.8); Cognitive therapy - pre = 20.9 (+/- 4.7), post = 17.4 (+/- 5.4)				
Oldroyd 2001	Weight change (kg) at 6 months: Behavioral = -1.	Systolic blood pressure: Behavioral = -7.9 (SD 16.7)	Fasting plasma glucose: Behavioral = 0.	Total cholesterol: Behavioral = -0.16 (SD 0.	Change in Energy Intake: Behav-	Resting pulse: Behavioral = -1.8 (SD 8.1)	

(*Continued*)

	5 (SD 2.6) kg, Control = 0.5 (SD 2.2) kg	mmHg, Control = -0.3 (SD 14.3) mmHg; Diastolic blood pressure: Behavioral = -2.9 (SD 9.9) mmHg, Control = 1.9 (SD 10) mmHg	02 (SD 0.6) mmol/L, Control = 0.2 (SD 1.1) mmol/L; HbA1c: Behavioral = 0.2 (SD 0.4)%, Control = 0.2 (SD 0.3)%; Fasting insulin: Behavioral = -2.5 (SD 4.2) mU/L, Control = 0.9 (SD 4.4) mU/L; Fasting C-peptide: Behavioral = -0.1 (SD 0.3) mmol/L, Control = 0.04 (SD 0.2) mmol/L	55) mmol/L, Control = -0.18 (SD 0.59) mmol/L; HDL-C: Behavioral = 0.04 (SD 0.2)mmol/L, Control = 0.06 (SD 0.2) mmol/L; LDL-C: Behavioral = -0.1 (SD 0.5) mmol/L, Control = -0.2 (SD 0.6) mmol/L; Triglycerides: Behavioral = -0.2 (SD 0.8) mmol/L, Control = -0.01 (SD 0.7) mmol/L; Apolipoprotein A-1: Behavioral = 0.05 (SD 0.2) g/L, Control = 0.03 (SD 0.15) g/L; Apolipoprotein B: Behavioral = -0.03 (SD 0.2) g/L, Control = -0.05 (SD 0.16) g/L; Fibrinogen: Behavioral = 0.14 (SD 0.9) g/L, Control = 0.03 (SD 0.7) g/L	ioral = -832 (SD 2563) kJ, Control = 30 (SD 1994) kJ; Change in Total Fat Intake: Behavioral = -16.8 (SD 34.6) g, Control = 5.1 (SD 29.8) g; Change in sucrose intake: Behavioral = 0.9 (SD 6.1) g, Control = 1.5 (SD 4.8) g; Change in Fibre Intake: Behavioral = 0.2 (SD 6.0) g, Control = -0.8 (SD 5.7) g	beats/min, Control = 1.8 (SD 5.7) beats/min; Distance walked: Behavioral = 57 (SD 89) m, Control = 47 (SD 69) m; Recovery pulse: Behavioral = 7.2 (SD 17.1) beats/min, Control = 12.3 (SD 1.1) beats/min; Vigorous activity: Behavioral = 26.9 % (n), Control = -3.2 % (n)	
Painot 2001	Weight change (kg) at 3	Beck Depression Inventory at 3 months:	Hospital Anxiety and Depression (De-	Hospital Anxiety and Depression (Anx-	Eating Disorder Inventory at 3 months:		

(*Continued*)

	months: NCB (nutrition-cognitive-behavioural) group = -1.9 (+/-0.6), CB (cognitive-behavioural) group = -0.5 (+/- 0.6)	NCB = 17 +/- 2 before treatment and 14 +/- 2 after treatment; CB = 17 +/- 2 before treatment and 11 +/- 1 after treatment	pression) Scale at 3 months: NCB = 6 +/- 1 before treatment and 5 +/- 1 after treatment; CB = 6 +/- 1 before treatment and 5 +/- 1 after treatment	iety) Scale at 3 months: NCB = 11 +/- 1 before treatment and 10 +/- 1 after treatment; CB = 10 +/- 1 before treatment and 9 +/- 1 after treatment	NCB = 79 +/- 6 before treatment and 66 +/- 7 after treatment; CB = 82 +/- 5 before treatment and 62 +/- 5 after treatment		
Rozensky 1976	Weight change (lb) at 3 1/2 months: high self-reinforcement - self-control = -9.3 lb, external control = -1.81 lb; low self-reinforcement - self-control = -7.0 lb, external control = -5.4 lb; control = -3.9 lb						
Saccone 1978	Weight change (lb) at 12 months: Behavior program + weight monitoring = -5. 1 (SD2.9) lb; Behavior program + behavior monitoring = -3.7 (SD 7.4) lb; Therapist reinforcement + weight monitoring = -5.3 (SD 5. 9) lb; Significant other reinforcement +						

(*Continued*)

	weight monitoring = -6.9 (SD 6.3) lb; Therapist reinforcement + monitor behavior change = -7.6 (SD 6.2) lb; significant other reinforcement + monitor behavior change = -13.0 (SD 5.7) lb						
Sbrocco 1999	Weight change (kg) at 12 months: Behavioral choice treatment = -10.0 (SD3.4) kg; Behavioral therapy = -4.3 (SD 2.5) kg	Beck Depression Inventory at 6 months: Behavioral choice treatment = 3.09 (SD 2.62) kg; Behavioral therapy = 7.88 (SD 6.17)	State Self-Esteem Scale at 6 months: Behavioral choice treatment = 80.90 (SD 9.1); Behavioral therapy = 71.40 (SD 7.90)	Eating Inventory (restraint subscale) at 6 months: Behavioral choice treatment = 5.55 (SD 1.94); Behavioral therapy = 8.09 (SD 2.80)	Eating Disorders Inventory - 2 (drive for thinness) subscale at 6 months: Behavioral choice treatment = 2.0 (SD 1.7); Behavioral therapy = 5.0 (SD 5.71)	Eating Disorders Inventory - 2 (Body Dissatisfaction) subscale at 6 months: Behavioral choice treatment = 12.70 (SD 8.65); Behavioral therapy = 16.81 (SD 9.98)	Eating Disorders Inventory - 2 (Bulimia) subscale at 6 months: Behavioral choice treatment = 0.22 (SD 0.63); Behavioral therapy = 2.0 (SD 2.28)
Stevens 2001	Weight change (kg) at 36 months: treatment group = -0.2 kg (-0.7 to 0.3), control = 1.8 (1.3 to 2.2)	Blood pressure at 36 months: difference between treatment group and control = 2.7 mmHg (2 to 3.5)					
Stuart 1971	Weight change (lb) at 12 months: Intervention group = - 35 lb; comparison group = - 21 lb						

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Wing 1984	Weight change (lb) at 6 months - massed, low calorie = -7.4 (+/- 5.7), spaced, low calorie = -4.4 (+/- 4.4), massed, behavioural = -3.7 (+/- 2.4), spaced behavioral = -10.4 (+/- 5.2)	High versus low self-monitoring -18.1 lb lost vs 7.2 lb lost at week 10	Eating Behavior Inventory - improvement in eating habits at 6 months (F(1, 35)=27.7, P<0.001)				
Wing 1985	Weight change (kg) at 16 months = -1.78 kg for behaviour modification, -3.03 kg for nutrition education and -3.42 kg for standard care						
Wing 1991	Weight change (lb) at 12 months: behavioral intervention = -7.0 (SD 11.7) lb; comparison intervention = -11.6 (SD 22.9) lb	HbA1c change at 12 months: behavioral intervention = -0.1 (SD 1.9)%; comparison intervention = -0.7 (SD 2.7) %	Calories expended in exercise per week: behavioral intervention - pre = 743 (SD 694) cal, post = 1148 (SD 752) cal; comparison intervention - pre = 682 (SD 641) cal, post = 1251 (SD 1275) cal	Eating behavior inventory: behavioral intervention - pre = 69.7 (SD 12.3), post = 78.8 (SD 12.7); comparison intervention - pre = 69.9 (SD 9.9), post = 83.0 (SD 12.1)			
Wing 1996	Weight change (kg) at 6 months: Stan-						

(*Continued*)

	dard behavior therapy (SBT) = -8 (+/- 6. 2) kg; SBT + structured meal plan = -12 (+/- 7.2); SBT + meal plans + food provision = -11.7 (+/- 5.4) kg; SBT + free food = - 11.4 (+/- 6.5) kg						
Wollersheim 1970	Weight change (lb) at 6 months:						

WHAT'S NEW

Last assessed as up-to-date: 29 June 2003.

Date	Event	Description
6 November 2008	Amended	Converted to new review format.

HISTORY

Protocol first published: Issue 3, 2002

Review first published: Issue 2, 2005

CONTRIBUTIONS OF AUTHORS

KELLY SHAW: Protocol development, literature search, assessment of trials and data extraction. Will also be the principal reviewer to be performing the analysis and interpretation of data, as well as the development of the final review.

PETER O'ROURKE: Assessment of trials and data extraction. Assistance with analysis and interpretation of data and development of the final review.

JUSTIN KENARDY: Protocol development. Assessment of trials.

CHRISTOPHER DEL MAR: Development of the final review.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- Royal Australian College of General Practitioners, Australia.

External sources

- National Health and Medical Research Council, Australia.

INDEX TERMS

Medical Subject Headings (MeSH)

*Body Weight; Cognitive Therapy [*methods]; Obesity [psychology; *therapy]; Randomized Controlled Trials as Topic

MeSH check words

Adult; Humans