Evidence for Success of Behavior Modification in Weight Loss and Control

John P. Foreyt, PhD, and G. Ken Goodrick, PhD

■ **Behavior modification applied to the treatment of obesity has evolved from the environmental control of eating behavior to a broader approach characterized by systematic manipulation of all factors associated with eating and exercise patterns. This approach has shown success in helping obese persons lose modest amounts of weight. The average length of treatment is 18 weeks, and the average weight loss is 9.9 kg. About 66% of these weight losses are maintained at 52 weeks of follow-up. Because obesity is a chronic condition with a substantial potential for relapse, longer-term treatments are needed. In the future, behavioral modification is likely to be further combined with other treatment methods.**

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From Baylor College of Medicine, Houston, Texas. For current author addresses, see end of text.

Psychodynamic theories of obesity have focused on overeating as a symptom of unresolved conflicts, such as "orality," caused by premature weaning, or conceptualized eating as a substitute for love. In an attempt to make psychology scientific, behaviorists restricted themselves to observable variables and focused on self-control of eating through the manipulation of variables associated with eating. The original work in behavior modification for the treatment of obesity (1) was based on the assumption that obesity is caused and maintained by overeating and that obese persons overeat in response to various environmental cues. The treatment approach therefore involved reducing the range of stimuli thought to influence overeating—a principle called stimulus control. To inventory the controlling stimuli and to measure the effect of stimulus control changes, self-monitoring of antecedents to eating was introduced. To counteract the reinforcing effect of eating, other nonfood reinforcers were introduced, contingent on prudent eating or weight loss, thus forming the basis of contingency management.

Current behavioral approaches recognize that obesity can be maintained by overeating or lack of exercise. Increasing attention has focused on the emotional and cognitive processes associated with overeating. The treatment approach involves an analysis of the factors related to inappropriate eating and exercise. These analyses lead to the detection of patterns defined by recurring and potentially causal factors. Such factors may include personal relationships, irrational thoughts, family or work stressors, or negative affect. The goal of treatment is to initiate and maintain a process of problem solving to determine whether the removal or reduction of the putative causal factors results in more prudent weight management behaviors (2). After achieving a weight that is maintainable without excessive exercise or overly restrictive eating limitations, patients are encouraged to enter a maintenance program for continuing support.

Treatment Components

Various treatment components can be subsumed under the behavioral approach (Table 1). They all derive from a functional analysis of target behaviors (involving the systematic examination of factors preceding and following the behaviors) and the manipulation of such factors in a problem-solving, therapeutic framework. Treatment manuals suitable for patient (3, 4) or therapist (5, 6) use are available.

Self-monitoring is the core of all behavioral programs and consists of self-observation and self-recording of those observations. The situational factors, behaviors, thoughts, and feelings that occur before, during, and after attempts at prudent eating and exercise behaviors are recorded. Self-monitoring may prevent inappropriate behavior because the patients know that their recorded indiscretions will be scrutinized by a therapist or peer (7). Early studies found that patients spontaneously reduced calorie intake when daily diet records were kept. Patients who monitored their caloric intake and expenditure lost more weight than did those who did not use self-monitoring (8). Several studies have found good correlations between self-monitoring and weight loss (8, 9) and maintenance (10, 11), although self-monitoring and success could both be caused by a third motivational factor (7).

Stimulus control involves the modification of cues leading to inappropriate eating or exercise. Early theories suggested that obese persons were particularly sensitive to environmental cues and less sensitive than nonobese persons to internal, hunger cues (12, 13). Later research indicated that such sensitivity is not confined to obese persons and that not all obese persons are particularly sensitive (14). Although little research has compared behavioral treatments with and without stimulus control, the concept of controlling the environment is widely accepted as clinically effective. Control of food cues may help eating management because exposure to such cues has been shown to produce physiologic reactions such as insulin shifts, which may predispose one to overeat (15).

Contingency management involves the application of rewards for appropriate behavioral patterns leading to weight loss or maintenance. Contracts are used to for-

Table 1. Behavior Modification Treatment Components

Component	Description	Examples
Self-monitoring	Recording of target behaviors and factors associated with behaviors	Food and exercise records, moods and environment associated with overeating
Stimulus control	Restricting environmental factors associated with inappropriate behaviors	Keep away from high-fat foods; eat at specific times and places; set aside time and place for exercise
Contingency management	Rewarding appropriate behaviors	Give prizes for achieving exercise goals
Changing behavior parameters	Directly altering target behavior topology	Slow down eating; self-regulate exercise
Cognitive-behavior modification	Changing thinking patterns related to target behaviors	Counter social pressure to be thin to reduce temptation to diet

malize agreements. Contracts should be short term and should focus on increasing healthful behaviors associated with weight loss rather than on weight loss itself (5). The effectiveness of contingency management usually ends when the rewards end. Initially, changes in eating and exercise habits may be intrinsically aversive; in such cases, artificial rewards for adherence are needed. Later, as the new eating and exercise behaviors become perceived as enjoyable and intrinsically rewarding, the contracts can be allowed to expire.

Alterations in behavior topology through modification of the speed or intensity of target behaviors may be needed to optimize outcome. For example, reductions in the rate of eating in response to behavior therapy have been positively correlated with weight loss in the short term (16). Gradual modification of eating behaviors away from dieting and meal skipping toward more normal eating patterns (three meals a day) using a gradual substitution of lower-fat alternatives may be needed to avoid feelings of deprivation that could trigger lapses in eating control (17). Similarly, healthful exercise habits should be developed gradually to allow for cardiorespiratory adaptation and to avoid the patient perception that exercise is punishment.

Cognitive-behavioral strategies can be used to help move thinking patterns away from self-rejection and toward self-acceptance. The focus is on the ways in which thoughts, moods, diets, and social pressure to be thin affect eating control (4). About 40% of all obese patients seeking treatment suffer from binge-eating disorder, characterized by frequent and uncontrollable episodes of binge eating (18). Cognitive-behavioral treatment for binge eating has been shown to be effective (19) and may need to precede behavioral treatment of obesity. An approach using cognitive-behavior treatment to reduce restrictive dieting appears to have alleviated much of the psychological distress associated with obesity (20). Further research is needed to determine whether such methods are effective in promoting and maintaining weight loss.

Treatment Results

Because behavior modification encompasses various methods with differing applications and because these methods are applied with various eating and exercise regimens, it is difficult to assess the unique effect of behavior modification or the contributions of a particular treatment component (7). Because much of the data in this area comes from university-based studies, results may not be generalizable to normal clinical practice (21).

Many comprehensive reviews of weight loss programs using behavior modification have been published (5-7, 21-26). From these programs, we determined the average duration of behavioral treatment to be 18 weeks. Attrition, which was a serious problem before behavioral methods were introduced, was less than 15%. Average weight losses were 9.9 kg for the total treatment program (0.5 kg [1.1 lb] per week). Moderately obese patients could expect to lose 10% of their body weight. The average reported duration of follow-up monitoring was 52 weeks. Participants maintained about 66% of their weight losses at 52 weeks of follow-up without continued treatment. Three- to 5-year follow-up studies showed a gradual return to baseline weight (21).

A review of randomized, controlled trials of behavior therapy for obesity conducted before 1975 and during 1978, 1984, and 1986 seemed to show that treatments were becoming more effective (23). This finding may, however, be due to the fact that the weight of study patients increased over the years; no trend was seen in percentage of weight or of overweight lost at follow-up.

Treatment duration increased from an average of 8.4 weeks before 1975 to an average of 16.7 weeks in 1986 (23). Because weekly weight losses during treatment remained relatively constant at 0.5 kg, longer treatment seemed to result in greater weight losses. This hypothesis was confirmed in a controlled study that compared treatments of 20 and 40 weeks duration (8). This effect may be due to extended therapist contact rather than to increased exposure to behavior modification techniques (7).

Maintenance Results

The main problem with all treatments for obesity is a slow return to baseline weight after treatment intervention ends. The process of eating lapses and relapse have been studied episodically (27), but the longitudinal processes need further investigation (26). The evidence for the greater effectiveness of longer treatment periods and the chronicity of the disorder emphasize the need for a continuous-care model for obesity (6). A series of studies (Table 2) (6) has shown that maintenance of modest weight losses can be achieved to a good degree using

Table 2. Weight Maintenance Strategies after Behavioral Treatment

Strategy (Reference)	Description
Relapse prevention (28)	Identify situations with a high risk for relapse; use problem solving to develop coping strategies; practice coping with high-risk situations; master the negative feelings and sense of failure associated with lapses
Therapist contact (29)	Patients mail in self-reports; therapists call patients to discuss progress
Peer groups (30)	Meetings using problem-solving structure. Monitor each other's weight, reinforce progress with praise; help each other to solve problems
Aerobic exercise (6)	Brisk walking, stationary cycling, or equivalent
Social Influence (31)	Monetary group contingencies for adherence and weight loss; patients become involved in giving minilectures; patients receive training in how to provide support by telephone; peer-group meetings

combinations of strategies during the post-treatment period.

Table 3 summarizes five representative examples of randomized, controlled, behavioral studies with at least 12 months of follow-up that specifically investigated maintenance strategies after behavioral treatment. Clinically relevant weight losses were maintained by participants in intensive follow-up programs. Whether these results can be generalized to normal clinical practice and whether the cost of such intensive programs is perceived as worthwhile by patients remains to be seen.

Trends

Behavioral techniques have been combined successfully with very-low-calorie diets (VLCDs). A 1-year follow-up study showed that behavior therapy combined with a VLCD resulted in 32% of patients maintaining end-of-treatment losses compared with only 5% of those receiving a VLCD alone (34). A VLCD program with a 6-week inpatient stay followed by intensive behavior therapy and continued contact for 4 years resulted in an average maintained weight loss of 11.4 kg; the average maintained loss 6 years later was 9.5 kg (35).

The central principle in behavior therapy is that patients must learn dietary restraint to resist unhealthful eating habits. Presumably, restraint usually fails due to increased hunger (36). Drugs may enhance restraint by affecting eating in response to internal cues, thus reducing hunger and making initial acquisition of adaptive eating habits easier. A combination of behavior modification and drug therapy can be more effective than either treatment alone; however, patients receiving only drug therapy may regain much more weight after withdrawal of the drug than those receiving only behavior modification therapy (37). A recent long-term study using a combination of fenfluramine and phentermine with behavior modification showed good and sustained weight losses during a period of 3.5 years; however, weight was regained after drug withdrawal, and the behavior modification did not seem to help prevent the regain (37). Future research will need to explore the ways in which behavior modification can be integrated into longer-term drug regimens.

It is important to focus on realistic weight goals. Because behavioral treatment does not usually result in dramatic weight loss for most patients, two aspects of treatment are receiving increasing emphasis. First, patients should be motivated to change their behaviors to improve health rather than to achieve a particular weight to satisfy their vanity; the latter usually results in patient frustration. Second, weight losses in the range achieved by behavioral methods can produce significant improvements in health and can reduce risk factors for disease.

Table 3. Results of Randomized Trials Using Maintenance Strategies after Behavioral Treatment of Obesity

Maintenance Strategy Combination (Reference)	Post-Treatment Weight Loss	Follow-up Weight Loss	Length of Follow-up
	kg		*mo*
Relapse prevention and therapist contact (29)	9.5	10.5	12
Peer groups, self-monitoring, therapist contact (30)	5.9	4.5	21
Aerobic exercise, self-monitoring, therapist contact, peer groups (32)	10.9	8.0	18
Therapist contact (33)	10.5	6.8	18
Peer groups (33)	10.5	6.8	18
Therapist contact, aerobic exercise, social influence (31)	13.2	13.6	18

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Requests for Reprints: John P. Foreyt, PhD, Baylor College of Medicine, Nutrition Research Center, 6535 Fannin, MS-F700, Houston, TX 77030.

Current Author Addresses: Drs. Foreyt and Goodrick: Baylor College of Medicine, Nutrition Research Center, 6535 Fannin, MS-F700, Houston, TX 77030.

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