Chapter 13

Behavioral Strategies for Controlling Obesity

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1. INTRODUCTION

Obesity occurs when the energy consumed exceeds the amount of energy expended, and the long-term result is excess body weight caused by storage of "extra" energy in body fat stores [1]. The prevalence of overweight and obesity is considered a serious public health issue in the United States [2]. Over the past few decades, overweight and obesity prevalence rates among children, adolescents, and adults have increased markedly across all racial/ethnic groups and men and women [3–5]. Overweight and obesity have been shown to be associated with chronic and life threatening disorders, such as diabetes, hypertension, and hyperlipidemia [6]. However, it has recently been suggested that comorbid symptoms (e.g., cardiovascular disease) and mortality rates associated with obesity are improving (lower than previous estimates) [7]. This finding is of interest because it contradicts prior conclusions [8, 9] concerning the costs and health outcomes associated with the current epidemic of obesity. Nevertheless, there is no evidence to suggest that obesity rates are decreasing [10]. Further, for severe underweight and obesity, particularly higher levels of obesity (body mass index [BMI] $\geq$ 30), mortality rates relative to normal weight individuals continue to be a concern [7].Thus, despite recent evidence that comorbid symptoms of obesity have improved, obesity remains to be a significant public health problem for which effective treatment strategies are needed.

Behavioral approaches for weight management have been extensively studied as one strategy for addressing this health problem. Modest weight loss (5% to 10% of total body weight) through lifestyle intervention approaches has been found to have a beneficial effect on comorbid conditions, particularly hypertension and type 2 diabetes. Recent lifestyle intervention research also suggests that moderate weight loss may delay or prevent the onset of type 2 diabetes [11]. In 2003, the Diabetes Prevention Program [11] reported that a lifestyle intervention for obesity reduced the risk of diabetes by 58%. This study found that lifestyle intervention was more effective than metformin, and

was effective in individuals of every gender, age and BMI group. These results suggest that there is great promise for the application of lifestyle behavioral interventions for the reduction of obesity and the risk for comorbid health conditions [12].

Effective behavioral treatment of obesity involves modification of eating and physical activity behavior patterns to yield negative energy balance. This chapter describes the behavioral approach for weight management and summarizes research findings. These studies have found that interventions that combine a low-calorie diet, increased physical activity, and behavior therapy are most effective for weight loss and maintenance. Further, extended length of treatment contact, weight loss satisfaction, and social support may promote positive long-term outcomes in obese adults, adolescents, and children. Given the success of lifestyle intervention for the induction of moderate weight loss, behavioral treatment for obesity is a logical initial treatment option for people who are overweight, moderately obese, or desire to adopt a healthier lifestyle.

2. HISTORY OF BEHAVIORAL STRATEGIES FOR CONTROLLING OBESITY

The origins of behavioral treatment for obesity date back to the late 1960s. Since the 1970s, behavioral treatment programs for obesity have been intensified in terms of length and aggressiveness, yielding average weight losses ranging from 7% to 10% of initial body weight. On average, most people reach their maximum point of weight loss about 6 months after the initiation of treatment. However, it is important to note that these weight losses usually occur in the short term and are not maintained in the long-term, after treatment ends. Thus, maintenance of weight loss is an important focus of treatment outcome research.

2.1. Philosophy of Treatment

A general principle underlying the theory of behavior therapy for obesity (based on Social Learning Theory) is that obese individuals have learned eating and exercise patterns that are contributing to weight gain and/or maintenance of obesity. These behaviors can be modified to produce weight loss. Learning principles from both classical and operant conditioning are applied in training new behaviors. Behavioral treatment of obesity seeks to alter the environment, since some environmental reinforcement contingencies shape eating behavior and physical activity.

3. BEHAVIORAL TREATMENT FOR ADULTS

3.1. Approach and Outcomes

Behavioral studies of weight management have focused on changing physical activity, eating behavior, and motivational strategies to improve weight loss. Behavioral treatment is best coordinated by the collaboration of a multidisciplinary team of professionals, including medical doctors, psychologists, dietitians, and exercise physiologists. The two phases of the behavioral treatment approach are (1) weight loss induction and (2) weight maintenance. To induce weight loss, specific calorie goals for food intake and specific goals for physical activity are prescribed for each individual. These goals are designed to yield a 1- to 2-pound weight loss per week. Physical activity and exercise goals are gradually increased until individuals engage in a minimum of 150 minutes (30 to 45 minutes, 5 days per week) of moderate intensity activity (e.g., brisk walking) per week [13]. Treatment typically involves attendance to weekly outpatient treatment groups during the 6 months of the weight loss induction phase and is reduced to biweekly or monthly meetings thereafter. Generally, longer duration of treatment (at least 6 months) and the combination of diet and exercise have been shown to yield greater success in weight loss and weight maintenance over time [14].

3.2. Duration of Treatment

In an effort to make weight loss therapies more effective, treatment length has been increased over time from an average of 8 weeks in 1974 to an average of 21 weeks by the 1990s. Comparable increases in weight loss have occurred with increases in treatment duration. In 1974, the average weight loss associated with the 8-week treatment protocol was 3.8 kg, and in 1990, the average weight loss associated with a 21-week treatment protocol was 8.5 kg. In 2000, Jeffery et al. [15] estimated that average weight losses in behavioral treatment studies have increased by approximately 75% between 1974 and 1994. In 1989, Perri et al. [16] reported that treating participants for 40 weeks as opposed to 20 weeks was associated with more weight loss. In a review of this research in 1998, Perri [17] concluded that extended contact with participants yielded better weight loss. Therefore, longer duration of treatment has been consistently associated with greater weight loss.

3.3. Targets and Tools

The targets for the behavioral treatment of obesity include the individuals' eating and physical activity as well as ways in which they interact with the environment. The primary goal of treatment is to create negative energy balance, i.e., caloric expenditure exceeds caloric intake. Accomplishment of this

goal requires many behavior and lifestyle alterations. In recent years, there has been a growing trend toward individually tailoring treatment. To accomplish individualized treatment plans, the weight management therapist needs many therapeutic "tools." These tools include self-monitoring, stimulus control, goal setting, behavioral contracting and reinforcement, nutrition education, meal planning, portion-controlled foods (e.g., meal replacements), modification of physical activity, social support, cognitive restructuring, and problem-solving. Each of these primary tools for change are described in Table 1; however, further description and research outcome related to the use of some of these tools is described below.

3.3.1. Meal planning. Prescribed meal plans are typically based on dietary exchange programs, utilization of portion controlled foods, or meal replacements, and/or structured meal planning. Use of structured meal plans with food provision (actually providing the persons with the appropriate food) can increase initial weight loss, but is no more effective in the long term than provision of a calorie goal such as 1000 to 1500 kcal/day. The most important component of structured meal plans is the provision of structure for foods that are to be consumed and the provision of grocery shopping lists. Therefore, it is not the provision of food per se that is important. Structured meal plans appear to be useful because they provide assistance for selecting healthy foods, and by creating a regular meal pattern (i.e., breakfast, lunch, dinner, snacks).

3.3.2. Portion control. Utilization of meal replacement plans (e.g., Slim Fast®) has also been studied. These studies prescribed meal plans for consuming 1200 to 1500 kcal per day by eating two or three meal replacements and one healthy meal, usually at dinner in the evening. This approach has yielded weight losses of 7 kg over the first 3 months of treatment, and 10.2 kg at 24-month follow-up for those who continued on meal replacements [18]. A meta-analysis of studies that included partial meal replacements and reduced calorie diets indicated that meal replacements were associated with greater weight loss and less attrition at 1 year compared to reduced calorie diets [19]. These studies suggest that meal replacements or portion-controlled foods facilitate adherence to the meal plan and the prescribed calorie level.

3.3.3. Modification of physical activity and exercise. Physical activity alone does not reliably produce significant weight loss, but physical activity is a predictor of long-term weight loss maintenance. A number of studies have investigated different aspects of physical activity and weight loss, including: (1) lifestyle activity vs. structured exercise, (2) long bout vs. short bout of exercise, and (3) home-based vs. group-based exercise. In long-term weight loss (1 year or longer follow-up), Wing [20] concluded that there was greater

Table 1. Behavioral strategies that can be used to promote weight loss and weight maintenance

Self-monitoring	Self-monitoring of food intake and physical activity helps people become aware of their eating and exercise habits. Self-monitoring also allows the counselor to monitor behaviors and note changes that occur over time.
Stimulus control	Stimulus control involves altering the environmental antecedents that affect eating and exercise behaviors. The environment is changed to provide cues for healthy behavior, such as eating healthy and exercising.
Goal setting/shaping	Setting small attainable goals helps foster motivation for behavior change and create feelings of accomplishment when they are achieved. As treatment progresses, the goals gradually become more challenging.
Behavioral contracting/ reinforcement	Rewarding oneself for attaining a goal helps maintain motivation for behavior change and give the person a sense of accomplishment.
Nutrition education	Patients are educated on the nutritional aspects of weight loss and weight maintenance.
Meal planning	Patients are encouraged to plan the type and amount of foods that are to be eaten for their meals. Meals should also be regularly scheduled.
Portion-controlled foods	Portion-controlled foods, including nutrition shakes and bars, and microwavable entrees, are an easy way for patients to eat healthy. These foods are affordable and easy to prepare and eat while away from home.
Modification of physical activity	Decreasing sedentary behavior and increasing physical activity are important for weight loss maintenance.
Social support	Social support may be derived from a spouse, family member, or friends. Family and friends are encouraged to support the patient in making lifestyle changes.
Cognitive restructuring	Cognitive restructuring helps patients identify and the negative consequences of dysfunctional thoughts, which might be associated with repeated dieting attempts, depressed mood, or body image dissatisfaction. Negative dysfunction thoughts can contribute to depressed mood and eating behavior. Patients are taught how to combat these thoughts and replace them with more adaptive ones.
Problem-solving	Problem-solving training teaches patients to systematically overcome problematic situations.

long-term weight loss for groups receiving diet plus exercise treatment, though the effects of the combined treatment were often only marginally better than those achieved by diet alone. It has been suggested that the limited long-term impact of exercise programs may be due to the inability of most people to maintain physical activity regimens over a long duration of time. With regard to improvement of exercise adherence, studies of supervised group exercise versus home-based approaches to physical activity have reported that home-based programs may have a long-term advantage, because they promote greater adherence. In addition, short-bout exercise prescription was shown to yield higher maintenance of physical activity in the long term (12 to 18 months) as well as overall better weight loss than long-bout exercise programs [14, 20].

The amount of exercise has been shown to be an important variable in the success in weight loss and weight maintenance over time. Typical exercise prescriptions recommended in behavioral weight loss programs consist of at least 150 minutes of moderate intensity physical activity per week. Nevertheless, it appears that the duration of physical activity is associated with long-term weight loss. Reports from the National Weight Control Registry (adults who have lost significant weight and maintained it for at least one year) have indicated that successful weight loss maintenance was achieved by an average of 2800 kcal per week of physical activity [21]. Thus, higher levels of exercise than are typically prescribed in behavioral programs may be necessary for long-term weight maintenance.

3.3.4. Social support. Enhancement of social support has been studied as a means for improving long-term weight loss [22]. The most common way to enhance social support has been to include spouses, family members, or close friends in the treatment process. These studies have reported that there are both short-term and long-term weight loss benefits for inclusion of strong family support [22].

3.3.5. Satisfaction with weight loss. Obese adults often have difficulty establishing reasonable weight loss goals. Setting unreasonable weight loss goals in the behavioral treatment of obesity often leads to disappointing outcomes and little motivation to continue adherence to treatment programs. A recent study [23] investigated whether informing obese persons of the expectation of a weight loss of 5% to 15% would influence them to adopt more realistic expectation for weight loss. This study found that simply providing information promoting an expectation of moderate weight loss (5% to 15%) had no significant impact on weight loss expectations. Therefore, if weight loss expectations are to be modified, it appears that a more intensive effort will be required.

3.4. Weight Maintenance Strategies

The primary strategy used to facilitate weight maintenance is to extend the length of treatment and maintain longer therapeutic support and/or booster treatment as needed. The increased length of contact should result in continuous use of weight loss strategies, and thus, weight maintenance. Perri [17] concluded that the addition of therapist contact via the telephone and mail, significantly enhanced maintenance of weight loss for a group that received behavior therapy plus relapse prevention training. Similar results have been obtained with the use of booster sessions to enhance maintenance of weight loss [24].

3.4.1. Internet approaches. Also, in recent years, the Internet has been employed as a means of increasing therapist contact to improve long-term weight maintenance, and preliminary results of this approach are encouraging [25]. Overall, four studies have investigated the use of the internet for the purpose of delivering a weight management program in adults. The research designs of two of the studies [26, 27] compared the efficacy of interactive Internet-based interventions to health education Web sites. Both studies found a 2.5-kg difference between the two treatments at the end of 6 to 12 months. A third study [28] tested the efficacy of an Internet-based intervention as a weight maintenance strategy for adults who had lost weight using a face-to-face behavioral counseling approach. The study reported negative results in that the Internet-based intervention did not yield good weight maintenance in comparison to face-to-face contact. A recent study [29] reported no differences in weight maintenance results between face-to-face contact and Internet support. Thus, mixed evidence has been found for the efficacy of utilizing the Internet as a means for yielding long-term weight maintenance.

3.4.2. Relapse prevention and problem solving. There is a general consensus [24] that development of skills to respond immediately to overeating, periods of inactivity, or to small weight gains, is useful for long-term management of obesity. Relapse prevention is based on the idea that individuals will encounter "high-risk" situations that threaten behavior change. Relapse prevention training, which develops plans to cope with situations that place the person at risk for returning to previous unhealthy patterns of behaviors, is incorporated into many treatments for weight loss. An alternative approach for long-term weight maintenance is called problem-solving therapy, which has been found to be superior to relapse-prevention training for promoting long-term weight loss maintenance [30]. Problem-solving therapy advocates that patients require professional guidance and advice to effectively cope with situations that put their weight loss maintenance at risk. This model, therefore, involves continued contact with a professional.

3.5. Special Considerations

3.5.1. Cultural considerations. Cultural issues may influence one's motivation and ability to succeed in weight loss. For example, the stigma of obesity varies across cultures, genders, and races. Women, more than men, are likely to attempt weight loss for appearance reasons. Men are more likely to enter into obesity treatment programs when they believe that their overweight status has negative health consequences or when they have been prompted by a health care professional. Generally, African Americans are less likely to experience social pressures to lose weight and may therefore be less motivated to seek treatment. For some individuals, it may be useful to emphasize health-related benefits of weight loss rather than appearance-based reasons for weight loss.

3.5.2. Health considerations. An individual's physical health must be considered when prescribing caloric restriction and/or a physical activity regimen. A physician should evaluate the safety of caloric restriction and increased exercise on an individual basis. A dietitian or nutritionist should be consulted to formulate dietary recommendations. Individuals with type 2 diabetes or cardiovascular disease may require special diets and medical monitoring throughout the course of any weight loss program. Further, overweight individuals may experience knee or other joint problems; in such cases, physical activity may be limited.

3.5.3. Psychosocial consequences. It is also important to consider the psychological sequelae of obesity. In American culture, there is a stigma associated with obesity. The "obesity stereotype" is that people who are overweight tend to be less socially competent, lazier, and less intelligent than normal weight individuals. In addition, most obese people have experienced various forms of discrimination and teasing about their weight. As a result, obese people often suffer from low self-esteem and may be very concerned about their body size and shape. In addition, many individuals may have attempted unsuccessfully to lose weight in the past, or they may have lost weight only to regain it later. A pattern of unsuccessful weight loss attempts frequently leads to frustration and lowered self-esteem. It is important that clinicians remain sensitive to these issues when treating obesity.

3.5.4. Eating disorders. Finally, it is important to identify individuals with eating disorders. The most common type of eating disorder associated with obesity is binge eating disorder (BED). BED is characterized by recurrent episodes of binge eating in which the individual consumes large amounts of food and perceives a loss of control over eating. Unlike the pattern of behavior observed in bulimia nervosa (BN), binge eating episodes in BED do

not occur with compensatory behaviors to prevent weight gain (e.g., fasting, purging, excessive exercise). BED occurs in fewer than 2% of obese people, though binge-eating as a behavioral symptom is much more common. When such problems are identified, the treatment strategy should incorporate a component to reduce the frequency of binge episodes.

4. BEHAVIORAL TREATMENT FOR CHILDREN AND ADOLESCENTS

4.1. Approaches, Tools, and Outcomes

The main goal for treating pediatric obesity is the regulation of normal body weight, with consideration for growth and development [31]. Effective behavior change in children involves three primary components: (1) behavior therapy to foster healthier behavior change, (2) modification of diet, and (3) modification of physical activity habits. Tools for behavior change in children, just as in adults, often include reinforcement, stimulus control, behavioral contracting, self-monitoring, meal planning, modification of physical activity, problem solving, and social support. Intensive behavioral treatment programs generally yield weight losses of 6 to 10 kg during the initial weight loss induction phase that is completed in about 6 months [31]. Research studies have found that treatment spanning 1 year or more generally results in greater weight loss.

The Internet has also been utilized for the purpose of weight loss and maintenance in adolescents and children. Two studies related to pediatric obesity have been reported. A study reported by Baranowski et al. [32] tested the efficacy of an 8-week Internet-based intervention, for overweight 8-year-old African-American girls. The study did not yield significant weight changes in comparison to a control group. The second study, the Health Information Program for Teens (HIPTeens) project, is the only study that has reported the use of an Internet-based approach for weight *loss* in children or adolescents. The parents of these children were also overweight and were also targets of the Internet-based treatment. This study [33] yielded body fat loss for the adolescent girls and greater weight loss for their parents, providing further support for Internet-based interventions for weight loss. For more information on these approaches, see Williamson et al. [34].

4.2. Reinforcement, Adherence, and Behavior Change

Frequent or daily reinforcement is necessary to foster motivation and adherence. This reinforcement most commonly comes from parents. From a behavioral viewpoint, positive reinforcement for healthy behavior is necessary

to establish sustained behavior change. Over time, parents are likely to revert to punishment to influence children's behavior, which promotes negative parent–child interactions. Adherence to recommendations such as self-monitoring of diet and physical activity habits is extremely difficult for both the child and parent, and these records are frequently inaccurate. Therefore, the child and parent should work with the therapist to establish small attainable goals. They should establish clearly specified guidelines for treatment (called behavioral contracts) and, upon successful attainment of the goals, rewards should be provided. Children and adolescents can learn to monitor eating and exercise, but parents must assist by reminding and reinforcing completion of self-monitoring. Parents are also trained to use behavioral contracting, which generally includes some type of reinforcement contingency for successful attainment of the goal (e.g., child receives a music compact disc for meeting a weekly physical activity goal).

4.3. Social Support and Parent Training

Parent involvement in treatment is recommended [22] to promote the enhancement of social support, which can be accomplished by inviting parents to treatment sessions. In these sessions, parents learn to be supportive of the child's progress (and reinforce healthy behavior change) and to avoid actions that sabotage progress. One reason for the significant impact of parental involvement on weight change is control over the home environment, including types and amounts of foods available, food preparation methods, and physical activity opportunities. Another reason for parental involvement and social support is to foster the morale and encourage the child in the behavior change process.

Research has provided support for not only parental involvement, but for specific types of parent training related to healthy eating and exercise. These findings support the inclusion of parents in childhood obesity treatment, even if the child is relatively unengaged in treatment.

4.4. Problem-solving

In therapy sessions, parents and children are trained in problem-solving techniques to aid in identifying and solving potential situations that threaten success, particularly adherence in behavioral weight loss treatment. They learn to use these skills to promote adherence and to remove obstacles for successful weight management.

4.5. Meal Planning

Several different dietary approaches have been reviewed with children including individualized dietary interventions, the diabetic exchange program,

the "traffic-light" diet, and the protein-sparing modified fast (PSMF). Meal planning for children and adolescents relies on moderate calorie restriction (800 to 1000 kcal per day). More restrictive diets produce more weight loss in the short term. However, they produce long-term results similar to those of the less restrictive diets. It is important to note that the addition of nutrition education to the behavioral techniques of self-monitoring, behavioral contracting, positive reinforcement, and stimulus control procedures significantly improves reduction in percentage overweight, versus nutrition education alone [31].

4.6. Physical Activity

Exercise combined with dietary change improves childhood obesity greater than alteration of diet alone. Reduction of sedentary lifestyle behavior (versus programmed aerobic exercise), such as watching television, has been found to be a useful form of exercise prescription. When children are reinforced for less sedentary behavior they lose more weight and maintain better progress over time. However, it is important to note that reducing the duration of sedentary behavior may not necessarily promote children to allocate more time to physical activity.

Physical activity, combined with dietary changes, facilitates weight loss and long-term weight maintenance in children. Research on this topic has found that: (1) diet plus lifestyle groups maintained weight loss over time, whereas diet plus aerobic activity, diet plus callisthenic activity, and controls exhibited increases in weight over time, and (2) children reinforced for decreasing sedentary behavior and children reinforced for increasing physical activity showed comparable results in reduction of overweight. Thus, there may be a limit for the amount of physical activity that can be used to replace sedentary behavior.

4.7. Special Considerations

4.7.1. Health considerations. Once a child has been identified for weight control treatment, a medical evaluation is necessary to determine if a medical condition (e.g., hypothyroidism) is contributing to excess body weight or rapid weight gain. In addition, a child should receive medical clearance before increasing physical activity, a primary component of behavioral weight control interventions.

4.7.2. Cultural and family considerations. Special issues related to the treatment of pediatric weight problems include cultural factors, eating disorders, and motivation for lifestyle change. Ethnic and cultural factors should be considered when making recommendations. For example, dietary plans should take into consideration religious events or special dietary needs. Motivation for behavior change and adherence to recommendations are particularly problematic for children and adolescents, especially in an environment

conducive to sedentary behavior and ingestion of large portions of energy-dense/high-calorie foods. In addition, motivation for lifestyle behavior change can be strongly impacted by culture. For example, some overweight African-American girls are relatively unconcerned about their weight status and may have fatalistic attitudes about the health risks associated with obesity.

The presence of child or parental psychopathology negatively affects weight loss and maintenance. Should psychopathology or family conflict be present, referrals for mental health treatment or family counseling to address these problems before initiating weight loss treatment may be appropriate. Finally, family support may not be universal and not all family members will support the behavioral changes necessary to promote weight loss for the child or adolescent who is the focus of therapy. For example, family members may offer poor food choices to the person in therapy, tease them, or reinforce their behavior with the provision of food.

4.7.3. Eating disorders. Another concern about dieting by children and adolescents is the development of eating disorder symptoms or the effect of dieting on the growth and development of children and adolescents. Research findings suggest that moderate calorie restriction might temporarily reduce growth rate, but there is no effect on long-term growth.

5. CONCLUSIONS

In summary, research on weight control in children suggests that frequent or daily reinforcement facilitates behavior change and weight loss. In addition, weight loss is promoted by gradual or extended therapeutic contact. It is wise to present didactic information to the child at a pace that is flexible and promotes mastery of concepts. Providing children with perceived choices in therapy also promotes weight loss and longer therapy is generally associated with greater weight loss. Self-control training and cognitive therapy in the absence of parental support have not been found to promote long-term weight loss in children or adolescents. Therefore, the most effective treatment involves parents so that the child's environment is modified to promote healthy nutrition and physical activity, as well as the provision of adequate social support.

6. SUMMARY

Behavioral weight control generally involves two phases: (1) weight loss induction and (2) weight maintenance. During the period of weight loss, energy intake via eating is reduced and energy expenditure resulting from physical activity is increased. During the period of weight maintenance, the person learns

to match energy intake (eating habits) with energy expenditure (physical activity and exercise). The most effective behavioral weight loss programs have offered a combination of exercise, diet, and behavior modification. Specific treatment components can be used to enhance long-term successful weight management for adults and children. These components include, but are not limited to, (1) portion control and structured meal plans, (2) home-based and short-bout exercise prescriptions, (3) prolonged and regular therapeutic contact during weight loss induction, (4) utilization of social support throughout treatment, and (5) extended therapeutic contact or booster treatment to promote long-term weight maintenance. For long-term success, it is clear that the overweight person must sustain his or her efforts to change behavior patterns and prevent relapse by proactively modifying barriers to lifestyle behavior change. Further, behavioral weight management is most efficacious when the treatment plan is tailored to match an individual's cultural, social, and motivational circumstances.

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