

# Behavioral Approaches to the Treatment of Obesity

KAYLONI OLSON, MA; DALE BOND, PhD; RENA R. WING, PhD

## INTRODUCTION

Behavioral (or lifestyle) interventions are considered the cornerstone of obesity treatment. These programs are designed to produce long-term weight losses through changes in diet and physical activity. Behavioral approaches form the basis for the prevention and treatment of obesity in both children and adults. In addition, they are critical components of pharmacological and surgical approaches to obesity.

The Weight Control and Diabetes Research Center, which is affiliated with The Miriam Hospital, conducts research to develop and evaluate new behavioral approaches to weight control (<http://weightresearch.org>). Participants entering these research studies receive state-of-the-art behavioral programs at no cost.

## COMPONENTS OF A BEHAVIORAL WEIGHT LOSS PROGRAM

Lifestyle programs are designed to help patients lose 1–2 pounds per week resulting in a 5–10% weight loss by 6 months. Subsequent efforts are focused on maintaining the weight loss or if desired, losing additional weight. Such weight losses are realistic for patients and as will be discussed below, produce important health benefits. To accomplish these weight changes, behavioral programs include the following components,<sup>1</sup> which are summarized in **Table 1**.

### Diet Interventions

Weight loss requires an energy, or calorie, deficit, created primarily through restriction of dietary intake. Patients are

given individualized calorie goals to produce a 500 to 1000 kilocalorie (kcal) deficit from their baseline intake and thus produce a 1–2 pound per week weight loss. In most programs, individuals under 200 lbs are prescribed a 1000–1500 kcal/day diet, whereas those over 200 lbs are given a 1500–1800 kcal/day goal. Although there are extensive data that weight loss is primarily related to caloric restriction rather than to the macronutrient composition of the diet, behavioral programs typically encourage participants to reduce fat intake (< 30% of calories from fat) to help achieve the calorie goal. Weight loss can be achieved with a low fat or low carbohydrate diet, as long as the diet produces a decrease in overall calories consumed. Since adherence to diet prescription and reduction in calorie intake is critical, behavioral programs often include use of meal replacement products or structured meal plans to help patients adhere to the calorie goals. Self-monitoring of intake also is a key component (see below).

### Physical Activity

Behavioral programs encourage gradual increases in physical activity using moderate intensity activities such as brisk walking. The goals for physical activity typically start at 50 minutes/week, but they are gradually increased to 150 minutes/week, with patients encouraged to achieve this goal over 5 days in the week. Reaching these goals can be done in short bouts of 10 minutes and accumulated over the course of the day. Recent data suggest that even higher levels of physical activity (200–250 minutes per week) are associated with better maintenance of weight loss; thus programs now encourage participants to try to achieve these higher goals.

In addition, patients are encouraged to identify and decrease sedentary behaviors, particularly watching television given its association with increased intake of energy dense foods. This is in addition to finding ways to increase lifestyle (or non-structured) physical activity such as using stairs rather than elevators. It remains unclear whether using contemporary fitness tracking devices (such as a FitBit) are helpful in promoting adherence to the physical activity goal and improving weight loss outcomes.<sup>2</sup>

**Table 1.** Key components of a Behavioral Weight Loss Program

<b>Calorie Restriction</b>	<b>Individualized calorie goals to produce a 500 to 1000 kcal deficit from baseline</b> <ul style="list-style-type: none"> <li>• Those &lt; 200 lbs: prescribed a 1000–1500 kcal/day diet,</li> <li>• Those &gt; 200 lbs: prescribed a 1500–1800 kcal/day diet</li> <li>• Reduce fat intake to help achieve calorie goals</li> </ul>
<b>Physical Activity</b>	<b>Increases in moderate intensity activities such as brisk walking</b> <ul style="list-style-type: none"> <li>• Begin with 50 minutes/week (10 min on 5 days in the week)</li> <li>• Gradually increase to 150 minutes/week (30 minutes on 5 days in the week)</li> <li>• For better maintenance of weight loss, increase further to 200 or 250 minutes/week</li> </ul>
<b>Behavioral Strategies</b>	<b>Behavioral strategies to increase adherence to the diet and activity goals</b> <ul style="list-style-type: none"> <li>• Self-monitoring (recording weight, diet and activity on a daily basis)</li> <li>• Stimulus control (removing high calorie foods from the home)</li> <li>• Goal setting, preplanning, and problem solving areas</li> </ul>

## Behavioral Strategies

To help patients make and sustain the prescribed changes in eating and activity behaviors a variety of behavioral strategies are used, chief of which is self-monitoring. Self-monitoring, or recording of weight, diet and activity on a daily basis has been shown to be the most important component of a behavioral weight loss program. Participants are encouraged to weigh themselves daily so that they can see the relationship between their eating and activity and their body weight. Other behavioral strategies include stimulus control (removing high calorie foods from the home and making certain that low calorie, healthy options are available), goal setting, preplanning, and problem solving. These strategies, and in particular the use of problem solving, allow for individualization of the program to address specific problem areas (e.g. emotional eating, restaurant eating, etc.).

## Format

Behavioral programs are typically offered in a closed group format, with approximately 15–20 patients treated together in weekly sessions ranging from 16–24 weeks. Following the chronic disease model, continuation of contact is important but is gradually reduced to bi-weekly and monthly check-ins. Although longer programs have been shown to increase weight loss and delay weight regain, these time-intensive programs have been criticized as too costly and burdensome to translate and deliver outside of research settings. Recent studies have shown that phone contact can be used successfully in lieu of face-to-face contact. Likewise, providing the intervention via Internet or mobile devices can allow for more cost-effective dissemination of these programs.<sup>3</sup>

## OUTCOMES ACHIEVED IN BEHAVIORAL WEIGHT LOSS PROGRAMS

### Weight and Health Outcomes

On average, behavioral programs produce weight losses averaging approximately 7–9 kg, with maximum weight loss typically achieved around 6–12 months.<sup>4</sup> This modest weight change has been shown to facilitate meaningful improvements in cardiovascular risk factors and to reduce hypertension and hyperlipidemia and the incidence of type 2 diabetes.<sup>5</sup> For example, in the Diabetes Prevention Program, the lifestyle intervention produced a mean weight loss of 7% at 6 months and 4.9% at 3 years. These modest weight losses were successful in reducing the risk of developing diabetes by 58% relative to a control group.<sup>6</sup> In Look AHEAD,<sup>7</sup> a study of 5,000 individuals with type 2 diabetes, those assigned to the lifestyle intervention had greater improvements in sleep apnea, kidney disease, urinary incontinence, depression, number of hospitalizations and medications. However, there were no significant differences between the intervention and control group on the incidence of cardiovascular morbidity

and mortality. The benefits of weight loss are not limited to medical morbidity but also include psychological benefits such as reduced depressive and anxiety symptoms, increased self-esteem, improved body image and quality of life.<sup>8</sup>

### Variability in weight loss outcomes

There is marked variability in weight loss outcomes in behavioral programs, with the standard deviation for weight loss as large as the mean. Thus, some individuals do well whereas others lose little or even gain weight during treatment. It remains a challenge to identify pre-treatment indicators of success or to determine who may be at risk for poor results.<sup>9</sup> Countless baseline predictors have been studied over the past two to three decades but few have proven to be reliable indicators of treatment outcome. The single best predictor of successful weight loss is adherence to regular self-monitoring of dietary intake.<sup>10</sup> Because dietary changes are an essential target of treatment in order to alter an individual's energy balance in favor of weight loss, careful attention to food intake through tracking is thought to facilitate adherence to caloric goals. Additionally, early response to treatment, defined by the weight loss observed within the first month of treatment, has been associated with the likelihood of achieving 10% weight loss after one year of treatment.<sup>11</sup>

### Weight maintenance

Among those who lose weight, weight regain occurs commonly in the months following weight loss treatment.<sup>12</sup> This weight regain occurs in part due to physiological adaptations to weight loss (which predispose to weight regain) and to the obesogenic environment (broadly defined as micro- and macro-level features of the environment that promote inactivity and overconsumption), which makes it challenging to sustain healthy changes in eating and activity long-term. A major objective of obesity researchers is to better understand how and why weight regain occurs, who is at risk, and how to enhance maintenance over time. The National Weight Control Registry, established by Hill and Wing,<sup>13</sup> includes over 10,000 individuals who lost 30 pounds or greater and maintained the weight loss for at least one year. It was developed to provide empirical support for the notion that weight maintenance is possible and to better understand factors that impact long-term weight control. Perhaps unsurprisingly, individuals who continue to adhere to a low calorie/low fat diet, engage in regular exercise, and self-monitor their weight are more likely to maintain weight loss over time.<sup>14</sup> In fact, regular exercise is one of the strongest and most reliable predictors of long-term weight control following weight loss.<sup>12</sup> However, it is not clear how to promote long-term adherence to these behaviors, and there have been only a few randomized trials which have successfully improved the maintenance of weight loss.<sup>15</sup>

## PHARMACEUTICAL ADJUVANT THERAPY

A number of anti-obesity drugs are available to assist with weight loss;<sup>16</sup> these agents are reviewed in a separate contribution in this issue (*Obesity Epidemic: Pharmaceutical weight loss – Stephanie A. Curry, MD*). Current guidelines recommend using these medications in combination with intensive lifestyle intervention to augment weight loss outcomes. This combination produces greater mean weight loss and greater likelihood of achieving 5% weight loss compared to use of either medication or lifestyle intervention alone. Anti-obesity drugs have also been explored as a ‘rescue strategy’, with the medication prescribed when an individual fails to achieve significant weight loss or starts to regain. This approach has received minimal research attention but preliminary data indicate no benefit of implementing anti-obesity medication treatment to rescue non-responders. Conversely, more promising empirical support has been found for the introduction of pharmaceutical treatments following successful weight loss during behavioral treatment. When administered to individuals who lost at least 5% of their body weight during intensive lifestyle intervention, anti-obesity medication was associated with greater likelihood of maintaining initial weight loss as well as continued weight loss compared to a placebo control condition.<sup>17</sup> As maintenance of weight loss following behavioral treatment continues to be a major clinical concern, these preliminary findings are encouraging and require further evaluation.

## BARIATRIC SURGERY

Bariatric surgery is described in detail in another article in this issue (*Diabetes, obesity, and other medical diseases – is surgery the answer? – Dieter Pohl, MD, FACS, FASMBS; Aaron Bloomenthal, MD, FACS*). While bariatric surgical procedures generally produce weight losses that are far superior and more durable than behavioral or pharmacological weight loss treatments, most patients begin to experience weight regain as early as after the initial postoperative year. Importantly, bariatric surgery is not an obesity cure, but another tool patients may use in combination with behavioral changes to achieve weight loss and related health improvements. To be most successful after bariatric surgery, patients must make multiple behavior changes such as consuming small meals/snacks ( $\leq 8$  oz),  $\geq 5$  meals/snacks each day, eating slowly, stopping at satiation, and avoiding alcohol and concentrated sweets/snacks.<sup>18</sup> Although surgical outcomes are enhanced when combined with changes in diet, activity, and other weight-related (e.g., self-weighing) behaviors, development and testing of behavioral interventions for bariatric surgery patients has received limited attention. Our group recently tested a behavioral intervention to increase moderate-intensity walking before bariatric surgery, as prior studies have shown that higher physical activity levels before surgery are related to greater physical activity levels and weight loss after surgery. Our

intervention employed standard behavioral strategies (e.g., self-monitoring, goal-setting) to help patients increase their physical activity in bouts  $\geq 10$  minutes. Patients in the intervention group increased objectively-monitored moderate to vigorous physical activity in bouts  $\geq 10$  minutes by nearly 5-fold (from 4.4 to 21.0 min/d) where patients randomly assigned to standard care did not change (from 7.9 to 7.6 min/d). Additionally, in those patients who went on to have bariatric surgery, those who had received the intervention maintained higher physical activity levels through 6-months post-surgery compared to those in the control condition.<sup>19</sup> Other recent randomized controlled trials showed that patients who received dietary counseling or were given a structured dietary intervention incorporating portion-controlled foods after surgery achieved better results than those given standard care. Research on the role of adjunctive behavioral interventions in bariatric surgery is in its infancy and critical questions regarding appropriate timing, intensity, duration, and content need to be answered.

## CONCLUSION

Changing behavior is critical to weight loss success. Comprehensive behavioral interventions that help patients change their eating and exercise behaviors produce weight losses of 5–10% of body weight and clinically significant improvements in health. Such behavioral approaches are important as a stand-alone approach to weight loss as well as a key component of pharmacologic therapy or surgical approaches to weight control.

## References

1. Diabetes Prevention Program (DPP) Research Group. (2002). The Diabetes Prevention Program (DPP) description of lifestyle intervention. *Diabetes care*, 25(12), 2165-2171.
2. Jakicic, J. M., Davis, K. K., Rogers, R. J., King, W. C., Marcus, M. D., Helsel, D., Belle, S. H. (2016). Effect of wearable technology combined with a lifestyle intervention on long-term weight loss: the IDEA randomized clinical trial. *Jama*, 316(11), 1161-1171.
3. Thomas, J. G., & Bond, D. S. (2014). Review of innovations in digital health technology to promote weight control. *Current diabetes reports*, 14(5), 1-10.
4. Wing, R. R., Lang, W., Wadden, T. A., Safford, M., Knowler, W. C., Bertoni, A. G., Look AHEAD Research Group. (2011). Benefits of modest weight loss in improving cardiovascular risk factors in overweight and obese individuals with type 2 diabetes. *Diabetes care*, 34(7), 1481-1486.
5. Blackburn, G. (1995). Effect of degree of weight loss on health benefits. *Obesity research*, 3(S2), 211s-216s.
6. Diabetes Prevention Program Research Group. (2009). 10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study. *The Lancet*, 374(9702), 1677-1686.
7. Look AHEAD Research Group. (2003). Look AHEAD (Action for Health in Diabetes): design and methods for a clinical trial of weight loss for the prevention of cardiovascular disease in type 2 diabetes. *Controlled clinical trials*, 24(5), 610-628.

8. Lasikiewicz, N., Myrissa, K., Hoyland, A., Lawton, C. L. (2014). Psychological benefits of weight loss following behavioral and/or dietary weight loss interventions. A systematic research review. *Appetite*, 72, 123-137.
9. Wilson, G. T. (1995). Behavioral and psychological predictors of treatment outcome in obesity. In *Obesity treatment* (pp. 183-189). Springer US.
10. Burke, L. E., Wang, J., & Sevvick, M. A. (2011). Self-monitoring in weight loss: a systematic review of the literature. *Journal of the American Dietetic Association*, 111(1), 92-102.
11. Unick, J. L., Hogan, P. E., Neiberg, R. H., Cheskin, L. J., Dutton, G. R., Evans Hudnall, G., West, D, S. (2014). Evaluation of early weight loss thresholds for identifying nonresponders to an intensive lifestyle intervention. *Obesity*, 22(7), 1608-1616.
12. MacLean, P. S., Wing, R. R., Davidson, T., Epstein, L., Goodpaster, B., Hall, K. D., Rothman, A. J. (2015). NIH working group report: innovative research to improve maintenance of weight loss. *Obesity*, 23(1), 7-15.
13. Klem ML, Wing RR, McGuire MT, Seagle HM & Hill JO (1997). A descriptive study of individuals successful at long-term maintenance of substantial weight loss. *American Journal of Clinical Nutrition*, 66, 239-246.
14. Thomas JG, Bond DS, Phelan S, Hill JO, Wing RR. (2014). Weight-loss maintenance for 10 years in the National Weight Control Registry. *American Journal of Preventive Medicine*, 46, 1, 17-23.
15. Wing RR, Tate DF, Gorin AA, Raynor HA, Fava JL. A self-regulation program for maintenance of weight loss. *The New England journal of medicine* 2006;355:1563-71.
16. Yanovski, S. Z., & Yanovski, J. A. (2014). Long-term drug treatment for obesity: a systematic and clinical review. *Jama*, 311(1), 74-86.
17. Wadden, T. A., Hollander, P., Klein, S., Niswender, K., Woo, V., Hale, P. M., & Aronne, L. (2013). Weight maintenance and additional weight loss with liraglutide after low-calorie-diet-induced weight loss: the SCALE Maintenance randomized study. *International journal of obesity*, 37(11), 1443-1451.
18. Thomas, J. G., Bond, D. S., Ryder, B. A., Leahey, T. M., Vithianathan, S., Roye, G. D., & Wing, RR. (2011). Ecological momentary assessment of recommended postoperative eating and activity behaviors. *Surgery for Obesity and Related Diseases*, 7(2), 206-212.
19. Bond, D. S., Vithianathan, S., Thomas, J. G., Trautvetter, J., Unick, J. L., Jakicic, J. M., Wing, R. R. (2015). Bari-Active: a randomized controlled trial of a preoperative intervention to increase physical activity in bariatric surgery patients. *Surgery for Obesity and Related Diseases*, 11(1), 169-177.

## Authors

KayLoni Olson, MA, Weight Control and Diabetes Research Center, The Miriam Hospital, Providence, RI.

Dale Bond, PhD, Weight Control and Diabetes Research Center, The Miriam Hospital, Providence, RI; Associate Professor of Psychiatry and Human Behavior (Research), Warren Alpert Medical School of Brown University.

Rena R. Wing, PhD, Director, Weight Control and Diabetes Research Center, The Miriam Hospital, Providence, RI; Professor of Psychiatry and Human Behavior, Warren Alpert Medical School of Brown University.

## Correspondence

Rena R. Wing, PhD,

Director, Weight Control and Diabetes Research Center

196 Richmond St., Providence RI 02903

401-793-8959

Fax 401-793-8944

[RWing@Lifespan.org](mailto:RWing@Lifespan.org)

[Rena\\_Wing\\_PhD@brown.edu](mailto:Rena_Wing_PhD@brown.edu)