

## Lifestyle change as therapy for obesity

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### Abstract

Lifestyle change (comprising adequate diet, physical activity, and behavior therapy) represents the cornerstone of obesity therapy. Dietary intervention consists primarily in reducing the energy content of the diet and secondarily in altering the relative macronutrient composition. It is recommended to ingest low-calorie diets rather than very-low-calorie diets, because they are safer and better accepted and provide at least similar long-term results. Low-fat diets have traditionally been prescribed for weight loss, because they facilitate energy restriction. Low-carbohydrate diets are helpful because they favor energy restriction, as well. Physical activity has favorable effects in obese patients: it prevents the decline in resting energy expenditure that accompanies diet-induced weight loss, reduces the amount of free-fat mass lost, decreases the risk of developing type 2 diabetes mellitus and of dying from cardiovascular disease, increases the rate of weight loss, and helps maintaining the results on long term. Behavior therapy aims at altering eating and activity habits that promote obesity. It usually involves multiple strategies, including stimulus control, self-monitoring, problem solving skills, cognitive restructuring, social support, and relapse prevention. Many obese persons can achieve short-term weight loss by dieting alone. However, successful long-term results are much more difficult to obtain and require a more complex strategy, including physical activity and behavior therapy.

**Key words:** *lifestyle change, dietary intervention, physical activity, behavior therapy, weight loss*

### Rezumat

Modificarea stilului de viață (reprezentată de dietă, activitate fizică și modificarea comportamentului alimentar) constituie baza tratamentului obezității. Intervenția alimentară constă în reducerea conținutului energetic al alimentelor ingerate, în primul rând, și în schimbarea compoziției relative în macronutrienți, în al doilea rând. Se preferă consumul unor diete cu conținut energetic scăzut, care, spre deosebire de dietele cu conținut energetic foarte scăzut, sunt mai sigure și mai ușor acceptate de către pacienți, conferind rezultate similare pe termen lung. Regimurile alimentare hipolipidice au fost prescrise, în mod tradițional, în scopul inducerii scăderii ponderale, acest lucru realizându-se prin restricția energetică pe care ele o favorizează. Dietele hipoglicidice sunt și ele utile, fiind și ele hipocalorice. Activitatea fizică are efecte favorabile la persoanele obeze: previne reducerea metabolismului bazal care însoțește pierderea ponderală indusă de dietă, scade rata catabolismului țesutului non-adipos, reduce riscul diabetului zaharat tip 2 și al mortalității cardiovasculare, crește viteza scăderii ponderale și favorizează menținerea rezultatelor pe termen lung. Modificarea comportamentului alimentar promovează schimbarea obiceiurilor alimentare și a unor activități asociate cu ingestia de alimente. Acesta include strategii multiple: evitarea stimulilor

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ce declanșează ingestia de alimente, automonitorizarea alimentelor ingerate, rezolvarea problemelor personale colaterale, adoptarea unei atitudini pozitive, crearea unei rețele de suport social și prevenirea revenirii la greutatea inițială. Pe termen scurt, numeroși obezi pot să scadă în greutate doar cu ajutorul unui regim alimentar. Totuși, menținerea rezultatelor pe termen lung este mult mai dificilă și necesită o strategie complexă, care asociază activitatea fizică și modificarea comportamentului alimentar.

**Cuvinte cheie:** *modificarea stilului de viață, intervenție alimentară, activitate fizică, modificarea comportamentului alimentar, scădere ponderală*

The mainstay of obesity therapy is to increase the use of endogenous fat stores as fuel by reducing energy intake below energy expenditure. For most obese persons, negative energy balance is more readily achieved by decreasing food intake than by increasing physical activity. Therefore, dietary intervention is considered the cornerstone of weight-loss therapy. With dieting, weight loss is composed of approximately 75% to 85% fat and 15% to 25% fat-free mass (FFM). An energy deficit of approximately 1000 kcal is required to oxidize 100 g of adipose tissue. However, because of the oxidation of lean tissue and associated water losses, a 1000 kcal energy deficit will reduce body weight by more than 100 g (1).

Many obese persons can achieve short-term weight loss by dieting alone, but successful long-term weight maintenance is much more difficult to

achieve. *Weight cycling* and *yo-yo dieting* are popular terms used to describe repetitive cycles of weight loss and subsequent regain. Although some adverse consequences have been associated with weight cycling, available data on the negative health effects are inconclusive and should not deter obese persons from attempting to lose weight (2).

A practical guide to the management of overweight and obesity was developed by the North American Association for the Study of Obesity in conjunction with the U.S. National Institutes of Health (NIH) (3). An overview of this guideline is shown in table I, which outlines a stepwise approach for weight loss. One can note that lifestyle change (including diet, physical activity, and behavior therapy) is recommended for all overweight patients with additional obesity-related disease or risk factors for atherosclerosis, and for all obese patients.

**Table I.** Suggested weight-loss treatment options based on BMI and risk factors (3)

Treatment	BMI category (kg/m <sup>2</sup> )				
	25-26.9	27-29.9	30-34.9	35-39.9	≥40
<b>Diet, physical activity, and behavior therapy</b>	With CHD risk factor or obesity-related disease	With CHD risk factor or obesity-related disease	Yes	Yes	Yes
<b>Pharmacotherapy*</b>	-	With obesity-related disease	Yes	Yes	Yes
<b>Surgery**</b>	-	-	-	With obesity-related disease	Yes

**Legend:** BMI=body mass index; CHD=coronary heart disease; \*=pharmacotherapy should only be considered in patients who are not able to achieve adequate weight loss by available conventional therapy (diet, physical activity, and behavior therapy) and who do not have any absolute contraindications for drug therapy; \*\*=bariatric surgery should only be considered in patients who are unable to lose weight with available conventional therapy and who do not have any absolute contraindications to surgery.

### **Dietary intervention**

Weight-loss diets generally involve changes in energy content and macronutrient composition. However, the degree of weight loss achieved primarily depends on the energy content of the diet, rather than on its relative macronutrient composition.

Diet-induced weight loss decreases resting energy expenditure (REE), which favors weight regain. This observation underlies the theory which states that body weight is predetermined so that weight loss (or gain) promotes a decrease (or increase) in metabolic rate that acts to restore body weight to a preset level. In both lean and obese persons, hypocaloric feeding reduces REE by 15% to 30%. This reduction in REE cannot be completely accounted for by the accompanying decrease in body size or lean body mass and is considered a normal part of the physiologic adaptation to energy restriction. The reduction in REE that occurs during negative energy balance is transient and does not persist during maintenance of a lower body weight. As reported in several studies, long-term maintenance of weight loss is not associated with an abnormal decrease in REE or total energy expenditure when adjustments are made for changes in body composition (4).

### **Energy content**

Weight-loss diets can be classified according to their energy content. A balanced-deficit diet of conventional foods usually contains less than 1500 kcal/day and an appropriate balance of macronutrients. Low-calorie diets (LCDs) contain 800 to 1500 kcal/day. Very-low-calorie diets (VLCDs) contain less than 800 kcal/day and are generally rich in protein (70-100 g/day) and poor in fat (<15 g/day). Diets may be consumed as liquid formula, nutritional bars, conventional food, or a combination of these items.

The use of VLCDs induces a faster weight loss than LCDs, but this weight loss is not usually maintained (5). In fact, several randomized trials have shown that weight regain is greater after VLCD than after LCD therapy. With VLCDs, there is greater risk of the medical complications associated with dieting, such as hypokalemia, dehydration, and gallstone formation. Patients treated with a VLCD, therefore, require closer medical supervision than those treated with an LCD.

According to the treatment guidelines issued by NIH (3), persons who are overweight and have two or more cardiovascular disease risk factors and persons who have class I obesity should decrease their energy intake by approximately 500 kcal/day. This deficit in energy intake will generally promote weight loss of about 0.4 kg/week and result in about a 10% reduction of initial weight at 6 months. The NIH guidelines recommend a more aggressive energy deficit of 500 to 1000 kcal/day for patients with class II or III obesity. In such persons, this energy deficit will generally produce weight loss of more than 0.5 kg/week and result in a 10% weight loss at 6 months.

Total daily energy requirements can be estimated by using standard equations, based on the patient's height, age, sex, and activity level. However, the use of standard equations is cumbersome and may be unreliable in obese persons. The simple diet guidelines outlined in tables II and III are suggested as an alternative to a specific energy-deficit diet based on the patient's daily energy requirements. Patients who follow these guidelines generally lose weight. Because many patients do not fully adhere to their prescribed diet, the energy content of the diet should be regularly adjusted according to the patient's weight loss response.

**Table II.** Suggested energy composition of initial reduced-calorie diet (1)

Body weight (kg)	Suggested energy intake (kcal/day)
67.5-90	1000
90-112.5	1200
112.5-135	1500
135-157.5	1800
≥157.5	2000

**Table III.** Suggested macronutrient composition of initial reduced-calorie diet (1)

Macronutrient	Suggested amount
Fat	20-30% of total calories
Saturated fatty acids	8-10% of total calories
Monounsaturated fatty acids	Up to 15% of total calories
Polyunsaturated fatty acids	Up to 10% of total calories
Cholesterol	<300 mg/day
Protein	15-20% of total calories
Carbohydrate	55-65% of total calories

### Macronutrient composition

Altering the macronutrient composition of the diet does not induce weight loss, unless total energy intake is reduced.

*Low-fat diets* have traditionally been prescribed for weight loss because such diets facilitate energy restriction. Triglycerides, the main component of dietary fat, increase the palatability and energy density of food (defined as the energy present in a given weight of food). The results of epidemiologic and diet intervention studies suggest that increased dietary fat intake is associated with increases in total energy intake and body weight. Conversely, data from a large number of studies suggest that decreasing fat intake is associated with spontaneous decreases in total energy intake and body weight, even when carbohydrate and protein intakes are not restricted (6).

The weight-loss effects of a low-fat diet may be related to the effect of dietary fat on energy density. Because the energy density of fat is so high, there is

a high correlation between dietary fat content and diet energy density. According to short-term studies, energy intake is regulated according to the weight of ingested food rather than its fat or energy content. For example, the weight of food ingested was the same when lean and obese subjects were given either an *ad libitum* high-fat/high-energy-density (1.5 kcal/g) diet or a low-fat/low-energy-density (0.7 kcal/g) diet. As a result, energy intake on the high-fat/high-energy-density diet (3000 kcal/day) was nearly double the intake on the low-fat/low-energy-density diet (1570 kcal/day). The results of short-term studies show that dietary fat content itself does not affect total energy intake, apart from its effects on dietary energy density and food palatability. Whether diets of low energy density can help induce and maintain weight loss remains to be confirmed by long-term studies in obese subjects (7).

*Low-carbohydrate diets* have been evaluated as a potential therapy for obesity in clinical studies. Several short-term trials compared the effects of low-carbohydrate and high-carbohydrate diets on weight loss when energy intake was kept constant. These studies suggest that despite equal energy intakes, weight loss during the first 4 weeks may be greater with a low- than with a high-carbohydrate diet but that weight loss between 6 and 12 weeks was the same with either diet. Other trials conducted in adults found that subjects randomized to a low-carbohydrate diet (approximately 25% to 40% carbohydrate) achieved greater short-term (6 months), but not long-term (12 months), weight loss than those randomized to a low-fat diet (approximately 25% to 30% fat, 55% to 60% carbohydrate). The data from these studies also found greater improvements in serum triglyceride and HDL-cholesterol concentrations, but not in serum LDL-cholesterol concentration, in the low-carbohydrate versus the low-fat group. The mechanism responsible for the decrease in body weight associated with a low-carbohydrate diet can be completely explained by a decrease in total energy intake. However, the mechanism responsible for decreased energy consumption when dietary carbohydrates are restricted, despite an unlimited intake of fat and protein, is not known (8).

#### **Physical activity**

Physical activity, as part of lifestyle change, exerts favorable metabolic and clinic effects in obese patients.

#### **Metabolic rate**

Although there is a profound increase in energy expenditure during an actual episode of exercise, the addition of regular exercise to a weight-loss program has negligible effects on REE. In a meta-analysis of prospective, controlled trials that

randomized obese subjects to treatment with diet alone or diet plus exercise, the addition of exercise did circumvent the expected decline in REE, when REE was adjusted for body mass (9).

#### **Body composition**

The composition of weight loss can be influenced by the addition of exercise to a diet program. Data from two meta-analyses found that exercise can reduce the loss of FFM that occurs with weight loss. When diet-induced weight loss was approximately 10 kg, regular exercise of low or moderate intensity reduced the percentage of weight loss as FFM from approximately 25% to 12%. Although the difference in weight loss as FFM was large on a percentage basis, it nonetheless represented only a small ( $\approx 1$  kg) difference in the absolute amount of FFM lost. This preservation of FFM with exercise might not necessarily reflect preservation of muscle protein but might, instead, involve increased retention of body water and muscle glycogen (10). Whether there is a difference between the effects of endurance and resistance exercise on FFM conservation is not clear because the available data are limited and conflicting.

#### **Diabetes and coronary heart disease**

Endurance exercise increases insulin sensitivity and is associated with a decreased risk of developing type 2 diabetes mellitus and dying from cardiovascular disease (11, 12).

#### **Weight loss**

Increasing physical activity alone is not an effective strategy for promoting initial weight loss. Most studies have shown that moderate endurance exercise, such as brisk walking for 45 to 60 minutes, 4 times a week, for up to 1 year, usually induces only minor weight loss. In obese persons, the energy deficit created by exercise is usually much less and requires more effort than the energy deficit created

by a reduced-calorie diet. For example, to lose 0.5 kg of fat, an obese patient would have to walk or run approximately 7-8 km/day for one week or to consume a 500 kcal/day deficit diet for one week (1).

Although exercise alone is not an effective strategy for inducing initial weight loss, increasing physical activity might be an important component of successful long-term weight management. Several large-scale, cross-sectional case studies have shown that obese subjects who were successful in maintaining weight loss for 1 year or more engaged in regular exercise. Retrospective analyses of data from clinical studies found that subjects treated with diet-plus-exercise who continued to exercise sustained significantly larger long-term weight losses than subjects who stopped exercising or subjects treated with diet alone. However, most prospective randomized trials do not find that exercise has a statistically significant effect on the long-term maintenance of weight loss, presumably because adherence to the exercise program is often poor (13). The amount of exercise that is associated with weight-loss is considerable and requires expending approximately 2500 kcal/week. This level of energy expenditure can be accomplished through vigorous activity (aerobics, cycling or jogging) for approximately 30 min/day or more moderate activity (brisk walking) for 60 to 75 min/day. Most obese persons cannot easily achieve this level of activity. Therefore, prescribed activity goals should be initially modest and increased gradually over time (1).

## **Behavior therapy**

### ***Principles***

Behavior therapy attempts to enable obese patients to recognize and subsequently alter eating and activity habits that promote their obesity. Behavior therapy is derived from the classic conditioning

principle that behavior is often triggered by an antecedent event. The association between the antecedent event, such as watching television, and the behavior, such as eating, is strengthened by repetition so that the more often the two are paired, the stronger becomes the association between them.

Behavior therapy for obesity usually involves multiple strategies for modifying eating and activity habits. These strategies include: stimulus control (avoiding the cues that prompt eating), self-monitoring (keeping daily records of food intake and physical activity), problem-solving skills (developing a systematic manner of analyzing a problem and identifying possible solutions), cognitive restructuring (thinking in a positive manner), social support (cooperation from family members and friends in altering lifestyle behavior), and relapse prevention (methods to promote recovery from bouts of overeating or weight regain) (1).

### ***Effectiveness***

Treatment by a behavior therapy group approach generally results in about a 9% loss of initial weight in 20 to 26 weeks. When treatment ends, weight regain is commonly observed. Although in the year following treatment, patients generally regain about 30% to 35% of their lost weight, most patients sustain clinically significant weight loss of more than 5% of initial body weight (14).

To conclude, based on the experience of patients who have achieved successful long-term weight loss without bariatric surgery, there are some general recommendations for all people treated for obesity (15):

- consume a diet that is low in calories and fat;
- engage in high levels of regular physical activity;
- monitor food intake and physical activity;
- check weight regularly.

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