



FORFEIT THE FAT, LEAVE THE LEAN: OPTIMIZING WEIGHT LOSS FOR ATHLETES

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KEY POINTS

- Most active people must focus on dietary change to lose weight because they already have high rates of energy expenditure.
- To reduce risk of adverse health and performance consequences, the rate of weight loss should not exceed 1-2 % of body weight per week.
- Body weight goals for athletes should be based on: current body composition, time remaining until the competitive season, body weight history, and sport-specific rules.
- Diet recommendations for weight loss include modest energy restriction (-500 to 750 kcal/d), low fat (20-25% of energy intake), moderate protein (15-25% of energy but not greater than 2 g/kg body weight per day), and high carbohydrate (60-70% of energy).
- Avoid reliance on supplements and fad diets.

INTRODUCTION

Many athletes and others who are not necessarily overweight still would like to lose weight. They include athletes whose performances might benefit from reductions in body weight and/or fat. As examples, a runner expends less energy if body weight is lowered, and a basketball player who reduces body weight may be able to jump higher for rebounds. In addition, wrestlers and other athletes in weight-class sports may try to move down a weight class to improve their chances of success in the sport.

Dietary change can typically speed weight loss efforts relative to exercise alone. "Active" fitness club participants, for example, may feel that they are fit because they meet the Centers for Disease Control guidelines of 30 min of moderate activity on most days of the week, but this activity may require as little as 100 additional kcal/d. With no change in diet, it would take more than a month to lose 1 lb (3500 kcal) of fat as a result of this activity. To lose fat weight faster, dietary change is critical.

GUIDELINES FOR DEVELOPING BODY WEIGHT GOALS

Not all active people who desire weight loss should be counseled to lose weight. For example, it is questionable that a lean female runner at 13% body fat could maintain good health by losing more weight. Minimum body fat guidelines for wrestlers have been suggested in a position statement from the American College of Sports Medicine (1996). This organization recommends 5% body fat as minimum for men and 12-14% for women. Recently, the National Collegiate Athletic Association (NCAA) has mandated that collegiate male wrestlers cannot be allowed to compete with a body fat equivalent to less than 5% of total body weight (Nat'l. Coll. Atl. Assoc., 1998), and governing bodies for high-school wrestling have identified 7% body fat as the minimum (Opplinger et al., 1995). Such

guidelines for minimum body fat should not be interpreted as ideal body fat for athletes. Body composition recommendations for athletes should be sufficiently flexible to allow for those who have unusual body types and weight histories. There is no guarantee that performance in any sport will be improved as a result of weight loss. In fact, as discussed in the accompanying supplement, it could be harmful if the weight is lost inappropriately.

Body fat is typically assessed with skinfold measurements, and some athletic groups, including wrestlers (Roberts, 1998) may have a sport-specific equation for estimating body fat with skinfold calipers. Once the athlete's current lean body weight has been estimated, a body weight goal can be derived using the equation in Table 1 of the supplement to this article. This equation requires the determination of a desired body fat goal, and this decision should be made after considering a variety of factors, including:

- average body fat estimates for elite athletes in the particular sport or player position in the sport
- amount of time available to lose weight prior to the season (according to new NCAA guidelines for wrestlers, weight loss rate should not exceed 1.5% of body weight per week or about 1 kg (2.2 lb) per week)
- body weight history (e.g., athletes should rarely be expected to achieve a weight less than their lowest adult weight while eating a healthy diet)
- any applicable rules of the particular sport for minimum body fat content.

The athlete should get advice from a nutritionist or dietitian in making a nutrition plan for weight loss. These professionals should exercise caution because athletes sometimes take recommendations to an extreme. For example, a belief that dietary fat reduction is the key to weight loss pushed some female bodybuilders studied in our laboratory to reduce their dietary fat to as low as 6 % of their energy intake. Such extremes can result in numerous dietary deficiencies of vitamins and minerals and are unnecessary for weight loss. Some extreme dietary behavior can be corrected once the individuals are educated about the hazards of their approaches. However, some people are unable to easily alter their dietary behaviors and obsessions. A discussion of eating disorders is beyond the scope of this paper, but those suspected of having disordered eating behaviors should be referred to appropriate professionals.

RESEARCH REVIEW

Successful Dietary Strategies for Weight Loss

It would be useful to know which strategies and/or lifestyle changes are most likely to be successful in causing long-term weight loss. Some possible strategies for achieving weight loss include counting calories consumed each day, sporadically fasting, and eliminating high-calorie or high-fat foods from the diet. Is there any evidence that one of these strategies is superior to the others? An interesting group to study with regard to this question are members of the Weight Loss Registry, people who have lost at least 30 lb and maintained that weight loss for at least 1 y (Klem et al., 1997). Almost all these people increased their physical activity to help them lose weight. The three most widely used dietary strategies in this

group were limiting certain types of food (88%), limiting quantities of food (44%), and counting calories (44%). About one third of these people specifically tried to limit fat intake, and 25% counted fat grams. Estimates from food records indicated that the average fat intake of this group was 24% of daily energy intake.

Data on men from the Multiple Risk Factor Intervention Trial (MRFIT) study identified changes in specific nutrients and foods that were associated with weight loss during follow-up (Stamler & Dolecek, 1997). Weight loss was positively associated with a) decreases in consumption of refined sugar, total fat, cholesterol, and energy as the result of reducing the intake of medium-fat dairy products, eggs, visible fats, crackers, snacks, and refined sweets and b) increases in total carbohydrate and fiber caused by greater consumption of low-fat dairy foods, breads, cereals, fruits, and vegetables.

Over 170 women who were at high risk of breast cancer were asked to reduce their intake of fat as part of an intervention for reducing breast cancer incidence (Sheppard et al., 1991). In spite of a lack of emphasis on weight loss, the women in the intervention group lost 3.1 kg in 1 y, concurrent with a reduction in dietary fat from 39% to 22% of energy intake, compared to a loss of 0.4 kg in the control group.

In summary, studies that have followed the long-term diets of both men and women find that an increase in dietary fat is associated with weight gain, and a reduction in dietary fat corresponds to weight loss. Individuals are more likely to lose weight if they reduce dietary fat to 20-25% of total calories.

Dietary Guidelines for Weight Loss

Several professional organizations have made recommendations on dietary change for weight loss. Most include recommendations to modestly reduce total energy intake and consume a balanced, normal diet to result in a weight loss of 0.5-1 kg/wk. For example, the American Dietetic Association (1997) recommends that individuals focus on "healthy eating" rather than on dieting because except for a lower energy content, the characteristics of the diet recommended for weight loss are virtually identical to those recommended for daily living (i.e., rich in complex carbohydrates and containing fiber, fruits and vegetables, lower-fat dairy products, and lower-fat meats or meat alternatives). The American Heart Association (1994) takes a similar stand but gives specific recommendations that total energy intake not fall below 1200 kcal/d for women or 1500 kcal/d for men; they also recommend consuming 15% of energy as protein, less than 30% as fat, and at least 55% as carbohydrate, while drinking 1.5-2.0 qts of fluids daily. Foods chosen should be rich in micronutrients to ensure that the diet achieves the recommended dietary allowances (RDA) for vitamins and minerals. Nutrient density (the amount of nutrients in a given number of food calories) is an important concept to emphasize when trying to discourage the person who justifies eating a low-fat cake instead of a turkey sandwich for lunch because they provide similar amounts of calories; compared to the sandwich, the cake has little nutrient value beyond its energy content.

Diet and Weight Management

Research is constantly being performed to try to refine the optimal dietary approach to weight loss and to determine why some people who adhere strictly to the same diet seem to be more successful than others at losing weight. Identical twins have been used to study the possibility that there is a genetic component that explains differences in ability to lose weight. Various studies have been conducted in which groups of identical twin pairs were either over- or under-fed to produce an identical change in energy balance, e.g., a negative energy balance of 1000 kcal/d. Theoretically, all the individuals should lose the same amount of weight, but in fact, a wide variation among subjects has been observed. For example, in one study, among all individuals who were in negative energy balance of 1000 kcal/d for 93 d, weight loss ranged from less than 1 kg to 8 kg (Bouchard et al., 1994). However, within each twin pair, the body weight changes were very similar. This research shows that there is a genetic component to the response of

body weight to negative energy balance and that one should not expect all people to lose weight at the same rate on the same recommended diet, even if they comply with the diet to the same extent.

Dietary Fat. Most dietary recommendations for weight loss include a reduction in dietary fat to 30% of energy or less. The current fat intake of adults in the U.S., about 34% of energy, is lower as a percentage value than it was in the 1970s, but this is only because the total daily energy intake has risen about 200 kcal; the total amount of fat consumed by the average American each day has not changed. Only about 21% of adult males and 25% of adult females actually consume the recommended "less than 30% of calories from fat."

Fat tends to increase the potential for weight gain for a variety of reasons, including the facts that:

- Fat is very energy dense; it has more than twice the amount of energy found in the same weight of carbohydrate or protein.
- High-fat foods tend to be palatable and desirable for many people, so they tend to eat more.
- Fat is very efficiently digested and assimilated; thus, the energy required for these processes is low for dietary fat.
- Fat intake does not stimulate fat oxidation, whereas carbohydrate intake does increase the body's use of carbohydrate.

A series of studies completed by one laboratory shows that increasing the fat content of the diet increases the spontaneous intake of energy in normal weight individuals (Poppitt & Swan, 1998). This is likely to be largely due to the fact that the energy density of the diet is greater if more fat is included, i.e., eating the same amount of food results in greater energy intake. Evidence that this is the case comes from studies showing that as the energy content per gram (energy density) increases, the actual weight of food consumed remains constant, whereas the energy intake rises linearly.

Several studies have shown that lowering dietary fat intake aids weight loss. For example, Carmichael et al. (1998) counseled overweight women to reduce their dietary fat over a 3-mo period as part of a weight loss effort. The average dietary fat intake (from diet records kept by the women) fell from 36 to 22% of calories, and the degree of success with dietary fat reduction predicted weight loss. Those women who had the most reduction in their dietary fat lost the most weight over the 3 mo. In addition, all those women who were able to reduce their dietary fat below 40 g/d lost weight.

In another study of obese women afflicted with non-insulin-dependent diabetes mellitus, half the women focused only on energy restriction (1000-1500 kcal/d), whereas the other half had the same calorie reduction goal but had a fat restriction goal (<20 g/d) as well (Pascale et al., 1995). Both groups lost weight, but the women with both calorie and fat goals lost about 70% more weight over the 16-wk program and maintained five times as much weight loss after 1 y as did the group that restricted only energy intake. Thus, there is ample evidence that education about the fat content of foods and implementation of a dietary fat reduction goal can lead to sustained weight loss.

A caveat to the above discussion is that fat reduction is valuable for weight loss only if it subsequently reduces total energy intake. If calories are held constant, the fat content of the diet probably does not have much, if any, effect on weight and fat loss. Golay et al. (1995) fed obese adults either a high (53%) or low (26%) fat diet of 1000 kcal in a hospital environment for 6 wk. Weight loss was the same regardless of the diet composition, i.e., energy intake and the resulting energy balance, not fat intake alone, determined weight change.

In summary, recent research suggests that high fat intake will often result in

a passive increase in energy intake; reducing fat intake will often result in lower energy intake; and those who reduce dietary fat the most tend to be the most successful in weight loss.

Dietary Protein. Protein causes a greater increase in metabolic rate after its ingestion than either carbohydrate or fat. This is related to the increased metabolic cost of digesting and assimilating protein, which is known as the thermic effect of food (TEF). There has been controversy concerning the magnitude and relevance of TEF. In other words, TEF may be of such minor magnitude as to be unimportant for weight management. Westerterp et al. (1999) carefully measured the energy expenditure of female volunteers for 24 h while they consumed isocaloric diets high in either protein and carbohydrate (60% of energy as carbohydrate, 30% as protein, 10% as fat) or high in fat (60% fat, 30% carbohydrate, 10% protein). The metabolic rate following meals was about 88 kcal/d higher when the women were provided with the higher protein diet, and the total energy expenditure for the 24 h was about 80 kcal higher on that diet. Although 80 kcal/d seems small, assuming all other factors remain the same, this would theoretically result in loss of about 8 lb over a year.

Crovetti et al. (1998) compared not only the energy expenditure caused by food consumption but also the effect on hunger or fullness for 7 h after consuming 557 kcal meals high in either a protein (68% of energy), carbohydrate (69%), or fat (70%). The high-protein meal caused the greatest increase in metabolic rate (about 170 kcal more expended during the 7 h after eating than the other meals) and the greatest sense of fullness. There was no difference in fullness or post-meal energy expenditure between the meals high in fat or carbohydrate. In spite of these effects of protein consumption, the subjects ate the same number of calories at a meal fed 7 h after the test meal, regardless of the composition of the test meal. It may be that the prolonged delay (7 h) between meals reduced the chance of seeing any effect of a prior high-protein meal on subsequent food consumption.

Skov et al. (1999) tested the hypothesis that a higher protein diet causes superior weight loss in obese individuals. Sixty-five obese individuals were provided with a reduced calorie diet that was either low (12% of energy) or high (25% of energy) in protein. After 6 mo, those consuming the higher protein diet lost more weight (8.9 vs 5.1 kg) and more body fat (7.6 vs 4.3 kg) than did those provided the lower protein diet. Also, 35% of the subjects in the higher-protein group lost more than 10 kg, compared to only 9% of the lower-protein group.

Few studies have examined the effects of diets differing in protein on weight loss in active, normal weight individuals or in athletes. However, one study from our laboratory found that male resistance trainers who for 7 d consumed a low-energy (18 kcal/kg body weight) diet containing either moderate or high amounts of protein (0.8 or 1.6 g/kg) lost similar amounts of weight (about 3.8 kg), but they lost less body protein if they consumed more protein (Walberg et al., 1988).

Overall, there has been less research testing the effect of manipulation of dietary protein than dietary fat on weight loss. Thus, the following conclusions must be considered preliminary until further research confirms the current findings:

- Dietary protein increases the thermic effect of a meal.
- High protein meals tend to increase one's sense of fullness.
- Higher protein diets may increase total weight loss relative to average protein diets.
- Higher protein diets may increase retention of body protein while dieting.

There are potential dangers of very-high protein diets, including a possible

increase in dietary fat consumed as a component of some protein-rich foods, excess urinary calcium loss, elevated blood ammonia levels, and kidney dysfunction (American Dietetic Association, 1993). Thus, it is recommended that individuals consume no more than 20-25% of their energy (2 g of protein per kg body weight each day) as protein.

Dietary Carbohydrate. Adequate dietary carbohydrate is important during weight loss, particularly for people involved in strenuous activity. Weight loss can reduce body glycogen stores, and a weight-loss diet with little carbohydrate will exacerbate this effect.

Numerous studies have found that a low-carbohydrate diet limits the performance of endurance exercise (Walberg-Rankin, 1995). Even athletes participating in brief, intense activities can experience a reduction in physical abilities with a low-carbohydrate, weight-loss diet. For example, wrestlers who consumed weight-loss diets containing either 41% (Horswill et al., 1990) or 55% (McMurray et al., 1991) of energy as carbohydrate experienced a decrement in their performance of high-intensity exercise, whereas those who ate 66% or 70% of their energy as carbohydrate were able to maintain their pre-weight-loss performance. This suggests that many athletes who attempt to lose weight should eat at least 5 g of carbohydrate per kg body weight each day. For example, a 70 kg (154 lb) wrestler who consumes 2000 kcal/d would eat 350 g (1400 kcal) of carbohydrate each day to achieve a 70% carbohydrate diet.

PRACTICAL APPLICATIONS FOR THOSE ADVISING ACTIVE INDIVIDUALS WHO WISH TO LOSE WEIGHT

Recent research supports the following strategies for optimizing weight loss in active individuals.

- Encourage weight loss for competitive athletes during the off-season.
- Assess the individual's initial body composition, diet, and physical activity patterns.
- Determine a body weight goal based on current body composition, time prior to competitive season, body weight history, and applicable rules for the particular sport.
- Discourage any rate of weight loss greater than about 1-2% of body weight per week.
- Discourage weight loss for those who are already lean, and refer those whom you suspect may have disordered eating to a professional trained in this area.
- Educate individuals about foods they can substitute for high-fat foods currently in their diets.
- Encourage consumption of fruits and vegetables
- Provide or educate about lower-fat snack choices
- Encourage individuals to try reduced-fat foods
- Limit fat add-ons (e.g., sour cream, high-fat salad dressings, butter, and margarine)
- Emphasize the importance of reading labels to determine the nutrient contents of foods
- Consider increasing the individual's dietary protein to 2 g/kg body weight per day or up to 25% of dietary energy.
- Encourage individuals to consume at least 60% of their food energy as carbohydrate (at least 5 g carbohydrate per kg body weight daily).

SUMMARY

Active people with excess body fat should concentrate on changing their food intake to achieve negative energy balance. Weight loss can be achieved with modest dietary changes, but it should happen slowly to avoid negative effects on health and physical performance. Professionals with appropriate training in nutrition can provide education regarding appropriate food choices for safe and effective weight loss.

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LOSE BODY FAT SAFELY

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If losing some excess body fat might improve your appearance and/or your performance in a sport, it is important that you first determine a body weight goal after having your body fat determined (Table 1) and then gradually lose the fat, preferably before your competitive season begins.

Table 1. DETERMINING YOUR BODY WEIGHT GOAL

1. Have your body fat measured by a trained professional.
2. Calculate your current lean body weight.
(total body weight – fat weight = lean body weight)
3. Decide on your desired percent lean and fat weight.
4. Divide your current lean body weight (lbs) by the percent lean body weight desired.
5. Multiply this value by 100.

Example For A Male Athlete

Current: 190 pounds 15% body fat (85% lean)

Desired: 10% body fat (90% lean)

Calculations: Current lean weight = $190 \times .85 = 161.5$ pounds

Body Weight Goal = $(161.5 / .90) \times 100 = 1.794 \times 100 = 179.4$ pounds

(See Back)

HAZARDS OF RAPID WEIGHT LOSS

Three collegiate wrestlers died in 1997 while attempting rapid weight loss for their weight-class certifications. Death is obviously the most extreme consequence of rapid excessive weight loss, but others include:

- Inadequate intake of vitamins and minerals
- Lack of energy, especially from reduced carbohydrate stores in muscles and liver; slowed metabolism
- Negative changes in mood; exercise seems more difficult
- Eating disorders, especially in women
- Loss of muscle mass, strength, and power
- Reduced endurance; mental and physical exhaustion
- Loss of bone mineral density
- Depressed immune function

Rapid weight loss by fluid restriction leads to dehydration—not fat loss. As the percentage of body weight lost from fluid increases, so do the dangerous consequences of dehydration. Early signs of dehydration include nausea, dizziness, fatigue, and difficulty concentrating. Dehydration increases the risk of heat injury, including muscle cramps, heat exhaustion, and heat stroke. Even a 2-3 pound loss of body weight as fluid can have a negative impact on performance and body temperature regulation.

The only way to safely and effectively lose fat and preserve muscle is through modest calorie restriction and exercise. This is best achieved during the off-season to minimize any detrimental effect on performance. Losing weight by depriving the body of vital nutrients and fluid compromises health and athletic performance.

GUIDELINES FOR EVALUATING WEIGHT LOSS DIETS

Many diets are based on the premise that a "special" combination of foods and/or supplements can build muscle and lose fat, regardless of how many calories are consumed. Believers are more likely to lose dollars than pounds. Be wary of weight loss programs that:

- Promise dramatic weight loss of more than 1-2 pounds per week
- Emphasize one macronutrient (such as protein) while restricting another (such as carbohydrate) or claim that a food or nutrient is either the "key" to weight loss or the primary "villain" that keeps people overweight
- Promote eating foods in "special fat-burning combinations"
- Make claims such as "quick and easy," "metabolically proven," "eat all you want and still lose weight," "burns fat and builds muscle," and "energizing"
- Promote unproven or spurious weight-loss aids such as herbs, amino acid supplements, body wraps, "Lose weight while you sleep" pills, etc.
- Claim that a weight-control product contains a unique ingredient or component that is unavailable in other products
- Fail to inform users about the risks associated with rapid weight loss
- Use diuretics and/or appetite suppressants

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