The role of physical activity in the prevention and management of obesity

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ABSTRACT

The United States is facing 2 major lifestyle-related epidemics that are intricately linked: an epidemic of obesity and an epidemic of inactivity. Multiple interactions exist between lack of physical activity and obesity. Increased physical activity lowers the risk of obesity, may favorably influence distribution of body weight, and confers a variety of health-related benefits even in the absence of weight loss. Physical activity is important for achieving proper energy balance, which is needed to prevent or reverse obesity. Not only is energy expended during physical activity, physical activity also has a positive effect on resting metabolic rate. Regular physical activity can improve body composition. Properly designed programs of physical activity may preserve or even increase lean muscle mass during weight loss. Physical activity has also been strongly associated with maintenance of weight loss. Physical activity that expends 1,500 to 2,000 kcal/week appears necessary to maintain weight loss.

Numerous studies have shown that the combination of proper nutrition and regular physical activity is the most effective intervention for weight loss and maintenance of weight loss. Walking is the most convenient and logical way most obese persons can increase their physical activity. Physical activity plays multiple roles in the prevention and treatment of obesity. Dietitians and other health care workers who treat obese patients should understand the role physical activity plays in comprehensive obesity treatment as well as how to incorporate a physical activity prescription in treatment plans for obese clients. J Am Diet Assoc. 1998;98 (suppl 2)-S31-S38.

The United States is in the midst of an unprecedented epidemic of obesity. According to recent data from the third National Health and Nutrition Examination Survey (NHANES III), more than one third of the adult population in the United States is currently obese (1). Moreover, the prevalence of obesity grew a shocking 40% between 1980 and 1990 (2). Although the high prevalence of obesity affects both men and women and virtually all ethnic groups, black and Hispanic women are at particular risk (2). It has been estimated that more than half of all adults in the United States are at least somewhat overweight.

Obesity is a chronic disease with monumental public health implications in the United States. Obesity is associated with coronary heart disease (CHD) (3,4), hypertension (5,6), type 2 diabetes (7,8), and dyslipidemias (9-11) as well as a variety of other chronic diseases and conditions (12). By the time a person reaches a body mass index (BMI), calculated as weight [kg]/[height [m²]] greater than 27, there is a more than 70% chance that a comorbid condition will be present (13).

The United States is also facing another epidemic, which promises equally dire health consequences, that is, the epidemic of inactivity. The Healthy People 2000 recommendations set forth the modest goal that 30% of the population engage in regular physical activity for at least 30 minutes per day (14). Yet, only 22% of adults in the United States currently achieve this modest exercise standard. According to the Surgeon General's report Physical Activity and Health (15), approximately 54% of adults are intermittently active but do not meet this exercise standard, and 24% are completely sedentary (ie, reported no leisure-time physical activity within the past month).

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Multiple interactions exist between physical activity and body weight. In some studies, physically active persons appear less likely to gain weight (16-18). Physical activity, along with proper nutrition, plays an important role in helping people lose weight and maintain weight loss. Physical activity has been shown to influence changes in body composition that occur during weight loss as well as psychological parameters during weight loss (19,20). Physical activity confers a variety of metabolic benefits (particularly with respect to blood lipid composition during weight loss [21]). In addition, physical activity offers both obese and normal-weight individuals a variety of health benefits, whether or not weight loss is achieved.

This review will explore the relationship between physical activity and both prevention and management of obesity. Particular emphasis will be placed on practical aspects of developing programs for increased physical activity for weight loss and maintenance of weight loss. The potential key role of the dietitian as both nutrition and physical activity counselor will be highlighted.

PHYSICAL ACTIVITY AND OBESITY

Although it has been argued that physically active people are less likely to gain weight during their lifetime than inactive persons, the medical literature in this area is not conclusive. Several cross-sectional studies (16-18) have reported lower body weights and indexes of body fatness (skinfold measures and BMI) among individuals with self-reported high levels of physical activity or fitness. Several prospective studies (17,22) have reported inverse relationships between physical activity and subsequent weight gain. However, 1 study found that physical activity was inversely associated with weight gain in women but not in men (23), and another failed to show an association between physical activity and weight gain (18). It has been argued that results in these last 2 studies may have been confounded by the use of only 1 initial measurement of physical activity and that multiple measurements may be required to accurately portray the interrelationship of physical activity and body weight.

Several comprehensive reviews (24,25) have explored the relationship between physical activity and obesity. These reviews have reached the following conclusions:

- The combination of physical activity and energy restriction is more effective for weight loss (and possibly maintenance of weight loss) than energy restriction alone.
- Physical activity affects body composition favorably during weight loss by preserving or increasing lean mass while promoting fat loss.
- Physical activity affects the rate of weight loss in a dose-response manner that is based on both frequency and duration of physical activity.

Each of these conclusions will be explored in depth in this review.

Physical activity may favorably affect the distribution of body fat independently of its effect on body weight. Several large, cross-sectional studies in the United States, Canada, and Europe (26,27) have reported an inverse relationship between levels of physical activity and indirect measures of body fat distribution (e.g., waist-to-hip ratio). This independent effect appears biologically plausible in view of the established high metabolic activity of visceral abdominal fat.

PHYSICAL ACTIVITY IN CHILDREN

Unfortunately, the increasing prevalence of obesity is not a problem confined only to the adult population in the United States. The prevalence of obesity in both children and adolescents in the United States has more than doubled in the past 20 years (28,29). Although childhood obesity and the relationship between physical activity and body weight in children are beyond the scope of this review, several aspects of these issues are worth noting.

Levels of physical activity among children have declined in the past 20 years (30). Furthermore, an age-related decline in physical activity occurs from childhood through adolescence. Average performance on a variety of standardized physical fitness tests has also declined during this period (30).

The relationship between physical activity and obesity in children remains the subject of debate and ongoing research. Several studies (31,32) comparing obese and nonobese children have found higher levels of physical activity among nonobese children. Other studies (33,34) have shown little or no relationship between childhood obesity and physical activity. Most cross-sectional studies have found that BMIs and skinfold thickness measures are lower in physically active children than in their less active peers. Several longitudinal studies (35,36) have recently shown an inverse relationship between physical activity and triceps skinfold measurement, although 1 such study found such an inverse relationship in boys but not in girls (37). Thus, although the majority of studies have found an inverse relationship between physical activity and body fatness in children, more research is needed to corroborate this relationship.

Increased physical activity remains a mainstay of treatment of childhood obesity. Because physical activity confers a variety of health benefits and minimal risk of adverse events in children, it is the first-line therapy for obese children (38).

PHYSICAL ACTIVITY AND HEALTH

This review focuses primarily on the relationship between physical activity and obesity, but it is important to emphasize that increased physical activity offers a wide range of health benefits over and above its role in weight management (39). The known or suspected health benefits of increased physical activity were delineated in 2 recent major reviews by the Centers for Disease Control and Prevention and the American College of Sports Medicine (39) and the office of the Surgeon General of the United States (15). Data from large population studies demonstrate that increased physical activity substantially lowers the risk of CHD, certain forms of cancer (e.g., breast and, possibly, colon), type 2 diabetes, hypertension, and osteoporosis (13,39). Increased physical activity may improve psychological health by reducing incidence or severity of conditions such as anxiety or depression (40) and may also enhance quality of life (41,42).

In addition to its role in disease prevention, physical activity is also an important component of treatment for established disease (43,44). Regular physical activity will reliably lower blood pressure in previously sedentary persons with hypertension (45,46). Physical activity improves glucose handling in persons with type 2 diabetes (47) and, when incorporated into comprehensive cardiac rehabilitation programs, lowers the risk of cardiovascular morbidity and mortality in persons with established CHD (48).

For all these reasons, it is essential that health care professionals who treat obese persons become skilled in the basics of prescribing increased physical activity, whether or not the physical activity contributes to weight loss. It should also be emphasized that relatively low levels of physical activity will often provide health benefits. The recent statement from the expert panel from the Centers for Disease Control and Prevention and the American College of Sports Medicine advocates that all adults try to engage in at least 30 minutes of moderate physical activity during most, if not all, days (39).
ROLE OF PHYSICAL ACTIVITY IN OBESITY MANAGEMENT

Aside from its established role in preventing weight gain, physical activity also plays an important role in the treatment of obesity. The key areas where physical activity contributes to safe and effective obesity treatment relate to its effects on energy balance, body composition, mood and other psychological parameters, quality of life, risk for disease, adherence to weight management, and body fat distribution in obese and nonobese persons.

Physical Activity and Energy Balance

At its most fundamental level, weight gain results from positive energy balance, i.e., more energy is consumed than expended. Major components of energy expenditure that could be readjusted by increased physical activity are: the actual energy expended during physical activity, the effect of physical activity on resting metabolic rate (RMR), and the effect of physical activity on the thermic effect of food. Each of these components of energy expenditure has been studied extensively.

Energy expenditure related to physical activity

Clearly, the most direct way physical activity affects energy balance is through the actual energy expended during physical activity. A typical program of physical activity involving 30 to 45 minutes of moderate intensity physical activity undertaken 5 to 7 days per week can result in an additional energy expenditure of 300 kcal/day or 1,500 to 2,100 kcal/week.

Although it may be argued that most obese persons could achieve larger daily energy deficits by restricting caloric intake, the benefits of consistent extra energy expenditure should not be underestimated. Even small energy deficits achieved consistently can have a profound effect on weight loss. For example, if an individual engages in moderately brisk walking (4 mph pace) for 45 minutes 4 times a week for a year, and does not increase caloric consumption, an energy deficit resulting in weight loss (depending on the person’s body weight) of approximately 18 lb will result (49).

Physical activity and resting metabolic rate

Energy expended maintaining metabolic functions while the body is at rest accounts for by far the largest amount of energy expenditure. The effects of physical activity on RMR have been extensively studied. The scientific literature is not completely conclusive in this area, but it appears that physical activity may positively affect RMR in a variety of ways.

Several cross-sectional and longitudinal studies (50,51) have found that persons who increase their physical activity also increase their RMR. A recently completed study (52) that used the doubly labeled water method to compute RMR reached similar results. These results could reflect the well-established fact that RMR remains somewhat elevated for several hours after an exercise session. Supporting this theory is a study that showed that increased RMR in physically active individuals declined after only 3 days of detraining (53). Low RMR has been shown to be a predictor of obesity (54). In addition, reduction in RMR, presumably caused by loss of lean muscle tissue (55) further compounds the decrease in RMR induced by energy restriction. Thus, the effect of physical activity on RMR may be clinically relevant for a variety of reasons.

Physical activity and diet-induced thermogenesis

The digestion of food requires energy expenditure and slightly increases body temperature. This effect is called diet-induced thermogenesis. Most studies have shown that physical activity has little or no effect on diet-induced thermogenesis (56).

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean change from baseline</th>
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<tr>
<td></td>
<td>Weight (kg)</td>
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<tr>
<td>Diet*(n=10)</td>
<td>-3.65</td>
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<tr>
<td>Diet/resistance*(n=11)</td>
<td>-3.49</td>
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<tr>
<td>Diet/resistance aerobics*(n=8)</td>
<td>-4.46</td>
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<tr>
<td>Diet/resistance plus aerobic*(n=9)</td>
<td>-5.39</td>
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<tr>
<td>Control (n=6)</td>
<td>+1.52</td>
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*LBM=Lean body mass.
*Diet=Energy-restricted diet only.
*Diet/resistance=Energy-restricted diet plus resistance strength training.
*Diet/aerobic=Energy-restricted diet plus aerobic exercise (cycling on a stationary bicycle).
*Diet/resistance plus aerobic=Energy-restricted diet plus a combination of resistance strength training and aerobic exercise.

Obese subjects have been shown to have a blunted diet-induced thermogenesis compared with lean subjects; however, physical activity does not correct this problem in a clinically meaningful way (57).

Physical Activity and Body Composition

Studies conducted in our laboratory at The Center for Clinical and Lifestyle Research (19) and by other researchers (20) have demonstrated that physical activity during weight loss can have a substantial effect on body composition. A major detrimental side effect of weight loss achieved through energy restriction alone is the loss of lean muscle tissue as well as body fat. Losses of lean muscle tissue that constituted between 10% and 30% of total weight loss have been reported in a number of studies (58,59). Loss of lean muscle tissue is deleterious because muscle tissue is estimated to be up to 70 times as metabolically active as fat. Thus, loss of lean muscle mass reduces RMR and may play a major role in the propensity to regain lost weight. Furthermore, when weight is regained, a higher percentage of the amount regained is typically fat than was the original weight lost. Loss of lean muscle tissue during energy-restricted weight loss may also lead to declines in physical strength and the perception of “weakness” and dysphoria often experienced during this method of weight loss.

Conversely, studies (20,60) have shown that increased physical activity helps preserve lean muscle tissue during weight loss. In 1 study (60), persons who lost weight either through a combination of energy restriction and moderate exercise (walking) or through walking alone lost less than 10% of weight as lean muscle tissue. In contrast, those who lost weight through energy restriction alone lost a significantly higher 22% of weight as lean muscle tissue. In another study (61), women were asked to expend an average of at least 1,500 kcal/week by walking during weight loss. These women lost a significant amount of weight over 15 weeks (average weight loss=7.5 kg), while losing only 12% of this weight as lean muscle tissue.

Adding resistance strength training to aerobic activity during weight loss may further enhance body composition. In 1 study (30), body composition changes were compared in overweight women who followed 5 different protocols during weight loss: energy-restricted diet alone, diet plus aerobic exercise (stationary cycling), diet plus resistance strength training, diet plus a combination of aerobic exercise and resis-
dance strength training, or no changes in either diet or exercise (control group).

As shown in the Table, women in the group that followed an energy-restricted diet and engaged in a combination of aerobic activity and resistance strength training achieved the most favorable body composition results. They lost the most weight (an average of 5.39 kg over 12 weeks) while actually increasing their lean muscle tissue slightly (an average of 0.30 kg).

**Improved Mood and Other Psychological Benefits**

Obesity imparts an enormous psychological burden. Although some of the psychological symptoms may be seen as the consequences of obesity rather than part of the etiology, depression, anxiety, and poor self-esteem are more common in obese persons than in the general population (62,63). Although the literature on psychological response to weight loss is complex, psychological problems may be exacerbated during weight loss, rendering treatment difficult or impossible.

The most effective approach to weight loss and maintenance of weight loss involves the combination of sound nutrition and increased physical activity.

In contrast, studies conducted in our laboratory (64) and by others (65) have demonstrated linkages between physical activity and improved psychological state. Thus, a benefit of physical activity during weight loss may be improvement in psychological parameters, or at least blunting of any deterioration of psychological state. In a study (66), overweight women who participated in regular aerobic exercise experienced significant improvements in feelings related to anxiety, mood, and overall self-worth; perception of their ability to achieve physical fitness; and satisfaction with their bodies while losing a significant amount of weight during a 12-week trial.

**Physical Activity and Quality of Life**

Chronic conditions, such as obesity, account for more than 50% of all health care expenditures in the United States (67-69). Maximizing daily function and perceived well-being in persons with chronic conditions is associated with decreased morbidity and mortality as well as decreased health care expenditures. Validated instruments to measure these concepts, which have been called "quality of life," have recently become available and are starting to be used in obesity and weight loss research. Two recent studies (66, 70) have demonstrated that persons who lose weight improve their quality of life.

In a study (66), moderately overweight women (average weight = 81.2 kg) who lost moderate amounts of weight (6.7±4.0 kg) achieved significant improvements in the physical function, vitality, and mental health components of the standard instrument used to measure quality of life, with positive trends in all the other quality of life indexes. Although research in this area is relatively new, it holds great promise as data assessing the relationships between improved quality of life, morbidity, and mortality in obese individuals who successfully lose weight and maintain this weight loss become available.

**Physical Activity and Risk for Disease**

In addition to its role in helping obese persons lose weight and maintain weight loss, increased physical activity may also confer other health-related benefits. Several prospective studies have shown an inverse relationship between physical activity or fitness level and morbidity and mortality in overweight men and women. In both the College Alumni Study (71) and the Nurses Health Study (72), there was an inverse relationship between level of physical activity and likelihood of developing type 2 diabetes. The relationship was particularly strong in persons with a BMI greater than 25. In a study of 9,376 British civil servants (73), men were assigned to 4 physical activity groups, ranging from those reporting frequent and vigorous aerobic exercise (Group 1) to those reporting no vigorous physical activity (Group 4). In men with BMI greater than 27, the rate of coronary events was 7 times higher among men in Group 4 than among those in Group 1.

Blair and colleagues (74) reported all-cause mortality rates in more than 13,000 men and women across low, moderate, and high fitness levels. Even for persons in the highest weight category (BMI >25), highly fit individuals had lower all-cause mortality than persons in the low and moderate fitness groups.

On the basis of these studies, it appears that the recommendation that obese persons increase their physical activity is appropriate because it will likely confer health benefits whether or not it contributes to weight loss. A plausible mechanism by which obese persons may achieve these health benefits is provided by a study from Tremblay and colleagues (75) who examined metabolic profiles in 4 women after they completed 15 months of endurance exercise training followed by 14 months of exercise and low-fat diet. Average weight in these women declined from 92 kg to 81 kg while metabolic profiles normalized (plasma levels of glucose, insulin, and most lipid values). The regular exercise program may have contributed to this metabolic improvement.

**Adherence to Weight Management Strategies**

One aspect of physical activity that may contribute to its role in promoting weight loss and maintenance of weight loss is that it may enhance adherence to all aspects of effective weight management. There are few hard data to support this assertion, but many obesity investigators (including the authors) think that regular physical activity helps people organize their approach to long-term weight management and promotes a more positive emotional experience both during weight loss and afterwards. The known relationships between regular exercise, reduction of anxiety and depression (40), and the improvement in mood experienced by most people (64) provide a plausible mechanism through which adherence to weight management might be improved.

**Physical Activity and Body Fat Distribution**

In addition to the risk associated with overall adiposity, having elevated levels of visceral abdominal fat has been identified as a strong, independent risk factor for CHD, type 2 diabetes, and various dyslipidemias (76,77). It appears that metabolic properties of visceral abdominal adipocytes (particularly their highly...
lipolytic properties and insulin resistance) trigger a cascade of metabolic abnormalities resulting in abnormal glucose handling, dyslipidemias, and, in some instances, hypertension.

Several lines of evidence suggest that physical activity may be particularly valuable in reducing visceral abdominal fat. Several population-based studies (78-80) have shown that physically active men and women have more favorable (lower) waist-to-hip ratios than their sedentary counterparts. Laboratory studies (81) have shown that trained individuals have greater total body lipolysis at rest than obese individuals. Persons who have greater visceral abdominal fat have lower response to catecholamine-stimulated lipolysis at rest (82). Exercise training may correct the disordered lipolysis observed in these persons.

**PHYSICAL ACTIVITY AND CARDIOVASCULAR RISK FACTORS IN OBESE PERSONS**

Obesity is associated with a variety of risk factors for CHD, including hypertension, type 2 diabetes, and dyslipidemias. Three large population-based studies (83-85) found that obesity is also a strong, independent risk factor for CHD in both men and women. The Nutrition Committee of the American Heart Association published a recent review summarizing the evidence for obesity as an independent risk factor for CHD. Increased physical activity may therefore be particularly valuable as a way for obese patients to lower their risk for CHD.

**Obesity, Physical Activity, and Dyslipidemias**

Obesity is associated with a variety of abnormalities in both lipids and lipoproteins (9). The most prominent lipid abnormalities in obese persons include elevated serum triglyceride levels and decreased high-density lipoprotein (HDL) levels (9,76). Although many obesity components of dyslipidemias improve with weight loss, HDL levels may actually decline during the active phase of weight loss, particularly when a low-fat diet is employed (86). This initial decline in serum HDL levels is typically reversed during the weight maintenance phase in both men and women.

Physical activity may reverse the diet-induced decline in serum HDL levels often seen during initial phases of weight loss. Wood et al (21) compared diet alone to diet and exercise during weight loss. Persons who exercised during weight loss had more beneficial lipid profiles and, in particular, higher HDL levels, than persons who lost weight simply through energy restriction. In another study (87), persons who lost weight using a combination of low-fat diet and exercise experienced slight increases in serum HDL levels and significant improvements in the ratio of total cholesterol to HDL cholesterol during the active phase of weight loss.

**Physical Activity and Other Risk Factors for CHD**

Increased physical activity may reduce other risk factors for CHD, whether or not weight loss occurs (39). Because physical inactivity itself is a major risk factor for CHD, the most direct benefit of increased physical activity is to reduce this common risk factor in obese individuals (88).

Both weight loss and increased physical activity have been shown to have independent effects on lowering blood pressure in persons with hypertension. Thus, increased physical activity should be particularly beneficial for obese persons with hypertension because it may exert a synergistic effect with weight loss on lowering of blood pressure to reduce cardiovascular risk. Likewise, both weight loss and physical activity improve glucose handling in persons with diabetes. Therefore, increased physical activity as a component of weight loss may be particularly valuable for obese persons with type 2 diabetes.

**PHYSICAL ACTIVITY AND MAINTENANCE OF WEIGHT LOSS**

Increased physical activity appears to be particularly valuable in the maintenance of weight loss. A recent study of 640 persons who lost at least 12 kg and kept the weight off for at least 5 years showed that most persons used physical activity as a component of their regimen to maintain weight loss (89). Eighty-nine percent of those who successfully maintained weight loss reported relying on a combination of increased attention to diet and increased physical activity, and virtually all engaged in regular physical activity.

Physical activity that expends at least 1,500 kcal/week, and perhaps as much as 2,000 kcal/week, is optimal to help maintain weight loss; walking is almost always the most appropriate form of physical exercise to recommend for obese persons.

A classic study by Pavliu et al (90) underscored the benefit of regular physical activity for maintenance of weight loss. In this study, 160 overweight male police officers (average weight of 100 kg) were recruited and randomly assigned to 1 of 4 weight-loss diets. In each group, half the volunteers were given a 90-minute supervised exercise session 3 times a week in addition to their diet program. At the end of the 8-week initial intervention, there was little difference in weight loss between diet alone and diet plus exercise (mean weight loss of 12.2 kg for diet alone and 12.2 kg for diet plus exercise). However, at follow-up at 8 and 18 months, those who continued to exercise were significantly less likely to have regained weight than those who did not. A study by Ewbank et al (91), which examined 45 persons who had initially lost weight using a very-low-caloric diet, reported that 2 years after completion of the diet, those who engaged in regular physical activity were significantly less likely to have regained weight than those who did not.

**How Much Physical Activity Is Required to Minimize Weight Regain?**

Some information is available concerning the level of physical activity needed to maintain weight loss. In the study by Pavliu et al (90), increased physical activity at a level of approximately 1,500 kcal/week was required to minimize weight regain. In the study by Ewbank et al (91), those who expended
more than 1,575 kcal/week maintained 76% of weight loss at the end of 2 years compared with approximately 25% maintenance of weight loss in less active individuals. Of note, in this study persons who expended more than 2,000 kcal/week maintained more than 55% of initial weight loss. A recent study by Schoeller et al (92) noted a threshold effect of 11.5 kcal/kg of body weight for maintenance of body weight after weight loss in previously obese persons.

Taken as a whole, this literature suggests that physical activity that expends at least 1,500 kcal/week, and perhaps as much as 2,000 kcal/week, is optimal to help maintain weight loss. This level of weekly physical activity is also the level recommended by the American College of Sports Medicine for maintenance of good health.

All health care professionals who treat obese patients should understand the role physical activity plays in comprehensive obesity treatment as well as how to incorporate a physical activity prescription in treatment plans for obese clients.

STRATEGIES FOR WEIGHT LOSS AND MAINTENANCE OF WEIGHT LOSS
Because the fundamental pathway for weight gain is an excess of energy consumed over energy expended, weight-loss strategies are typically designed to reverse this process. The 3 basic strategies are: energy restriction alone, increased physical activity, and a combination of energy restriction and increased physical activity.

Energy Restriction
In short-term studies, energy restriction is a powerful tool for weight loss, but, numerous studies have demonstrated that fewer than 5% of persons who lose weight through energy restriction alone are able to maintain this weight loss for 2 years or more.

Increased Physical Activity
The efficacy of increased physical activity alone as a weight-loss modality remains controversial. Most controlled exercise training studies have demonstrated modest weight loss of 2 to 3 kg (93). However, some obesity experts have argued that this amount of weight loss is inconsequential. Many studies that have attempted to explore the issue of weight loss and exercise have not adequately controlled diet and suffer from inadequate follow-up. It is important to emphasize, however, that large amounts of exercise are required to achieve weight loss when exercise is utilized as the sole modality. Furthermore, small increases in caloric consumption may totally subvert weight loss achieved through increased exercise alone.

Combination of Energy Restriction and Increased Physical Activity
The combination of energy restriction plus physical activity (often in conjunction with other components of behavior modification) has generally yielded the most positive results for maintenance of weight loss. As already discussed, a study of persons who successfully maintained at least a 12-kg weight loss for 5 years found that most relied on the combination of energy restriction and increased physical activity (89). A review of obesity treatments (94) estimated success rates between 50% and 60% for maintenance of weight loss over 2 years when a combination of energy restriction and increased physical activity is used.

GUIDELINES FOR PRESCRIBING PHYSICAL ACTIVITY
Increased physical activity is not only a crucial component of weight loss and maintenance of weight loss, it also confers many additional health benefits. It seems reasonable, therefore, that health care professionals recommend increased physical activity as a routine part of obesity treatment. These principles should guide health care professionals in prescribing increased physical activity to prevent or manage obesity.

- The most effective approach to weight loss and maintenance of weight loss involves the combination of sound nutrition and increased physical activity. All health care professionals treating obese patients, or hoping to prevent obesity, should recognize this core principle and become skilled in at least basic nutrition concepts and physical activity guidelines.

- Increased physical activity confers multiple health benefits beyond weight loss and maintenance of weight loss. This is true for both obese and nonobese patients and provides another potent rationale for recommending physical activity for obese patients, whether or not weight loss ensues.

- Walking is almost always the most appropriate form of physical activity to recommend for obese individuals. Our experience with weight-loss protocols over the past 15 years has shown that walking is almost invariably the best form of physical activity for most obese persons. All health care practitioners who treat obese patients should become skilled at incorporating walking exercise into a weight-loss regimen.

- Team management of obesity is optimal. Given the multifactorial nature of the etiology of obesity, a multidisciplinary team consisting of physician, dietitian, exercise specialist, and behaviorist is optimal.

- Lifestyle therapy of obesity will continue to play a central role in its management. Even as more pharmaceutical agents become available to help treat obesity, the cornerstones of therapy will remain proper nutrition choices and increased physical activity.

CONCLUSIONS
The obesity epidemic and the epidemic of inactivity in the United States are inextricably linked. Increased physical activity plays a critical role in the prevention and treatment of obesity. Increased physical activity also is crucial for maintenance of weight loss. Engaging in physical activity during weight loss can improve a person’s metabolism, body composition, psychological well-being, quality of life, and, perhaps, adherence to obesity management. In addition, increased physical activity confers a host of health benefits, even in the
absence of weight loss. For all these reasons, all health care professionals who treat obese patients must become knowledgeable about the basic principles and practices of physical activity prescription.

References


