Appropriate Intervention Strategies for Weight Loss and Prevention of Weight Regain for Adults

AMERICAN COLLEGE of SPORTS MEDICINE®

POSITION STAND

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SUMMARY

ACSM Position Stand on the Appropriate Intervention Strategies for Weight Loss and Prevention of Weight Regain for Adults. *Med. Sci. Sports Exerc.*, Vol. 33, No. 12, 2001, pp. 2145–2156. In excess of 55% of adults in the United States are classified as either overweight (body mass index = 25–29.9 $kg \cdot m^{-2}$) or obese (body mass index $\geq$ 30 $kg \cdot m^{-2}$). To address this significant public health problem, the American College of Sports Medicine recommends that the combination of reductions in energy intake and increases in energy expenditure, through structured exercise and other forms of physical activity, be a component of weight loss intervention programs. An energy deficit of 500–1000 $kcal \cdot d^{-1}$ achieved through reductions in total energy intake is recommended. Moreover, it appears that reducing dietary fat intake to <30% of total energy intake may facilitate weight loss by reducing total energy intake. Although there may be advantages to modifying protein and carbohydrate intake, the optimal doses of these macronutritents for weight loss have not been determined. Significant health benefits can be recognized with participation in a minimum of 150 min (2.5 h) of moderate intensity exercise per week, and overweight and obese adults should progressively increase to this initial exercise goal. However, there may be advantages to progressively increasing exercise to 200–300 min (3.3–5 h) of exercise per week, as recent scientific evidence indicates that this level of exercise facilitates the long-term maintenance of weight loss. The addition of resistance exercise to a weight loss intervention will increase strength and function but may not attenuate the loss of fat-free mass typically observed with reductions in total energy intake and loss of body weight. When medically indicated, pharmacotherapy may be used for weight loss, but pharmacotherapy appears to be most effective when used in combination with modifications of both eating and exercise behaviors. The American College of Sports Medicine recommends that the strategies outlined in this position paper be incorporated into interventions targeting weight loss and the prevention of weight regain for adults.

INTRODUCTION

Obesity is a significant public health problem in the United States and other developed countries throughout the world. Obesity has been shown to be associated with chronic diseases and health conditions such as heart disease (89,108), diabetes (16,60), cancer (31,34,60,108), hyperlipidemia (3,40,90), hypertension (30), and hyperinsulinemia (38,100). The risk associated with obesity is concerning because it is estimated that approximately 55–60% of adults over the age of 18 have a body mass index (BMI) $\geq$ 25 $kg \cdot m^{-2}$, with approximately 22% having a BMI $\geq$ 30 $kg \cdot m^{-2}$ (30,56,67). Moreover, the prevalence of individuals with a BMI $\geq$ 25 $kg \cdot m^{-2}$ in the United States increased from 44.3 to 52.6% from the late 1970s to the early 1990s, with the prevalence of individuals with a BMI $\geq$ 30 $kg \cdot m^{-2}$ increasing from 13.4 to 21.2% during this same time period (30). The increased prevalence of overweight and obesity has resulted in an estimated $100 billion spent to treat obesity-related conditions annually, with the direct costs of obesity being approximately 5–10% of the health care dollars spent annually (112). Thus, it is important to develop programs that improve the prevention and treatment of obesity.

The purpose of this position stand is to outline recommendations for safe and effective weight loss and prevention of weight regain (maintaining a body weight that is within 2.3 kg of one's current weight (92,93)) after weight loss. It is recognized that clinical guidelines for weight loss have been published by the National Heart, Lung, and Blood Institute (69), and this current position stand will state the position of the American College of Sports Medicine relative to these previously published clinical guidelines. Moreover, as a leading professional organization in exercise and physical activity research and public health initiatives, the American College of Sports Medicine will provide detailed information relative to exercise interventions most appropriate for weight loss and the prevention of weight regain.

For the purpose of this position stand, recommendations will be limited to weight loss in overweight and obese adults, and will not address weight loss issues related to sport and athletic performance, nor weight loss interventions specifically targeting children and adolescents. Within this position stand, overweight is defined as a BMI equal to 25–29.9 $kg \cdot m^{-2}$, with obesity defined as a BMI $\geq$ 30 $kg \cdot m^{-2}$.

IDENTIFYING ADULTS FOR WHOM WEIGHT LOSS IS RECOMMENDED

It is estimated that approximately 55–60% of adults in the United States are classified as overweight (BMI $\geq$ 25

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$kg \cdot m^{-2}$), with 20–25% of these individuals meeting criteria for obesity (BMI $\geq$ 30 $kg \cdot m^{-2}$) (30,56,67), with prevalence rates continuing to increase (66). These estimates are based on population data that have focused on BMI as a measure of overweight. Studies in this area have consistently shown a linear or J-shaped relationship between BMI and relative risk of morbidity and/or mortality, with primary emphasis placed on cardiovascular disease and other chronic conditions (8,24,27,41,57,60). However, the point at which there is a significant increase in the health risk associated with an elevated BMI has undergone some debate. Recent evidence suggests that there is a significant increase in risk with a BMI $\geq$ 25 $kg \cdot m^{-2}$, although there is also evidence that the health risk may increase at BMI levels even lower than 25 $kg \cdot m^{-2}$ (62,94,109). Nonetheless, the recent recommendations of the National Institutes of Health suggest that weight loss is indicated in adults with a BMI $\geq$ 25 $kg \cdot m^{-2}$ (69).

It is recognized that more sophisticated measures of body composition are available. However, in contrast to BMI, there are no clearly agreed upon levels of body fatness that identify the point at which morbidity and mortality significantly increase. Thus, aside from monitoring change in body composition in response to treatment, it is unclear how the availability of body composition data can be used clinically to enhance obesity treatment. Therefore, it is recommended that clinical standards for body composition be developed. In addition, it is recognized that there are numerous techniques for assessing body composition, and each technique has advantages (e.g., low cost, ease of administration) and disadvantages (e.g., high cost, measurement error). Thus, it is also recommended that standard measurement techniques that can be used widely in clinical settings be developed to provide an accurate and meaningful measurement of body composition.

There is also concern with regard to the pattern of body fat distribution and how this may be related to health risk. For example, as early as 1956, Vague (99) suggested that there may be a link between the amount of fat deposited on the trunk of the body and health risk. Since these initial observations, studies using sophisticated techniques, such as computed tomography, have confirmed that intra-abdominal fatness is positively associated with such factors as hyperinsulinemia, hypercholesterolemia, and hypertension, which may contribute to the increase in health risk associated with obesity (21,78). Because sophisticated scanning techniques are expensive and not practical outside of the research setting, anthropometric techniques have been used to provide an estimate of intra-abdominal fatness. It has been shown that a girth measurement of the abdomen provides an adequate estimation of intra-abdominal fatness (86,87), and it may be advantageous to include this measurement in standard clinical health screening procedures. Thus, weight loss is recommended when the girth of the abdomen is $\geq$ 102 cm ($\approx$40 inches) in men and $\geq$ 88 cm ($\approx$35 inches) in women, and this is consistent with the National Heart, Lung, and Blood Institute's recommendations for weight loss (69).

MAGNITUDE OF WEIGHT LOSS RECOMMENDATION

Optimal body weight does not need to be achieved for health benefits to be realized, because the research suggests that even modest reductions in body weight (5–10%) will significantly improve health. These health improvements may include decreasing blood lipids, blood pressure, and factors related to the onset of type 2 diabetes (35,111). For example, Wing et al. (111) have shown that as little as a 4.5-kg weight loss that was sustained for a period of 24 months significantly reduced the risk of developing diabetes in overweight adults with a family history of this disease. Thus, consistent with the recommendation for the National Heart, Lung, and Blood Institute (69), an initial weight loss goal should be to decrease body weight by 5–10% and to sustain this magnitude of weight loss long-term. However, even though a weight loss of $<$10% is associated with initial improvements in risk factors, the maintenance of a weight loss that is $<$10% may not result in the improvements in these risk factors being sustained long-term (91). Therefore, long-term health benefits may be maximized with sustained weight loss of $\geq$10% of initial body weight.

DIETARY RECOMMENDATIONS

One aspect of energy balance that can affect body weight is energy intake. The following sections will address issues related to energy intake, very-low calorie diets, and macronutrient composition as they related to weight loss.

Energy intake. An examination of the weight loss literature shows that changes in energy intake play a significant role in reducing body weight. In simplistic terms, when energy intake is reduced below the energy needs of the body, weight loss will occur. It is common for weight loss programs to reduce energy intake to 1000–1500 $kcal \cdot d^{-1}$ to induce weight loss in overweight adults (44,48,102,110), and this has been shown to be safe and effective for weight loss for individuals averaging 90.7 kg (200 pounds) before weight loss. Assuming that resting energy expenditure (REE) is approximately 1 $kcal \cdot kg^{-1} \cdot h^{-1}$ (1 metabolic equivalent [MET]), this level of energy intake would result in an energy deficit of approximately 500–1000 $kcal \cdot d^{-1}$ for individuals weighing approximately 90.7 kg (200 pounds). (Note: Because of variability of energy expenditure between individuals of similar body size, and because REE may change with weight loss, there may be some advantage to directly measuring energy expenditure to individualize treatment recommendations across the weight loss process.) However, the absolute energy intake should be adjusted based on body weight to elicit an energy deficit of 500–1000 $kcal \cdot d^{-1}$. Thus, with this level of energy deficit, a minimum weight loss of 0.5–0.9 kg (1–2 pounds) per week would be realistic, and studies have consistently shown weight loss of approximately 9.0 kg within the initial 16 to 26 wk of treatment (101). Currently, there is no evidence that a faster rate of weight loss or greater magnitude of

initial weight loss will improve long-term weight loss outcomes compared with more conservative approaches.

Very-low calorie diets. Very-low-calorie diets (VLCD) are defined as energy intake <800 kcal·d^{-1}, and the use of a VLCD can greatly increase the magnitude and rate of weight loss compared with more conservative reductions in energy intake (103). However, due to the low energy value of these diets, they are used for relatively short periods of time (e.g., 12–16 wk), are used in conjunction with dietary supplements, and require medical supervision.

The energy deficit when using a VLCD is typically greater than 500–1000 kcal·d^{-1}, which results in greater initial weight loss compared with more conservative dietary approaches. However, when compared with these more conservative dietary approaches, long-term weight loss may not be improved with a VLCD. For example, Wadden et al. (102) compared weight loss using a VLCD (420 kcal·d^{-1}) with a 1200-kcal·d^{-1} balanced deficit diet. Weight loss after 26 wk of treatment was 21.5 kg in the VLCD group compared with 11.9 kg in the balanced deficit diet group. However, after 52 wk of treatment, total weight loss was comparable in both groups, with the VLCD group maintaining a 10.9-kg weight loss and the balanced deficit diet group maintaining a 12.2-kg weight loss. These results suggest that excessively low levels of energy intake to produce a greater magnitude of initial weight loss do not necessarily translate into better maintenance of weight loss long-term. Therefore, use of a VLCD may not be recommended for weight loss in most individuals (69), but use of a VLCD may be appropriate when medically indicated.

Macronutrient composition. Commercial programs recommend various combinations of macronutrient compositions for weight loss including high fat, high protein, and high- and low-carbohydrate diets. Despite the popularity of many of these dietary approaches, the optimal macronutrient composition of the diet for weight loss has not been determined. However, current scientific evidence suggests (4,15,47,49,61) that the level of energy intake has the greatest impact on weight loss short-term and that changes in the composition of the diet affects weight loss by ultimately affecting energy intake.

One area that has received attention is the impact of dietary fat reduction on weight loss. Schlundt et al. (84) examined the impact of reducing dietary fat intake versus dietary fat intake combined with reductions in energy intake on weight loss across a 16- to 20-wk program. Results showed that weight loss was significantly greater with the combined reduction in kcal and dietary fat intake (-8.8 kg) compared with reducing dietary fat alone (-4.6 kg). There is also evidence that targeting reductions in fat intake may result in a spontaneous reduction in *ad libitum* energy intake, which can significantly affect body weight (4,15,47,49,61). Thus, weight loss resulting from a reduction in dietary fat intake appears to be a result of a concomitant reduction in total energy intake.

Continuing to maintain a low fat intake may also be important for maintaining weight loss long-term. Observational data from the National Weight Control Registry (52) has shown that individuals who have maintained an average weight loss of approximately 13.6 kg for an average of 5.5 yr are consuming approximately 24% of energy from fat, 19% of energy from protein, and 56% of energy from carbohydrates. Moreover, Jeffery et al. (48) have reported that fat intake is inversely associated with weight loss across an 18-month treatment program. Further evidence supporting the need to target dietary fat intake comes from a review of the literature by Bray and Popkin (12). This review concluded that even though the effect on body weight may be small (16 g·d^{-1} of weight loss), a 10% reduction in fat intake can have a significant impact on energy balance and body weight over the long-term. These findings provide evidence that level of dietary fat intake may be important for long-term weight loss and is consistent with the treatment recommendations of the National Heart, Lung, and Blood Institute (69). In addition, reducing dietary fat intake may significantly affect risk factors such as blood lipid concentrations (36,68), which further improve health outcomes in overweight adults.

There is some theoretical rationale to suggest that diets that are high in protein and carbohydrate may be beneficial for weight loss and weight maintenance. The studies in this area suggest that increasing protein intake can increase thermogenesis and satiety (18,106,107), which may impact energy balance by altering energy intake and/or expenditure. However, another possibility is that similar to dietary fat intake, changes in protein or carbohydrate intake may simply reduce overall energy intake, which will result in a reduction in body weight. Despite these potential mechanisms for how changes in protein intake may affect weight loss, evidence from clinical trials supporting optimal protein and carbohydrate intake for long-term weight loss and weight maintenance is lacking.

In summary, the currently available scientific evidence appears to indicate that macronutrient content of the diet will affect body weight only when there is also a reduction in total energy intake. In the context of reductions in total energy intake, it does appear that reducing dietary fat intake to $\leq$30% of total energy intake will affect body weight and risk factors such as hypercholesterolemia (55). Although it does appear that protein and carbohydrate intake can potentially affect thermogenesis and satiety, the optimal levels of these macronutrients for weight loss have not been determined. Therefore, further research regarding the optimal macronutrient composition of the diet is warranted.

EXERCISE RECOMMENDATIONS

Energy balance is also affected by energy expenditure resulting from exercise. This section will justify the need to include exercise within weight loss programs and provide specific recommendations with regard to the type and amount of exercise that is appropriate for weight loss in overweight adults.

Justification for inclusion of exercise for weight loss. Another technique of inducing an energy deficit is to increase energy expenditure through increases in physical

activity. The scientific evidence suggests that the combination of dietary modification and exercise is the most effective behavioral approach for weight loss (69), and the maintenance of exercise may be one of the best predictors of long-term weight maintenance (65,79).

Despite the importance of exercise, there is little evidence that suggests that exercise alone produces magnitudes of weight loss that are similar to what can be achieved with dietary modification (69). However, in a review by Ross et al. (83), it was shown that when the energy deficit is held constant and other factors that affect energy balance are controlled, exercise can induce significant weight loss. For example, Ross et al. (82) have shown that a 700-kcal·d^{-1} energy deficit produced solely through exercise with energy intake remaining constant resulted in a weight loss of 7.6 kg over a 3-month period. The weight loss resulting from a similar energy deficit achieved through changes in energy intake was 7.4 kg. It is important to note that the energy deficit in this study was achieved through strictly supervised exercise for a duration of approximately 60 min daily, and there were strong recommendations for participants not to change their dietary intake across this 12-wk program. Thus, the failure of exercise to produce a magnitude of weight loss similar to diet in studies of free-living individuals may be a result of individuals compensating by increasing energy intake and/or failing to achieve adequate levels of energy expenditure.

When examining the effect of exercise on body weight, it has been suggested that there may be "responders" and "nonresponders" to the same exercise intervention. In a classic study, Bouchard et al. (10) examined the effect of exercise on weight loss both within and between pairs of identical twins. Results of this study showed that the variance for changes in body weight was 6.8 times greater between pairs than within pairs, suggesting that the effect of exercise may be influenced by genetic differences between individuals. The effectiveness of exercise for weight management may also be influenced by gender, with Wood et al. (113) reporting that exercise resulted in greater weight loss in men compared with women. These factors should be considered when examining the effectiveness of exercise for managing body weight across individuals.

Exercise prescription considerations for weight loss. It is important to consider the amount, intensity, and type of exercise that should be recommended for weight loss. To allow adequate time for individuals to progressively increase their exercise, the recommended level of exercise for sedentary adults during the initial phases of weight loss should be differentiated from the amount of exercise that can be achieved at later stages in the weight loss process. Moreover, the amount of exercise necessary to improve fitness may be different than the amount of exercise necessary for successful long-term weight loss.

Exercise duration and weight loss. The current public health recommendation for physical activity is for individuals to participate in at least 30 min of moderate intensity physical activity on most, preferably all, days of the week (72,98). This recommendation has typically been interpreted as a minimum of 150 min of physical activity per week (5 d, 30 min·d^{-1}) and is based primarily on the effects of exercise on cardiovascular disease and other chronic conditions such as diabetes mellitus. However, close examination of the scientific evidence suggests that levels of exercise greater than this minimum recommended amount may be important for maintaining weight loss long-term.

Results from a randomized trial of overweight women in a weight loss program that included dietary modification showed that individuals adopting and maintaining an average of >280 min of exercise per week maintained a weight loss of ≈13 kg over an 18-month intervention (44). This amount of weight loss was significantly greater than the 6.5-kg and 3.5-kg weight losses after 18 months shown with 150–200 and <150 min of exercise per week, respectively. Moreover, individuals averaging approximately 280 min of exercise per week showed no weight regain from 6 to 18 months of treatment, whereas individuals exercising <200 min·wk^{-1} showed significant weight regain during this period. In this study, individuals reporting >200 min of exercise per week also reported >2000 kcal·wk^{-1} of leisure-time physical activity as measured by the questionnaire developed by Paffenbarger and colleagues (71). The recommendation for levels of exercise that are greater than the minimal public health recommendation is supported by Schoeller et al. (85), with their results showing that the equivalent of 65 min·d^{-1} of moderate-intensity activity was associated with improvements in the maintenance of weight loss long-term.

The recommendation to progress overweight adults to 200–300 min of exercise per week or >2000 kcal·wk^{-1} may present a significant challenge for interventionists and public health professionals. Therefore, this recommendation should be viewed in the context of the exercise level that most individuals are willing to adopt and maintain. In response to this concern, it is recommended that individuals be progressed to these higher levels of exercise gradually over time and that a variety of behavioral strategies be used to facilitate the adoption of this level of exercise. However, even in the absence of weight loss and attainment of these higher levels of exercise, overweight individuals can realize significant improvements in health by achieving the minimum public health recommendation for physical activity and by improving their level of cardiorespiratory fitness (7,58,105).

Exercise intensity and weight loss. There have been few studies that have adequately examined the impact of various intensities of exercise on weight loss. Duncan et al. (25) attempted to maintain total volume of exercise while manipulating intensity in a 24-wk study of overweight women. The results of this study showed that the intensity of exercise affected the magnitude of change in cardiorespiratory fitness, with greater increases demonstrated with higher intensities of exercise, but the intensity of exercise did not result in differential effects on body weight or body composition after 24 wk of treatment. Data from the National Weight Control Registry suggest that long-term maintenance of weight loss may be enhanced with at least 26%

of exercise being vigorous in intensity (52); however these data are from an uncontrolled observational study, which limits the ability to draw any meaningful conclusions related to causality. Currently, there are long-term clinical interventions being conducted that focus primarily on the impact of exercise intensity on long-term weight loss and the prevention of weight regain. Thus, it appears that a sufficient amount of moderate-intensity (55–69% of maximal heart rate) exercise can be beneficial for management of body weight, with limited published scientific evidence from randomized trials to support the necessity of more vigorous (≥70% of maximal heart rate) forms of exercise for management of body weight long-term.

Intermittent exercise and weight loss. There have been a few studies that have examined the effectiveness of intermittent exercise in weight loss programs (23,43,44). Intermittent exercise has typically been defined as accumulation of 30–40 min of exercise per day through participation in multiple 10- to 15-min exercise sessions daily (20,28,43,44). There has been interest in this form of exercise because early studies showed that intermittent exercise effectively increased cardiorespiratory fitness and favorably impacts coronary heart disease risk factors (20,28). This resulted in the Centers for Disease Control and Prevention and the American College of Sports Medicine recommending the "accumulation" of at least 30 min of moderate intensity activity per day (72), yet at the time of this recommendation, there was no evidence that this would be an effective strategy for overweight adults seeking weight loss. However, Jakicic et al. (43) showed that this strategy was effective for increasing initial adoption of exercise in overweight women in a 20-wk behavioral weight loss program, and there was a trend that this could potentially improve weight loss. Recently, Jakicic et al. (44) showed again that this strategy can be effective for initial adoption of exercise; however, there was no added weight loss benefit when compared with continuous exercise across an 18-month behavioral weight loss program that also included a dietary intervention. Donnelly and colleagues (23) compared continuous and intermittent exercise, with no dietary intervention, over a period of 18 months and showed no change in body weight following treatment. The use of intermittent exercise may be advantageous for individuals that dislike continuous exercise or perceive barriers to continuous exercise. These factors should be considered when prescribing exercise to overweight adults seeking weight loss treatment.

Lifestyle activity and weight loss. Lifestyle activity may be an effective option for increasing fitness and modifying body weight in overweight adults. Andersen et al. (1) reported that when combined with a dietary intervention, lifestyle activity resulted in weight loss that was comparable to aerobic forms of exercise after both 16 and 68 wk of treatment. In addition, Dunn et al. (26) have reported that lifestyle activity is as effective as structured exercise at improving cardiorespiratory fitness across a 24-month intervention. Based on these results, lifestyle activity appears to be a promising alternative to structured forms of exercise. However, although these studies have documented the type of activity that was prescribed, these studies have not provided data with regard to the type of activity that was performed that constituted lifestyle activity. Therefore, overweight adults should be encouraged to engage in activities that are at least moderate in intensity as part of a physically active lifestyle. Further research is necessary to examine the effectiveness of specific forms of lifestyle physical activity to change both body weight, cardiorespiratory fitness, and risk factors that may be common in overweight adults.

Resistance exercise and weight loss. Although most research studies have examined the effect of endurance exercise on weight loss, the inclusion of resistance training in weight loss programs has clear advantages. Resistance training is a potent stimulus to increase fat-free mass (FFM), muscular strength, and power and thus may be an important component of a successful weight loss program by helping to preserve FFM while maximizing fat loss (6,32,33,54,63,73,80,81). However, when resistance exercise is combined with dietary energy restriction, there appears to be little benefit in terms of absolute weight loss (6,33,53,54,97). These results have been consistent across studies with energy intakes as low as <800 kcal·d^{-1} or as high as approximately 1300 kcal·d^{-1}. In one of the few long-term studies (40 wk) to date, Wadden et al. (103) have shown that resistance exercise alone or in combination with endurance exercise did not enhance weight loss compared with endurance exercise alone in a behavioral weight loss program, with all groups prescribed a diet ranging from 900 to 1250 kcal·d^{-1}.

Leibel et al. (59) showed that reductions in body weight and FFM resulted in reductions in REE, whereas increases in body weight resulted in increases in REE. These data may suggest that preserving FFM will prevent declines in REE that are often observed with weight loss. However, intervention studies do not support this belief, with the majority of studies showing that resistance training does not prevent the decline in REE that occurs with diet-induced weight loss (33,53,54,96,97). For example, Kraemer and colleagues (54) combined a periodized resistance-training program with an endurance exercise component and dietary modification. The periodized resistance exercise program consisted of 3 d·wk^{-1} that alternated heavy and moderate training days. Approximately 11 different exercises were performed, and subjects progressed to three sets of each exercise throughout the duration of the 12-wk study. On heavy days, 5–7 repetitions per set were performed to fatigue, with moderate days including 8–10 repetitions per set to fatigue. Endurance exercise consisted of 3 d·wk^{-1}, with duration progressing from 30–50 min·d^{-1}, at an intensity of 70–80% of functional capacity. Energy intake was approximately 1500 kcal·d^{-1}. The addition of resistance exercise did not improve weight loss or blunt decreases in REE compared with diet combined with endurance exercise or the diet only condition. Moreover, the addition of resistance exercise to endurance exercise and diet modification did not minimize the loss of FFM compared with endurance exercise combined with dietary modification or dietary modification alone.

Thus, although resistance exercise may improve muscular strength in overweight adults, there is no scientific evidence to suggest that resistance exercise is superior to more commonly used forms of endurance exercise for weight loss. However, the ability of resistance exercise to improve muscular strength and endurance may be especially beneficial because of the impact on functional tasks (e.g., getting out of a chair, lifting one's own body weight), which may facilitate the adoption of a more active lifestyle in sedentary overweight and obese individuals.

RECOMMENDATIONS FOR THE USE OF PHARMACOLOGICAL WEIGHT LOSS TREATMENTS

Although lifestyle interventions are helpful for many obese individuals, without recurrent contacts by health care professionals, most individuals regain their lost weight within 3–5 yr (76). These poor long-term results, and the understanding that obesity is a chronic disease requiring lifelong management, have led to the development of pharmacologic approaches that may minimize weight regain and enhance long-term weight loss. All current guidelines consider pharmacotherapy to be an adjunct to lifestyle modification interventions and limit their use to patients with a BMI > 30 kg·m^{-2} (obese), or a BMI > 27 kg·m^{-2} (overweight) with additional comorbidities (such as hypertension, dyslipidemia, or type 2 diabetes) (69,70). Early studies examined the efficacy of drug treatment alone, behavior therapy alone, or their combination (17,95). Results of these studies showed that both behavior therapy alone and the combination intervention produced significantly better weight losses than drug treatment alone. However, the effects of pharmacotherapy tend to maximize at 6 months, and the weight losses usually are maintained for the duration of active treatment (13). For example, data from trials of relatively long duration do not show continued weight loss beyond what is typically achieved at 24 wk, with continued use of pharmacotherapy beyond this period resulting in the maintenance of 8–12% weight loss at 1–2 yr (19,104).

Despite the interest in the potential use of pharmacotherapy for the management of body weight, there are few drugs approved for this use. Currently, there are only two prescription drugs that are approved in the United States by the Food and Drug Administration (FDA) for long-term use: sibutramine and orlistat. The use of both of these weight-loss agents should be used only under direct supervision of a physician.

Sibutramine. Sibutramine is a serotonin and noradrenaline reuptake inhibitor (64). It has been studied in a large number of randomized, double-blind, placebo-controlled trials lasting up to 24 months (2,29,46). Dose-response relationships have been reported and weight losses have been significantly greater in sibutramine-treated subjects than in those receiving a placebo. For example, Bray et al. (14) reported weight losses of 1.2%, 6.1%, 8.8%, and 9.4% in placebo, 10-, 20-, and 30-mg doses, respectively. Moreover, there is some evidence that sibutramine enhances the maintenance of weight loss for 6–18 months after initial weight loss (46).

Adverse events are predictable based on the drug's pharmacology and include a mean increase in mean arterial pressure of 1–2 mm Hg, diastolic blood pressure of 2–3 mm Hg, and resting heart rate of about 4 beats·min^{-1}. Sibutramine should be used with caution in patients with a history of hypertension and should not be used with those with uncontrolled or poorly controlled hypertension. However, findings from a recent study suggest that the addition of exercise to sibutramine therapy may prevent increases in resting blood pressure and heart rate (9). Drug interactions include monoamine oxidase inhibitors, selective serotonin reuptake inhibitors, erythromycin, and ketoconazole.

Orlistat. Orlistat is a lipase inhibitor that works in the gastrointestinal tract to reduce the body's absorption of fat (37). There have been a number of randomized, double-blind, placebo-controlled trials of orlistat lasting up to 24 months (19,42,45,91). In all of the studies, patients who took orlistat lost significantly more weight than patients who took a placebo. Mean weight losses are about 6–10% at 6 months, with reasonably good maintenance with continued use of orlistat over the following 6–18 months. Decreases in total and low-density lipoprotein cholesterol, systolic and diastolic blood pressure, and fasting insulin and glucose have been reported.

Adverse events are predictable based on the drug's mechanism of action and include changes in bowel habits, steatorrhea, and fecal urgency. These events can be minimized or eliminated by reducing the intake of dietary fat (39). Because the drug blocks dietary fat, it reduces the absorption of fat-soluble vitamins A, D, E, and K, and beta-carotene, requiring the use of a multi-vitamin supplement containing fat-soluble vitamins. Its use is contraindicated in patients who suffer from chronic malabsorption syndrome or cholestasis.

BEHAVIORAL RECOMMENDATIONS FOR WEIGHT LOSS TREATMENT

There is evidence that including behavioral principles within a weight loss program improves long-term outcomes. For example, obesity is a chronic disease and should be treated with a chronic disease model to improve overall success (75). Thus, it is assumed that it is important to maintain treatment focusing on healthful eating and exercise behaviors to maintain weight loss and prevent weight regain long-term. In a summary of behavioral weight loss programs, Wadden (101) has shown that the duration of treatment programs has gradually increased from the early 1970s to the mid 1990s. This may be important because Perri and colleagues (74) have shown that maintaining contact with participants long-term improves long-term weight loss outcome, and this is considered an important component of behavioral weight loss programs. Within the context of these interventions, participants should be trained in behavioral concepts such as problem solving, social support, goal

setting, stimulus control, and other behavioral skills to enhance the effectiveness of these treatments.

Another important component of behavioral weight loss programs is self-monitoring of eating and exercise behaviors. There is consistent evidence that individuals who self-monitor these behaviors are more successful at weight loss than those individuals who are inconsistent with self-monitoring (5,11). Thus, despite the potential inaccuracy of current self-monitoring techniques, overweight individuals should be encouraged to self-monitor their eating and exercise behaviors to improve weight loss outcomes.

The use of portion control diets may also improve weight loss outcomes by minimizing choice and providing specific guidance to overweight and obese adults that precipitates weight loss. For example, structured meal plans which specifically outline types and amounts of foods to be consumed resulted in greater weight loss than recommending a specific energy and fat intake goal with no structure (110). In addition, the use of prepackaged meals with predetermined portion sizes may also be an effective strategy for inducing decreases in energy intake that result in improved weight loss (22).

It is also important to identify strategies that may facilitate the adoption and maintenance of exercise behaviors in previously sedentary overweight or obese adults. For example, home-based exercise or nonsupervised exercise may improve participation compared with requiring individuals to attend supervised exercise sessions (50,51,77). Thus, despite the advantage to supervised exercise for research purposes, there may be advantages to not requiring supervised exercise within clinical weight loss programs. In addition, it may be important to provide exercise options, such as the use of intermittent (43,44) or lifestyle (1,26) approaches to exercise, which may improve the adoption and facilitate the maintenance of a physically active lifestyle.

SUMMARY OF ACSM RECOMMENDATIONS FOR WEIGHT LOSS TREATMENT

Based on the evidence presented in this position stand, the American College of Sports Medicine recommends that individuals seeking weight loss treatment and prevention of weight regain select programs that meet the following guidelines.

1. It is recommended that individuals with a body mass index >25 kg·m^{-2} consider reducing their body weight, especially if this level of body weight is accompanied by an increase in abdominal adiposity. Individuals with a body mass index ≥ 30 kg·m^{-2} are encouraged to seek weight loss treatment (see Table 1). Although it is recognized that body mass index may misclassify the health risk of very active and/or lean individuals, the use of body mass index provides a meaningful clinical assessment of health risk. Moreover, although it is also recognized that more sophisticated measures of body composition are available, there is no consensus on the absolute amount of body fatness at which health risk increases.

2. It is recommended that overweight and obese individuals target reducing their body weight by a minimum of 5–10% and maintain at least this magnitude of weight loss long-term. This amount of weight loss is consistent with what is attainable with standard weight loss programs that focus on modifying eating and exercise behaviors, and this amount of weight loss has been shown to be associated with improvements in risk factors and a reduced likelihood of chronic diseases including coronary heart disease, type 2 diabetes, hypertension, and hyperlipidemia.

3. It is recommended that individuals strive for long-term weight maintenance and the prevention of weight regain over the long-term, especially when weight loss is not desired, or when attainment of ideal body weight is not achievable. Prevention of weight gain or weight regain has been defined as maintaining a body weight that is within 2.3 kg (5 pounds) of one's current weight (92,93).

4. It is recommended that weight loss programs target changing both eating and exercise behaviors, as sustained changes in both behaviors have been shown to result in significant long-term weight loss. Moreover, it is important for programs targeting modifications in these behaviors to incorporate strong behavioral modification strategies to facilitate the adoption and maintenance of the desired changes in behavior.

5. It is recommended that overweight and obese individuals reduce their current level of energy intake by 500–1000 kcal·d^{-1} to achieve weight loss and that this be combined with a reduction in dietary fat to $<30\%$ of total energy intake. It is also recommended that an individualized level of energy intake be established that prevents weight regain after initial weight loss, while maintaining a low-fat diet ($\leq 30\%$ of total energy intake) (55). Additional research is needed with regard to changes in other macronutrients and long-term weight loss.

6. It is recommended that overweight and obese individuals progressively increase to a minimum of 150 min of moderate intensity physical activity per week, as this level of exercise may have a positive impact on health in overweight and obese adults. However, for long-term weight loss, overweight and obese adults should eventually progress to higher amounts of exercise (e.g., 200–300 min·wk^{-1} or $\geq$ 2000 kcal·wk^{-1} of leisure-time physical activity). Table 2 provides specific information regarding energy expenditure for various modes of physical activity.

7. It is recommended that resistance exercise supplement the endurance exercise program in overweight and obese adults that are undertaking modest reductions in energy intake to lose weight. Resistance exercise should focus on improving muscular strength and endurance in this population.

8. It is recommended that pharmacotherapy for weight loss only be used in individuals with a body mass index $\geq$ 30 kg·m^{-2}, or with a body mass index >27 kg·m^{-2} in the presence of additional comorbidities. In addition, it is recommended that weight loss medications only be used in combination with a strong behavioral intervention that focuses on modifying eating and exercise behaviors, and be used under the supervision of a physician.

TABLE 1. Table to estimate body mass index (kg/m^2) based on weight and height.

Height		Weight (lb)													
Ft/In	In	120	130	140	150	160	170	180	190	200	210	220	230	240	250
4′10″	58	25	27	29	31	33	36	38	40	42	44	46	48	50	52
4′11″	59	24	26	28	30	32	34	36	38	40	42	44	46	48	50
5′	60	23	25	27	29	31	33	35	37	39	41	43	45	47	49
5′1″	61	23	25	26	28	30	32	34	36	38	40	42	43	45	47
5′2″	62	22	24	26	27	29	31	33	35	37	38	40	42	44	46
5′3″	63	21	23	25	27	28	30	32	34	35	37	39	41	43	44
5′4″	64	21	22	24	26	27	29	31	33	34	36	38	39	41	43
5′5″	65	20	22	23	25	27	28	30	32	33	35	37	38	40	42
5′6″	66	19	21	23	24	26	27	29	31	32	34	36	37	39	40
5′7″	67	19	20	22	23	25	27	28	30	31	33	34	36	38	39
5′8″	68	18	20	21	23	24	26	27	29	30	32	33	35	36	38
5′9″	69	18	19	21	22	24	25	27	28	30	31	32	34	35	37
5′10″	70		19	20	22	23	24	26	27	29	30	32	33	34	36
5′11″	71		18	20	21	22	24	25	26	28	29	31	32	33	35
6′	72		18	19	20	22	23	24	26	27	28	30	31	33	34
6′1″	73			18	20	21	22	24	25	26	28	29	30	32	33
6′2″	74			18	19	21	22	23	24	26	27	28	30	31	32
6′3″	75				19	20	21	22	24	25	26	27	29	30	31
6′4″	76				18	19	21	22	23	24	26	27	28	29	30
6′5″	77				18	19	20	21	23	24	25	26	27	28	30

Body mass index <18 kg/m^2 is not recommended, and therefore these values have not been represented on this table.

SUMMARY OF WEIGHT LOSS RECOMMENDATIONS FOR THE LAY PUBLIC

It has been shown that 29% of men and 44% of women are attempting to lose weight (88). Of those individuals that report that they are currently attempting to lose weight, only 22% of men and 19% of women are reducing energy intake and exercising $\geq$ 150 min of exercise per week (88). Considering the scientific evidence supporting the importance of modifications to both eating and exercise for weight loss, it is important that this information be disseminated to the lay public along with other factors related to long-term weight loss and the prevention of weight regain. Therefore, it is recommended that the lay public consider the following guidelines when engaging in a weight loss program.

1. Although moderate changes in energy intake and exercise are typically safe for most individuals, it is recommended that individuals consult with their personal physician or other trained health care professional before engaging in a weight loss program.

2. It is recommended that individuals with a body mass index $>$ 25 kg·m^{-2} consider engaging in weight loss efforts to reduce their body weight. Individuals can determine their body mass index from their height and weight using the information provided in Table 1. (Weight should be taken without shoes and with patients wearing lightweight/minimal clothing.)

3. It is recommended that individuals undertaking nonmedically supervised weight loss initiatives reduce energy intake by 500–1000 kcal·d^{-1} to elicit a weight loss of approximately 0.5–0.9 kg·wk^{-1} (1–2 pounds·wk^{-1}). In ad-

TABLE 2. Minutes of continuous activity necessary to expend 300 kcal based on body weight.

	Body Weight (lb)													
	120	130	140	150	160	170	180	190	200	210	220	230	240	250
Conditioning exercises														
Cycling														
Stationary	66	61	57	53	50	47	44	42	40	38	36	35	33	32
Outdoor (leisure)	83	76	71	66	62	58	55	52	50	47	45	43	41	40
Walking (level)														
2.5 mph	110	102	94	88	83	78	73	70	66	63	60	58	55	53
3.0 mph	94	87	81	76	71	67	63	60	57	54	52	49	47	45
3.5 mph	83	76	71	66	62	58	55	52	50	47	45	43	41	40
Water aerobics	83	76	71	66	62	58	55	52	50	47	45	43	41	40
Lap swimming	41	38	35	33	31	29	28	26	25	24	23	22	21	20
Yoga	83	76	71	66	62	58	55	52	50	47	45	43	41	40
Resistance exercise	55	51	47	44	41	39	37	35	33	31	30	29	28	26
Dancing														
Aerobic dance	55	51	47	44	41	39	37	35	33	31	30	29	28	26
Low-impact aerobic dance	66	61	57	53	50	47	44	42	40	38	36	35	33	32
Ballroom dance (fast)	60	56	52	48	45	42	40	38	36	34	33	31	30	29
Ballroom dance (slow)	110	102	94	88	83	78	73	70	66	63	60	58	55	53
Lifestyle activities														
Golf (walking)	73	68	63	59	55	52	49	46	44	42	40	38	37	35
Raking the lawn	83	76	71	66	62	58	55	52	50	47	45	43	41	40
Lawn mowing														
Walking power mower	73	68	63	59	55	52	49	46	44	42	40	38	37	35
Riding mower	132	122	113	106	99	93	88	84	79	76	72	69	66	63
Vacuuming/sweeping	132	122	113	106	99	93	88	84	79	76	72	69	66	63

dition to reducing total energy intake, it is recommended that dietary fat intake be reduced to <30% of total energy intake.

4. It is recommended that individuals seeking weight loss include exercise as a key component to their weight loss program. It is recommended that overweight and obese adults progress to a minimum of 150 min of moderate intensity exercise per week and, when possible, progress to >200 min of moderate intensity exercise per week.

5. It is recommended that individuals interested in using dietary supplements or weight loss enhancing agents do so only under the guidance of their personal physician or other trained health care providers.

CONCLUSION

Obesity is a significant public health problem in the United States, with the prevalence of obesity increasing over the past few decades. Based on scientific evidence, there are a number of intervention strategies that can be used to induce and maintain significant weight loss, and these include changes in energy intake and energy composition, increases in energy expenditure through exercise and other forms of physical activity, and, when indicated, the use of pharmacotherapy. Regardless of the intervention approach, it is necessary for these changes in behavior to be maintained to enhance long-term weight loss outcomes. This position stand for the American College of Sports Medicine is intended to provide guidance on appropriate programs for weight loss and the prevention of weight regain to health care professionals and the lay public. This may enhance the delivery of quality interventions for treating obesity, which may help to reduce the public health burden related to this chronic condition.

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