CME CREDIT ***EDUCATIONAL OBJECTIVE:*** Readers will give their obese patients instructions for exercise that are specific, measurable, attainable, realistic, and timely

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Prescribing exercise to help your patients lose weight

ABSTRACT

Exercise, in conjunction with diet, is critical to losing weight and maintaining health in obese patients. While it can be challenging for an obese person to transition to a healthy lifestyle, the physical and emotional benefits of a regular exercise program make it worth the effort.

KEY POINTS

Exercise not only helps people lose weight and keep it off, it lowers blood pressure, improves lipid levels, improves insulin sensitivity, and lowers blood glucose levels.

Of the various types of exercise, aerobic exercise provides the most benefits, but resistance, flexibility, and balance exercises have additional value. Specifically, continuous moderate-intensity aerobic or high-intensity interval training in combination with some resistance exercises appears to be most effective for weight management.

For people who are extremely obese, low-impact exercises performed for a longer duration may be more manageable and are still effective.

The clinician should monitor the patient's compliance and progress and give appropriate encouragement and feedback for sustained success.

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Although exercise is probably less effective than diet in reducing weight, most studies show that adding it to a diet regimen will increase the weight loss.[1,2] Guidelines from the American Heart Association, American College of Cardiology, and Obesity Society recommend a comprehensive lifestyle program that includes a low-calorie diet as well as an increase in physical activity.[3]

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Here, we review the many benefits of exercise for obese patients, not only in terms of weight loss, but also its positive cardiovascular and metabolic effects. Then we discuss how to motivate and prescribe exercise for this challenging group.

EXERCISE IMPROVES WEIGHT LOSS

Increasing energy expenditure by exercising can mobilize and burn stored fat and thus lead to weight loss.[4]

Typically, with no changes in caloric intake, exercising 60 minutes at low intensity most days of the week will remove up to 0.5 lb per week.[5] Exercising harder for longer will take off more weight, up to 3 lb per week.[1,6] Some practitioners believe that the total volume of exercise (frequency multiplied by time) is more important than the intensity in determining the amount of weight loss.[2,7,8]

Ross et al[9] randomized 101 obese men to try to lose weight by exercising at a low to moderate intensity, to try to lose weight by dieting, to exercise without the goal of losing weight, or to do nothing (the control group). About half the participants declined or dropped out, but 52 completed the trial. The weight-loss-through-exercise group had lost approximately

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15 lb by 12 weeks; the diet group lost a similar amount. Total body fat, visceral fat, and abdominal obesity were all reduced with both diet- and exercise-induced weight loss.

In a study in 130 severely obese adults, after 6 months of high-intensity physical activity for a mean duration of 71 minutes per week, those on an exercise-and-diet regimen lost an average of 24 lb, compared with 18 lb with diet alone.[10]

Another trial involved obese patients who were instructed to jog the equivalent of 20 miles (32.2 km) a week, with no restriction on caloric intake.[11] They lost only 2.9 kg (6.5 lb) over 8 months. Increased food intake explained this minimal weight loss.

In an analysis of 20 studies, exercise-only interventions of 4 months or less resulted in a mean weekly weight loss of 0.4 lb (0.2 kg), with a total loss of about 5 lb (2.3 kg).[12]

A systematic review of 15 studies noted that aerobic exercise for 3 months or more resulted in a significant reduction in visceral adipose tissue in overweight men and women as measured by computed tomography.[13]

Effects that different types of exercise have on weight loss

Without a change in diet, exercising 1 hour at low intensity most days of the week will remove up to 0.5 lb per week

In a study of 119 sedentary adults who were overweight or obese and who were randomized to aerobic, resistance, or combined aerobic-resistance training over 8 months, those involved in aerobic or combined aerobic and resistance training had the greatest reduction in total body and fat mass.[14] Given that the combined aerobic-resistance training program required twice the time commitment of the aerobic-alone program, the authors suggested that the most efficient manner of reducing body and fat mass is aerobic training alone.[14] In contrast, if the goal is to increase lean muscle mass rather than lose weight and fat, then resistance training would be preferred.[14]

A meta-analysis confirmed the benefit of aerobic exercise, which resulted in significantly more loss in weight (1.2 kg, 2.6 lb), waist circumference (1.57 cm), and fat mass (1.2 kg, 2.6 lb) than resistance training.[15] However, combined aerobic and resistance training was even better, with significantly more weight loss (2.0 kg, 4.4 lb) and fat mass reduction (1.9 kg, 4.2 lb).[15]

In summary, aerobic and combined aerobic-resistance training appear to be more effective for weight management in obese people than resistance training alone.

ADDITIONAL BENEFITS OF EXERCISE

Increasing regular physical activity through structured exercise has the additional benefits of improving physical fitness, flexibility, mobility, and cardiovascular health.[16,17]

Even before patients lose a significant amount of weight (eg, 10%), low-intensity exercise such as walking 30 to 60 minutes most days of the week will rapidly improve cardiorespiratory fitness and have positive effects on cardiovascular risk factors such as hypertension, elevated blood glucose, and dyslipidemia.[18,19] Aerobic exercise and resistance training also reduce chronic inflammation, which is a strong indicator of future disease, especially in obese patients who have high levels of inflammatory biomarkers.[20,21]

Even if he or she does not lose much weight, an obese exercising person with good cardiorespiratory fitness has lower cardiovascular risk than a person who is not obese but is poorly conditioned.[22]

Exercise lowers blood pressure

Overactivity of the sympathetic nervous system is thought to account for over 50% of all cases of hypertension.[23] Obesity in concert with diabetes is characterized by sympathetic overactivity and progressive loss of cardiac parasympathetic activity.[24] Cardiac autonomic neuropathy is an underestimated risk factor for the increased cardiovascular morbidity and mortality associated with obesity and diabetes, and physical exercise may promote restoration of cardioprotective autonomic modulation in the heart.[24]

Several studies have shown that aerobic endurance exercise lowers blood pressure in patients with hypertension, and reduction in sympathetic neural activity has been reported as one of the main mechanisms explaining this effect.[23] Another mechanism is endothelium-mediated vasodilation: even a single exercise session may increase the bioavailability of nitric oxide and decrease postexercise blood pressure.[25]

Different types of exercise have been shown to have different effects on blood pressure.

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Aerobic training has been shown to reduce systolic blood pressure by 5.2 to 11.0 mm Hg and diastolic blood pressure by 3.0 to 7.7 mm Hg.[26]

The hypotensive effect of endurance aerobic training is probably mediated at least in part by a reduction in systemic vascular resistance through decreased activity of the sympathetic and renin-angiotensin systems and through improved insulin sensitivity.[26] Other factors that may be involved include improved endothelium-dependent vasodilation, enhanced baroreceptor sensitivity, and arterial compliance.[26]

Dynamic resistance exercise has less of an effect than aerobic exercise, but it has been shown to reduce systolic blood pressure by 0.5 to 4.8 mm Hg and diastolic blood pressure by 0.5 to 4.1 mm Hg.[26]

In a meta-analysis of studies of resistance training lasting more than 1 month in healthy adults age 18 and older, the authors noted that resistance training induced a significant blood pressure reduction in 28 normotensive or prehypertensive study groups (–3.9/–3.9 mm Hg), whereas the reduction was not significant for the five hypertensive study groups.[27]

Isometric resistance exercise has been associated with small cardiovascular benefits, but has been shown to reduce systolic blood pressure by 10.5 to 16.5 mm Hg and diastolic blood pressure by 0.62 to 16.4 mm Hg.[26]

Exercise improves type 2 diabetes

Regular physical activity improves glycemic control and can prevent or delay the onset of type 2 diabetes mellitus.[28] Furthermore, physical activity positively affects lipid levels, lowers blood pressure, reduces the rate of cardiovascular events, and restores quality of life in patients with type 2 diabetes.[24,29]

A meta-analysis of the effect of supervised exercise in adults with type 2 diabetes found that structured exercise achieved the following:

- Lowered systolic blood pressure by 2.42 mm Hg (95% confidence interval 0.45–4.39)
- Lowered diastolic blood pressure by 2.23 mm Hg (1.25–3.21)
- Raised the level of high-density lipoprotein cholesterol by 0.04 mmol/L (0.02–0.07)
- Lowered the level of low-density lipoprotein cholesterol by 0.16 mmol/L (0.01–0.30).[30]

The metabolic stress from physical exercise can increase oxidation of carbohydrates during exercise, increase postexercise consumption of oxygen (which can increase the rate of fat oxidation during recovery periods after exercise), improve glucose tolerance and insulin sensitivity, and reduce glycemia for 2 to 72 hours depending on the intensity and duration of the exercise.[25]

Exercise lowers the Framingham risk score

Exercise improves several of the risk factors for coronary artery disease used in calculating the Framingham risk score—ie, systolic blood pressure, total cholesterol, and high-density lipoprotein cholesterol—and thus can significantly lower this number. (It is important to remember that the Framingham score is a surrogate end point of cardiovascular risk that may correlate with a real clinical end point but does not necessarily have a guaranteed relationship.)

In a study of a 12-week exercise program in middle-aged women (ages 40–55), treadmill running for 30 minutes a day 3 days a week significantly reduced 10-year cardiovascular risk scores: 10-year risk 2.2% vs 4.3% in the nonexercising group.[31] Others have also shown that enhanced levels of fitness are associated with lower 10-year Framingham risk estimates.[32]

A study of 31 healthy sedentary adults ages 50 to 65 who were randomized to an unsupervised but pedometer-monitored home-based walking program of 30 minutes of brisk walking 5 days a week noted significant reductions in systolic and diastolic blood pressure and stroke risk, and increased functional capacity in the walking group at 12 weeks.[33] Thus, the Framingham risk scores were significantly lower in the exercising group than in with the control group.[33]

Given that overweight and obese patients who are starting to exercise may find jogging or running daunting, it should also be noted that three brisk 10-minute walks a day are at least as effective as one continuous 30-minute walk in reducing cardiovascular risk in previously sedentary people.[34]

Fit, obese people have lower cardiovascular risk than unfit normal-weight people

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SETTING 'SMART' GOALS

Because obese adults typically do not comply well with prescriptions for exercise, it is important to educate them about its benefits and to provide tools such as perceived exertion scales so they can monitor their exercise, document their performance, and chart their progress; smartphone apps can also be helpful.[35] Supervised exercise may improve compliance and results.[36] Initially, personal trainers are excellent for starting a habit change, but they are expensive. Virtual trainers are now available and cost far less.[37]

People do not become obese overnight. They gain weight over a long time. Likewise, weight reduction takes time if done in a sustainable and healthy manner. Thus, SMART goals—**s**pecific, **m**easurable, **a**ttainable, **r**ealistic, **t**imely—should be set to sustain the self-discipline required.

EXERCISE RECOMMENDATIONS

Any exercise program should target 30 to 60 minutes of effort per day, most days of the week, ie, 150 to 300 minutes per week or more.[38] But beginners should start low and go slow to avoid dropout, musculoskeletal strain, and joint injury.

Aerobic training lowers systolic blood pressure by 5.2 to 11.0 mm Hg and diastolic blood pressure by 3.0 to 7.7 mm Hg

The American College of Sports Medicine (ACSM)[38,39] recommends combining aerobic and progressive resistance exercise as the core components of an exercise program. The aerobic component can include anaerobic high-intensity interval training (see discussion below). In addition, we recommend flexibility and balance exercises for obese patients.[40]

Combining aerobic and resistance exercises likely results in greater decreases in abdominal adiposity in the obese.[41] In addition, the aerobic portion of a combined exercise regimen can improve functional capacity, and the resistance portion may prevent injury by strengthening the muscles, bones, and joint support systems.[42] Adding exercises that promote flexibility and balance helps with range of motion and prevents injuries while exercising.[43] These exercises not only expend calories during the exercise itself, but also increase resting energy expenditure for the remainder of the day, as the effects of the raised metabolism persist for hours.[44]

Aerobic exercise is the foundation

Aerobic exercises that involve large muscle groups, especially walking, should be the foundation of cardiopulmonary exercise for obese persons.[45] Many patients can tolerate weight-bearing exercises such as walking or bike riding, but for some, exercises with limited or no weight-bearing such as swimming or aqua-aerobics are better.[46]

Tips for prescribing. Patients should exercise:

- On 5 or 6 days each week
- At low to moderate intensity (30%–60% of maximum oxygen consumption [Vo_2 max])
- For at least 150 minutes per week, with a long-term goal of 300 minutes per week
- By walking, riding a stationary bicycle, or swimming.[38,47]

To mobilize and use free fatty acids as an energy source, lower-intensity longer-duration aerobic exercise is preferred.[5] Thus, frequent, low-intensity or moderate-intensity training (30%–60% of Vo_2 max) of longer duration (at least 60 minutes) may be the best approach to losing body fat in obese persons.[5,48] Early on in the exercise program, keep the intensity low, as high-intensity training will preferentially use stored glycogen or carbohydrate as an energy substrate rather than free fatty acids or fat.[5]

With light-moderate exercise, the heart rate will increase and patients will perspire, but they still should be able to carry on a conversation.

Measure (or have patients measure) the heart rate using the radial artery in their wrist after 6 minutes of walking. A pulse of 100 beats per minute or more is associated with an exercise intensity of approximately 50% (or more) of Vo_2 max.[5]

A study of 136 obese men and women who exercised for 6 months found that those doing aerobic exercise only and those doing a combination of aerobic and resistance exercise had greater cardiopulmonary fitness, greater reductions in abdominal and visceral fat, and more improved insulin sensitivity than those doing resistance exercise only.[41] Although the aerobic-only group lost more weight (6 lb) than the aerobic-plus-resistance group (5.1 lb) and the resistance-only group (1.4 lb), combining aerobic and resistance exercise is considered optimal.

All physical activity is beneficial, but activities that have less impact on the joints are less likely to cause injuries and joint pain.

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Aerobic activities that are especially useful in obese adults include walking at a speed of at least 2.5 miles per hour, bicycling, jogging, treadmill walking, swimming, aqua-aerobics, rowing, and low-impact aerobics classes.

Walking is the easiest way for most people to start their program, as it is safe, accessible, and relatively cheap with respect to equipment.[35] Adding a simple pedometer or smartphone app to measure the amount of exercise, together with physician counseling, may improve compliance and thus weight loss.[49,50]

Obese patients may have been inactive for quite a while. Therefore, the sessions should be short and low-intensity at first, then steadily progress.[51] To minimize dropout, avoid hard exercise too soon for people with a low exercise capacity or high body mass index at baseline, and give positive feedback and encouragement at each visit.[52]

It is reasonable to introduce other aerobic exercises to vary the routine, use other muscle groups, and reduce the chance of injury from overuse of one muscle or joint group. Then, as cardiorespiratory fitness improves, the patient will be more confident about trying activities that are more challenging, such as jogging and aerobics classes. An aerobic exercise program consisting only of swimming is less efficacious for weight loss in this population.[53]

High-intensity interval training

High-intensity interval training involves relatively brief bursts of vigorous exercise separated by periods of recovery and is a time-efficient, novel alternative to continuous exercise.[54] The exercise component is anaerobic, meaning muscle movement that does not require oxygen. Anaerobic exercise uses fast-twitch muscle fibers, and thus helps that musculature to become stronger, larger, and more toned. Evidence suggests that high-intensity interval training induces health-enhancing adaptations similar to those of continuous exercise, despite a substantially lower time commitment.[41]

The ACSM recommends that most adults engage in moderate-intensity cardiorespiratory exercise training for at least 30 minutes a day on at least 5 days a week for a total of at least 150 minutes per week, or high-intensity cardiorespiratory exercise training for at least 20 minutes a day on at least 3 days a week for a goal of 75 minutes a week.[38] Thus, high-intensity interval training may be attractive for obese patients because it entails a shorter time commitment to achieve similar weight loss and improved insulin sensitivity than low-intensity or moderate-intensity continuous exercise.

High-intensity exercise has been shown to be effective for obese patients if they can do it.[54–56] In one study,[57] 134 obese patients, mean age 53, underwent supervised high-intensity interval training with resistance training two or three times a week, were encouraged to perform one or two additional exercise sessions a week (unsupervised), and were counseled to follow a Mediterranean diet. At 9 months, investigators noted a significant reduction in body mass, waist circumference, and fat mass.

A study of 12 weeks of high-intensity interval training, moderate-intensity interval training, or no exercise in 34 obese adolescent girls noted that body mass and percentage body fat were significantly decreased with both interval training regimens. However, the high-intensity group had greater reductions in waist circumference and more significant improvements in blood lipid levels, adiponectin levels, and insulin sensitivity.[58]

Of 62 overweight and obese patients (mean age 53.3, mean body mass index 35.8 kg/m^2), 97% adhered to a program of high-intensity interval training over 9 months, which resulted in an average weekly energy expenditure of 1,582 kcal.[55] Clinically and statistically significant improvements occurred in body mass (–5.3 kg), body mass index (–1.9 kg/m^2), and waist circumference (–5.8 cm) ($P < .0001$ for all variables). Total fat mass, trunk fat mass, and lipid levels also significantly improved ($P < .0001$), and the prevalence of metabolic syndrome was reduced by 32.5% ($P < .05$).

In a meta-analysis of the effect of exercise on overweight adults, training of moderate or high intensity was noted to have the highest potential to reduce visceral adipose tissue in overweight men and women.[13] Another meta-analysis noted that high-intensity interval training appeared to promote more improvement in fitness and similar improvements in some cardiometabolic risk factors than moderate exercise performed for at least 8 to 12 weeks in overweight patients.[56]

Three brisk 10-minute walks a day are at least as effective as one continuous 30-minute walk

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TABLE 1

Typical aerobic exercise program for obese adults

Week	Frequency	Exercise[a]	Duration
1–2	5 days per week[b]	Walking or stationary bicycle	10 minutes per day total
3–4	5 days per week	Walking or stationary bicycle	20 minutes per day total[c]
5–6	5 days per week	Walking or stationary bicycle	30 minutes per day total[c]
7–8	5 days per week	Walking or stationary bicycle	40 minutes per day total[c]
9–10	5 days per week	Walking or stationary bicycle	50 minutes per day total[c]
> 10	5 days per week	Walking or stationary bicycle	60 minutes per day total[c]

[a] Continuous exercise of low to moderate intensity; if the patient prefers high-intensity interval training and can do this effectively, the duration can be halved. Other aerobic exercises that can be performed include low-impact aerobics, seated aerobics, water aerobics, swimming, treadmill, slow jogging, elliptical stepping, recumbent cycling, and seated stepping.
[b] Preferably on days not doing resistance exercises.
[c] Can be done in 10-minute increments.

A typical progressive exercise program for obese adults is shown in **Table 1**.

Progressive resistance exercise

'SMART' goals: specific, measurable, attainable, realistic, timely

Progressive resistance exercises are generally easier for obese patients, as they are not aerobically challenging, allow patients to exercise around physically active people who thus motivate them, and encourage positive feelings about completing their exercise sets.[59] The result is improved muscular fitness, socialization, and increased confidence in their abilities (self-efficacy).[59]

Progressive resistance exercises also promote favorable energy balance and reduced visceral fat deposition through enhanced basal metabolism and activity levels while counteracting age- and disease-related muscle wasting.[59] They have been shown to improve cognitive ability, self-esteem, movement control, muscle mass, strength, glucose control, insulin sensitivity, resting blood pressure, lipid profile, and bone mineral density and to reduce fat weight, low back pain, arthritic discomfort, insomnia, anxiety, and depression.[60]

Gym neophytes should spend a few sessions with a personal trainer to learn how to use the equipment.

While the primary goal of resistance training is more muscle strength, it can reduce fat and weight, burning up to 170 kcal in a 20-minute intense exercise session.[61] It reduces both total body fat and visceral adipose tissue, thus benefiting obese persons by reducing insulin resistance.[62] All exercise, and especially resistance exercise, can help to strengthen the musculoskeletal system, reduce muscle atrophy, and improve bone mineral density.[63]

The ACSM guidelines[38] recommend progressive resistance exercise on 2 or 3 nonconsecutive days a week. It should involve:

- Exercises that work 8 to 10 muscle groups per session
- Two to four sets of 8 to 12 repetitions for each muscle group.

Exercising on nonconsecutive days allows time for the complete cycle of muscle tissue remodeling.[64] Such self-regulated intensity reduces the likelihood of excessive delayed-onset muscle soreness, which can discourage new participants.[65]

To prevent muscle injury, obese people should begin with low-intensity workouts using lower resistance, one set of 8 to 12 repetitions 2 days a week. Then, they should gradually but progressively increase the intensity, volume, and frequency of the training.[47] This will obviate a plateau in training and will maximize musculoskeletal adaptation. The prescription should include exercises for the upper body (eg, biceps curls), lower body (eg, leg presses), and the midsection (eg, abdomi-

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TABLE 2

Typical resistance exercise program for obese adults

Week	Frequency	Muscle groups	Sets and repetitions
1–2	1 day per week	10	1 set of 12 repetitions
3–4	2 days per week [a]	10	1 set of 12 repetitions
5–8	2 days per week	10	2 sets of 12 repetitions
9–12	2 days per week	10	3 sets of 12 repetitions
> 12	2 days per week	10	4 sets of 12 repetitions

[a] Done 3 days apart, preferably on days when aerobic exercises are not being done.

nal curl-ups, which give better abdominal muscle engagement and less risk to the back than crunches) and focus on the correct exercise form and function rather than the amount of resistance or weight lifted.

A typical progressive resistance exercise program for obese adults is shown in **Table 2**.

Flexibility exercise

Flexibility exercise involves stretching to improve the movement of muscles, joints, and ligaments.[45] While not specifically used in an energy-expenditure strategy, flexibility (or mobility) exercises help to increase or maintain joint range of motion and can reduce muscle and joint pain associated with obesity and exercise.[66]

The ACSM recommends that stretching exercises be done when the muscles are warm after a brief warm-up or exercise session.[38] Typically, muscles should be stretched for at least 15 seconds, and stretching is recommended at a frequency of 2 to 4 days per week.[38]

A good way to incorporate flexibility exercise is to join a yoga class, as yoga has been shown to improve strength and flexibility and may help control physiologic variables such as blood pressure, lipids, respiration, heart rate, and metabolic rate to improve overall exercise capacity in obese patients.[67]

Balance exercise

Balance exercises help obese patients improve their stability. Poor balance is associated with injuries, accidents, and falls during activities of daily living.[68]

Balance, the ability to maintain the body's center of gravity within its base of support, can be categorized as static (sustaining the body in static equilibrium or within its base of support) or dynamic (maintaining equilibrium during a transition from a dynamic to a static state), which is more challenging.[69] Doing both static and dynamic balance training maximizes balance and stability.[69] While most activities that involve moving the body or body parts (such as walking) will improve balance, some additional balance exercises can be beneficial.

Exercise targets: 30 to 60 minutes a day, most days of the week

Balance exercises can be done without any equipment. Examples are balancing on one foot for 15 seconds and standing up and sitting down without using the hands. However, specific equipment can help, including physioballs, stability balls, cut-in-half stability balls, balance discs, balance wedges, wobble boards, rocker boards, and Indo boards.[70] In fact, balance boards and stability balls engage more muscle fibers in other areas of the body (lower back, lower abs, quads, hamstrings, and calves) than exercises done without those balancing devices.[71]

Balance training for at least 10 minutes a day, 3 days a week, for 4 weeks that incorporates various methods of balance training appears to improve balance.[56] Obese patients commencing a program should start with static balance exercises and then progress to dynamic ones. In addition, as balance training progresses, obese patients can integrate balance and stability training exercises with other pieces of equipment, such as performing squats on a balance board, and then gradually add weights

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TABLE 3

A comprehensive weekly exercise program for obese adults

Day of week	Type of exercise			
Monday	Aerobic [a]			Balance
Tuesday	Aerobic		Flexibility	
Wednesday		Resistance		Balance
Thursday	Aerobic			
Friday	Aerobic		Flexibility	
Saturday		Resistance		Balance
Sunday	Aerobic			

[a] Continuous exercise of low to moderate intensity; if the patient prefers high-intensity interval training (anaerobic) and can do this effectively, that is a suitable substitute.

(eg, dumbbells) to the exercise.

An example of a weekly comprehensive exercise program for an obese patient that incorporates all major exercise types is provided in **Table 3**. In addition, some smartphone apps that are especially helpful in overweight newcomers to exercise include Couch-to-5K, GymGoal 2, Moves, Fitbit, Workout Trainer, Endomondo, MapMyFitness, Fitocracy, and Fitness Buddy.

Don't make the exercise too hard too soon, and always give positive feedback and encouragement

BARIATRIC SURGERY AND LIFESTYLE MANAGEMENT FOR OBESITY

Bariatric surgery is a safe and effective treatment for severe obesity and comorbidities including type 2 diabetes mellitus, but weight loss and health outcomes vary considerably among individuals.[72,73] Of importance, postoperative weight loss after bariatric surgery and long-term weight loss largely depend on the extent to which patients can make and sustain changes to their lifestyle, including diet, exercise, and behavior modification.[72,74]

Exercise, especially supervised, is associated with more weight loss after bariatric surgery.[61] In a meta-analysis of bariatric patients, exercise participants involved in moderate or greater levels of exercise lost a mean of 3.6 kg more than the minimal exercise groups.[75] Another meta-analysis noted the beneficial effects of exercise incorporating more than 30 minutes a day of moderate physical activity following bariatric surgery and was associated with a greater weight loss of over 4% of body mass index.[76] These findings were consistent with those of yet another meta-analysis.[77]

In summary, exercise appears to significantly increase weight loss after bariatric surgery.

TREATMENT CONSIDERATIONS IN MORBID OBESITY

Challenges faced by severely obese or morbidly obese patients affect their exercise options. The types of exercise they are able to perform are limited in most cases to very-low-impact, low-intensity exercises, which may not be as efficient in weight loss or weight maintenance.[48] Therefore, it may be prudent to set more conservative weight-loss goals for them, especially early in the program. Compliance and success rates may be better with low-impact activities such as walking, water aerobics, stationary cycling, and resistance training in the severely obese population.

The more severe the obesity, the more comorbidities such as diabetes, hypertension, hyperlipidemia, arthritis, sleep apnea, gastroesophageal reflux disease, and the greater the risk of metabolic syndrome—and conversely, the greater the potential benefit from bariatric surgery followed by exercise.[74]

A LONG-TERM ENDEAVOR

For obese patients, a comprehensive exercise program will improve functional status, favorably influence cardiovascular risk factors, and help with weight loss or weight maintenance.

Managing obesity is a long-term endeavor.[78] For it to succeed, both the patient and the physician need to keep up their efforts. To keep the patient from becoming discouraged, the clinician should focus not just on weight, but also on improvements in metabolic profile and cardiorespiratory fitness. In addition, a careful evaluation, a clear exercise prescription, defined goals, ongoing monitoring (by the patient and the provider), frequent feedback, and charting of progress will improve daily performance and the chance of long-term success.

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