Exercise Prescription for Treatment of Obesity

By

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Exercise Prescription for Treatment of Obesity

Abstract

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The disease of obesity is a disorder characterized by excessive accumulation of body fat defined as a body mass index (BMI, WT in KG/ Height in M$^2$) greater than 30. Secondary pathologies associated with obesity include sleep apnea, diabetes and heart disease. Researchers estimate the incidence of obesity to be 17% of the population in the United States and rising. The etiology of obesity stems from the continued daily accumulation of excess calories over a period of time. The primary treatments for this condition are exercise and calorie restriction. Exercise is underutilized and not well understood by health care providers. Proper exercise prescription implementation is essential in the effective treatment of obesity.
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Introduction

Unlike a variety of illnesses treated in our health care community, obesity is difficult to address or treat effectively. This article addresses issues related to identifying those at risk for developing obesity and appropriate exercise treatment guidelines using the theoretical framework of stages of change to facilitate treatment.

Stages of Change framework aids providers in understanding how and why people change lifestyle behaviors in helping to promote active changes in behavior towards a healthier lifestyle. Prochaska & DiClemente developed the framework in 1981, and it is formally identified as a trans-theoretical model dealing with Stages of Change (Prochaska, Norcross & DiClemente, 1994). Its relevance stems from the need to understand how the individuals’ readiness to implement life style changes will impact how the provider approaches treatment of the individual’s obesity. Eventual treatment and potential correction of obesity is primarily through life style modifications and maintenance of those modifications. The stages of change model consists of five stages

1. Pre-contemplation – Individuals not intending to change their current behavior.
2. Contemplation – Individuals considering changing their current behavior.
3. Preparation – Individuals making small changes in current behavior in preparation for a larger life style modification.
5. Maintenance – Individuals sustaining the changes in their current behavior over a period of time.
These stages progress in a cyclical pattern, starting at a point and progressing through the levels in a predictable manner. Progression through the stages is based on an individual's preparedness for change of current health behaviors. The practitioner must recognize that different individuals will present at varying stages of change. The patient will progress predictably through all stages. At any point relapse may occur to a previous stage, thus requiring the patient to progress through the stages again.

Scope of the Problem

Obesity is the most common nutritional disorder in the developed world and is associated with significant metabolic diseases (Campfield, 1999). The percentage of overweight individuals (BMI greater than 25) in the United States (US) is estimated to be 59.4% of men and 50.7% of women, a total of 97.1 million people (Kuczmarski, Carroll, Flegal & Troiano, 1997, Must et al., 1999). Mokdad et al., (1999) found that obesity has increased in prevalence from 12.0% to 17.9%, an overall increase of 5.9% from 1991-1998.

The high prevalence of obesity results in an associated cost, estimated to be 190 billion dollars every year (Bray, 2000). This cost of obesity is not only a direct result of its pathology, but also a result of secondary pathologies that develop with increased weight. Complications of obesity that can be attributable to the metabolic changes associated with obesity include diabetes mellitus, gallbladder disease, hypertension, cardiovascular disease and some forms of cancer (Bray, 2000). Obesity makes people at risk for a number of diseases that are among the leading causes of death in the US. In 1999, 32,500 deaths were attributed to obesity in those individuals or patients with a body mass index (BMI) of greater than or equal to 30 kg/m². Decreased quality of life
associated with osteoarthritis, sleep apnea, and the mental difficulties (i.e. depression and poor self esteem) associated with increased BMI complicate the underlying issue of obesity (Bray, 2000). These secondary pathologies are highly debilitating and largely preventable or modifiable with proper weight reduction and control.

Exercise prescription can help correct underlying behaviors that lead to the development of obesity. The rate of physician counseling about exercise is low (29-35%) nationally and may represent important missed opportunities for primary prevention (Nawaz, Adams & Katz, 1999; Wee, McCarthy, Davis & Philips, 1999). Only 5-25% of the American population exercises regularly or vigorously enough to produce cardiovascular fitness and known epidemiological benefits (Tiffany, 2001).

Changing the current status of the obesity epidemic is further complicated by the large percentage of the population in the pre-contemplation stage. Obese patients are less open to the facts and gravity of the situation and its implications on their health. At any given time approximately 20% of the population is in the preparation or action stage (Prochaska, Norcross & Diclemente, 1994).

Definition & Pathophysiology of Obesity

Overweight is defined as a BMI above 25 kg/m² and obesity is defined as a BMI of 30 kg/m² of body fat (World Health Organization, 1997). Obesity is an insidious process presenting painlessly over a period of months to years. A variety of contributing pathologies (see table1) include neuro-endocrine, Cushing’s syndrome, hypothyroidism, polycystic ovary syndrome, growth hormone deficiency, pregnancy, drug induced, smoking cessation, sedentary lifestyle, nighttime eating syndrome, binge eating disorders, and progressive hyperphagic obesity (Bray, 2000). Though these pathologies may result
in the development of obesity, the incidence of these diseases as the primary cause fails to explain the incidence of obesity seen in our society.

The primary pathology behind the development of excess weight is related to a state of energy excess. Obesity results from an imbalance between the energy value of the food individual’s eat and daily energy expenditure (Bray, 2000; Campfield, 1999; Chisholm et al., 1998; Weinsier, Hunter, Heini, Goran & Sell, 1998). In its simplest form, the development of this condition results from accumulation of more energy than is expended in a day. This excess energy then accumulates in the form of adipose tissue. The development and maintenance of obesity can be considered to result from the integration, or the accumulation, of small daily errors in energy balance over several months and years (Campfield, 1999). Individuals that consume more energy than they expend, put themselves at increased risk for the development of obesity. Individuals developing obesity from this common cause tend to be in the pre-contemplation stage.

Genetics play what is believed to be a small, but unquantified role in the development of obesity. The most commonly accepted model for the role of genetics in human obesity is an interaction between genetic predisposition and environmental factors (Bray, 2000; Campfield, 1999; Chisholm et al., 1998, Weinsier et al., 1998). Though there has not been a gene identified that explains the large percentage of the population that is obese, genetics can make people prone to the development of obesity. A family history of obesity correlates with the development of obesity throughout an individual’s lifetime. Despite some slight increase in the susceptibility to the development of obesity, the primary factor in developing obesity is environmental. Genes permit individuals to
become obese; the environment determines if people become obese (Weinsier et al., 1998).

Epidemiology

Throughout the last part of the late 1800’s and through the early 1970’s there was a fairly stable level of obesity generally representing about 12% of the United States population (Mokdad et al., 1999). Obesity has traditionally been more prevalent among the less educated, lower socioeconomic class, and the elderly. Prevalence among the upper economic classes, educated and young has risen (Campfield, 1999). The prevalence of obese individuals increased from 12% (traditional until the last half of the twentieth century) to an incidence of nearly 20%, occurring from birth to 70 years of age (Seidell & Flegal, 1997).

Reasons for this significant increase are multi-factorial. Modern societies have developed a variety of machines that have resulted in energy conservation, ie. tractors, trailers and cars. New developments in society have created a culture more sedentary than any other culture in the history of the United States. As society continues to develop, a further tendency towards energy conservation versus expenditure, the scope of the problem will continue to become more widespread and important.

Along with the changing technology of modern society and its impact on the current epidemic of obesity, cumulative changes have occurred in diets. These changes have resulted in a current diet high in saturated fat and high calories. “Many of us live in a world with a large and increasing variety of highly palatable food, together with declining incentives and opportunities for physical activity” (Campfield, 1999 pg. 14). These factors have created a world in which the amount of physical activity and energy
expenditure have decreased to an all time low, in which the number of calories being consumed have increased to an all time high (Campfield, 1999). The epidemiology of obesity is dependent upon the technology, recreation and dietary aspects of a particular society.

Clinical Findings

An individual may not be aware of the onset of obesity. Excess adipose tissue generally accumulates over an extended period of time. The change to the individual may seem more the norm than the unusual. Overweight or obese people often remain asymptomatic in the early to mid stages of obesity, with the only complaint of a cosmetic nature.

Another difficult aspect of the presentation of being overweight or obese is the person’s perception that obesity simply is a normal part of aging or of particular life situations, such as pregnancy. Strategies for the early identification of the clinical presentation of obesity include routine monitoring of weight, calculation of BMI and measurement of waist circumference at the time of an office visit. (See Table 3) Routine monitoring offsets the insidiousness of obesity. Routine screening will lead to a well-informed provider and patient. This screening may additionally help motivate the patient by facilitating self-awareness of bodily changes and recognition of the current state of change. Such awareness can promote and facilitate progression in the stages of change. This initial step of making an individual aware of their obesity will allow the provider to promote self-change (or the progression from one stage of change to another) and begin the process of empowering them to make a change. If a patient is unaware of a need for change, they will never attempt to initiate change to correct the underlying lifestyle
behavior causing the problem. Obesity often becomes an issue for the provider or the patient in the later stages when both are forced to deal with the effects of uncorrected obesity. The most prevalent complaints come as a result of secondary pathologies such as osteoarthritis, diabetes, and CAD. Obesity is easy to recognize, but difficult to treat.

Obesity Screening Criteria & Diagnostic Tools

The most clinically appropriate diagnostic plan offers both prevention and treatment. “The treatment of the overweight or obese patient consists of a two step process: assessment and treatment/management. Assessment requires determination of the degree of overweight and overall risk status. Management includes both reducing excess body weight and instituting other measures to control accompanying risk factors” (Expert Panel, 1998 pg 1).

The only way to reveal weight changes and progression towards obesity is regular assessment of weight, height, and waist circumference. Body Mass Index (derived from the weight and height assessment) indicates individuals with a relatively high body fat percentage that puts them at risk for obesity and related diseases. The BMI has a sensitivity of 95% and specificity of 100% for obesity. BMI is a general population measure and may not be applicable to small sub-groups of the population such as the avid weight lifter (who should be easily identified by exam and history). BMI does not measure the difference between lean body mass and fat mass and may inaccurately indicate someone as being obese who is not in this subgroup, due to the high level of lean body mass in relation to their height and predicted weight. Lean body mass is then misinterpreted as fat mass by the BMI calculation and then becomes an inaccurate
measurement of body fat percentage (Kushner & Weinsier, 2000). For the general population, the BMI is an accurate measurement of body fat percentage.

Monitoring waist circumference (WC) helps ensure that possible outliers are encompassed in this diagnostic approach. Lean, Han, & Seidell 1998, found that people with excess abdominal fat accumulation have a three fold increase in the incidence of low back pain, decreased physical functioning, type 2 diabetes and cardiovascular disease. Men with a waist circumference greater than 102 cm (42.5 in) are at greatest risk. Women have a 2.7 increase in the same associated disease factors with a waist circumference greater than 88 cm (36.5 in). Waist circumference has sensitivity and specificity both greater than 95% for those at risk for obesity related risk factors (Han et al., 1996; Lean, Han & Morrison, 1995). Abdominal fat accumulation is a predisposing factor for disease pathologies associated with being overweight or obese. By combining BMI with WC, the number of at risk people not being accurately screened should represent a relatively small and easily identifiable percentage of the population.

Making the patient aware of the presence or possible impending development of obesity and its adverse affects on their health helps the patient become more aware of the state of their body. Such self-awareness possibly helps patient’s progress from their current stage of change to the next level.

Everyone who comes to the office for a visit should routinely receive height, weight and waist circumference measurement every visit. Routine collection of this data provides a simple efficient process to calculate BMI in conjunction with use of waist circumference, to identify those at risk.

Pertinent History Data
Once at-risk individuals have been identified, the practitioner should obtain some basic history and laboratory data. The history is important to ascertaining a person’s current condition and capability to participate in treatment regime (See figure 1 & table 2 regarding the history questions). Obtaining a list of the current medications and their possible effects in the development of weight gain helps practitioners further refine the treatment program.

Information about the life style a person leads provides important data to control the development and maintenance of obesity. An individual’s experience with obesity helps determine the likelihood of complying with therapy and previous treatments for their condition. Eating habits are a major factor in the development and treatment of obesity. Determining physical conditions that limit activity can help the provider evaluate their contribution to the development of obesity and to make appropriate alterations in the treatment regime. Response to previous weight loss attempts aid in identifying what variables a person will respond to in treatment. Physical activity levels should be assessed to determine how difficult it might be to motivate an individual to exercise.

Motivation and readiness to deal with obesity will impact a person’s willingness to complete a treatment program. Understanding an individual’s information will also be important in helping an individual progress through the stages of change. A provider must be able to understand what behaviors are keeping the patient in the current stage of change, and by doing so may educate the patient and empower them to make changes and progress through the stages of change. Family history information is important to ascertain the presence of cardiac risk factors and diabetes. Lastly, review of systems is
important in the identification of possible associated pathologies and to differentiate the origin of a person's obesity, i.e., hypothyroidism vs. lifestyle.

Diagnostic Testing

A fasting lipid profile should be obtained to determine cardiac risk factors. A fasting glucose test should be obtained to assess for the presence of diabetes, a cardiac risk factor often associated with obesity. An ECG should be done to assess proper functioning of the cardiovascular system for evaluation of existing pathology that might hamper treatment. The American College of Sports Medicine recommends that men over 40 years of age, women over the age of 50, people with two or more cardiovascular risk factors, or people with known cardiac disease should complete an exercise stress test, before the initiation of vigorous exercise (Kligman, Wewitt, & Crowell, 1999).

Diagnostic Algorithm

The diagnostic algorithm starts with routine monitoring integrated into every office visit (See Figure 1-4). The process should begin with the attainment of a person's weight, height and waist circumference. Once those measures are obtained the next step is to calculate BMI using the following formula: weight in kilograms divided by height in meters squared or by a standard BMI chart. Following the calculation of BMI, the next step is to determine obesity-associated pathologies and potential complicating risk factors. Associated pathologies include CAD, diabetes mellitus, osteoarthritis, sleep apnea, HTN, smoking, hyperlipidemia, personal history of obesity, stroke, gallstones, gout, malignancies (uterine, colon, breast, prostate), and men age 40 or women 50 and older (Kern, 1997). Additional laboratory data should be obtained by the index of suspicion related to history and physical exam (Kushner & Weinsier, 2000). Once the
appropriate information has been gathered the provider can assess the need for intervention.

Individuals with a BMI 19-24.9 (normal weight as indicated by WHO, 1997), waist circumference less than 102 cm for men/ less than 88 cm for women with or without any cardiovascular risk factors do not need intervention (Berke, & Morden, 2000; Despres, Lemieux & Prud’Homme, 2001; Expert Panel, 1998; Han, van Leer, Seidell, & Lean 1995, Han, van Leer, Siedell, & Lean, 1996; Hazra, 1999; Liemeux, Prud’Homme, Bouchard, Tremblay, & Despres 1996; Kern, 1997). However, patients should be monitored on a regular basis equivalent to the scheduled physical intervals.

Individuals with a BMI 19-24.9, waist circumference greater than 102 cm for men or 88 cm for women, with or without two risk factors require treatment (Berke, & Morden, 2000; Despres, Lemieux & Prud’Homme, 2001; Expert Panel, 1998; Han, van Leer, Seidell, & Lean 1995, Han, van Leer, Siedell, & Lean, 1996; Hazra, 1999; Liemeux, Prud’Homme, Bouchard, Tremblay, & Despres, 1996; Kern, 1997). Follow-up visits should be scheduled at six-month intervals to monitor progress. Treatment should begin with education on the importance of treatment, the benefits of treatment, and the process to expect. The provider and the patient should develop mutual goals in the attainment of proper weight, such as a waist circumference below the risk indicator. The patient should then begin diet and exercise therapy. An exercise stress test should be obtained before the initiation of exercise therapy in men older than 40, women over the age of 50, those with known cardiac disease and individuals with two or more risk factors to ensure adequate cardiac functioning (ACSM, 1998).
Patients who have a BMI 25-29.9 (WHO, 1997) pursue a different course of treatment. Those with a BMI of 25-29.9 and a waist circumference greater or less than 102 cm for men and 88 cm for women, with or without two risk factors need a physical exam to assess their conditioning for the initiation of exercise and diet therapy (Expert Panel, 1998; Kern, 1997). An exercise stress test should be obtained for those over age 40 for men, over age 50 for women and those with known disease or two or more cardiac risk factors (ACSM, 1998). Those who have a WC greater than 102 cm for men/99 cm for women should be rechecked in six months to a year for individuals without any cardiac risk factors. Those with two or more risk factors should be seen again in three to six months. While those with a WC below the indicated treatment level and no cardiac risk factors may be rechecked in one year and those with two or more risk factors should be rechecked in six months.

BMI greater than 30 (WHO, 1997), regardless of risk factors should receive a physical exam and exercise stress test. The practitioner should pay attention to physical capabilities, i.e., gait, respiratory status and cardiovascular status. Obese patients with a BMI greater than 30 need to start diet and exercise therapy with follow up on a regular basis, starting at every two weeks, then every four to six weeks (Expert Panel, 1998; Kern, 1997). Severely physically compromised patients should be seen every three weeks.

After assessing the need to intervene, the practitioner must properly educate the individual to help them progress through the stages of change. An individual advised for the first time of the need for intervention, may need a period of time and reinforcement of the need for intervention before entering a stage of Preparation or Action. The eventual
goal of self-change is to help the individual achieve a maintenance stage, where the largest and most significant progression of change in their obesity will be made.

Helping an individual through the stages of change is a process of education, empowerment, and follow up. First an individual must understand the negative impact of this condition and what are the possible life long implications to them. Once a person has a basic and firm understanding of the scope of the problem they must be empowered to make a change and assisted in their self-change. This will involve encouragement and reassurance that a change can be made that will improve their obesity. They must understand that they are the only ones that are capable of making this change. Lastly, it will be important to follow up repeatedly to empower the patient and help them progress through the stages of change and promote weight reduction.

The goal attainment and maintenance step follows the initiation of medical management of those who are overweight or obese. Progress should be monitored to assess for goal attainment. Once goal attainment is reached, a maintenance program should be initiated to ensure long-term stability at the proper weight (Agrawal, Worzniak & Diamond, 2000).

Treatment

The treatment plan should include approaches with the same basic premise, the reduction of an individual’s fat accumulation. Any appropriate weight loss program should include diet modification, lifestyle modification, and exercise. Additions to the base plan may include medications or surgery, but these additions offer limited application to the larger populace and therefore will not be addressed. Obesity is a long-term disease requiring continuous therapy over months to years (Agrawal et al., 2000).
Exercise Prescription

Exercise is an integral part of an individual’s weight loss program and perhaps the part of the treatment that is the least implemented and understood. Appropriate exercise is of vital importance in rectifying an individual’s obesity. The National Health Interview Survey, as well as other current studies, confirms the rate of physician counseling about exercise at 29-35%. These low rates may represent important missed opportunities for primary prevention (Nawaz et al., 1999; Wee et al., 1999). Exercise prescriptions help individuals advance through the stages of change if the prescription is appropriate to the current assessed stage of change.

The fundamental objective of an exercise prescription is to create a change in personal health behaviors to include regular physical activity (Petrie, Mathews & Howard, 1996). As with any prescription, the treatment is prescribed at a specific dose intended to produce an intended response (Speed & Shapiro, 2000).

Exercise will positively impact weight loss, muscle tone and secondary pathologies associated with being overweight or obese American College of Sports Medicine (ACSM, 1998). Aerobic exercise improves cardio-respiratory fitness by roughly 8% (Donnelly, Jacobsen, Heelan, Seip & Smith, 2000; Utter, Nieman, Shannonhouse, Butterworth & Nieman, 1998). Aerobic exercise has also been shown to decrease body fat, increase fat free mass (muscle), decrease abdominal fat mass, prevent the abnormal accumulation of fat, and allow individuals to maintain an appropriate weight (Donnelly et al., 2000; Kyle et al., 2001; Ross et al., 2000). Exercise improves lipid profiles by reducing LDL and increasing HDL levels (Donnelly et al., 2000; Kodis et al., 2001). Exercise plays a large role in treatment and control of blood pressure.
Those who do not participate in exercise having a 2.6 times greater chance of having elevated blood pressure (Liu et al., 2001). Exercise has a significant impact on improving depression, reducing stress and overall mood (Dimeo, Bauer, Varahram, Proset & Halter, 2001; Salmon, 2001). Exercise improves insulin’s effect and has a beneficial impact on diabetes (Donnelly et al., 2000; Ryan, 2000). Evidence also suggests that exercise decreases the incidence of gastrointestinal cancer by roughly 50% and may have beneficial effects on other gastrointestinal disorders (Peters, De Vries, Vanberge-Heregouwen, & Akkermans, 2001). Exercise maintains immune function over a period of time, while lack of exercise results in a declined immune response (Paw et al., 2000). Finally exercise improves functional capacity in daily life (Chin et al., 2001; McMurdo & Rennie, 1993).

A few basic principles guide exercise and help the patient to obtain its maximum benefits. Integrating sound principles will allow a provider to better utilize an exercise prescription and a patient to understand how to appropriately utilize an exercise program in the action and maintenance stages of self-efficacy (Petrie, Mathews & Howard, 1997).

The overload principle involves the idea that the body will physically adapt to stress. Overload of a particular body system past its threshold will force the body to adapt to new physiologic stress. Overload stress causes the body’s tissues during the recovery period between exercise sessions to repair and restore the tissue to an over compensated state. This principle explains the physiological progression a person observes from increased stressors in their exercise program.

The specificity principle refers to the body’s tendency and ability to adapt according to the specific nature of the training activity. Therefore, the adaptations
occur to the metabolic and physiologic systems of the specific muscles and tissues exercised.

The individual differences principle refers to the differences in individuals differing genotype. Variations in the adaptations can be expected from a given exercise depending on an individual's particular genetic makeup.

The reversibility principle indicates that the benefits of exercise are lost when overload stops. The rate of decline may vary, but decline is inevitable when the physiologic stressors required to get an individual to a particular level of fitness are removed that individual will lose the benefits that had been obtained.

The progression principle is a further adaptation of the overload principle. Since the body adapts to stressors that are applied over a period of time, to continue to make improvements in fitness, the stressors need to increase over a period of time (Petrie, Mathews & Howard, 1997).

Exercise prescription is designed to guide individuals to improve their level of physical fitness in a safe manner, as they exercise to achieve the desired effect. The goal behind an exercise prescription is to achieve physical fitness, described by the ACSM as the ability to perform moderate to vigorous levels of physical activity without undue fatigue and the capability of maintaining such ability throughout life (ACSM, 1990; Lewis & Lynch, 1993). An exercise prescription improves a number of measurable categories that allow an individual to achieve the ACSM definition of physical fitness. The measurable categories include cardio-respiratory endurance, muscular strength, flexibility, muscular endurance, and body composition.
The provider should specify the mode, frequency, duration, and intensity of an exercise prescription to ensure proper understanding and maximal benefit (Petrie, Mathews, & Howard, 1996). The guidelines present a framework with which the health care provider may individualize treatment to meet a patient’s needs (McConnell, 1996). An exercise prescription is dependent on the specific disease state, as well as age, medication and psychosocial factors (Speed & Shapiro, 2000). A dose response to exercise derives benefits through varying quantities of physical activity ranging from approximately 700 – 2000 plus kilocalories of effort per week (Fletcher, Balady & Blair, 1996; Lee, Chung-Cheng & Paffenbarger, 1995; Surgeon General, 1996). Each session of exercise should include a warm up period, exercise period and cool down period. The aerobic training portion of the program is generally the largest component due to the fact that it has the largest ability to improve disease states, modify risk factors, and body composition (Lampman, 1997).

For cardio-respiratory fitness in healthy adults, aerobic training 3-5 days per week for 20 – 60 minutes a day is recommended. The exercise program can be carried out in ten-minute bouts, accumulated throughout the day (Pollock et al, 1997). The desired intensity of the exercise should range from 55 – 65 % of the heart rate max (HRmax). Wenger & Bell (1986) found that training fewer than 2 days per week generally does not result in a meaningful increase in VO2 max (a measure of oxygen consumption used to evaluate an individual’s cardio-respiratory status). Training for more than five days per week shows only minimal improvement in VO2 max over the recommended 3-5 days, while increasing the incidence of injury disproportionately (Blair, Hohl, & Goodyear, 1987; Hickson, Foster, Pollock, Galassi & Rich, 1985; Hickson, Kanakis, Davis, Moore,
& Rich 1982; Hickson & Rosenkoetter, 1981). There are significant benefits in exercise accumulated over a day to achieve the recommended time specified (ACSM, 1998). Duration of training is based upon reasonable daily accomplishments by the average American, with a minimal duration for benefit and a variable range based upon the time available each day (ACSM, 1998).

Intensity of exercise should be adjusted to the individual’s desired effect (related to the dose effect of exercise). For those who desire to improve health, but not necessarily achieve a high level of physical fitness, the lower end of the intensity may be used. A HRmax of 55% (HRmax is equal to 220 minus the age of the individual) resulted in measurable and significant impact in fitness/health (Crews & Roberts, 1976; Kavanagh & Shephard, 1990; Sharkey, 1970). Individuals seeking benefits of greater impact on their health and physical functioning can exercise at 65% of HRmax. HRmax above 65% was not shown to have any further significant improvement in VO\textsubscript{2} max past that intensity (Wenger & Bell, 1986). HRmax is appropriate in healthy individuals without cardiac disease or cardiac modifying drugs. The use of exercise prescription by heart rate is not an appropriate modality for patients on cardiac medications that alter the heart rate response to exercise eg., digoxin and beta blockers (Lampman, 1997). Referring these individuals for graded exercise testing to determine an appropriate heart rate training zone offers the most time efficient and effective process.

Aerobic exercise should involve a sustained dosage of rhythmic actions of large muscle groups varied by intensity duration and frequency (Speed & Shapiro, 2000). Varying aerobic activity ensures a well-balanced development of muscles and ensures maintenance of a participant’s interest in sustaining the behavior.
While aerobic exercise is the largest component of a well-balanced exercise program muscular resistance training is also important. Muscular resistance training in exercise prescription is largely aimed at the improvement in an individual's physical function, muscular strength and endurance (Fiatarone et al., 1990; Gettman, Ward & Hagman, 1982). Tolerance to weight bearing activities may be significantly improved by first improving muscle strength, joint stability and balance. Thus increased tolerance will improve an individual's ability to implement aerobic activity requiring at least a functional level (Mazzeo & Cavanagh, 1998). Muscular resistance training can build muscular strength or endurance depending on the number of sets prescribed and the number repetitions within those sets. Muscular strength is best developed by using heavier weights with few repetitions, and muscular endurance is best developed by using lighter weights with a greater number of repetitions (Borer, 1995). For a well-balanced program an individual should perform 8 – 10 upper and lower body exercises 2-3 days a week with sets of 1 containing 8-12 repetitions (Pollock, 1998). Performing more than one set does not result in significant improvement over the benefits achieved from performing one set (Feigenbaum & Pollock, 1997). Sessions should be kept under sixty minutes per session, because sessions of greater time frame are associated with higher drop out rates (Pollock, 1988). The patient may find working with a trainer in a local gym helpful.

Stretching will help to prevent injuries, improve joint function/range of motion and enhance muscular performance (Raab, Agre, McAdam & Smith, 1988; Worrell, Smith & Winegardner, 1994). The ACSM (1998) recommends that static stretches be held for 10-30 seconds, with at-least four repetitions per muscle group, 2-3 days per
week. Holding stretches for the recommended duration at the point of mild discomfort enhances flexibility, without significantly greater benefit from longer durations (Bandy & Irion, 1994; Taylor, Dalton, Seaber & Garrett, 1990). More than four repetitions of stretching showed minimal gains in subsequent range of motion (Taylor et al., 1990).

An exercise prescription program should be modified according to a person's ability, previous experience, educational level and stage of change. For example, an individual unable to walk due to severe osteoarthritis of the knee, will be unable to run, walk or probably ride a bike, but the individual may be able to swim or row.

Summary

Weight loss and the maintenance of weight loss demand a long-term commitment (Agrawal et al., 2000). Exercise provides the primary means of achieving the necessary weight loss. A person can change and maintain their weight at an appropriate level by achieving a level of maintenance, or a state in which they can keep themselves at a healthy weight. Self-change is important in understanding how an individual will progress through the process of lifestyle modifications necessary to achieve risk factor reduction, weight loss and a healthy lifestyle. Once a treatment program is initiated and maintained, people can overcome this medical condition (Agrawal et al., 2000).

It is important to remember that stages of change will guide the treatment program the provider implement. The exercise prescription the provider implement can only be as aggressive as the stage of change that the patient is in. As the patient progress through the stages of change the complexity of your treatment program and the ambitiousness of the goals progress. Lastly, it is essential to remember that success in the fight against obesity is a function of the individual's willingness to intervene and
participate in treatment (self-change) and it is the provider’s obligation to help empower them to do so.
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<td>Cushing's Disease</td>
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Table 2 History Key Questions for Differential Diagnosis

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<tr>
<td>Sedentary Life Style</td>
<td>Evident in the history with respect to activities that reveal energy expenditure.</td>
</tr>
<tr>
<td>Diet</td>
<td>Diet high in caloric intake and low in energy expenditure. A 72-hour diet history may be helpful.</td>
</tr>
<tr>
<td>Night Time Eating Syndrome</td>
<td>Revealed by a history of large amounts of caloric consumption in the nocturnal hours.</td>
</tr>
<tr>
<td>Binge Eating Disorders</td>
<td>Revealed with times of large energy consumption for discrete periods of time. Then it is often associated with purging of ingested calories.</td>
</tr>
<tr>
<td>Progressive Hyperphagic Eating</td>
<td>Associated with larger and larger consumption of calories over a period of time, leading to an extreme excess of energy consumption.</td>
</tr>
<tr>
<td>Drug Induced</td>
<td>Associated with the use of drugs that cause weight gain. Drugs such as steroids and contraceptives are prime candidates.</td>
</tr>
<tr>
<td>Polycystic Ovary Syndrome</td>
<td>Often associated with infertility, obesity, type 2 diabetes and hirsutism. Should be identified in the history.</td>
</tr>
</tbody>
</table>

Source: Bray, 2000
Table 3 Clinical Findings

<table>
<thead>
<tr>
<th>Body Mass Index</th>
<th>Waist Circumference</th>
</tr>
</thead>
<tbody>
<tr>
<td>-a general population measure</td>
<td>-indicates those at risk for obesity related risk factors regardless of BMI</td>
</tr>
<tr>
<td>-95% specific</td>
<td>-955 sensitive</td>
</tr>
<tr>
<td>-100 specific</td>
<td>-95 specific</td>
</tr>
</tbody>
</table>

Source: Han et al., 1996; Lean, Han & Morrison, 1995
Figure 1. Objective & Subjective Data for Diagnosing & Treating Obesity

- **Wt Measurement**
- **Ht Measurement**
- **Calculate BMI**
  - Sensitivity 98%
  - Specificity 100%
- **Measure Waist Circumference**
  - Sensitivity > 95%
  - Specificity > 95%
- **History Key Questions**
  - Medications
  - Social History
  - Family History
  - Previous Experience With Obesity
  - History of Weight Loss
  - Eating Habits
  - Physical Conditions Limiting Activity
  - Response To Previous Weight Loss Attempts
  - Physical Activity Patterns
  - Motivation & Readiness
  - Review of Systems
- **DETERMINE DISEASE RELATED RISK FACTORS**
CAD
DIABETES MELITUS
SLEEP APNEA
HTN
SMOKING
HYPERLIPIDEMIA
AGE > 45 MEN > 65
WOMEN
OSTEOARTHRITIS
HISTORY OF
OBESITY

Laboratory Data

Fasting Lipid Profile
Fasting Blood Glucose
EKG

Additional laboratory data determined by index of suspicion. Exercise stress test should be obtained in those older than 40 for men, 50 for women, with 2 or more risk factors, or known cardiac disease.

Figure 2. Treatment for BMI 19-24.9

<table>
<thead>
<tr>
<th>BMI 19-24.9 WC &lt;102 cm M &lt;88 cm W W/out or less than 2 risk factors</th>
<th>BMI 19-24.9 WC &lt;102 cm M &lt;88 cm W W/2 or more risk factors</th>
<th>BMI 19-24.9 WC &gt;102 cm M &gt;88 cm W W/out any risk factors</th>
<th>BMI 19-24.9 WC &gt;102 cm M &gt;88 cm W W/2 or more risk factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
</tr>
<tr>
<td>No Therapy Indicated Monitor Yearly</td>
<td>No Therapy Indicated Monitor Yearly</td>
<td>Complete PE Indicated</td>
<td>Complete PE Indicated &amp; Exercise Stress Test</td>
</tr>
<tr>
<td>↓</td>
<td>↓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determine Goals of Therapy</td>
<td>Determine Goals of Therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>↓</td>
<td>↓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diet &amp; Exercise Therapy Indicated Monitor Every Six Months</td>
<td>Diet &amp; Exercise Therapy Indicated Monitor Every Six Months</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sources: Berke & Borden, 2000; Expert Panel on the Identification, Evaluation, and Treatment of Overweight in Adults, 1998; Han et. al., 1995; Han et. al., 1996; Kern, 1997; Lean et. al., 1995; Lemieux et. al., 1996
Figure 3 Treatment of BMI 25-29.9

| BMI 25-29.9  | BMI 25-29.9  | BMI 25-29.9  | BMI 25-29.9  |
| WC < 102 cm M | WC < 102 cm M | WC > 102 cm M | WC > 102 cm M |
| < 88 cm W   | < 88 cm W   | > 88 cm W   | > 88 cm W   |
| W/out or < 2 Risk Factors | W/out or < 2 Risk Factors | W/2 or more Risk Factors | W/2 or more Risk Factors |

↓ ↓ ↓ ↓

| Complete PE | Complete PE | Complete PE | Complete PE |
| Indicated for all groups | Indicated for all groups | Indicated for all groups | Indicated for all groups |
|  | & Exercise Stress Test |  | & Exercise Stress Test |

↓ ↓ ↓ ↓

| Determine Goals of Therapy | Determine Goals of Therapy | Determine Goals of Therapy | Determine Goals of Therapy |

↓ ↓ ↓ ↓

| Diet & Exercise Therapy Indicated As Modified by PE Monitor Yearly | Diet & Exercise Therapy Indicated As Modified by PE Monitor Every Six Months | Diet & Exercise Therapy Indicated As Modified by PE Monitor Every Six Months | Diet & Exercise Therapy Indicated As Modified by PE Monitor Every Three Months |

Sources: Berke & Borden, 2000; Expert Panel on the Identification, Evaluation, and Treatment of Overweight in Adults, 1998; Han et. al., 1995; Han et. al., 1996; Kern, 1997; Lean et. al., 1995; Lemieux et. al., 1996
Figure 4 Treatment of BMI > 30

BMI > 30
Regardless of WC
Or
Risk Factors

↓

Complete PE
Indicated
&
Exercise Stress Test

↓

Determine Goals of
Therapy

↓

Diet & Exercise
Therapy Indicated
As
Modified by PE
Monitor Every
Six Weeks

Sources: Berke & Borden, 2000; Expert Panel on the Identification, Evaluation, and Treatment of Overweight in Adults, 1998; Han et. al., 1995; Han et. al., 1996; Kern, 1997; Lean et. al., 1995; Lemieux et. al., 1996
References


