

The Obesity Epidemic and Weight Loss Treatment Strategies

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## **Abstract**

Obesity has become an epidemic in the United States, our population has become accustomed to overeating, often eating foods that are high in fat and cholesterol. Americans not only have forgotten about what and how much portion sizes are, but Americans are physically inactive too. When combining the lack of activity and nutrition, an obese individual may face serious health concerns such as cardiovascular disease (CVD), type two diabetes (T2DM), hypertension, cancer and even death in some cases. One of the biggest issues the obese population faces is that keeping the weight off for long periods of time is extremely difficult. Lifestyle modifications are a popular method individuals use to combat obesity. Lifestyle modifications target diet and physical activity but they also include behavior therapy. Due to the rate in which obesity has spread throughout the United States, other models such as Multiple Behavior Change have become increasingly popular. Research done on Multiple Behavior Change suggests that when participants combine diet and exercise the likelihood of weight loss is much greater. To make an impact on the obesity epidemic, effective multiple behavior interventions must focus on physical activity, diet, and sedentary behaviors. This is especially important for our youth because active children often become active adults. Therefore, intervening early is necessary for them to establish active lifestyles they will hold onto for a lifetime.

## **Introduction**

### **1. Definition and statistics**

Obesity has reached epidemic levels in the United States, affecting the lives of millions of Americans. Obesity has become a public health concern for all children, adolescents, and adults because of its severe impact on psychological health, cardiovascular health, and overall physical health (Sanyaolu et al., 2019). The CDC reported that in the years 2017-2018, the age adjusted prevalence of obesity in adults was 42.4%. They also found that the prevalence of severe obesity was the highest among adults that age spanned from 40 to 59. The rate of obesity and severe obesity increased from 30.5% to 42.4% during the time span of 1999-2000 to 2017-2018 (*Products - Data Briefs - Number 360 - February 2020*, 2020). Obesity has become prevalent in the United States because our society has become accustomed to overeating, often eating foods that are high in fat and cholesterol, and they have forgotten about what and how much portion sizes are. But Americans are also physically inactive too. The CDC has reported that about 31 million adults aged 50 or older are inactive, meaning they get no physical activity beyond that of daily living. Therefore, our society has become accustomed to living very sedentary lives, spent sitting, reclining, or laying down too often. Their lack of activity and increase in sedentary behaviors increases the risk of becoming obese sometime in their life. Becoming obese can contribute to additional concerns and health implications such as heart disease, type 2 diabetes, and cancer (*Lack of Physical Activity | CDC*, 2019).

The American Medical Association has declared obesity as a chronic medical disease, in hopes that its declaration would have far more positive than negative consequences. By declaring obesity, a disease, the medical association hoped they would be able solicit more resources into

prevention, treatment, and research. They also hoped that it would help to reduce the stigma and discrimination that has affected many obese persons (Campbell-Scherer & Sharma, 2017).

Obesity has been defined by the CDC based on Adult Body Mass Index or BMI. Body Mass Index (BMI) is calculated by dividing a person's weight in kilograms by the square of their height in meters. A high BMI score can be an indicator of high body fatness. The BMI chart is divided into 4 categories. The first is if your BMI is less than 18.5, falling within the underweight range. The second is BMI ranging from 18.5 to 24.9, which states that your BMI is normal. The third range is 25.0-29.9, this range deems someone into the overweight category. The final category is if your BMI is 30.0 or higher, classifying someone as obese. From these categories obesity is often subdivided into 3 categories. Class one obesity is a BMI of 30-34.9, class two obesity is a BMI of 35-39.9, and class three obesity is a BMI of 40 or higher. A class three obesity categorization is often termed as "extreme" or "severe" obesity. BMI is a great screening tool for obesity that takes little to no time to calculate, but it should not be used as a diagnostic tool. BMI does not measure body fat directly. A more direct measure of body fatness and/or obesity can be obtained through direct tests such as skinfold thickness measurements, bioelectrical impedance, underwater weighing, or dual-energy x-ray absorptiometry (DXA). It is important for anyone concerned about obesity to seek out assistance from a healthcare provider. They will be able to evaluate an individual's health status and risks more accurately than a BMI reading or other direct test (Defining Adult Overweight and Obesity | Overweight & Obesity | CDC, 2020).

## **2. Excess caloric consumption**

When it comes to food intake, individuals often become obese because of the relationships they have with food. Food intake becomes a problem when individuals are

sedentary and/or are consuming more calories than they are burning. Eating an excessive amount of calories can be a significant cause of obesity and weight gain. It is very common to see food craving tendencies in obese individuals. These tendencies are characterized by a strong motivation or desire to consume a particular food(s). There is also evidence to show that food cravings are strongly associated with calorie consumption. In a cross-sectional study of 646 adults, Chao et al. (2014) reported that reducing or negating food cravings has a significant positive relation between food and BMI (Chao et al., 2014). Relationships between food cravings, energy intake, and BMI, with experimental evidence suggest that restricting calories is directly related to decreased food cravings and weight loss (Anton et al., 2012; Martin et al., 2011). It is very important for obese individuals to achieve a negative energy balance to lose weight. To achieve a negative energy balance, it is common to see a diet that restricts high calories foods because it will help decrease the abundant food cravings obese individuals face (Buscemi et al., 2017).

### **3. Physical activity**

Another major cause of obesity is lack of physical activity. As years have passed, physical activity levels have dramatically decreased. Most people do not engage in the recommended levels of physical activity. Adolescents have also experienced a significant decrease in physical activity levels. There is less access to physical activity, less physical education in schools, and more time spent on sedentary behaviors such as watching television, surfing the internet, or playing video games. As technology has advanced, there are now more efficient ways to do things, like turning on the television with a remote versus getting up and turning on the television or using an automatic garage door opener instead of getting out of the car and walking to the garage keypad, typing in the code, and opening it. The never-ending

advances in technology often lead Americans to living less active lives as well as decreasing their number of calories expended throughout the day. Individuals who lead inactive lives have a higher chance of becoming obese, it is very important to meet physical activity recommendations in order to avoid obesity or reverse the process (Wright SM & Aronne LJ, 2012).

#### **4. Combination of low levels of physical activity and increased caloric intake**

Obesity can be caused by more than one factor; the most common combination of factors are an increased caloric intake and a decreased energy expenditure or lack of physical activity. The food or “built” environment we live in has shifted in ways that promote overeating and an overconsumption of calories. When we enter a grocery store or restaurant, it is common to see that highly caloric and fat-laden foods are affordable and easily accessible. Think about the number of fast-food restaurants that are accessible to you in your area. Eating from these restaurants will become a problem when an individual is constantly choosing these restaurants whether it be due to cost or convenience. Weight gain will occur because these foods are highly processed, often being cooked in unhealthy fats, and because the foods are high in sugar, fat, and sodium, they will have a higher caloric value. Not only are fast food items high in calories but they do not follow portion sizes, which will also increase an individual’s daily caloric intake. When it comes to grocery shopping, processed foods that’re high in sugar, fat, and sodium, are highly accessible and continue to become more prevalent as time goes on. The majority of the products in our grocery stores are non-perishable, highly processed, and pre-packaged. Companies have heavily marketed these foods not only to adults but to children too. They are convenient, easy to prepare, and inexpensive. They are consumed heavily by society due to the fast-paced lives Americans live. An individual will run into weight gain problems and potentially become obese when they participate in these behaviors as well as being inactive. Americans live

very sedentary lives and when you combine this with unhealthy relationships with food the chance of becoming obese dramatically increases (Wright SM & Aronne LJ, 2012).

## **Childhood Obesity**

Childhood obesity has become increasingly popular, researchers say that it has reached epidemic levels here in The United States. Obesity in childhood has a significant impact on both physical and psychological health. When children face obesity at a very early age it is extremely likely for them to remain obese during adulthood. The chances they develop non-communicable diseases like diabetes and cardiovascular disease dramatically increase too. Researchers suggest that childhood obesity is often caused by an excessive sugar intake by consuming soft drinks, increased portion sizes, and a steady decline in physical activity. Obesity is not just caused by your typical increase in calories and fat intake. In children, obesity can significantly impact a child's physical health, social, and emotional well-being, and self-esteem. Research also suggests that obesity in early childhood can affect academic performance negatively and lower a child's quality of life (*Childhood Obesity: Causes and Consequences*, n.d.).

### **1. Childhood obesity definition**

Like obesity in adulthood, childhood obesity is defined as an excess of body fat. In classifying obesity in children and adolescents there is no cut-off point for excessive fatness. Flodmark CE et al., defined overweight being between at or above the 85<sup>th</sup> percentile and below the 95<sup>th</sup> percentile. These researchers defined overweight as at or above the 95<sup>th</sup> percentile. It is widely known that obesity results from an imbalance between energy intake and expenditure. Davison et al., in their ecological model suggest that child risk factors for obesity include dietary intake, physical activity, and sedentary behavior. Genetics have also been one of the biggest

factors examined, some studies have found that BMI is 25-40% heritable. This factor does not dramatically increase the rates of childhood obesity, but genetics does play a role in the development of obesity (*Childhood Obesity: Causes and Consequences*, n.d.).

## **2. Influences on eating and activity behaviors**

Family characteristics, such as parents planning and lifestyles, environmental factors, such as school policies, demographics, and parents' work-related demands all play a role in influencing their children's eating and activity behaviors. Parental factors contribute to the poor diets of many of our youth, children model their parents and their peers' preferences. Their food intake and willingness to try new foods are also influenced by their parents' and peers'. Having availability of, and repeated exposure to healthy foods is essential to developing preferences, but also to overcome the dislike of foods. Studies have shown that eating out or watching TV while eating is associated with a higher intake of fat. Parental feeding style has also been discussed by researchers. They've concluded that authoritative feeding or determining what foods are offered, allowing the child to choose, and providing rationale for healthy options is associated with positive cognitions about healthy foods and a healthier intake of such foods. Children who rebel against their parents often feel there is an authoritarian restriction of 'junk-food'. This is associated with an increased desire for unhealthy food and higher weight in children. Furthermore, it is important to implement authoritative feeding tactics that're discussed above (*Childhood Obesity: Causes and Consequences*, n.d.).

## **3. Fast food consumption**

Fast-food consumption has also been linked with obesity, many families have two parents working outside of the home and they opt for these places because they're convenient,

inexpensive, and favored by their children. This becomes an issue because the food served at fast-food restaurants contain a high number of calories and they lack nutritional value. Sugary beverages have also been examined, these drinks are not limited to soda, they include juice and other sweetened beverages. These beverages are known to be less filling than food and they can be consumed faster. Which in turn increases a child's caloric intake. Now, many children that play sports are also consuming energy or sports drinks like Gatorade and Powerade. Most of these drinks are high in calories because of the amount of sugar they contain. In a 12 fluid oz bottle of Gatorade, there are 34 grams of sugar, which means a child is consuming 6.8 teaspoons of sugar every time they drink one Gatorade. This becomes a problem when children drink these types of drinks regularly throughout the day. Parents should focus on buying their children sugar-free options, Gatorade and Powerade for example now sell sugar-free options that have either no calories or have very few calories compared to the traditional kinds. Parents can also encourage their children to consume drinks such as water, milk, or milk alternatives like almond milk. These drinks will keep a child full longer and give them nutritional benefits (*Childhood Obesity: Causes and Consequences*, n.d.).

#### **4. Sedentary behaviors**

In recent years, children have become increasingly sedentary, they spend more time watching TV or playing video games than they do in physical activity. Research indicates that the number of hours children spend watching TV is related to the consumption of the most advertised goods. Such as, sweetened cereals, sweets, sweetened beverages, and salty snacks. The effects of advertising should not be underestimated, they greatly influence our youth and the food they want to consume. Environmental factors also contribute to childhood obesity. Environmental factors have reduced opportunities for children to be physically active. In the

past, many children walked or rode their bikes to school, but in recent years this has decreased dramatically. Another environmental factor that reduces children's odds of being physically active is the neighborhood they live in. Parents who have children who live in unsafe neighborhoods drive their children to school because they fear unsafe walking routes and child predators. In conclusion, children who live in unsafe areas or who do not have access to safe, well-lit walking routes have fewer opportunities to be physically active. Which makes these children more likely to become obese (*Childhood Obesity: Causes and Consequences*, n.d.).

### **Prevalence of Obesity in the United States**

Obesity has become prevalent in The United States due to the amount of time Americans spend in sedentary behaviors. Being increasingly sedentary has been associated with lower levels of physical activity energy expenditure, increased risk of weight gain, and increased risk of metabolic syndrome, diabetes, and heart disease. Sedentary behaviors have been defined as “a range of human endeavors that result in an energy expenditure of no more than 1.5 times’ resting energy expenditure.” Sedentary behaviors are often associated with time spent lying down, sitting, or reclining during the waking hours of a day. A study found that the participants that wore a monitor to track activity and movement spent 54.0% or 7.7 hours a day, in sedentary behaviors during waking hours of the day. Therefore, time spent in activities that require low levels of energy expenditure (sedentary behaviors) have been linked with obesity. These behaviors are linked with weight gain, which is the initial step to becoming obese. Once these behaviors continue over long periods of time, people who are obese could face serious medical implications, such as metabolic syndrome or diabetes (Matthews et al., 2008).

Once a person becomes obese it is extremely difficult for them to initially lose weight and to keep it off for a long period of time. Typically, obesity interventions result in early rapid weight loss and are followed by a weight plateau and progressive weight regain. Long-term weight loss management is extremely difficult due to the interactions between our biology, behavior, and the obesogenic environment. “The rise in obesity prevalence over the past several decades has been mirrored by the industrialization of the food system involving increased production and marketing of inexpensive highly-processed foods with supernormal appetitive properties.” Most of the calories consumed by Americans are ultra-processed, and their overconsumption has been a major causative factor in weight gain. These ultra-processed foods are calorically dense and far less healthy than unprocessed foods such as fruits and vegetables. These foods have become progressively cheaper so fewer people prepare meals at home. More meals, that are calorie-dense, are consumed at restaurants, ordered out, or bought already prepared because of their convenience and low expense. In addition, there has been a change in the physical activity environment, making it more difficult to be physically active throughout the day. Nowadays, occupations are more sedentary than they ever have been. More people drive to work or school than in the past where it was common to walk to work or school if it was close enough. When you combine the changes in food and physical activity environments, individuals tend to increase their food or calorie intake and decrease their activity. This ultimately results in weight gain and proves to be a challenge for the obese population who are looking to lose weight and maintain this over the long term. This is why it is extremely common to see initial weight loss but not long-term weight loss (Hall & Kahan, 2018).

Long-term weight loss is often not achieved due to poor adherence to the prescribed lifestyle changes such as a reduction in caloric intake and an increase in physical activity levels.

The lack of adherence will further stigmatize the obese patient as lacking willpower, motivation, or the fortitude to lose weight. With a decreased sense of willpower, the chances they will maintain the weight loss process over a long period of time dramatically decreases. In addition, it is also common to see a stall in the weight loss process which is often described as a “plateau”. The weight-loss plateau is described as early rapid weight loss that stalls after several months and is then followed by progressive weight regain (Hall & Kahan, 2018). During the first couple weeks of losing weight, a rapid drop in weight is normal to see. When someone cuts calories, the body responds initially by releasing stores of glycogen. Glycogen is a type of carbohydrate that is found in the liver and muscle and is mainly water when it is burned for energy, resulting in water loss as well as weight loss that is primarily water. This effect is unfortunately temporary. When shedding excess adipose tissue through a caloric deficit, it is common to lose muscle too. The muscle loss causes one’s metabolism to slow, resulting in fewer calories burned at rest compared to pre-weight loss metabolism before. Once an individual’s metabolism slows down, so will weight loss. Therefore, when the calories you burn equal the calories you eat you reach this plateau as described above (*Weight Loss Stalled?*, n.d.). As the obese population progressively loses more and more weight, they fight an increasingly difficult battle against the biological responses that oppose further weight loss. One explanation for the weight loss plateau is the change in appetite. Appetite changes slow down a person’s metabolism because the feedback circuit that controls long-term calorie intake has a greater overall strength than the feedback circuit controlling calorie expenditure. As they lose more and more weight their calorie expenditure decreases whereas appetite increases above the baseline level prior to weight loss, making it extremely difficult to avoid weight regain. Long-term behavioral changes are required for obesity management and weight loss. Short-term interventions are unlikely to yield

continuous positive outcomes without persisting intervention and support. In order to lose the weight long term, it is essential that one include long-term comprehensive weight loss management programs that continue for at least a year. It would be helpful for the obese population to include behavioral strategies too. Weight management behavioral strategies include frequent self-monitoring and self-weighing, reduced calorie intake, smaller and more frequent meals or snacks throughout the day, increased physical activity, consistently eating breakfast, more frequent at-home meals, reduced screen time, and the use of portion controlled meals or meal substitutes (Hall & Kahan, 2018).

### **Health Impacts of Obesity**

The obesity epidemic has become increasingly concerning not only in the United States but globally. In 2015, obesity was estimated to be the cause of death for more than 3.4 million people. Being or becoming obese will have physical health impacts, including cancers (breast, endometrial, ovarian, colorectal, esophageal, kidney, pancreatic, prostate), type 2 diabetes, hypertension, stroke, coronary artery disease, congestive heart failure, asthma, chronic back pain, osteoarthritis, pulmonary embolism, gallbladder disease, and an increased risk of disability. All of these physical health impacts of obesity contribute to the more than three million deaths worldwide annually. In industrialized countries, it is estimated that disabilities due to obesity-related cardiovascular diseases will increase, under an increasing trend. In addition, researchers believe that disability due to obesity-related type 2 diabetes and obesity-related morbidity and disability will also significantly increase. “Studies have confirmed that obesity is a major health problem which results in decreased life expectancy especially in younger age groups.” BMI calculations are a strong predictor of overall mortality. Not only does obesity cause chronic medical problems but it also impairs a person’s health-related quality of life. In addition, it

increased the health care and medication obese patients will need skyrocket health care costs (Djalalinia et al., 2015).

### **1. Cardiovascular disease**

Another major physical health implication that has been linked with obesity is cardiovascular disease (CVD). Cardiovascular disease is prevalent in subjects that receive little to no physical activity. Being physically active reduces CVD risk factors. In addition, as little as 75 minutes a week of light physical activity could reduce cardiovascular risk by almost 14% (Barnes, 2012). Prescribing physical activity to prevent CVD mortality is an effective solution. Engaging in light, moderate, or vigorous physical activity is associated with a decrease in risk of CVD mortality. In addition, CVD risk could potentially be decreased by 30% depending on the amount and type of physical activity done. Therefore, regardless of someone's metabolic profile there is a significance importance in participating in physical activity of any intensity to reduce the risk of CVD (Reddigan et al., 2011).

### **2. Mental Health Implications**

Obesity not only has physical health implications, but it also has mental health implications. Scientific evidence states that obesity can lead to being increasingly at risk for having low self-esteem, mood disorder, motivational disorders, eating problems, impaired body image, and interpersonal communication problems. All of which can directly or indirectly affect one's quality of life (Djalalinia et al., 2015). Obesity has been linked directly with depression and has been observed in clinical and epidemiological studies. In one clinic sample researchers found that 34% of the women seeking obesity treatment had major depressive disorder or MDD. This is concerning for the obese population because researchers suggest that "depressed

individuals tend to fair worse in weight loss interventions than their non-depressed counterparts, perhaps because their depression remains untreated and presents a barrier to behavior change.” Researchers believe that behavioral activation may be a solution for obese individuals that suffer from depression. Behavioral activation would increase one’s activity, decrease avoidance behaviors, and change maladaptive coping strategies. All of these strategies would help to not only decrease depression but also increase weight loss (Schneider et al., 2008).

## **Lifestyle Modifications**

When it comes to reversing the process of obesity some have found lifestyle modifications to be effective. Experts from the World Health Organization and the National Institutes of Health have recommended that obese adults take on lifestyle modifications as their number one option for achieving weight loss. Lifestyle modifications have also been referred to as behavioral weight control. These modifications have three main components: diet, exercise, and behavior therapy. Lifestyle modification programs usually provide weekly treatment sessions that are designed to modify eating and activity habits (Wadden et al., 2012).

### **1. First component- diet**

The first component of lifestyle modifications is diet, trials have used four well known diets: low-carbohydrate, low-fat, Mediterranean, and low-glycemic load regimes. Low-carbohydrate approaches, like the Atkins diet, prescribe low-carbohydrate intake and are typically high in protein and fat. It is believed that consuming more protein is associated with better satiety, thus, potentially improving energy restriction. Low-fat prescriptions, like the Ornish diet, have been recommend by the American Heart Association. These diets provide 10-20% of calories from fat and they also recommend plant-based foods including grains, fruits, and

vegetables. This prescription yields a low-energy-density-diet which also may improve satiety because of the large volume of food that can be consumed. A Mediterranean diet is almost the opposite, this diet encourages a higher intake of unsaturated fats. Such as olive oil, nuts, and fish, instead of saturated fats like red meat and butter. They also encourage prescribers to consume fruits, vegetables, and whole grains. Finally, low-glycemic prescriptions are diets that are based on the principle that foods with lower glycemic loads have a more favorable effect on blood sugar (Wadden et al., 2012).

Numerous trials have examined low-carbohydrate diets versus low-fat diets. Two studies found that participants that took part in a low-carbohydrate diet lost significantly more weight after 6 months than those who were prescribed to a low-calorie, low-fat diet. Researchers believe that the data collected from these trials suggests that low-carbohydrate diets produce larger short-term weight losses than low fat diets. Researchers believe this is due to a greater calorie deficit through the near elimination of carbohydrates during the initial phase of this diet. When researchers examined glycemic load diets, they found no significant differences in weight loss. When low-glycemic load diets were compared to low-fat diets they found no significant differences either. Studies have proven that the key to weight loss is calorie restriction rather than macronutrient composition. But all prescribers must keep in mind that any diet one chooses must be one that they can adhere to for several months. In order to achieve long-term weight loss obese individuals must consistently restrict their energy intake. They must do this by either reducing portion sizes, decreasing the energy density of the diet, or some combination of these two approaches (Wadden et al., 2012).

## **2. Second component- physical activity**

The second lifestyle modification that plays a critical role in improving an obese individual's life is physical activity. Increasing one's physical activity and fitness has proven to improve cardiovascular health in average-weight adults as well as obese adults. Physical activity is critical for long-term weight management. For weight control, researchers have found that activity can be performed at a moderate intensity and in short bouts, as brief as 10 minutes. In addition, multiple short bouts of activity through the day are just as effective as one long bout of exercise. Finally, other studies have shown that lifestyle activity, or increasing energy expenditure throughout the day, is also an effective strategy for weight control (Wadden et al., 2012).

### **3. Third component- behavior therapy**

The third lifestyle modification is behavior therapy, which refers to a set of principles and techniques for helping obese individuals modify eating, activity, and thinking habits that contribute to their excess weight. One key component of behavior therapy is "setting specific goals for behavior change that specify what an individual can do, and when, where, how, and for how long he or she can engage in the behavior." Another key component of behavior therapy is self-monitoring or recording one's behavior. This component is believed to be the most important component of behavioral treatment. Patients that partake in self-monitoring will keep detailed records of their food intake, physical activity, and body weight. All of which they will review with their "interventionist" to identify areas they are succeeding in and areas that need improvement. Frequent self-monitoring is believed to be a consistent predictor of both short and long-term weight loss for obese individuals. Behavior therapy has evolved since its introduction in 1967, it now includes several new components such as: mindful eating practices, stimulus

control, problem solving, cognitive restructuring, and relapse prevention training (Wadden et al., 2012).

### **Physical Activity Guidelines**

Regular physical activity is extremely important for good health, especially for individuals who are obese and trying to lose weight or maintain weight loss. According to the CDC everyone should work their way up to “150 minutes of moderate-intensity aerobic activity, 75 minutes of vigorous-intensity aerobic activity, or an equivalent mix of the two each week.” In order to lose weight and maintain weight loss the CDC recommends that an individual participate in a high amount of physical activity unless there is an adjustment of one’s diet and calories consumed. The CDC states that an individual may need to accumulate closer to 300 minutes per week of physical activity to see weight loss and or weight loss. They insist that in order to get to and remain at a healthy weight, an individual’s routine must include both regular physical activity and a healthy eating plan. The CDC describes moderate intensity physical activity as breathing heavier as well as having a slightly elevated heart rate in which you can still carry on a conversation. Examples of moderate intensity physical activity include, walking briskly (15 minute mile), light yard work, actively playing with children, or biking at a casual pace. The CDC describes vigorous intensity physical activity as a significant increase in heart rate and breathing in which a conversation cannot be held. Some examples include jogging, running, swimming laps, competitive sports like football, basketball or soccer, and jumping rope (CDC, 2020).

#### **1. Effects of sedentary behaviors**

Obesity has become an epidemic here in The United States because of our sedentary behavior and lack of physical activity in our everyday lives. Less than 5% of adults participate in 30 minutes of physical activity every day and only one in three adults receive the recommended amount of physical activity each week. In addition, more than 80% of adults do not meet the guidelines for both aerobic and muscle-strengthening activities and more than 80% of adolescents do not do enough aerobic physical activity to meet the guidelines for youth (President's Council on Sports, 2012). Physical inactivity puts any person at risk for becoming overweight and eventually obese. Not only does it put someone at risk for becoming obese, but it puts them at risk for developing chronic diseases like cardiovascular disease or type 2 diabetes. A study found that adults who were diagnosed with type 2 diabetes at the age of 20 lost about 17.2 to 17.9 years of life compared to similar aged, healthy adults. Therefore, remaining physically active is very important because inactive adults, especially ones with chronic diseases, may have a shorter life expectancy when compared to healthy, active adults (Booth et al., 2012).

## **2. Exercise**

It is extremely important for obese individuals to decrease their time spent in sedentary behaviors. In order to do so, they must begin participating in regular physical activity. Exercising not only combats obesity but it improved chronic diseases, reduced functional limitations, and delays cognitive impairments. In addition, exercise improves cognitive aging by influencing cognition directly or indirectly through a reducing obesity. Aerobic and anaerobic exercise has been reported to be effective at combating obesity. Aerobic exercise is described as any type of cardiovascular conditioning that increases breathing and heart rate. Nicklas et. al. reported that moderate or vigorous intensity aerobic exercise 3 days a week for 20 weeks led to a dramatic reduction of 25% abdominal visceral fat among obese adults. Another study reported that

aerobically exercising five times a week resulted in lower body weight, BMI, waist circumference, and percentage of body fat among obese adults. Anaerobic exercises also have been shown to be effective for combating obesity. These exercises are typically shorter in length but high in intensity. Researchers believe to combat obesity, both aerobic and anaerobic exercises should be included in training regimes. Aerobic exercise has been shown to reduce fat mass and weight where anaerobic exercise is crucial for increasing lean body mass (Chan et al., 2013).

### **Multiple Health Behaviors**

Multiple Health Behavior change has proven to be an effective way to combat obesity. Multiple health behavior change interventions are “designed to promote change in more than one health behavior at a time.” Researchers have found that multiple health behavior interventions have a greater impact on overall health than single-behavior interventions. In addition, researchers believe that health behavior change may serve as a gateway to changing an individual’s overall healthy lifestyle. They also believe that changing one or more behaviors may increase confidence or self-efficacy to improve risk behaviors that individuals with obesity have low motivation to change (Prochaska et al., 2008).

#### **1. Behavioral Treatment**

Multiple behavior change could include using behavioral treatment to combat obesity. Behavioral treatment is non-invasive and relatively low in cost, but it does require time and commitment by the individual participating. Behavioral treatment uses behavior principles that can easily be integrated into someone’s everyday life. These principles include: collaborative goal setting; or setting reasonable goals that are achievable and promote long-term success,

accountability, nutrition consultation and meal planning; meeting with a registered dietitian nutritionist, self-monitoring food intake, weight, and activity, stimulus control; or how to alter the environment to maximize healthy choices, problem solving, and relapse prevention. Behavior treatment has proven to be an effective way to lose weight and combat obesity because it is realistic. In addition, prescribers use small, manageable changes that do not overwhelm participants which will prevent behavior relapse and dropouts. These treatments teach participants how to make shifts to improve overall health in a long-term scope (Kelley et al., 2016).

## **2. Effects of Multiple Behavior Change on obesity**

Multiple health behavior change has become an increasingly popular weight-loss method due to its effectiveness . A large percentage of Americans do not engage in the recommended levels of physical activity (30-60 minutes of moderate intensity on most days of the week) and participate in proper dietary behaviors, such as, eating five to ten fruits and vegetables a day or limiting total fat intake to 20 to 35% of their daily intake. Both of these things have lead to a dramatic increase in obesity in the United States. Researchers suggest that “the combined effects of all diet and physical activity related behaviors that affect health directly and via their effects on obesity have a much larger total effect than any separate pathway.” Studies completed using multiple health behaviors reported significant weight loss results when the individuals participated in physical activity while following a proper diet. When interventions for physical activity and diet were combined the participants had a 65% reduction in the risk of chronic disease. In conclusion, multiple health behavior change can be an effective weight loss strategy and aid in weight gain prevention. But for the obese population, single interventions such as

exercise or diet, have been more effective at increasing healthy behaviors. (Sweet & Fortier, 2010).

Multiple risk behaviors have a negative influence on health, having both a poor diet and being physically inactive increases the likelihood someone will become obese, develop diabetes, cardiovascular disease (CVD) or develop certain cancers. Risk behaviors include, poor dietary habits, sedentary behavior, improper stress management and distress, heavy alcohol consumption or illicit drug usage. By implementing a multiple health behaviors intervention for risk behaviors there is a potential for increased health benefits, maximized health promotion, and reduced health care costs. For individuals who have low motivation to change their habits it is beneficial to change one or more lifestyle behaviors. Changing these specific behaviors would help improve their risk behaviors by increasing one's confidence levels and self-efficacy. Therefore, health behavior change may serve as a gateway to overall healthful lifestyle changes for the obese population (Prochaska & Prochaska, 2011).

### **3. Self-efficacy**

Multiple health behaviors should focus on increasing an individual's self-efficacy, which is an individual's confidence in his or her ability to carry out a specific behavior. Multiple theories have proposed that having a higher self-efficacy is associated with the better adoption of behavior change. These theories also believe that increasing one's self-efficacy is a "key strategy to increasing uptake of a specific health behavior." Research indicates there is evidence of a correlation between change in self-efficacy and change in weight over time. Wingo et al., 2013 reported that the participants who had the greatest increase in self-efficacy throughout their trial also had the greatest weight loss (Wingo et al., 2013). The Social Cognitive Theory states that

weight loss is a result of behavior change and behavior change is a “function of efficacy expectations.” Self-efficacy cannot be proven to directly affect weight loss, but its usage does influence weight through its effects on weight control behaviors. It is important to use self-efficacy measures that are specific to making changes in dietary intake or physical activity instead of just using self-efficacy for weight loss (Nezami et al., 2016).

#### **4. Removing barriers to weight loss and diet adherence**

Multiple health behaviors should also focus on removing barriers. Sharifi et al., 2013 reported 6 barriers to weight loss and diet adherence among overweight or obese women. The first was situational barriers which were the most common factor that kept participants from dietary adherence. It was difficult for the women participating to adhere to the diet when their daily routines are disrupted. Such as, going to a party, eating out, or traveling on vacation. In these situations, external cues most likely encourage people to eat more. Stress and depression were additional barriers identified. Obese women in this study “indicated that stress and depression made them eat too much and not adhere to the diet.” Another barrier the women faced was “food craving” or having a sweet tooth as they described it. There are associations between food cravings and excessive overeating, binge eating and bulimia, and low compliance with weight reduction programs. It is common to see these “food cravings” under a diet where there is strict dietary restraints. Social pressure also affected weight-loss diet adherence in the overweight or obese population of women in this study. The women indicated that family meal routines and feeding children were challenges they faced while following the weight-loss diet. In addition, they claimed that they did not have enough support from their husbands, parents, and friends to keep adhering to the recommended diet. Social situations, like eating with friends, also their adherence, they were easily influenced by friends to consume highly caloric foods. The last

two barriers to weight loss were the “adverse effects of weight-loss diet” and the “cost of diet” (Sharifi et al., 2013).

## **5. At risk behaviors**

Studies have found that being at-risk for one behavior significantly increases the likelihood of being at-risk for additional behaviors. To make an impact on the obesity epidemic, effective multiple behavior interventions must focus on physical activity, diet, and sedentary behaviors. This is especially important for our youth because active children often become active adults. Therefore, intervening early is necessary for them to establish active lifestyles they will hold onto for a lifetime. These interventions should “encourage and normalize lifestyles that include healthy diets, physical activity, and minimal sedentary behavior.” For individuals already at risk for these behaviors, interventions should focus on removing barriers and increasing self-efficacy. Individuals not at risk should focus on maintaining their healthy behaviors. Multiple behavior change is an approach that should be used in early interventions for obesity, especially among children and adolescents (Driskell et al., 2008).

### **Transtheoretical Model of Behavior Change (TTM)**

Long term behavior change is necessary for weight loss maintenance; therefore, it is essential to continue treatment beyond 6 months, which has proven to improve the maintenance of weight loss (Greene et al., n.d.). One theoretical framework that is based on the success of multiple behavior interventions is the Transtheoretical Model or TTM. TTM offers “a promising framework for multiple risk weight management interventions.” TTM is an “integrative model of behavior change that incorporates process oriented variables to explain and predict how and when individuals change behaviors.” In addition to the central construct, TTM also includes

behavior change constructs such as decisional balance, process of change, and self-efficacy (Johnson et al., 2008). Decisional balance involves someone's perceptions of the pros and the cons of changing their behavior. Temptations or situational self-efficacy involves the confidence in engaging in healthy behaviors during unfavorable conditions or perceived temptations to engage in an unhealthy behavior. Finally, the process of change involves the specific behavioral strategies that promote change in motivation and/or the behavior that helped the person advance through the stages of change (Greene et al., n.d.).

### **1. The stages of TTM**

Under TTM, individuals are classified into one of five stages of change for exercise and diet. This central organizing construct of stage change defines the temporal dimensions of the model, or when people change, as well as where people are in the change process. The first stage is known as precontemplation, in which there is "no intention of changing the goal behavior in the foreseeable future" (within the next six months). The second stage is known as contemplation, in which the individual "intends to reach the goal behavior in the foreseeable future" (within six months). The third stage is known as preparation, in which the individual "intends to reach the goal in the immediate future (within the next 30 days) and generally has taken behavioral steps towards the goal". The fourth stage is known as action, in which the individual has recently achieved the goal behavior (less than six months)." The fifth stage is known as maintenance, in which the individual "has achieved and continued the goal for at least six months." TTM suggests that the stage progression reflects the use of decisional balance, processes of change, and self-efficacy/temptations (Greene et al., n.d.).

## **2. Effects of TTM**

TTM and other multiple behavior interventions are important because they have significant effects one year post intervention. Specifically, on the progression to get to the action and/or maintenance stages, for healthy eating, exercising, managing emotional distress, and weight among those at risk. TTM also impacted fruit and vegetable consumption, which is known as a key health behavior. Johnson et al., 2018 suggested that “weight loss is not a behavior but rather an outcome of multiple behavior changes.” Research suggests that the goal should be to first produce significant changes in multiple behaviors, weight loss should follow when given time. TTM maximizes health benefits because eating healthy and exercising produces additional benefits in addition to those related to weight loss. In addition, multiple behavior interventions such as TTM have the “potential to have more than three times the impact of similar single behavior interventions.” To conclude, previous studies have documented that changing one behavior has the potential to change another (Johnson et al., 2008).

### **Prevention of Childhood Obesity**

Preventing obesity is extremely important, especially for children and adolescents. Evidence suggests that the majority of overweight adolescents go on to become overweight adults. Similar studies found that becoming obese during adolescence is the best single predictor of obesity in adulthood. In addition, obesity of biological parents is also independently associated with doubling the risk of obesity in adulthood. The primary prevention of obesity is being in an energy balance, which occurs when energy intake equals energy expenditure. Weight gain occurs when the energy intake exceeds energy expenditure and in opposition, weight loss

occurs when energy expenditure exceeds energy intake. Two factors that influence energy intake and expenditure are food intake and the energy spent on activity (Dietz & Gortmaker, 2001).

### **1. Primary factors**

Although obesity's primary prevention is achieving an energy balance, research also has found that there must also be a focus on primary factors, such as family, school, and community environments that play a role in food intake and physical activity. Environmental factors influence eating and physical activity. For example, the rapid increase in the availability of foods for consumption as well as a rise in advertising that promotes consumption influences consumption and activity. Food consumption is influenced by advertisements on television due to the substantial rise in the amount of time individuals spend viewing "mass media." To negate these effects and prevent obesity, parents and schools must promote healthy diets and adequate levels of physical activity (Dietz & Gortmaker, 2001).

### **2. Family-based approaches**

Family-based approaches should also be used in obesity prevention of children and adolescents. Family practices that're related to food consumption can affect food choice, preparation and consumption. To prevent obesity parents should think about the quality of food they bring into the home and whether it will increase caloric intake. Parents should avoid calorie dense foods such as regular milk, sugar-sweetened beverages, high-fat foods, and fast foods. Instead of consuming calorically dense foods, children should be consuming nutrient dense foods such as fruits, vegetables, and whole grains which have the potential to offset high-caloric intake. In relation to food preparation, food is typically prepared using oils, fats, cream, butter, margarine, or high fat cheeses. A logical approach to food preparation when it comes to obesity

is to minimize the amount of added fat. The final family-based approach to prevent obesity is food consumption inside and outside the home. When children eat meals at home with their families, they are more likely to consume fruits and vegetables. Whereas when they go out to eat, away from home, there are more fried foods and more soda available, increasing the caloric density of the meal (Dietz & Gortmaker, 2001).

Family-based approaches to combat childhood obesity also include behavior patterns that're associated with physical activity. Research has found that the time spent watching a television is related to the prevalence of obesity. Multiple studies have also found that reductions in the amount of time spent watching television reduced weight gain among children and overweight adolescents. To combat obesity, parents must present alternatives to watching television. Families that live in neighborhoods where there are opportunities for safe outdoor play have a greater chance for increased physical activity. Parents should give children daily activities that keep them physically active such as, walking them to school or give them errands that keep them moving (Dietz & Gortmaker, 2001).

### **3. Interventions**

Interventions should be put in place to combat obesity among children and adolescents. One intervention would be to reduce the excess food intake, such as fast foods, soda, or calorically dense foods advertised on television. An appropriate strategy is to not purchase these foods, not have them in the house, and/or to restrict them. An intervention to combat inactivity and screen time would be to set limits on the television. In addition, parents should consider eliminating televisions from bedrooms and regulating time spent watching the television to two hours a day. The final intervention should focus on the ways to increase physical activity in the

daily routines of children and adolescents. Most interventions recommend increasing the frequency in which children are walking, such as walking to school (Dietz & Gortmaker, 2001).

#### **4. School-based approaches**

School-based approaches have also been used in the prevention of obesity among children and adolescents. Approaches should focus on dietary interventions because of the excess consumption of sweetened beverages. Experimental research has even found that the consumption of sugary-sweetened beverages such as soda, significantly influences weight gain in adolescents. This becomes a problem within schools when children have access to items like these through cafeterias and vending machine usage. These approaches teach students healthier habits and motivate them to keep with these habits. In addition, they include environmental changes such as reductions in the fat content of school lunches, vending machine selections; they should promote fruit and vegetable intake, as well as more active physical education programming. The Planet Health Intervention that was used in middle schools included a curriculum that emphasized a healthy diet that reduced the consumption of fat and saturated fat. In addition, they emphasized a reduction in television-viewing time and replacing inactive time with a chosen physical activity (Dietz & Gortmaker, 2001).

#### **5. 3 levels of prevention**

To live healthy lives as adults, it is essential that obesity prevention is implemented as early as childhood. Obesity prevention can be rewarding, and it can provide better chances for reducing long-term complications such as type two diabetes or cardiovascular disease. At the childhood level there are three levels of prevention. The first level is primordial prevention which involves keeping a healthy weight and a normal BMI through childhood and into

adolescence. The second level is primary prevention which aims to prevent overweight children from becoming obese. The third level is secondary prevention which is directed towards the treatment of obesity. This may include reducing comorbidities and reversing overweight and obesity if possible. The pillar of the prevention program revolves around infusing healthy dietary and physical activity practices such as consuming more plant-based foods, increasing fruit consumption, and including exercises that keep children active on a daily basis. At the preschool level, the goal is to provide nutritional education to parents and children, so they develop healthy eating practices. These healthy practices would include offering healthy food preferences by giving children an early experience of different foods and flavors. Parents should also closely follow the rate of weight gain to prevent early adiposity rebound. In childhood, parents should be monitoring both height and weight of their child(ren), provide nutritional counseling, and place an emphasis on daily physical activity. In adolescence, the goals should be to prevent the increase in weight after a growth spurt, maintain a healthy eating behavior, and participate in daily exercises or workouts. The implantation of the traffic light diet to advocate nutritional goals may be beneficial for some children. The traffic light diet includes the three levels, green, yellow, and red. The green level means “GO” and, includes foods that’re low in calories and can be eaten without restrictions. The yellow level means “CAUTION”, these foods must be consumed in moderation because they have moderately-high-calorie content. The red level means “STOP”, these foods are high in calories, they should be avoided and/or eaten rarely (Pandita et al., 2016).

## **6. Behavior Change Model for Childhood obesity**

Introducing a behavior change model is also a prevention method for childhood obesity. This method includes the self-monitoring of target behaviors, and logging food, activity, or other

behaviors. This process allows the child and family to recognize the behaviors that contribute to their weight gain. The food log may also help identify other contributors to eating behaviors, such as the meal-time environment, boredom, and level of hunger. To monitor behavior change, clinician feedback is essential throughout the self-monitoring process. The behavior change model involves stimulus control to reduce environmental cues that contribute to unhealthy behaviors. Stimulus control includes reducing access to unhealthy behaviors, such as removing some categories of food from the house. In turn, patients should establish new, healthier daily routines. Such as, making fruits and vegetables more accessible. Goal setting is also an important step in the behavior change model because it is widely used for inspiration. All goals should be created and made appropriate based on the “SMART” principle. Goals should be Specific, Measurable, Attainable, Realistic, and Timely. Another part of this model is contracting for selected nutrition and activity goals. This is an explicit agreement to give a reward for the achievement of a specific goal. For children, this helps them focus on specific behaviors provides structure and incentive to their goal-setting process. The final step of this model is positive reinforcement of target behaviors. Positive reinforcement can be in the form of praise for healthy behaviors or in the form of rewards for achieving specific goals. Rewards should be small activities or privileges that the child can participate in regularly. They should not be monetary incentives or toys; food also should not be used as a reward. The behavior change model aims to reduce the rate at which obesity is drastically spreading, to ensure our youth do not face diseases like diabetes at an early age (Pandita et al., 2016).

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