TEXAS WOMAN'S UNIVERSITY INSTITUTE FOR WOMEN'S HEALTH (IWH): THE EFFECTIVENESS OF A 12 WEEK WEIGHT MANAGEMENT PROGRAM ON REDUCING BODY WEIGHT IN AN OVERWEIGHT AND OBESE POPULATION

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BY

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To the Dean of the Graduate School:

I am submitting herewith a thesis written by Ryan Bradley Reist entitled "Texas Woman's University Institute for Women's Health (IWH): The Effectiveness of a 12 Week Weight Management Program on Reducing Body Weight in an Overweight and Obese Population." I have examined this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science with a major in Exercise and Sports Nutrition.

Major Professor

We have read this thesis and recommend its acceptance:

Department Chair

Accepted:

Dean of the Graduate School

DEDICATION

To Don, Jacquie, Kyle, Lainey, and Hurley

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To Dr. Nancy DiMarco, thank you for your guidance, patience, and commitment. I am grateful for your insight and direction. Through the ups and downs you kept me pointed in the right direction and moving forward.

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ABSTRACT

RYAN BRADLEY REIST

TEXAS WOMAN'S UNIVERSITY INSTITUTE FOR WOMEN'S HEALTH (IWH): THE EFFECTIVENESS OF A 12 WEEK WEIGHT MANAGEMENT PROGRAM ON REDUCING BODY WEIGHT IN AN OVERWEIGHT AND OBESE POPULATION

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In the United States and other developed countries, obesity is increasing. Many diseases linked to obesity negatively affect individuals and society. The purpose of this study is to examine the effectiveness of a 12-week Weight Management Program in the Exercise and Sports Nutrition Clinic in the Institute for Women's Health at Texas Woman's University, Denton, TX on reducing body weight in an overweight and obese population.

Thirty two individuals were part of a 12-week weight management program. Each participant completed a stages of change survey (SOCS) and had weight, height, and BMI measured before and after the 12-week program. All of the participants met with a weight loss coach for one hour a week for 12 weeks. Weight loss strategies including increasing physical activity and dietary advice were provided each week. Effectiveness of the weight loss program was determined by comparing the mean weight loss of the group to a weight loss standard of 24 lbs. Based on the mean weight

loss compared to the weight loss standard, a quintile of effectiveness was used rank the overall effectiveness.

After the 12-week intervention, the mean weight loss for the participants was 1.1 kg ± 2 kg. The SOCS was not correlated to weight loss ($r = -0.31$; $p = 0.13$). There was a significant difference in body weight from baseline to after the intervention ($p = 0.00$). The weight loss program was found to be "slightly effective", the lowest quintile ranking.

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INTRODUCTION

Problem Statement

Obesity is a major modifiable risk factor for coronary heart disease by the American Heart Association (Lloyd-Jones, D. M., Hong, Y, Labarthe, D., Mozaffarian, D., Appel, L. J., Van Horn, L., et al., 2010). Both the National Institutes of Health (NIH) and the World Health Organization (WHO) classify obesity as a chronic disease and a major risk factor for diseases that are non-communicable. These diseases include type II diabetes, cancer, cardiovascular disease (CVD) (Guh, Zhang, Bansback, Amarsi, Birmingham, & Anis, 2009), and a range of psychosocial issues (Heymsfield, Lohman, Wang, & Going, 2005; NHLBI, 1998; WHO, 2006). Many of these diseases are the major causes of death in the United States. Over the last 30 years, the United States and other developed nations have seen the prevalence of obesity and overweight among individuals increase (Mokdad, Ford, Bowman, Dietz, Winicor, & Bales et al., 2003; WHO, 2006). As this trend continues and obesity-related diseases steadily increase, rises in healthcare costs will likely result. The healthcare costs related to these diseases are a financial burden (Birmingham, Muller, Palepu, Spinelli, & Anis, 1999; Guh et al., 2009) and affect many individuals and industries. Early retirement and increased risk of

disability in obese individuals has increased by 1.5% – 1.9%. The direct cost of obesity in 2006 U.S. dollars was found to be 147 billion dollars (CDC, 2009).

Purpose

The purpose of this study was to examine the effectiveness of the 12-week Weight Management Program (WMP) at the Institute for Women's Health (IWH) at Texas Woman's University in Denton, TX on reducing body weight in an overweight and obese population, ages 19 to 72 years old. In addition, the relationship between the stages of change survey (SOCS) on willingness to change and weight loss during the 12-weeks was also determined.

To date, no one has examined the effectiveness of a WMP at the IWH at Texas Woman's University, Denton, TX on weight measurement in an overweight and obese population. If the program is effective for managing weight and changing body composition, it is believed that the program can lead to a reduction in risks for development of cardiovascular disease (CVD), metabolic syndrome components, diabetes type II, asthma, hypertension, various cancers (breast, colorectal, endometrial, esophageal, kidney, ovarian, pancreatic, and prostate), arthritis, and other modifiable disease risk factors.

Aims of the Study

1. To determine if the WMP at the IWH is effective based upon weight loss of participants who complete the 12-week program.

2. To determine if the SOCS is an effective predictor for weight loss over the WMP period.

Null Hypotheses

1. There will be no significant differences in body weight of individuals who follow the WMP between baseline and 12-week measurements.
2. There will be no relationship between the SOCS and actual weight loss in individuals who follow the WMP over the 12-weeks.

Assumptions

1. It is assumed that each client fills out the SOCS truthfully.
2. It is assumed that each client is honest in reporting his/her weekly compliance to the program.
3. It is assumed that the clients are in the WMP to lose weight.
4. It is assumed that the instruments and methodology used are accurate and reliable.
5. It is assumed that the measurements made have been made accurately and reliably.

Limitations

1. All of the participants were women.

2. All participants were involved in the WMP at Texas Woman's University; therefore, results from this study cannot be generalized to other weight management programs.
3. Not all clients completed a SOCS.

Delimitations

1. Weight change is used as the determinant of effectiveness for the weight loss program.

Significance of the Study

Due to the relationship of obesity to numerous diseases and the footprint obesity has made on the United States, it is important to identify and implement interventions that can slow or stop the progression of obesity among individuals. By determining the effectiveness of the WMP based on changes in weight we may be able to recommend this program to reduce weight, improve body composition, and to reduce the risks of lifestyle related diseases with enthusiasm. If the program is found to not be effective in reducing weight over the WMP period, it will spotlight the need for changes in the WMP. If the SOCS has no relationship to weight loss, the SOCS form can either be altered or discarded. Determining the effectiveness of the WMP and the relation the SOCS has to weight loss outcomes in individuals should improve the effectiveness of the WMP for those who will participate in the future.

Operational Definitions

1. BMI is operationally defined as weight in kilograms divided by height in meters squared: kg/m^2 (Kasper, Fauci, Longo, Braunwald, Hauser & Jameson, 2005).
2. Overweight is operationally defined as a BMI of 25 to 29.9 kg/m^2 (Kasper et al., 2005).
3. Obese is operationally defined as a BMI $\geq$ 30 kg/m^2 (Kasper et al., 2005).
4. Effectiveness is operationally defined as 24 lbs or 10.9 kg of weight lost over the 12-week Weight Management Program. A 100% success rate is equal to 24 lbs or 10.9 kg of weight lost. Twenty percent effectiveness will be a weight loss of 4.8 lbs; 40%, 60%, and 80% effectiveness will be a weight loss of 9.6 lbs, 14.4 lbs, and 19.2 lbs weight lost, respectively, over the 12-week period.
5. SOCS is operationally defined as the stages of change survey and is scored with a score range from 7 to 35. The closer to 7 the score is indicates that a participant is not willing to change. Participants who are willing to change should have scores closer to 35, or 100% willing to change. A SOCS score of 7 represents 0% willingness to change. SOCS scores of 12.6, 18.2, 23.8, and 29.7 indicate 20%, 40%, 60%, and 80% willingness to change, respectively. A participant with a score between 7 and 12.6 would be considered to be in

Stage 1. Participants with scores between 12.7 and 18.2 would be in Stage 2; those with scores between 18.3 and 23.8 would be in Stage 3; those with scores between 23.9 and 29.4 would be in Stage 4; and participants with scores from 29.5 and 35 would be in stage 5.

6. WMP is operationally defined as the 12-week Weight Management Program at the Exercise and Sports Nutrition Clinic at the IWH at Texas Woman's University, Denton, TX.

CHAPTER II

LITERATURE REVIEW

This study will discuss obesity as a problem in the United States, BMI as a measure of body composition, the relation of obesity to disease states, the effectiveness of weight loss programs, and the program at the Institute for Women's Health (IWH) Exercise and Sports Nutrition Clinic at Texas Woman's University. The purpose of this study is to determine the effectiveness of the 12-week Weight Management Program (WMP) by tracking changes in weight from the beginning to the end of the 12-week study period. The stages of change survey (SOCS) scores will also be compared to weight loss outcomes to determine if there is any relationship between the two.

Obesity as a Problem in the United States

Obesity is the most widely seen form of malnutrition in the United States (Wieland & Hamilton, 2001). Various diseases are related to obesity including diabetes, heart disease (Guh, Zhang, Bansback, Amarsi, Birmingham, & Anis, 2009), dyslipidemia, cancer, sleep apnea, respiratory disorders, depression, gallstones, and musculoskeletal problems (Field, Coakley, Must, Spadano, Laird, Dietz et al. 2001; Heymsfield, Lohman, Wang, & Going, 2005; NHLBI, 1998; Rippe, McInnis, & Melanson, 2001; WHO, 2006; Wieland, 2001). The condition of obesity has been recognized by the American Heart

Association as a major modifiable risk factor for coronary heart disease (Eckel & Krause, 1998). The National Institutes of Health (NIH) and the World Health Organization (WHO) identify obesity as a chronic disease and a major modifiable risk factor for non-communicable diseases.

The distribution of obese individuals has increased in the United States and other developed nations (U.S. – 30.6%, U.K. – 23%, Greece – 21.9%, & Australia – 21.7%) (Boogerd, Alverdy, Kumar, Olson, & Schwenk, 2002; Mokad, Ford, Bowman, Dietz, Winicor, & Bales et al., 2003; WHO, 2006). As this trend continues and obesity related diseases steadily increase, rises in healthcare costs will continue. The healthcare costs related to these diseases are a financial burden (Birmingham, Muller, Palepu, Spinelli, & Anis, 1999; Guh et al., 2009) and affect many individuals and industries. Early retirement and increased risk of disability in obese individuals has increased 1.5% – 1.9%. The direct annual cost of obesity was estimated at 78.5 billion U.S. dollars in 1998 (Finkelstein E, Fiebelkorn I, Wang G., 2003). By 2006, this cost had risen to 147 billion U.S. dollars annually (CDC, 2009).

Even though there are a variety of factors influencing weight gain (Lyznicki, Young, Riggs, & Davis, 2001), obesity is related directly to an imbalance of calorie intake and calorie expenditure. Calories are the units to measure energy content of foods. When one consumes more calories than one expends, the result is storage of excess calories as adipose tissue. Food provides many important nutrients as well as calories.

There are many contributors to obesity in developed countries. As technology has advanced, overall daily physical activity at the work place has decreased. The availability of food and the nutrient composition of the diet have changed in conjunction with the advancement of technology. Food availability, decreased physical activity (McLellan, 2002), varying food costs, personal behaviors and perceptions, psychological issues, and a host of other factors may lead to increases in body weight (Anderson, Quinn, Glanz, Ramirez, Kahwati, & Johnson et al., 2009). These factors are likely major driving forces for the weight gain of Americans over the last 30 years (Lyznicki et al., 2001).

The majority of the population in the Unites States is obese or overweight. One third of Americans are within a healthy weight range according to the Body Mass Index (BMI) scale. In 2002, NHANES found the prevalence of overweight or obesity to be 65.7% and obesity to be 30.6% of the adult population, 18 years and older (Hedley, Ogden, Johnson, Carroll, Curtin, & Flegal, 2004). The growing overweight and obesity trend in the United States began more than two decades ago and continues today (CDC, 2008). If effective interventions are not adopted then the projections that 100% Americans will be overweight or obese by 2048 may come true (Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008).

Body Mass Index as a Measurement of Body Composition

Overweight and obesity in adults are currently defined at BMIs of 25-29.9 kg/m^2 and ≥ 30 kg/m^2, respectively (Kasper, 2005; NHLBI, 1998; WHO, 2006). The NIH and WHO specified the word overweight for BMI values from 25-29.9 kg/m^2, pointing out that health risks can exist within this range. By identifying the overweight classification, these groups hoped to increase awareness for strategies to prevent further weight gain (WHO, 2006). BMI values between 18.5 to 24.9 kg/m^2 are defined by the WHO and NIH as recommended ranges with the least morbidity. Numerous groups support the defined BMI ranges (Kasper, 2005) including the NIH, WHO, and the Centers for Disease Control and Prevention (CDC). Since there is an increased disease burden associated with overweight and obese individuals compared to those with BMIs in the range of 18.5 to 24.9, it is important to target overweight and obese individuals with programs for prevention. These programs should include diet and exercise (Blackburn, 1999). BMI can be used in adults for disease risk stratification. This is important in relating BMIs of overweight and obesity to disease risk. BMI is used most often in studies comparing relationships between body fatness and CVD risk factors (Heymsfield, 2005). The CDC considers BMI an effective and appropriate tool to screen for obesity. The National Heart, Lung, and Blood Institute (NHLBI) states that "BMI is used to classify underweight, normal weight, overweight, and obesity based on its relationships to body fatness and healthy outcomes" (NHLBI, 1998). The majority of data available relating

obesity to disease risk is based on indexes of weight for height (Heymsfield, 2005). BMI is one of these indexes.

The primary limitation in using BMI or any weight based index is that they cannot delineate between excess adiposity and greater than average muscular or skeletal tissue (Heymsfield, 2005). In the case of an individual with a BMI that is classified as overweight or obese, one can measure a patient's body composition using various methods to determine a more accurate picture of risk for disease (Shopbell et al., 1999). Each body composition measurement is based on various assumptions (Heymsfield, 2005); however, even when BMI increases, an increase in fat mass is shown to directly relate to an increased risk for disease such as cardiovascular disease, type II diabetes, hypertension, and specific cancers (breast, colorectal, endometrial, esophageal, kidney, ovarian, pancreatic, and prostate); an increase in lean mass is associated with a decreased risk (Allison, Faith, Heo, & Kotler, 1997; Lahmann, Lissner, Gullberg, & Berglund, 2002).

Due to the close relation BMI has with identifying disease risk, it serves as a convenient tool. Since specified BMI ranges are associated with certain disease risks BMI is directly related to weight and acts as a natural instrument to use to relate weight to disease risk (See Table A in Appendix A). Numerous studies and years of research in this area give strength to BMI as a predictor for specific disease risks.

The Relationship of Body Mass Index to Disease Risk

Co-morbidities associated with overweight and obesity are related to an increased incidence of future morbidity and mortality (Haslam & James, 2005; McTigue, Hess, & Ziouras, 2006; Pi-Sunyer, 1999). The CDC and WHO recognize that CVD, diabetes, osteoporosis, and certain cancers (breast, colorectal, endometrial, esophageal, kidney, ovarian, pancreatic, and prostate) are related to diet and lifestyle. A concern in all of these major chronic diseases is the relationship each has to an unhealthy amount of excess weight (Mokdad et al., 2003). Overweight and obesity are major risk factors in both the prevention and the control of heart disease, stroke, diabetes, and breast cancer. It is estimated that two thirds of adults over age 20 are overweight or obese. Since 1991, this number has increased nearly 75% as noted by the American Heart Association. Across all racial and ethnic groups, as BMI increases, disease burden associated with excess adiposity increases as seen in the NHANES III study (Must, Spadano, Coakley, Field, Colditz, & Dietz 1999). An increase in the prevalence of all health outcomes with increases in overweight and obesity have been observed (Mokdad et al., 2003). Greater risks for diabetes (Folsom, Kushi, Anderson, Mink, Olson, & Hong, et al. 2000; Hu, Manson, Stampfer, Colditz, Liu, Solomon et al., 2001; Wang, Rimm, Stampfer, Willett, & Hu 2005), hypertension (HTN) (Folsom et al., 2000; Huang, Willett, Manson, Rosner, Stampfer, & Colditz, 1998), concentration of total cholesterol, asthma (Camargo & Weis; Ford, Mannino, Redd, Mokdad, & Mott, 2004; Nystad, Meyer,

Nafstad, Tverdal, & Engeland, 2004), arthritis, and fair or poor health status were seen in overweight and obese individuals when compared to those with BMI ranges between 18.5 and 24.9 (Mokdad et al., 2003). Framingham Heart Study showed that overweight and obesity are associated with an increased relative risks for CVD risk factors and mortality (Wilson, D'Agostino, Sullivan, Parise, & Kannel, 2002).

Adipose tissue is not only used to store excess calories, but is also an active endocrine and paracrine organ (Dedoussis, Kapiri, Samara, Dimitriadis, Lambert, Pfister, et al., 2010; Karastergiou, & Mohamed-Ali, 2010; Spiroglou, Kostopoulos, Varakis, & Papadaki, 2009). Leptin, vaspin, chemerin, adiponectin, and visfatin among other bioactive proteins are adipokines that are secreted from adipose tissue and regulate metabolic processes, inflammation, food intake, and insulin sensitivity (Dedoussis et al., 2010; Spiroglou et al., 2009). Leptin is related to long term energy balance and is increased in obese individuals. Increased leptin levels result in obesity which then promotes the release of more leptin; increased leptin levels results in leptin resistance and promotes further obesity, resulting in a cyclical process (Maury, & Brichard, 2010). High plasma concentration of vaspin is seen in obese individuals and is associated with decreased insulin sensitivity (Youn, Klöting, Kratzsch, Lee, Park, Song, et al., 2008). Chemerin may play a role in metabolic syndrome and is closely related to BMI, plasma triglyerides, and blood pressure. Pro-inflammatory traits are also related to chemerin (Bozaoglu, Bolton, K., McMillan, Zimmet, Jowett, Collier, et al., 2007). Adiponectin

levels are inversely related to obesity and have insulin sensitizing effects (Liu, Chewchuk, Lavigne, Brûlé, Pilon, Houde et al., 2009). Another adipokine, visfatin is secreted by visceral adipose tissue and emulates insulin's effects. This compound may also play a role in the genesis of type II diabetes (Adeghate, 2008). In obesity, adipokines, such as leptin, may be hypersecreted and can synergistically work to further promote obesity and inflammation (Maury, & Brichard, 2010). Obesity affects the concentration of each of these adipokines in the blood, and therefore plays a role in promoting insulin resistance, metabolic syndrome, and continued obesity. The concentration of C-reactive protein, tnf-alpha, and IL-6 are increased in obese individuals (Dedoussis et al., 2010). These compounds and a variety of adipokines are indicative of inflammation in the body. It is well known that the major diseases of today begin with the inflammatory process. Obesity is linked to the genesis of many diseases including, cardiovascular disease, hypertension, diabetes II, asthma, arthritis, and cancer (Folsom et al., 2000; Huang et al., 1998; Mokdad et al., 2003). Research continues to uncover complete mechanisms by which these biochemical compounds relate to disease origins. While the causes are being revealed with these relationships, it is known that these compounds increase inflammation and are related to obesity; therefore they are related to the increased risk for an array of diseases.

There is a definite relationship between excess weight and numerous disease states. Many of the diseases of today are related to behavior; therefore preventative

measures should be seriously considered. Weight management through diet and exercise intervention is a preventative measure that has shown promising benefits.

Effectiveness of Weight Loss Programs

The focus here is to review studies of 12-week weight loss programs based on weight loss by dietary changes, and promotion of physical activity. The variables observed, methods, and the results of each study are the primary areas of interest. An eight week study was also included as the difference in study length is minimal and likely would have similar results if it were done on a 12-week schedule.

Weight loss programs have been used for years as a means to reduce weight and the risk for developing lifestyle related diseases. The two primary driving mechanisms of weight loss programs are diet and exercise. These components are used singularly or in combination to create a daily calorie deficit. Various methods have been used to aid the participant in reaching their weight loss goals. Some programs provide information and food products so the participant can carry out the program on their own such as, Weight Watchers and Nutrisystem. Other programs are more hands on and may assist the participant with face to face demonstrations and practices such as the WMP at Texas Woman's University in Denton, TX.

Lifestyle modification is the backbone of obesity intervention. Changes in behaviors and habits that lead to obesity are the main focus of intervention. Along with exercise and diet, self-monitoring, problem solving, goal setting, stimulus control,

cognitive restructuring, and relapse prevention are utilized as part of a complete obesity intervention plan (Berkel et al., 2005). Once weight loss has occurred, weight maintenance is paramount for success. Exercise is essential for long term success in keeping the weight off (Mahan & Escott-Stump, 2007).

It was observed in a three year follow up of a 12-week weight loss program based in Australia that the average weight loss maintained from baseline was 3.8 kg (± 5.5) to 4.4% (± 6.1%) of their body weight. One hundred female participants began the study and 86 were participating at the three-year follow-up. This program focused on a food-based structured diet. Participants were encouraged to exercise at least three days per week for a minimum of 30 minutes per day. Starting at baseline and at four week intervals, each participant was interviewed by phone by a dietitian. The dietitians provided instructions on dietary intake and daily needs, as well as suggested food quantities and recorded the participant's self-reported weight. The suggested energy content of the diet was set at 5600 kJ. Weight loss of about one kg per week would be feasible at this energy level. Weight loss at 12-weeks for the sample was 7.5 kg. At the three year follow up, overall, 61% of the participants lost weight from baseline, 13% of the participants gained weight, and 26% maintained their current weight (Cleanthous, Noakes, Keogh, Mohr, & Clifton, 2007).

The RE-AIM approach was used to evaluate an insurance health promotion program based on five dimensions of: reach, effectiveness, adoption, implementation

and maintenance. Operational definitions for each of these dimensions were determined. Reach referred to the percentage of potential participants who enrolled in the program and their representativeness of the target population. Effectiveness was defined as changes in the participant outcomes during the program. The number and representativeness of sites willing to conduct the program were labeled as adoption. Site adherence to the program protocols was defined as implementation. Maintenance was considered for the individual outcomes after final intervention contact and program continuation at sites over the long term. The objective of this study was to use the RE-AIM program to evaluate the insurance health promotion program focusing on short-term physical and psychosocial changes in the participants. The secondary objective of the study was to critique the RE-AIM program. At 24 sites 1,952 participants participated in the study. There were two phases of the study. Phase I, or the intervention phase, was from baseline through the first 12-weeks of the study. Access to exercise sites, a 60 minute diet evaluation and planning session with a dietitian, a 60 minute fitness evaluation by an exercise physiologist, and monthly 30 minute exercise sessions with a personal trainer were performed. A 60 minute follow-up by the dietitian and the exercise physiologist were done at the 12-week time period as well. At this point, if the participant met the weight loss goal of 12 lb., they were allowed to continue into Phase II. Phase II was for the following nine months and provided a gym membership and one exercise training session per month. After one year, it was

determined that the program's effectiveness was moderate at 43.8% but implementation was considered high at 91.4%. Program reach and adaptation were both considered low, 5.4% and 8.8%, respectively. Maintenance was found to be high at 77.8%. The median weight loss for all participants was 13 lb for Phase I (12-weeks). The one year follow-up resulted in a total median weight loss of 15 lb for Phase II (1 year). The average weekly weight loss was found to be 1.1 lb per week for Phase I (Abildso, Zizzi, & Regar-Nash, 2010).

A current study examines the medically healthy obese (MHO) population. This group of individuals has excess body fat with insulin sensitivity, is normotensive, and has a favorable blood lipid profile. The MHO population highlights that there are likely a variety of causes for obesity. At Yonsei University, 129 Korean women with BMI >25 kg/m^2 participated in the study. Those who were pregnant, presented with type II diabetes, hypertension, thyroid disorders, or any form of CVD, and those who were on medications that would alter any of the measured variables were excluded. Parameters for MHO included: homeostasis model assessment (HOMA) index < 1.95, and concentrations of triglycerides < 1.7 mmol/l, total cholesterol < 5.2 mmol/l, LDL-C < 2.6 mm/l, and HDL-C > 1.1 mmol/l. The intervention included a daily 300 calorie deficit in the diet. An individualized diet plan was provided for each participant based on their food frequency questionnaire and 24-hour recall. A nutritionist provided instructions over good nutrition. BMR was calculated with the Harris-Benedict equation. Total

energy expenditure was calculated from BMR and daily activity patterns. Concentrations of serum lipid, serum glucose, insulin, HOMA, plasma CRP, IL-6, and LDL were measured at baseline and at 12-weeks. Two groups were formed based on the MHO characteristics; a MHO group and a metabolically abnormal obese (MAO) group. The mean age for the MAO group was 39.8 and 36.4 for the MHO group. Only 23 individuals were in the MHO group, the remaining 106 were in the MAO group. From baseline to week 12, participants reduced their caloric intake from 2402 calories per day to 1980 calories per day. The MHO group had significantly lower visceral fat, concentrations of total cholesterol, triglycerides, and LDL-C, but higher HDL-C. HOMA, and concentrations of Apo B, and Apo A_1 were increased in the MHO group. Concentrations of plasma CRP, IL-6, and oxidized LDL were significantly decreased in the MHO group when compared to the MAO group. Weight loss was similar between groups. The MAO group had significant reductions in concentrations of CRP, and oxidized LDL, Apo B, abdominal fat, and blood lipids. The MHO group had significant reductions in amounts of subcutaneous and visceral fat. The favorable characteristics of MHO individuals may be attributable to the lower inflammation state they present. With lower visceral adiposity, less IL-6 is produced, and therefore, less CRP is produced by the liver. Reduction in weight reduces markers of inflammation, and can reduce the risk of CVD. The causes of the differences seen in the MAO and MHO groups are not yet understood at this time (Shin, Hyun, Kim, Kim, Jang, & Lee, 2006).

Culos-Reed and colleagues examined the efficacy and feasibility of an existing, Canadian, community-based, multi-dimensional weight control program. The focus of this program included positive lifestyle behavior changes in obese and overweight individuals. The characteristics used to evaluate the program were nutritional, physiological, and physical activity-related psychological factors. Baseline and 12-week follow-up measurements included a fitness assessment, physical activity-related psychological questionnaires, and a 3-day food record. The TrymGym intervention included two supervised, 50 minute exercise sessions per week and one 50 minute nutrition education session per week. Thirty five participants enrolled in the TrymGym study. Four participants were removed from the study since they did not have a BMI > 25 kg/m^2. After the 12-week program, only 18 of the 31 individuals chose to participate in the post-intervention measurement follow-up. This group presented improvements from baseline to week 12 in body weight, BMI , diastolic blood pressure, and circumferences of hip, waist, bicep, and neck. Weight loss for this group was 3.3 kg over the 12-week intervention; total energy intake decreased by 226 calorie/day. Improvements in body weight, nutritional habits, diet-related behaviors, and physical activity levels improved. A major limitation of this study was there was no control group with which to compare the results; therefore, effectiveness of the program is difficult to determine. The data, however, suggests that the program intervention was successful (Culos-Reed, Doyle-Baker, Paskevich, Devonish, & Reimer, 2007).

As in the United States, obesity is a major health concern in Australia. The National Health Study found that 86% of Australians between 16 and 84 do not consume the recommended amounts of fruits and vegetables. Fifty four overweight or obese men participated in a 12-week study. Face to face meetings were done at weeks 1, 2, 4, 8, and 12. A phone interview was done during week 10. Weight was measured at each visit and blood pressure was taken daily by the participants. A DASH type diet (high in fruits and vegetables, with fish, nuts, legumes, seeds, and dairy), known as the WELL group, was compared to a low fat (LF) diet in regards to loss of body weight and reduction in CVD risk factors. The WELL diet intervention (n = 27) focused on specific daily recommendations for fruits, vegetables, and reduced/non-fat dairy products. The LF group (n = 27) provided general advice to reduce fat and increase these foods in the diet. A FFQ was used to measure usual intakes of fruits, vegetables, and dairy for each participant. During the interventions, a three day food record was used to record the quantity and frequency of foods eaten from these main food groups (fruits, vegetables, fish, dairy, red, meat, legumes, nuts, and seeds). The WELL group increased their fruit, vegetable, and dairy intake from week one throughout the study, while the LF group did not see major differences. Increasing fruit, vegetable, and dairy intake were the focus of this study that resulted in a 5-6% weight loss (-4.89 kg for WELL, -4.6 for LF) over the 12-week intervention. Between the groups there was no mean difference in weight loss; however the WELL group did see improved cardiovascular health markers in the

form of a decrease in blood pressure over the LF group. Before the intervention, 7% of the WELL group met their recommended daily fruit intake, 15% met the daily vegetable intake, and 33% met their daily dairy intake. By week 12 of the intervention, these percentages increased to 67%, 48%, and 89%, respectively. In the LF group fruit intake improved from 30% to 48%, vegetable from 19% to 30%, and dairy stayed at 37%. Both groups met the requirements for dietary energy restrictions (Booth, Nowson, Worsley, Margerison, & Jorna, 2008).

In another study, lifestyle changes and exercise intervention were used to create caloric deficits for weight loss. Overweight and obese men and women were recruited to take part in this study. The participants were randomly assigned to one of two treatments groups after baseline measurements were done. The interventions were for 12-weeks and 60 minute group meetings were done weekly. One group was known as the aerobic exercise group (AER) and the other the lifestyle activity (LIFE) group. Both groups were prescribed a self-selected diet consisting of 1,200 to 1,800 calories per day. The AER group did moderately-vigorous aerobic exercise 3-4 days a week for up to 45 minutes per session. The LIFE group was told to accumulate 30 minutes of moderate intensity exercise at least 5 days per week. The AER and LIFE groups utilized the Borg Relative Perceived Exertion (RPE) scale to quantify intensity. The purpose of this study was to compare body composition (weight, fat free mass (FFM), fat mass, (FM)), and resting energy expenditure (REE) in the participants of each group. REE was measured

using indirect calorimetry. No between group differences were present in body composition variables or REE after the 12-week intervention period. Compared with baseline values, the weight loss for both groups was significant after the 12-weeks. It was determined that either the AER or the LIFE program would be effective in promoting weight loss for overweight and obese individuals (Andersen, Franckowiak, Bartlett, & Fontaine, 2002)

Focusing on walking and dose-response, another study compared different amounts of time spent walking and a dietary intervention on weight loss. The purpose of this study was to investigate the effects of two different volumes of walking combined with a low-fat *ad libitum* diet (LFAL), compared to a diet only control group. The variables include loss of body weight and modifiable health-related variables (HRV) in sedentary, overweight women. Eighty eight women were randomly assigned to one of the three groups; diet only (DO), diet plus exercise of walking 30 minutes per day five days per week at a self-selected intensity (DEX1), or diet plus exercise of walking 60 minutes per day five days per week at a self-selected intensity (DEX2). Of the 88 who signed up for the study, 56 met the requirements to complete the study. The program consisted of a baseline phase, a 12-week diet and exercise program, and a post-testing phase. Height, weight, BMI, body composition, waist and hip circumference, blood pressure, estimated $VO2_{max}$, concentrations of total cholesterol, HDL-C, and triglycerides were measured at baseline. The diet recommendations consisted of a diet of 1,200 to

1,400 calories per day. Recommendations were also given on the number of exchanges of each food each participant should consume for protein, fat, dairy, and high-fiber complex carbohydrates. Weekly food diaries were turned into a dietitian. The exercise protocols were as mentioned. At the post-testing phase, variable measurements were taken in the same order as baseline measurements. It was found that there were no significant differences in any physical, dietary, or health-related variables between the three groups at baseline. There was no volume-outcome difference dose-response seen between the 30 and 60 minute walking groups. There was no increased weight loss by adding 30 minutes/day per walking session. The DO group lost 9 lb, the DEX1 and DEX2 groups lost 13 lb each. Compared to the DO group, both the DEX1 and DEX2 groups showed significant decreases in waist and sagittal diameter. All groups had reductions in concentration of triglycerides. Both exercise groups had significantly reduced levels of LDL-C compared to the DO group. The DO group had a decreased $VO2_{max}$, while both exercise groups had improvements in estimated $VO2_{max}$ after the intervention. Neither the DEX1 or DEX2 intervention had any advantages over the other, but both showed improvements in metabolic fitness variables. Weight loss was similar between all groups, so the dietary component was likely the prevalent factor for weight loss (Brill, Perry, Parker, Robinson, & Burnett, 2002).

Japan is experiencing similar obesity trends as the United States. The health effects of excess weight are common across cultures. The purpose of the following

study was to examine how changes in food intake patterns affected body weight loss in a Japanese population who participated in a health promotion program. Body weight loss was examined after the 12-week intervention and also 9 months later. At a community center in Yamagata, Japan, 733 participants were involved in the study. Two intervention groups were created, group A and group B. All participants filled out a FFQ and a questionnaire about exercise and smoking. The day the forms were turned in, blood was drawn, blood pressure was taken, and physical measurements (height, weight, percent body fat, BMI) were made. This same process was carried out at the end of the 12-week program and at 9 months after the initial data collecting session. In group A, an RD counseled participants in response to their FFQ, once for 30 minutes at the beginning of the study. Throughout the program, professional health educators lectured about dietary intake for 45 minutes on three separate occasions, and exercise on two occasions for 45 minutes each. Once a week for 75 minutes, group aerobic exercise classes were held. In group B, an RD counseled participants in response to their FFQ, once for 30 minutes at the beginning of the study. This was the only counseling group B participants received. Food intake patterns were collected for baseline till the end of the program at 12-weeks and from the end of the program to 9-months. Participants were divided into two groups for each period, those who did change diet pattern and those who did not change diet pattern. Exercise patterns were used to classify four groups: habitual exercisers in both before and after the 12-week data

collection period; non-habitual exercisers for both periods; those who were habitual exercisers during the initial 12 weeks, but then became non-habitual exercisers after the 12-week data collection period; and those who were non-habitual exercisers during the first 12 weeks and became habitual exercisers after the 12-week data collection period. Food intake patterns were identified. Pattern 1 for food intake was labeled as "Plant foods and seafood". Pattern 2 for food intake was labeled "Sweets, meat, dairy products, and alcohol". Four groups were created to track changes in food pattern intake over the study. The four food pattern groups were: "Plant food and seafood" pattern both before and after the end of the program (PP); changed from "Sweets, meats, dairy, and alcohol" to "Plant food and seafood" (SP); changed from "Plant food and seafood" to "Sweets, meats, dairy, and alcohol" (PS); and "Sweets, meats, dairy, and alcohol" for both before and after the end of the program (SS). At 12-weeks, loss in body weight was the most for the SP (-1.9 kg) group, followed by the PP (-0.9 kg) and SS (-0.9 kg) groups. PS (-0.5 kg) group body weight loss was least of all groups. The SP group also saw the greatest reductions in BMI (-0.8 kg/m^2) and percentage body fat (-1.5%). For the SS, PP, and PS groups percentage body fat reductions were -0.4 % and BMI reductions were between -0.2 to 0.4 kg/m^2. At the nine month follow-up period, the greatest differences in BMI (-0.8 kg ± 0.1), body weight (-1.9 kg ± 0.2), and percentage body fat (-1.5 kg ± 0.3) were seen in the SP group after adjustments were made in age and sex. No differences were seen in any variables without adjustments for

the nine month follow-up period. The purpose was to compare weight loss between the dietary pattern groups. Weight loss was most in the SP group (-1.9 kg ± 0.2) and least in the PS group (0.5 kg ± 0.3). Body weight loss possibly related to a decrease in the calorie content of the foods consumed in the "Plant food and seafood" pattern as compared to the "Sweets, meats, dairy, and alcohol" pattern. The "Plant food and seafood" pattern was high in nutrients and low in calories and the "Sweets, meats, dairy, and alcohol" pattern was calorie dense while low in nutrients. Slight reductions in body weight were seen on the non-changer groups (SS, PP). The participants in Groups A and B were not separated as it was found more beneficial in keeping them together to focus on the influence of eating patterns. Overall, it was shown that changes in food intake patterns are related to body weight changes.

Most weight loss programs focus on middle to upper class white women. Female minorities appear to have greater challenges when it comes to weight loss, such as cost, family responsibilities, and lack of childcare. The purpose of this following study was to assess the effectiveness of a specific weight loss program on reducing body weight in low-income mothers to decrease obesity. The study also examined nutrition attitudes that are associated with weight loss and looked at relationships between dietary factors and nutrition attitudes. These secondary variables included: sensory motivators to eating, learning about indicators of healthful eating, emotional responses to eating, and perceived barriers to eating healthfully. The intervention group attended

2-hour classes that provided information on healthy eating, exercise, and behavior modification. Baseline and eight week measurements were done for the intervention group (n = 114) for height, weight, percentage of body fat, waist circumference, demographics, attitudes, dietary measures. At the week 24 follow-up, 93 participants of the intervention group were reassessed. A group of responders, those who lost 2.27 kg or more at week 8, and a group of non-responders, those who lost less than 2.27 kg at week 8 were formed. A control group also gave measurements for the same variables at baseline and week 8; however, the control group did not provide information on dietary attitudes or a dietary assessment. In the intervention group, the responders lost a significant amount of weight (-4.7 kg) and the non-reponders did not lose significant weight (-0.5 kg). The overall weight loss for the intervention group, responders and non-responders, was -2.7 kg. At the 24 week follow-up, for those who lost weight, the weight, waist circumference, and percentage body fat remained significantly lower than at baseline. Responders had reductions in body weight (-4.7 kg), waist circumference (-4.9 cm), and body fat percentage (-1.8%) that were greater than those of non-responders (-0.5 kg, -2.0 cm, and -0.5%, respectively). The control group mothers gained an insignificant amount from baseline to week eight. For both responders and non-responders, improvements in sensory motivators, healthful eating indicators, emotional eating responses, and perceived behaviors improved. Significant differences were seen between responders and non-responders for healthful eating indicators and

perceived barrier at week eight. Over 90% of the intervention participants reported learning a great deal about nutrition in the program. The maintenance of weight loss at the 24 week follow-up suggests that this program has potential in assisting in weight loss for obese and overweight low-income mothers (Jordan, Freeland-Graves, Klohe-Lehman, Cai, Voruganti, & Proffitt et al., 2008).

According to the Japanese Ministry of Health, Labor, and Welfare, one in two men and one in five women are suspected of having metabolic syndrome in Japan. Previously, internet-based weight loss programs have been effective. Information communication technology (ICT), an internet and telephone-based weight loss technology, was created as a method to provide more detailed data in a simpler manner. The purpose of this study was to monitor changes in weight, blood pressure, lipidemia, and impaired glucose tolerance (IGT) in response to nutritional guidance using the ICT system. There was also a comparative group that used face-to-face guidance. The comparative group had their blood pressure (BP), body weight (BW), and exercise measured each day. Guidance by a dietitian was also provided three times during the study period. Those in the face-to-face group were sub-divided into those who were given kanten jelly to consume and those who did not consume kanten jelly. The kanten jelly was eaten to prevent overeating at dinner. Kanten jelly is low in calories, high in fiber, readily absorbs water, and is very filling. All of the participants were obese and had characteristics of metabolic syndrome. Each participant was randomly assigned to

one of the three groups. This study looked at overweight and obese individuals who had one or more of the characteristics of metabolic syndrome. The ICT method utilized electronic connections to BP monitors, scales, and pedometers and the data was transmitted via the internet or phone to the laboratory. The data was then displayed graphically using software that was specifically created for this purpose. ICT group participants measured BP and body weight each morning and evening. Pedometer data was transmitted once each evening. Each ICT participant ate kanten jelly (180 g) before dinner each day. A FFQ was submitted at baseline and after 12-weeks. Weekly self-evaluation sheets were submitted. The ICT group had significant reductions in body weight (-3.8 kg), systolic blood pressure (134 mmHg to 128 mmHg), and diastolic blood pressure (84 mmHg to 78 mmHg). There were also improvements seen in concentrations of total cholesterol (-28 mg/dl), LDL cholesterol (-16 mg/dl), and HbA1c (-0.3%). For the two face to face groups, significant improvements in body weight (-3.2 kg with kanten jelly; -1.7 kg without) and blood pressure (-8 mmHg systolic and -6 mmHg diastolic in the kanten jelly group; -10 mmHg systolic and -6 mmHg diastolic without) were seen, but there were no significant improvements seen in the biochemical indices. Both the face to face group and the ICT group that consumed kanten jelly saw reductions in body weight and HbA1c, and fasting blood glucose (Ueki, Sakurai, & Tochikubo, 2009).

Canada is experiencing similar obesity trends as the U.S. Diet and exercise are the focus of weight reduction in this following study. An ideal weight loss program creates a calorie deficit by expending more calories than are consumed. Lean tissue sparing, body mass reduction, fat mass reduction, and the reduction of CVD risk factors characterize a healthy hypo-caloric diet. Various macronutrient diet arrangements promote weight loss when calorie restriction is the driving force. Low-fat diets lead to more favorable lipid profiles. Low-carbohydrate diets generally result in better insulin sensitivity. The purpose of this study was to examine 3:1 (CON) and 1:1 (HP) carbohydrate to protein hypo-caloric diets with exercise (CONex and HPex) and without exercise (CON and HP) on risk factors associated with metabolic syndrome in an overweight and obese population of Canadian women. Sixty overweight and obese women were randomly assigned to one of four hypo-caloric treatment groups. The CON diet consisted of the 3:1 ratio; the HP diet consisted of the 1:1 ratio. An exercise group was assigned to each of these diet arrays resulting in a CONex and an HPex group. At baseline and week 12, each participant had sub-maximal exercise testing, RMR, urinary nitrogen collection, and blood samples collected. Each week, body mass and blood pressure were measured. At baseline, week 6, and week 12, bioelectrical impedance (BIA) measurement was conducted. The exercise groups participated in a 36 minute circuit training program three days per week. Over the 12-week intervention period, each group lost weight. The CON group lost 2.1 kg; CONex lost 4.0 kg; HP lost 4.6 kg;

and HPex lost 7.0 kg. Only the HP and HPex groups were found to be in positive nitrogen balance. RMR, and concentrations of HDL, and LDL were not significantly different in any group. Exercise was shown to decrease HR aproximately 10 beats per minute for both exercise groups. A diet of 1.5:1, carbohydrate to protein ratio, improved weight loss over a 3:1 diet. Exercise increased weight loss for both diet groups (Meckling & Sherfey, 2007).

At Tufts University, Rippe observed the effects of a 12-week weight loss program that included exercise, a self-selected hypo-caloric diet, and group support on psychological well-being, quality of life, and health practices in obese women. A weight loss program consisting of 1500 kcals of exercise per week, 7,950 to 9,910 kcals diet per week, and weekly meetings was compared to a control group. Eighty obese women, with a weight 20 to 50% over the Met Life Insurance Tables, aged 20 to 49 years old were randomly assigned to participate in either the 12-week intervention group or the control group. Body weight, body fat %, estimation of ability to achieve physical fitness, and body cathexis were measured at baseline and week 12. Body cathexis is defined as body esteem, or how one feels about their body image. The intervention group lost 6.07 kg compared to the control group's loss of 1.31 kg. The intervention participants also achieved significant improvements in mean body cathexis of 18.6 points as compared to the 0.7 point improvement from the control group. Vitality and mental health were also shown to be improved in the intervention group compared to controls

(21.7 point increase vs. 2.9 point increase for controls; 10.4 point improvement vs. 2.3 point improvement for controls). Vitality is considered how lively one feels about themselves, i.e. – "Last week did you feel that you were full of pep?" Mental health is general term used to classify depression. Based on the National Aeronautics and Space Administration (NASA) physical activity scale, exercise levels significantly increased for the intervention group compared to controls (+4.4 for intervention vs. +0.6 for controls). The NASA physical activity scale scores a sedentary individual at 0 and a highly active individual, one who runs 25 miles per week, at 10. Levels of physical activity between these two extremes are scored 1-9. Weight loss strategies such as exercise, self-selected hypo-caloric diets, and group support can be effective for reducing body weight, improving health and psychological benefits in obese women (Rippe, Price, Hess, Kline, DeMers, & Damitz et al., 1998).

Lerman and colleagues compared a Mediterranean diet with a low-glycemic load (MED) with a phytochemically-based diet (PED) consisting of foods with soy proteins, phytosterols, proanthocyaninidins, and rho iso-alpha acid on cardiovascular risk factors for individuals with hypercholesterolemia and metabolic syndrome. Forty-nine individuals were randomly assigned to either the MED or PED group for the 12-week study. Fasting blood samples were taken and body weight was measured at baseline, 8 weeks, and 12-weeks. After the 12-weeks, the MED (- 5.7 kg) diet produced similar body weight loss in individuals as did the PED (- 5.9) diet; however, the PED intervention

group had significantly better improvements in concentrations of HDL-C (+ 7% PED vs. + 2.7% MED), TG/HDL (-42.7 % PED vs. -17.6% MED), and a continued reduction in ApoB/Apo A-1 (-17.5% PED vs. -9.9% MED) from weeks 8 to 12 than did the MED group. Overall, the PED group realized a 43% reduction in net resolution of metabolic syndrome as compared to 22% by MED participants. The 10-year Framingham coronary heart disease (CHD) risk score improved 5.6% for the PED arm and 2.9% for the MED arm. The 10-year Framingham CHD risk scale looks at age, gender, smoking status, systolic blood pressure, concentrations of HDL-C, and total cholesterol, and if blood pressure medications are being taken, to estimate the 10-year risk for developing coronary heart disease. Both diets groups experienced similar losses in body weight over the intervention period, but the PED diet resulted in improved cardiovascular and metabolic syndrome risks over the MED diet (Lerman, Minich, Darland, Lamb, Schiltz, Babish et al., 2009).

Various programs have been successful in providing means for weight loss and reduction of disease risk markers. Diet and exercise have been shown to be the driving forces in promoting calorie deficits for weight loss. The WMP includes exercise and dietary education as main components for creating calorie deficits.

Stages of Change Survey Review

The basis of the SOCS process is based on the Prochaska transtheoretical model. This model uses five stages to rank readiness to change; the stages include pre-

contemplation (not thinking about change in the next six months), contemplation (thinking about changing within the next six months), preparation (intending to take action, usually one month), action (specific changes have been made), and maintenance (working to prevent relapse) (Turner, Thomas, Wagner, & Moseley, 2008). For each of the seven questions of the SOCS, five options representing each of these five stages were available.

In the U.S., 300,000 deaths are associated with obesity annually. A weight loss team at the Department of Family Medicine and the School of Nursing at the Medical College of Georgia developed the Wellness Program for patients at the family medical center (FMC) in response to obesity related mortality. This program used the Prochaska transtheoretical model of behavior change as a theoretical framework. One hundred twenty two patients of the FMC began the program. A total of 109 participants completed the program. The age range was 22 – 72 years for the 81 participants who provided age information. The purpose of the study was to evaluate the effectiveness of the Wellness Program in advancing patients in their readiness to change nutrition and physical activity levels, helping them achieve weight loss, and improving patients' general health. The Prochaska model was explained to the participants, focusing on readiness to change. Stage of change was assessed by two questions. The participants were asked to select the response that most represented their answer for the questions, "How ready are you to change your eating habits?", and "How ready are you to change

your physical activity?" The intervention included 12 one week group meetings discussing educational weight loss activities. Three of the meetings were 90-minute aerobic exercise sessions. Participants were allowed to choose from one of three diet plans, a low calorie, a low fat, and a low carbohydrate diet. Body weight, body mass index (BMI), and blood pressure were measured at each meeting. The mean body weight at baseline was 227 lbs. At week 12, the mean body weight change was -4.5 lbs (± 7.0). Diet effects on weight loss were essentially the same (low calorie: -4.4 lbs; low fat: -3.9 lbs; low carbohydrate: -7.8 lbs). Exercise was shown to be the major determinant of weight loss. Almost half, 49.5% of the participants did not attend any of the three exercise sessions. Mean body weight change was -2.1 lbs. for those who did not attend any exercise sessions. For those who attended one exercise session (38.5%), mean body weight change was -5.4 lbs. Eight participants attended all three exercise sessions, and had a mean body weight change of 9.4 lbs. At baseline, no participants were in the pre-contemplation stage for eating; 3.2% of participants were in the contemplation stage; 8.5% in preparation, 41.5% in action, and 46.8% reported that they had already changed their eating habits and planned to maintain these habits. After the 12-week intervention, 86.3% of the participants were in the maintenance stage. For the exercise question at baseline, no participants were in the pre-contemplation stage; 2.1% of the participants were in the contemplation stage; 16% reported being in the preparation stage; 48.9% in the action stage; and 33.0% in the

maintenance stage. At week 12, for the exercise question, 56.9% of the participants were in the maintenance stage. Only one participant attended all 12 sessions for the program. Thirty five participants attended one to three sessions, and 68 participants attended four to 11 sessions. For the participants who completed four or more sessions and the 12-week and 24-week follow-ups, they were in the preparation or action stage when compared to those participants who attended one to three sessions. At baseline and week 12, body image silhouettes were used so each participant could identify which one they felt most represented them. Nine silhouettes, numbered from 1 (thin) to 9 (morbidly obese) were used. Ninety two participants completed the body image assessment, and 42.4% of them identified themselves as a 5 or 6. There was a significant correlation between body weight and the silhouette choices. The average change (-0.65) in body image assessment from baseline to week 12 was minimal. Overall, those who attended more sessions and participated in more exercise classes during the 12 weeks lost more weight than those who did not. The Prochaska stages of change model indicated that from baseline, 48.9% of participants were ready to attempt change. At week 12, 56% of participants were in the maintenance stage (Turner et al., 2008).

Obesity and overweight are related to several public health issues. The following study examined stages of change, using the transtheoretical model (TTM), for healthy eating, exercise, and emotional distress in an obese and overweight population working

to lose weight. A national recruitment of 1277 individuals was randomized into either a treatment or control group. At baseline, assessments were completed by phone. At three, six, nine, 12, and 24 months, mail assessments were sent. Phone assessments were completed for those who did not respond by mail. Assessed variables included: height, weight, stage of change for exercise, stage of change for healthy eating, stage of change for managing emotional distress, and stage of change for fruit and vegetable intake. At months six, nine, 12, and 24, the treatment group received a series of individualized TTM reports based on the previous assessment. These reports highlighted three of the four stages of change behaviors at each time point. If the participant was in the maintenance stage, they did not receive a report for that specific behavior. The control group completed measures at baseline, three, six, nine, 12, and 24 months. As compared to the control group, the treatment group had a greater percentage increase of participant's progress to the action or maintenance stages (A/M) at 12 months (31.3% and 43.9%, respectively) and 24 months (43.1% and 35.2%) for healthy eating. For the exercise outcome stages of change, 43%, 37.7%, and 44.9% of the participants in the treatment group progressed to the A/M stages at six, nine, and 12 months, respectively, compared to 34.6%, 35.9%, and 38.1% of the participants in the control group. The treatment group achieved progression percentages into the A/M stages of 44%, 45%, and 49.7% at six, 12, and 24 months for managing emotional eating. In comparison, the control group achieved 25.3%, 38.3% and 30.3% for the same time

points for managing emotional eating. At months six, 12, and 24, the treatment group progressed 44%, 45.3%, and 48.5% into the A/M stages for fruit and vegetable consumption. In comparison, the control group progressed 31.4%, 39.6%, and 39% for the same time points for fruit and vegetable consumption. At 24 months 27.4% of the treatment group and 20.3% of the control group lost at least 5% of their weight from baseline. Overall, the treatment group had significantly greater effects on progressing participants to the A/M stages than did the control group for healthy eating, exercise, managing emotional stress, and weight at 12 months after intervention. It was shown that multiple behaviors make up weight loss and that weight loss is not a singular behavior (Johnson, Paiva, Cummins, Johnson, Dyment, Wright, et al. 2008).

Malaysia is experiencing an increase in obesity. In Malaysia, obesity is most prevalently seen in Indians, followed by Malays and Chinese. The purpose of this following study was to determine the stages of change in losing weight and the self-efficacy in eating control of three indigenous groups of overweight and obese adults in Sarawak, Malaysia. Of the indigenous tribes, the Malays had the greatest percent of obese at 46.9%. This study utilized the TTM to rate the stages of change (SOC) for the Malay sample. A purposive sampling method was used to recruit participants since records of overweight and obese indigenous peoples was lacking. A pre-test questionnaire was used to collect data pertaining to: socio-demographic data, perception of body weight, and the presence of health problems. A SOC (one question

regarding willingness to make changes to lose weight) and a Weight Efficacy Lifestyle Questionnaire (20 questions rated on a 10 point Likert scale (0 = not confident -9 = very confident)) were used to assess participants' confidence to resist eating in certain vulnerable situations. Anthropometric data was recorded. Many of the rural residents were illiterate; therefore an interview format of the questionnaire was used in this case. Of the 271 participants, 32.8% were Malay; 31% were Ibans; and 36.2% were Bidayuhns. The age range was 21 to 65 years. Only 2.2% of the participants perceived they were obese; 76.8% perceived they were overweight. The SOC for weight loss indicated that 60.5% of participants were in pre-contemplation, 20.7% were in contemplation, 8.5% were in preparation, 8.9% were in action, and 1.5% were in the maintenance stage. The SOC group was further divided into either an action (stages 3-5) or pre-action group (stages 1 and 2). When the WEL data was analyzed, the lowest score was in the social pressure scale, the highest in the negative emotion scale, and had similar results to other studies for the remaining scales. A majority (85.7%) of participants had not taken action to lose weight (either pre-contemplation or contemplation stages). The main reason given for not taking actions to lose weight was that the participants did not know how to lose weight. It is surmised that one reason the Malaysian Ministry of Health's ready-for-action strategies to decrease obesity incidence may be due to the large percentage of individuals in the pre-contemplative and contemplative stages. The WEL data showed that this sample did not use eating to treat physical and emotional

problems. Other WEL data highlighted that overeating for this population is related to social expectancy to eat when one is invited to do so, otherwise it may be considered rude. Appropriate strategies to motivate this population would be most effective in eliciting a response toward implementing weight loss practices. The majority of the participants were in the pre-contemplative and contemplative stages (Chang, 2007).

Malaysia has experienced a four-fold increase in obesity in the last decade for adults aged 25-64. A major reason this trend may be occurring is that many obese individuals to not view their weight as abnormal; therefore, feel no need for weight loss. However, for those who are overweight or obese and intend to lose weight, the TTM is a convenient tool to identify those who would most benefit from weight loss intervention and advice. Different interventions can be used for the different stages of change. This qualitative study examined the perceptions and feeling of being overweight and obese, and the perceived barriers to weight loss among adults from lower socio-economic backgrounds in Sarawak, Malaysia. Focus groups were formed to assess the perceptions and feelings of being overweight and obese and barriers to weight loss. The TTM was used to assess each participant's intention to lose weight. Twenty one women and 17 men aged 25 to 60 years were recruited to take place in this study. Discussions of 35 to 75 minutes were conducted. These discussions were with little moderator involvement, and focused on open dialogue over topics of body weight that were pre-determined. Audio-recording of the discussion groups was done. All participants were in the pre-

contemplation stage of change. The main identified barriers to weight loss included: lack of knowhow, failed attempts, and difficulty to resist eating. Both females and males perceived increased waist lines with shame, frustration, and being less effective at work. Ugliness was also associated with increased waist lines. Anti-overweight or anti-obesity discrimination was not experienced by any of the participants, but the negative perceptions of being overweight or obese were self-induced. As is common with those in the pre-contemplation stage of the TTM, participants experienced low self-efficacy and self-esteem. Individuals with low self-efficacy often give up when faced with failure and difficulties. Individuals with a low sense of self efficacy avoid difficult tasks and doubt their own capabilities. Failures decrease self-efficacy. When one experiences success, self-efficacy increases. Increasing self-efficacy can progress one to the next stage of the TTM. The awareness of being overweight and obese in this group was not enough to motivate participants to lose weight. Education on weight loss methods, overcoming failure, and being able to resist overeating are practical steps to assist in weight loss for these participants, however; weight loss may not be achievable until these individuals are progressed in the TTM stages. Tailoring weight loss strategies for the stage in which the participant is in is the most effective treatment for weight loss (Chang, Chang, & Cheah, 2009).

Even though many obesity-related health risks can be reduced by minimal weight loss, many obese Americans do not engage in effective dietary and exercise

practices for weight loss. Individuals in the first two stages (pre-contemplation and contemplation) of the TTM are reluctant to make changes, whereas those in the three advanced stages (preparation, action, and maintenance), are more likely participate in action-oriented steps for behavior change. The following study examined the relationship between being at the advanced stages of weight loss, diet improvement, and exercise in primary care patients. Factors associated with being at advanced stages of readiness to lose weight and improve diet and exercise were also identified. One thousand patients from the Boston area were randomly selected from a hospital-based general internal medicine practice. Of the 1000 recruited patients, 366 responded and were included in the study. A telephone survey was used to collect data on height, weight, co-morbid illness, and health habits. Patient readiness to lose weight and change weight related behaviors (reduce portion size; reduce fat intake; increase fruit and vegetable intake; and increase exercise) was assessed using the TTM. For each behavior, participants were classified into one of the five stages for behavior. Two more classification groups were assigned, one for those in the first two stages and another for the three advanced stages. Over half (n = 199) of the participants were at one of the three advanced stages. Of these 199 in the advanced stages of change, 61% were also at an advanced stage of readiness to improve diet and exercise. For obese participants, these percentages were 72% and 47%, respectively. Thirty five percent of participants were at advanced stages to improve diet and 26% were at advanced stages to improve

exercise, but were at pre-contemplative or contemplative stages for weight loss. For obese participants, these percentages were 13% and 20%, respectively. Participants who were aware that weight was a possible health risk were the most likely to be at the more advanced stages of change (Wee, Davis, & Phillips, 2005).

For many reasons, obese individuals encounter roadblocks to weight loss. Many of these reasons are related to self-esteem and confidence. In the primary care setting there are various hurdles health care professionals observe are related to weight loss. The purpose of the following study was to examine factors that motivate or hinder people in taking action about their weight. This qualitative study was carried out in a sample of 16 coal miners in the Barnsley, Rotherdam, and Doncaster areas of England. Interviews of 20 to 40 minutes were conducted in the client's homes. The interviews focused on questions related to the weight of the client and the weight of those living around the client, current and previous attempts at weight loss, help and support requested and received, sources of weight loss information, beliefs about weight loss and health risks, and exercise habits. The TTM stages of change model was utilized to identify each client's readiness to change. For those interviewed, the most crucial factor of weight loss was psychosocial. Being overweight or obese and the triggers to take action to lose weight were often perceived as stressful for this population. Due to this perceived stress, although a decision to lose weight may have been made, the follow through to action was often incomplete. Clients stated that the decision to lose weight

was made slowly, precluded by accepting the idea of weight loss. Before successful weight loss was achieved, clients often noted many failed attempts and relapse. Motivation, lack of support, and the wrong state of mind were reasons for failed weight management. Triggers to the action stage include: embarrassment and humiliation such as comments about being overweight and the social stigma of overweight and obesity; health problems and health warnings; fear; critical events such as birthdays, weddings, and holidays; and image. Barriers to action were denial and previous bad experiences such as public weighing and previous failure at weight loss. Before action occurred for this group, pre-contemplation and contemplation periods took place. By identifying which stage individuals are in, health care providers can better focus weight loss intervention on those we are likely to succeed. For those who are not ready for action, they should be encouraged to move on to the next stage of change, rather than trying to force them to lose weight. This study identified that many barriers to change were related to psychosocial issues perceived by the client (Tod & Lacey, 2004).

The Weight Management Program at the Institute for Women's Health at Texas Woman's University

The WMP is utilized as a means to assist in weight loss through face-to-face weekly meetings that are focused on education. To date, no one has examined the effectiveness of the WMP at the Exercise and Sports Nutrition Clinic at the IWH on weight management in an overweight and obese population. The purpose of this study

is to examine the effectiveness of the WMP on reducing body weight in an overweight and obese population. The SOCS will also be put under the microscope to be examined if it has reliable estimation for weight loss outcomes. If the WMP is viable for managing weight and changing body composition, one can postulate that the WMP can possibly lead to a reduction in risks for cardiovascular disease, metabolic syndrome components, diabetes type II, asthma, hypertension, various cancers (breast, colorectal, endometrial, esophageal, kidney, ovarian, pancreatic, and prostate), arthritis, and other disease risk factors.

Summary and Conclusion

Being aware of the trends of weight gain in the United States highlights the need for interventions for this condition. The diseases associated with being overweight and obese impact society on many levels. Programs to deter weight gain are important and can act as a means of resistance and prevention for many lifestyle related diseases. The most important aspect of these programs may lie in the characteristic of prevention. Compliance to weight management programs is the major hurdle to effectiveness and is related to numerous issues. Education is key in promoting acceptance and compliance of these programs.

CHAPTER III

METHODS

Purpose

This study will determine if the 12-Week Weight Management Program (WMP) in the Institute for Women's Health (IWH) at Texas Woman's University is considered effective based on weight loss. The stages of change survey (SOCS) results will also be compared to weight loss to determine any relationship between the two.

Participants

The Institutional Review Board of Texas Woman's University approved this study. For this study, 32 female participants ranging in age from 19 – 72 years old volunteered for the WMP at the Exercise and Sports Nutrition Clinic at the Institute for Women's Health IWH at Texas Woman's University in Denton, TX. Each participant had their weight and height measured at baseline and after the WMP was completed. All participants were overweight (BMI = 25 – 29.9 kg/m^2) or obese (≥30 kg/m^2) according to BMI standards (Kasper et al., 2005). The participants had the following mean characteristics: age, 39.4 years (± 18.7); height, 162.2 cm (± 4.8); weight, 87.5 kg (± 16.7); BMI, 33.2 kg/m^2 (± 5.8); SOCS score, 23.0 (± 4.7). Standard deviation is seen in parentheses. For this study the Independent Variables (IV) were WMP and the SOCS

score. Dependent Variables (DV) included body weight as affected by the WMP and body weight change related to the SOCS score.

IV – 1) WMP; 2) SOCS score

DV – 1) Weight; 2) Weight Loss

Intervention

The intervention consisted of participating in 12, one-hour sessions focusing on changing dietary behavior and increasing physical activity. Educational materials and information were provided covering diet and exercise. During the 12-week intervention, the client participated in a Resting Metabolic Rate (RMR) test, $VO2_{max}$ test using the Bruce protocol, performed muscular endurance tests, was measured with calipers to determine body composition, and had waist and hip circumference measured with a tape measure, received a weight room walk through and education on form, frequency, intensity, and timing of resistance exercise, learned how to read nutrition labels and ingredient lists, was taken on a grocery store tour and taught prudent grocery shopping habits, was educated on proper nutrition, exercise, overcoming bad habits, the glycemic index, and was provided with various handouts and material related to each of these topics. The variables of interest for this study were changes in body weight from baseline to week 12 of the WMP and body weight changes correlated with SOCS scores.

Study Design

This study used a retrospective, longitudinal, pretest-posttest design focusing on participants who completed the WMP. The study was done at Texas Woman's University in Denton, TX at the Exercise and Sports Nutrition Clinic at the IWH.

The WMP consisted of a one-on-one weekly meeting for 12-weeks between the client and a coach. The client's role was to attend all 12 sessions and to incorporate a new weight management strategy into their lives each week. At the close of the 12-week program, the client was armed with various tools and strategies to assist in continuing weight management throughout life. Weight management strategies consisted of educational materials, handouts, demonstrations, information on proper nutrition, disease risks, and exercise.

To determine if the WMP was effective, participants had their weight and height measured at baseline and then 12-weeks later after completing the WMP. Complete compliance, or 100% effectiveness of the program, was set as a loss of 24 lbs. or 10.9 kg of body weight by the end of the 12-week Program. This amount of weight loss per week is considered safe for obese populations for the first six months of weight loss (Mahan, 2007). Effectiveness was based on weight loss. To determine effectiveness, the mean loss of body weight during the WMP program was made as a percentage of 24 lbs. (10.9 kg). The level of effectiveness was determined depending upon which quintile the group's mean loss of body weight fell. Quintile descriptions can be seen in Table B

in Appendix C. The quintiles are slightly effective, somewhat effective, moderately effective, effective, and very effective. The quintiles were used to determine the effectiveness of the WMP based on loss of body weight in lbs. or kg. The quintiles of effectiveness are: Slightly effective, Somewhat effective, Moderately effective, Effective, and Very effective. The mean loss of body weight for the 32 participants over the 12-week WMP was a percentage of the weight loss standard of 24 lbs. or 10.9 kg. This percentage fell into one of the quintiles and indicated an effectiveness classification based on mean weight loss compared to the weight loss standard.

Effectiveness

Percent effectiveness was determined by dividing the average weight change for the sample by the weight loss goal of 24 lbs. or 10.9 kg. The resulting value was a percentage of the weight loss standard of 24 lbs. or 10.9 kg. The resulting percentage from the effectiveness equation determined the effectiveness quintile (slightly effective, somewhat effective, moderately effective, effective, or very effective).

Stages of Change Survey

Each participant was instructed to complete a SOCS. The goal of this survey was to gauge the pre-program practices of the participants and how recently these practices had been in place. The proposition is that this form determined those who were willing to change and thus was an indicator of success for weight loss and effectiveness of the WMP. The form consisted of seven questions with five possible options for each

question. The format is that of a Likert scale. Scoring was done by adding the scores of all seven questions. A score of 35 was determined to be completely ready to change and should indicate one who was willing and ready to make changes for weight loss. A score of seven was the lowest score possible and indicated one who was not willing or ready to make changes related to diet, exercise, and weight loss. The SOCS scores was compared to weight loss in kilograms and submitted to a Pearson's correlation to determine the relationship of the SOCS scores and weight loss. Each participant's SOCS scores was compared to their changes in weight. The SOCS form can be found in Appendix E.

Body Mass Index and Height

Body mass index (BMI) was determined using each participant's weight in kg divided by height in meters squared. BMI = kg/m^2. An electronic scale (Tanita, Arlington Heights, IL) was used to measure weight. Participants stood facing forward as still as possible with arms at rest at the sides as the weighing device was used. Weight was recorded in kilograms. Two measurements were made for each participant to the nearest 0.1 kg; these values were averaged and recorded. Height was measured with a wall mounted stadiometer (Tanita, Arlington Heights, IL). Standing with feet flat and heels and back against the wall, participants stood with chin parallel to the floor and arms at the sides while height was measured to the nearest centimeter. Two measurements were taken to the nearest centimeter then averaged and recorded.

Participants removed shoes, pocket contents, and heavy outer wear before measuring weight and height.

Weekly Meetings

The client and the coach met weekly for goal setting, goal follow-up, updates, education, counseling, and motivation. The coach was a graduate student in the Exercise and Sports Nutrition Master's program at Texas Woman's University in Denton, TX. This individual may or may not be a Registered Dietitian or a Certified Personal Trainer but are under the guidance of the clinic coordinator. The coach provided support, offers guidance, educates, and administers the program.

The first meeting of the WMP consisted of the client filling out forms and a three-day food record. The food record tracked two weekdays and one weekend day. The coach reviewed the diet record and identified three areas of focus for nutrition education. Dietary trends and physical activity practices were shared with the coach during this meeting. Before departing, the coach and client set goals to work on for the next week.

Education on reading nutrition labels, weight room practices, prudent grocery shopping, the glycemic index, and proper nutrition were provided to each client. In addition, clients had blood work, basal metabolic rate (BMR), $VO2_{max}$, muscular endurance, and body composition assessed, however; these variables were not included in the current study.

Each meeting built upon the previous information and helped to create synergistic effects over time to assist the client in meeting their weight loss goals.

A weigh-in was performed each week or every other week to track weight loss.

Data Collection

Data were collected at baseline and included weight, height, and SOCS scores. At the end of the study, final weight and height measurements were made. The baseline weights were compared with the final weights to determine effectiveness of the WMP. Weight and height were measured and written on standard forms. The SOCS score was obtained by adding the score of each question on the SOCS for all seven questions. Each question had answers that were scaled from one to five with one indicating a non-willingness to change, a score of five indicated willingness to change.

Statistical Data Analysis

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 15.0. A paired t-test was used to determine differences from baseline weight and weight after the 12-week Weight Management Program. Pearson's correlation was used to determine any relationship between weight loss and the results of the SOCS. Significance was determined as p-values of less than 0.05. The r-value was used to identify correlations.

CHAPTER IV

RESULTS

Results of this study will be presented in this chapter. The primary variables of interest are body weight and body weight change. This project determined if the Stages of Change Survey (SOCS) score is related to weight change in each participant and if the 12-Week Weight Management Program (WMP) is related to change in body weight.

Purpose

The purpose of this study was to examine the effectiveness of the 12-week Weight Management Program (WMP) at the Institute for Women's Health (IWH) at Texas Woman's University in Denton, TX on reducing body weight in an overweight and obese population of females, ages 19 to 72 years old. In addition, the relationship between the Stages of Change Survey (SOCS) on willingness to change and weight loss during the 12 weeks was also determined.

Presentation of Results

Thirty two individuals met the inclusion criteria and participated in this study at Texas Woman's University in Denton, TX. All of the participants were women. Averages and standard deviations for age, height, baseline and post-intervention weight, baseline

and post-intervention Body Mass Index (BMI), weight change, percent effectiveness, quintile rank, and SOCS data are found in Table 1. All SOCS scores of zero represent participants who did not complete a SOCS. All zero scores for SOCS are not included in statistical analysis. Six participants did not complete a SOCS.

Table 1

Descriptive Statistics for Age, Height, Baseline Weight, Post-Intervention Weight, Baseline BMI, Post-Intervention BMI, SOCS, Weight Change, Percent Effectiveness, and Quintile Rank.

	N	Minimum	Maximum	Mean	Standard Deviation
Age (years)	32	19.0	72.0	39.4	±19.0
Height (cm)	32	148.5	174.0	162.2	±4.9
Baseline Weight (kg)	32	61.8	140.0	87.5	±17.0
Post-Intervention Weight (kg)	32	55.9	139.5	86.3	±17.4
Baseline BMI (kg/m^2)	32	25.3	51.4	33.1	±5.9
Post-Intervention BMI (kg/m^2)	32	23.2	51.2	32.7	±6.1
SOCS	26	15.0	31.0	23.0	±4.7
Weight Change (kg)	32	-3.2	6.4	-1.1*	±2.0
Percent Effective (%)	32	0.0%	59.0%	10.0%	±18.0%
Quintile	32	1.0	3.0	-	-

Note. BMI = Body Mass Index, SOCS = Stages of Change Survey score. (*) indicates significant difference.

At baseline, mean body weight for the group was 87.5 kg ± 16.7 kg. After the WMP, mean body weight for the sample was 86.3 kg ± 17.1 kg (Figure 1). There was a significant reduction (-1.1 kg ± 2.0 kg, $p = < 0.05$) in body weight from baseline to post-intervention of the WMP ($p = 0.00$). Baseline mean height for the sample was 162.6 cm

± 4.8 cm. For the 32 participants, the mean age was 39.4 ± 19.0 years old. The average effectiveness for the sample was determined to be 9.91%. This percent effectiveness was ranked as "Slightly Effective" in the effectiveness quintile (Table B in Appendix C). Individual values for baseline weight, post-intervention weight, weight change, percent effective, quintile, and quintile rank for each participant are seen in Table C in Appendix A. None of the participants who were obese according to BMI at baseline had lost enough weight to be listed in the overweight category after intervention. Just one participant who was in the overweight category at baseline moved to the normal weight category according to BMI standards after the WMP intervention. The mean baseline BMI was 33.2 ± 5.9 kg/m^2 and 32.7 ± 6.1 kg/m^2 post-intervention, a difference of -0.5 kg/m^2. Both BMI values are in the obese category. The mean SOCS score was 23.0 ± 4.7. The range of change in body weight was a gain of 3.2 kg to a loss of 6.4 kg and can be seen in Table C in Appendix A. Descriptive statistics for age, height, baseline weight, post-intervention weight, baseline BMI, post-intervention BMI, SOCS, weight change, percent effective, and quintile rank can be found in Table 1.

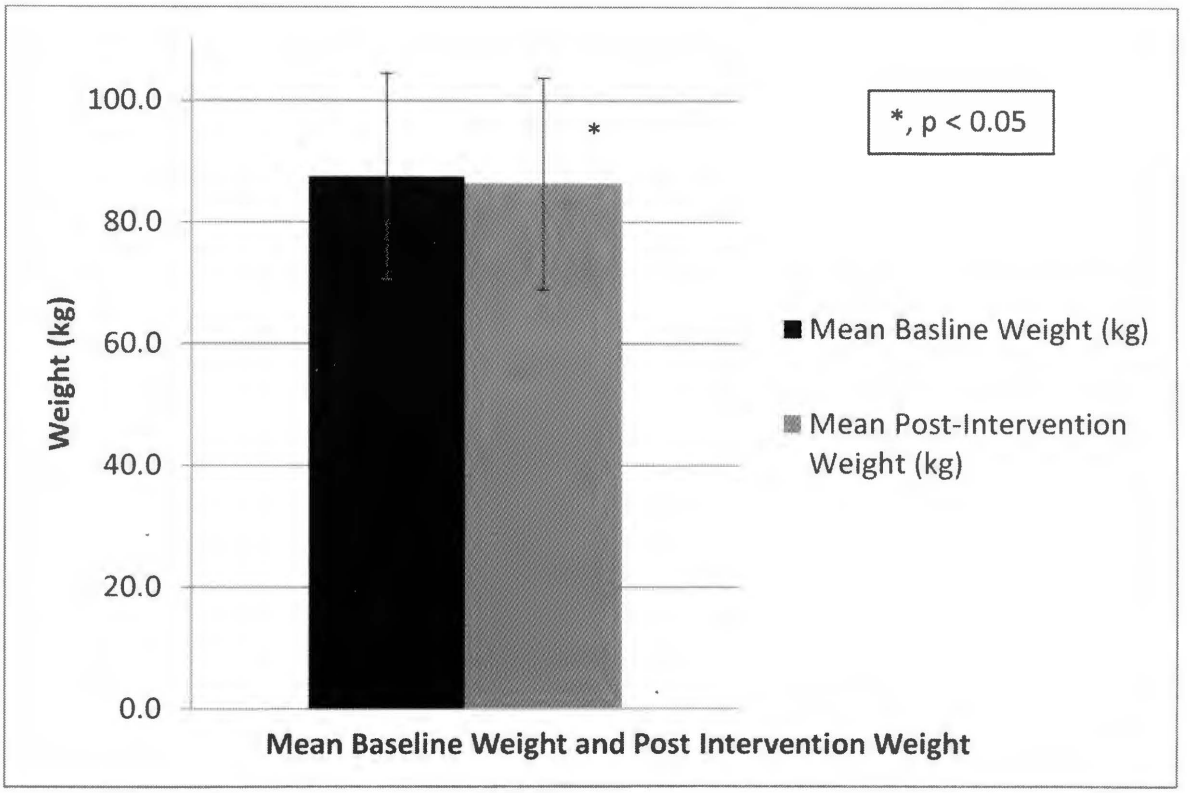

Figure 1. Differences in mean baseline weight and mean post-intervention weight. *Note.* Mean baseline weight = 87.5 kg; Mean post-intervention weight = 86.3 kg. (*) indicates significant difference.

Twenty six of the 32 participants completed a Stages of Change Survey (SOCS). There was no significant relationship between weight change and SOCS ($r = -0.31$, $p = 0.13$). A visual representation of this relationship can be seen in Figure 2. For this study, an increase in SOCS score does not correlate with change in body weight. Since the p-value is greater than α (0.05), we are unable to reject the null hypothesis: There will be no relationship between the SOCS and actual weight loss over the 12-week WMP.

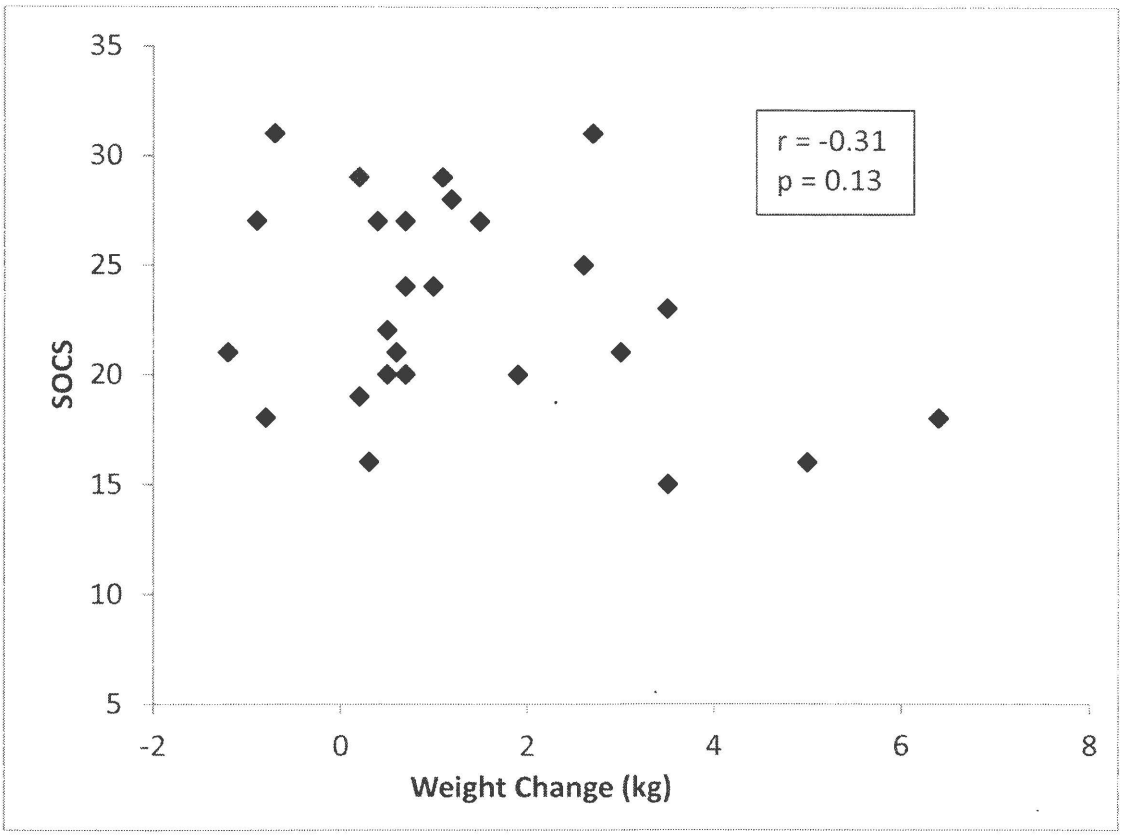

Figure 2. The distribution of Stages of Change Survey (SOCS) scores and weight change values.

Note. Change in SOCS scores is not affected by weight change scores ($p = 0.13$).

The mean SOCS score was 23.0 ± 4.7. None of the participants had SOCS scores in Stage 1. There were 5, 9, 8, and 4 participants in Stages 2, 3, 4, and 5, respectively (Figure 3). Since the majority of participants were in the advanced stages (3-5), one would expect a high degree of success in weight loss (Chang, 2007; Chang et al, 2009; Johnson et al., 2009; Turner et al., 2008; Wee et al., 2005).

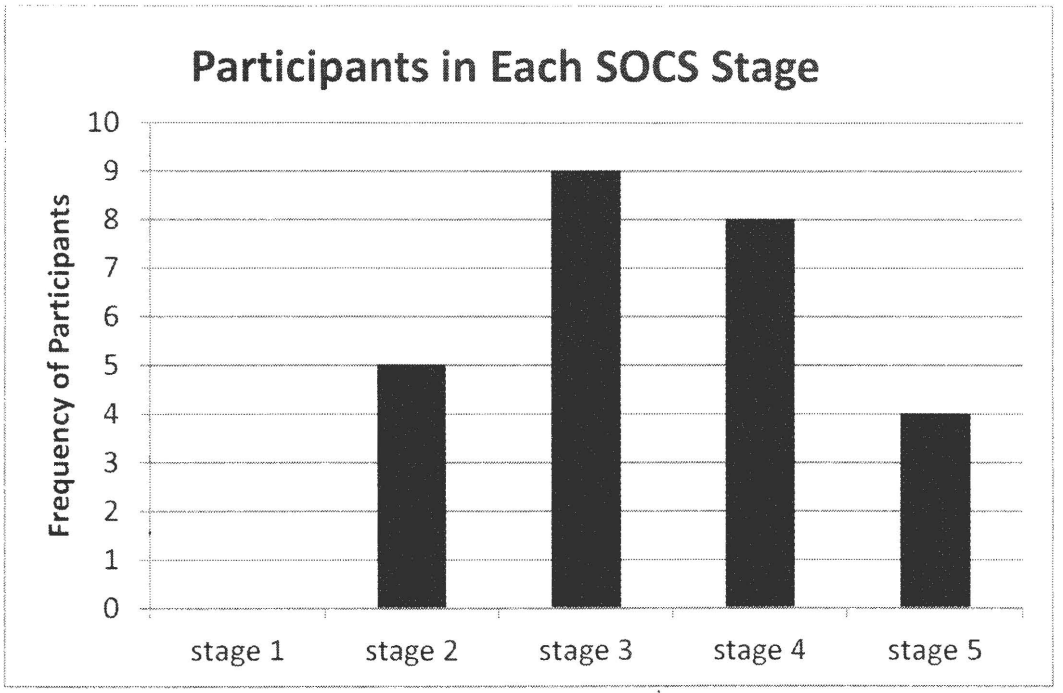

Figure 3. Distribution of participants across Stages of Change Survey (SOCS) stages.

Note. n = 26

The paired samples t-test indicates that there is a significant difference ($t = 3.22$, $p = 0.00$) between baseline weight and post-intervention weight. The significant difference in these means indicates that the WMP intervention had a significant impact on body weight. The paired samples t-test analysis rejects the first null hypothesis.

CHAPTER V

DISCUSSION

Problem Statement

Obesity has been recognized as a major modifiable risk factor for coronary heart disease by the American Heart Association (Lloyd-Jones et al., 2010). Both the National Institutes of Health (NIH) and the World Health Organization (WHO) classify obesity as a chronic disease and a major risk factor for diseases that are non-communicable. These diseases include type II diabetes, cancer, cardiovascular disease (CVD) (Guh, 2009), and a range of psychosocial issues (Heymsfield, 2005; WHO, 2006). These diseases are the major causes of death in the United States. Over the last 30 years, the United States and other developed nations have seen the prevalence of obesity and overweight increase among individuals (Mokdad et al., 2003; WHO, 2006). The direct cost of obesity in 2006 U.S. dollars was 147 billion dollars (CDC, 2009).

Purpose

The purpose of this study was to examine the effectiveness of the 12-week Weight Management Program (WMP) at the Institute for Women's Health (IWH) at Texas Woman's University in Denton, TX on reducing body weight in an overweight and obese population of females, ages 19 to 72 years old. In addition, the relationship

between the Stage of Change Survey (SOCS) on willingness to change and weight loss during the 12-weeks was also determined.

Discussion of the Results

Unlike most of the studies in the literature review, the WMP at Texas Woman's University (TWU) did not have a specific prescribed intervention or monitored diet and exercise regimens. The onus of incorporating the weight loss strategies was placed on each participant. No weekly compliance tracking, other than measurement of body mass, was carried out from initiation through the end of the program. The client was encouraged to adopt the weight loss practices, such as calorie counting, regular physical activity, increasing fruit and vegetable intake, reducing fat and sugar intake, and finding coping mechanisms other than food to relieve stress. Further, self-responsibility was strongly encouraged to help clients take ownership of their health. There was no requirement that the participant should incorporate these recommendations into their lives.

Overall, the mean body weight change was -1.1 kg ± 2.0 kg from baseline to the end of the WMP. As indicated by the paired samples t-test analysis, there was a significant difference in body weight from baseline to after the WMP, ($p = 0.00$). The change in body weight was a move in the right direction, but may be improved by requiring participants to complete a weekly food and exercise log. Logging will allow

participants to recognize where their calories are coming from and where these calories are being used.

BMI was used to classify overweight and obesity. The mean baseline BMI was 33.2 ± 5.9 kg/m^2 and 32.7 ± 6.1 kg/m^2 post-intervention, a difference of -0.5 kg/m^2. Both BMI values are in the obese category. Even though the post-intervention mean BMI still fell within the obese category, it was reduced.

Effectiveness was based on loss of body weight. An effectiveness of 100% would have been a -24 lb., or -10.9 kg, weight change from baseline to the end of the WMP. Since the mean weight change of the sample was -1.1 kg, the total mean effectiveness of the WMP was 9.91%. An increased loss of body weight by the sample would have increased the mean effectiveness of the WMP and the quintile ranking. Within the quintile ranking scale (Table B in Appendix C), 9.91% percent effectiveness was ranked within the first quintile (0% – 20%) as "Slightly Effective". Overall, the WMP was Slightly Effective based on the quintile of effectiveness.

Compared with the reviewed SOCS articles (Johnson et al., 2008; Turner et al., 2008), mean loss of body weight was less with the WMP. The reasons the WMP group had a lower mean weight loss compared to these two studies was likely due to the more structured programs carried out with both of these studies. Specific guidelines and recommendations were provided in most of these reviewed articles. Examples of these specific recommendations are presented in the literature review. With only guidelines

and general recommendations presented to each participant of the WMP rather than specific and consistent interventions, this may have resulted in less accountability and consistency for the WMP, and therefore, less weight lost in the WMP.

The SOCS stage each participant was in was expected to have provided an indication of weight loss success (Turner et al., 2008; Johnson et al., 2008). Those in stages 1 and 2 would not be expected to be ready to lose weight. Those with SOCS in stages 3-5 would be expected to be ready to incorporate weight loss practices and should benefit from specific weight loss strategies (Jordan et al., 2008). The average SOCS score of 23.0 indicates an overall stage rank for this population of 3, the preparedness stage. Individuals in higher stages of change, stages 3-5, had significantly greater losses of body weight when compared to individuals in stages 1 and 2 (Johnson et al., 2008; Turner et al., 2008). Individuals who started these studies with a higher SOCS ranking lost more weight when compared to those who were in the lowest stages of change (Johnson et al., 2008; Turner et al., 2008). Participants had a significantly greater loss of body weight when compared to participants who did not progress to higher stages of change throughout the study (Johnson et al., 2008). The Chang study examined a group's readiness to make changes related to weight loss. At baseline 81%, of participants were in stages 1 or 2 for readiness to make changes. Of all the participants, 86% of them who had previously attempted had failed to make changes

related to weight loss. There was no intervention, but Chang focused on identifying one's SOCS score to provide appropriate staged intervention (Chang, 2007).

The other SOCS reviewed articles focused on other factors of the SOCS method, such as barriers and triggers to action (Tod & Lacey, 2004), how confidence and past successes and failures affect stage advancement (Chang et al., 2009; Tod & Lacey, 2004), that when health risks are related to making health changes that stage advancement is increased (Tod & Lacey, 2004), how discussing SOCS stages with participants results in increased stage advancement (Johnson et al., 2008; Siero et al., 2000), and that cultural and social influence can inhibit or promote stage advancement (Chang et al., 2009). Reaching goals was more prevalent in stages 3-5 when compared to stages 1 and 2 (Change, 2007; Chang et al, 2009; Johnson et al., 2008; Turner et al., 2008; Wee et al., 2005). These results and implications are related to higher motivation and confidence seen in stages 3-5.

Pearson's correlation for change in body weight and SOCS scores was negative ($r = -0.31$). SOCS scores were not significantly related to change in body weight ($p = 0.13$). A relationship between the SOCS score and weight loss does not exist within the WMP study. The results from the WMP did not agree with the results and implications of the Johnson, and Turner articles (Johnson et al., 2008; Turner et al., 2008). These articles demonstrated correlations with SOCS scores and changes in weight from baseline to the end of each study (Johnson et al., 2008; and Turner et al., 2008), while

the other reviewed SOCS studies examined motivation and confidence and how these are related to individuals making changes for weight loss (Chang et al., 2009; Siero et al., 2000; Tod & Lacey, 2004). There are not many studies available that examine how SOCS correlates with change in body weight.

Data from the WMP study indicates that SOCS scores are not correlated with changes in body weight. If the SOCS is included in future WMP studies, more attention should be given to the participants on the importance of filling out the SOCS as honestly as possible. If additional studies of the WMP show that SOCS do not correlate with changes in body weight, the SOCS should not be included in subsequent WMP studies.

Effectiveness

There are various weight loss programs available; some are more effective than others. For a weight loss program to be effective, a daily caloric deficit must be present. Decreased dietary intake and increased exercise energy expenditure are two effective means to create daily caloric deficits. For the study at the IWH, effectiveness was based on a predicted 24 lb., or 10.9 kg, weight loss over the 12-week intervention period.

In a study from Japan, Ueki and colleagues demonstrated that using information communication technology (ICT), an electronic system that transmits daily weight and blood pressure assessments directly to a laboratory, participants were able to reduce weight and blood pressure more successfully than those who had face to face weight and blood pressure assessments (Ueki et al., 2009). This technology is not available at

Texas Woman's University; however, daily weight and blood pressure assessments could be sent daily via email to the coach. One issue that may arise from emailing weight and blood pressure data could be inaccurate measurements by the participant. In the case of the WMP, the current methods for obtaining body weight, blood pressure, and other assessments should be continued.

Supporting the weight loss strategies of the WMP, current studies (Andersen et al., 2002; Brill et al., 2002; Meckling & Sherfey, 2007; Rippe et al., 2002) demonstrated that hypo-caloric diets and regular structured exercise programs can be effective as weight loss strategies. The study by Andersen et al. divided participants into either an aerobic exercise group (3 days a week for up to 45 minutes) or a lifestyle exercise group (5 days a week of moderate intensity exercise of up to 30 minutes) and prescribed a daily calorie intake range between 1200 to 1800 calories. Both exercise groups were effective in reducing body weight in this study (Andersen et al., 2002).

Another study compared 3 groups, one that ate a low-fat diet, another that ate a low-fat diet and walked 30 minutes five days a week, and the last group walked up to 60 minutes per day five days a week and ate a low-fat diet. The low-fat diet for each group was between 1200 to 1400 calories per day. Weight was measured at baseline and then at the end of 12 weeks. For the two walking and low-fat diet groups, both averaged a 13 lb. weight loss, while the low-fat diet, no exercise group had an average weight loss of 9 lbs. Both the 13 lbs. and 9 lbs. of weight loss were significantly different from

baseline weights ($p = 0.00$). Adding an extra 30 minutes of walking to the 30 minute walking group did not result in any more weight loss (Brill et al., 2002).

In a study carried out in Canada, 60 overweight and obese women were assigned to one of four hypo-caloric groups. The two diet-only groups consumed diets that were 3:1 and 1:1 carbohydrate to protein ratio. Seven-day food records were used to find an average daily calorie intake. Five hundred calories were subtracted from each participant's daily calorie average to create the calorie deficit. The two exercise groups participated in a 36 minute circuit training program three days a week for 12 weeks. One of the exercise groups consumed the 3:1 diet and the other group consumed the 1:1 diet. Over the 12-week intervention period, each group lost weight. The 3:1 diet-only group lost 2.1 kg; 3:1 diet and exercise group lost 4.0 kg; the 1:1 diet-only group lost 4.6 kg; and the 1:1 diet and exercise group lost 7.0 kg (Meckling & Sherfey, 2007).

At Tufts University, Rippe observed the effects of a 12-week weight loss program that included exercise, a self-selected hypo-caloric diet, and group support on psychological well-being, quality of life, and health practices in obese women. A weight loss program consisting of 1500 kcals of exercise per week, 7,950 to 9,910 kcals diet per week, and weekly meetings was compared to a control group. Eighty obese women, with a weight 20 to 50% over the Met Life Insurance Tables, aged 20 to 49 years old were randomly assigned to participate in either the 12-week intervention group or the control group. Body weight, body fat %, estimation of ability to achieve physical fitness,

and body cathexis were measured at baseline and week 12. Body cathexis is defined as body esteem, or how one feels about their body image. The intervention group lost 6.07 kg compared to the control group's loss of 1.31 kg. The intervention participants also achieved significant improvements in mean body cathexis of 18.6 points as compared to the 0.7 point improvement from the control group. Weight loss strategies such as exercise, self-selected hypo-caloric diets, and group support can be effective for reducing body weight, improving health and psychological benefits in obese women (Rippe et al., 2002).

These studies (Andersen et al., 2002; Brill et al., 2002; Meckling & Sherfey, 2007; Rippe et al., 2002) show that structured hypo-caloric diets and exercise programs can result in effective weight loss for overweight and obese individuals. At TWU in the IWH, it may be difficult to have consistent, across the board recommendations for the WMP due to the fact that this program caters to a variety of individuals with varying weights, BMIs, and fitness levels. However, if a standard program for exercise and diet is adopted, change in body weight and other data that the IWH monitors for participants can be compared based on common intervention. And since these studies have promising results with structured hypo-caloric diets and exercise programs, it is logical to believe similar programs can work with the WMP.

An insurance-based weight management program focusing on changing behavior (diet and exercise) was the focus of a study by Abildso and colleagues. The main aim of

this study was to use the RE-AIM program to evaluate the insurance health promotion program focusing on short-term physical and psychosocial changes in the participants. The secondary objective of the study was to critique the program. The intervention included access to exercise sites, a 60 minute diet evaluation and planning session with a dietitian, a 60 minute fitness evaluation by an exercise physiologist, and monthly 30 minute exercise sessions with a personal trainer. A 60 minute follow-up by the dietitian and the exercise physiologist were done at the 12-week time period as well. At this point, if the participant met the weight loss goal of 12 lb., they were allowed to continue into Phase II. Phase II was for the following nine months and provided a gym membership and one exercise training session per month. The results of this study in changing behavior were 43.8% effective based upon their definition of effective, and the average weight loss for the group was 13.0 lbs. For this study, effectiveness was defined as changes in the participant outcomes during the program (Abildso et al., 2010). With well-defined and structured interventions, this study resulted in moderate effectiveness (43.8%) as defined in the study, and a 13.0 lb. average weight loss. With the WMP, a decrease in overall body weight and therefore an increase in effectiveness would be expected with consistent structured interventions for each participant. Introducing a second 12-week phase to the WMP, based upon weight loss success, may provide added motivation for participants to succeed.

Culos-Reed and colleagues demonstrated how TrymGym, a multi-dimensional lifestyle behavior change program, was effective in decreasing body weight by encouraging positive lifestyle behavior changes in obese and overweight individuals. This study examined the efficacy and feasibility of an existing, Canadian, community-based, multi-dimensional weight control program. The characteristics used to evaluate the program were nutritional, physiological, and physical activity-related psychological factors. Baseline and 12-week follow-up measurements included a fitness assessment, physical activity-related psychological questionnaires, and a 3-day food record. The TrymGym intervention included two supervised 50 minute exercise sessions per week and on 50 minute nutrition education course per week. Thirty five participants enrolled in the TrymGym study. After the 12-week program, only 18 of the 31 individuals chose to participate in the post-intervention measurement follow-up. This group presented improvements from baseline to week 12 in body weight, BMI, diastolic blood pressure, and hip, waist, bicep, and neck circumference. Weight loss for this group was 3.3 kg over the 12-week intervention; total energy intake decreased by 226 calorie/day. Improvements in body weight, nutritional habits, diet-related behaviors, and physical activity levels improved. A major limitation of this study was there was no control group with which to compare the results; therefore, effectiveness of the program is difficult to determine. (Culos-Reed et al., 2007). This study was similar to the program completed at the WMP; the group size was similar at baseline, physical activity and diet

modification were encouraged, there was no control group, and it was a 12-week study. Differences include monitoring daily calorie intake at baseline and post-intervention, tracking specific nutritional habits, diet-related behaviors, and improvement of physical activity levels for each participant. Monitoring changes in these variables in the WMP at the IWH would provide solid data that would complement change in body weight to create a more complete view of effectiveness of the program in regards to overall health.

In another study, a three year follow up of a 12-week weight loss program based in Australia that had an average weight loss maintained from baseline at 3.8 ± 5.5 kg or 4.4% ± 6.1% of their body weight. One hundred female participants began the study and 86 were participating at the three year follow up. This program focused on a food-based structured diet. Participants were encouraged to exercise at least three days per week for a minimum of 30 minutes per day. Starting at baseline and at four week intervals, each participant was interviewed by a dietitian over the phone. The dietitians provided instructions on dietary intake and daily needs, as well as suggested food quantities and recorded the participant's self-reported weight. The suggested energy content of the diet was set at 5600 kJ/day (1338 calories/day). Weight loss at 12-weeks for the sample was 7.5 kg. At the three year follow up, overall, 61% of the participants lost weight from baseline, 13% of the participants gained weight, and 26% maintained their current weight (Cleanthous et al., 2007). This study showed that a structured food

and exercise-based weight loss program administered by dietitians was effective for long-term weight loss. The WMP stresses both diet modification and increased physical activity to promote body weight loss. Inconsistent interventions at the WMP likely contributed to less change in body weight compared to this study.

The purpose of a recent study (Nakade et al., 2009) was to examine how changes in food intake patterns affected body weight loss in a Japanese population who participated in a health promotion program. This was examined after the 12-week intervention and also 9 months later. Seven hundred thirty three participants were involved in the study. Two intervention groups were created, group A and group B. All participants filled out a FFQ and a questionnaire about exercise and smoking. The day the forms were turned in, blood was drawn, blood pressure was taken, and physical measurements (height, weight, percent body fat, BMI) were made. This same process was carried out at the end of the 12-week program and at 9 months after the initial data collecting session. In group A, a registered dietitian (RD) counseled participants in response to their FFQ, once for 30 minutes at the beginning of the study. Throughout the program professional health educators instructed about diet for 45 minutes on three separate occasions, and exercise on two occasions for 45 minutes each. Once a week for 75 minutes, group aerobic exercise classes were held. In group B, an RD counseled participants in response to their FFQ, once for 30 minutes at the beginning of the study. This was the only counseling group B participants received. Food intake

patterns were collected for baseline till the end of the program at 12-weeks and from the end of the program to 9-months. Participants were divided into two groups for each period, those who did change diet pattern and those who did not change diet pattern. Exercise patterns were used to classify four groups: habitual exercisers in both periods, non-habitual exercisers for both periods, became non-habitual exercisers, or became habitual exercisers. Food intake patterns were identified. Pattern 1 for food intake was labeled as "Plant foods and seafood". Pattern 2 for food intake was labeled "Sweets, meat, dairy products, and alcohol". Four groups were created to track changes in food pattern intake over the study. The four food pattern groups were: "Plant food and seafood" pattern both before and after the end of the program (PP); changed from "Sweets, meats, dairy, and alcohol" to "Plant food and seafood" (SP); changed from "Plant food and seafood" to "Sweets, meats, dairy, and alcohol" (PS); and "Sweets, meats, dairy, and alcohol" for both before and after the end of the program (SS). At 12-weeks, loss in body weight was the most for the SP (-1.9 kg) group, followed by the PP (-0.9 kg) and SS (-0.9 kg) groups. PS (-0.5 kg) group body weight loss was least of all groups. The SP group also saw the greatest reductions in BMI (-0.8 kg/m^2) and % body fat (-1.5%). For the SS, PP, and PS groups % body fat reductions were -0.4 % and BMI reductions were between -0.2 to 0.4 kg/m^2. At the nine month follow-up period, the greatest differences in BMI (-0.8 kg ± 0.1), body weight (-1.9 kg ± 0.2), and % body fat (-1.5 kg ± 0.3) were seen in the SP group after adjustments were made in age and sex. No

differences were seen in any variables without adjustments for the nine month follow-up period. The purpose was to compare weight loss between the dietary pattern groups. Weight loss was most in the SP group (-1.9 kg ± 0.2) and least in the PS group (0.5 kg ± 0.3). Body weight loss possibly related to a decrease in the calorie content of the foods consumed in the "Plant food and seafood" pattern as compared to the "Sweets, meats, dairy, and alcohol" pattern. The "Plant food and seafood" pattern was high in nutrients and low in calories and the "Sweets, meats, dairy, and alcohol" pattern was calorie dense while low in nutrients. Slight reductions in body weight were seen in the non-changer groups (SS, PP). The subjects in Groups A and B were not separated as it was found more beneficial in keeping them together to focus on the influence of eating patterns. Overall, it was shown that changes in food intake patterns are related to body weight changes (Nakade et al., 2009). The Nakade study showed that dietary differences can influence weight loss. The WMP promotes healthy changes in dietary intake by promoting increased intake of fruits and vegetables, decreasing fast-food intake, promoting whole-grain consumption, avoiding concentrated sweets, among other health-eating advice. Weight loss occurred in some of the WMP participants, but overall mean weight loss (-1.1 kg ± 2.0 kg) and effectiveness was relatively low when compared to the desired weight loss goals of 24 lbs. or 10.9 kg over the 12-week WMP. Across the board consistent dietary recommendations may prove beneficial for the WMP. Tracking dietary intake would be a way to monitor participant's diets. A

grouping system, similar to the one in the Nakade study, may prove useful to understand if one dietary intake pattern aids more in weight loss.

The effectiveness of a specific weight loss program on reducing body weight in low-income mothers to decrease obesity was the purpose of another similar study (Jordan et al., 2008). The study also examined nutrition attitudes that are associated with weight loss and looked at relationships between dietary factors and nutrition attitudes. The intervention group attended 2-hour classes that provided information on healthy eating, exercise, and behavior modification. Baseline and eight week measurements were done for the intervention group (n = 114) for height, weight, percentage of body fat, waist circumference, demographics, attitudes, dietary measures. At the week 24 follow-up, 93 participants of the intervention group were reassessed. A group of responders, those who lost 2.27 kg or more at week 8, and a group of non-responders, those who lost less than 2.27 kg at week 8 were formed. A control group also was measured for the same variables at baseline and week 8. In the intervention group, the responders lost a significant amount of body weight (-4.7 kg) and the non-responders did not lose significant weight (-0.5 kg). The overall weight loss for the intervention group, responders and non-responders, was -2.7 kg. At the 24 week follow-up, for those who lost weight, the weight, waist circumference, and percentage body fat remained significantly lower than at baseline. Responders had reductions in body weight (x = -4.7 kg), waist circumference (x = -4.9 cm), and body fat percentage (x

= -1.8%) that were greater than those of non-responders (x = -0.5 kg, x = -2.0 cm, x = and -0.5%, respectively). The control group gained an insignificant amount of body weight from baseline to week eight. Over 90% of the intervention participants reported learning a great deal about nutrition in the program. The maintenance of weight loss at the 24 week follow-up suggests that this program has potential in assisting in weight loss for obese and overweight low-income mothers (Jordan et al., 2008). The intervention group in this study received education on healthful eating, behavior change, and exercise. Over the eight week study, the intervention group lost a significant amount of body weight compared to the control group. This information supports the basis of the WMP to educate participants with methods and ideas to reduce body weight through healthy eating, exercise, and behavior modification. One factor the Jordan study monitored that may benefit the WMP is nutrition attitude related to weight loss. Incorporating a nutrition attitude questionnaire at baseline and at week 12 of the WMP will provide evidence of changes in nutrition attitudes related to weight loss. This data may highlight specific attitudes and beliefs that are related to weight loss outcomes.

Summary

The focus on each of these articles was on specific behavioral modifications (daily dietary calorie goals and exercise prescriptions) to create a daily caloric deficit. The WMP at TWU utilizes these same principles to assist in weight loss. Diet and

exercise as a means to weight loss have been shown to be effective. Each of these articles supports practices of the WMP. One thing that appears to be lacking in the WMP is the structured, specific approach and consistent accountability. These studies highlight how specific structured recommendations have been shown to be effective in regards to weight management programs.

Better tracking of outcomes would be beneficial to the WMP. The fact that there was no intervention compliance tracking or continuity between coach's instructions was sure to result in varying outcomes. Standard guidelines would presumably result in more effective loss of body weight. By measuring weekly weights, providing a post-intervention SOCS, requiring tracking of dietary intake, incorporating a questionnaire on nutritional attitudes, and having blood work done at baseline and post-intervention would give more evidence on how and when changes in body weight and other risk factors occur with this population.

Even though the average baseline weight and the average post-intervention body weight were significantly different, the WMP was only slightly effective (Table B in Appendix C) based on the percentage of body weight lost by the group compared to the goal weight loss of 24 lbs. or 10.9 kg. Overall, the WMP resulted in -1.1 kg ± 2.0 kg weight change; however, the body weight loss with the WMP was much lower than any of the studies reviewed (Abildso et al., 2010; Andersen et al., 2002; Brill, 2002; Cleanthous et al., 2007; Culos-Reed et al., 2007; Jordan et al., 2008; Meckling & Sherfey,

2007; Rippe et al., 1998). These studies show that varying dietary and exercise interventions are effective; however each of these studies have continuity throughout. The WMP promotes changes in diet and increases in exercise, but different interventions are provided for each participant. For the 12-week WMP, specific and consistent dietary modification and physical activity recommendations would likely benefit the majority of participants.

The WMP may increase effectiveness by adopting a two-phase approach as in the Abildso study (Abildso et al., 2010). The client-tailored approach that is practiced at the IWH may be beneficial once a participant is found to have had success with initial weight loss attempts, after the initial 12 weeks. The second phase would consist of a subsequent 12-week WMP with interventions based upon SOCS scores from post-intervention of phase one. Even though the WMP study found that SOCS and weight change did not correlate, it may prove beneficial to provide stage-matched intervention. Perhaps this may promote increased weight loss and effectiveness for future WMP studies.

An additional consideration to increase effectiveness is introducing a commitment contract to each participant prior to the WMP. Each participant should be required to sign an agreement contract indicating they are committed and understand they will be expected to participate in regularly scheduled exercise and that dietary changes are expected.

Stages of Change Survey

The discussion of SOCS will illustrate how even though behavioral modification is an effective weight loss strategy, the readiness of the individual to change is a factor that can be as important or in some cases more important than the intervention. Stages of Change Survey scores are used to gauge each participant's readiness to make changes related to health, such as adopting exercise practices and incorporating healthy dietary habits. The SOCS can be used as a tool to identify one's readiness to change. This study highlighted the correlation of SOCS scores with changes in body weight from baseline to the end of the 12-week WMP. As determined by Pearson's correlation, for this study, there was no correlation of SOCS score to change in body weight ($r = -0.31$; $p = 0.13$).

In 2009, Johnson et al. showed participants where they ranked in stages of change on a regular basis over a period of time, that they had improved behavioral outcomes when compared to a control group who did not receive information on stages of change. The transtheoretical method (TTM) was used in this study to offer feedback for multiple behavior weight management strategies. One of the reasons this was effective was that the intervention group reassessed SOCS scores at 3, 6, 9, 12, and 24 months (Johnson et al., 2008). The importance of identifying SOCS stage to implement appropriate stage-matched interventions for weight loss was the focus of a recent study. Similar to the Johnson study, Siero and colleagues showed that individually

stage-matched information based on the TTM was useful in promoting changes in nutritional behavior (Siero et al., 2000).

The purpose of a study in Malaysia was to determine the stages of change in losing weight and the self-efficacy in eating control of three indigenous groups of overweight and obese adults in Sarawak, Malaysia. Of the indigenous tribes, the Malays had the greatest percent of obese at 46.9%. This study utilized the TTM to rate the stages of change for the Malays sample. A pre-test questionnaire was used to collect data pertaining to: socio-demographic data, perception of body weight, and the presence of health problems. A SOC (one question regarding willingness to make changes to lose weight) and a Weight Efficacy Lifestyle (WEL) Questionnaire (20 questions rated on a 10 point Lickert scale (0 = not confident -9 = very confident)) were used to assess participants' confidence to resist eating in certain vulnerable situations. Anthropometric data was recorded. Many of the rural residents were illiterate; therefore an interview format of the questionnaire was used in this case. Only 2.2% of the participants perceived they were obese; 76.8% perceived they were overweight. The SOC for weight loss indicated that 60.5% of participants were in pre-contemplation, 20.7% were in contemplation, 8.5% were in preparation, 8.9% were in action, and 1.5% were in the maintenance stage. The SOC group was further divided into either, an action (stages 3-5) or pre-action group (stages 1 and 2). When the WEL data was analyzed, the lowest score was in the social pressure scale, the highest in the negative

emotion scale, and had similar results to other studies for the remaining scales. A majority (85.7%) of the participants had not taken action to lose weight (either pre-contemplation or contemplation stages). The main reason given for not taking actions to lose weight was that the participants did not know how to lose weight. WEL data highlighted that overeating for this population is related to social expectancy to eat when one is invited to do so, otherwise it may be considered rude. Appropriate strategies to motivate this population would be most effective in eliciting a response toward implementing weight loss practices. The majority of the participants were in the pre-contemplative and contemplative stages. Focus on small successes for those in the pre-contemplative and contemplative stages should be encouraged as these individuals have low self-confidence and low motivation. Challenging those in stages 1 and 2 too much can result in avoidance of participants to attempt change (Chang, 2007). Motivational steps should be taken for WMP participants who are in stages 1 and 2, as this approach would be less likely to discourage individuals. Keeping challenges small and allowing for small victories for these individuals will help move them into stages 3-5. Once in the advanced stages of change, individuals are more likely to be successful at reaching health related goals.

A weight loss team at the Department of Family Medicine and the School of Nursing at the Medical College of Georgia developed the Wellness Program for patients at the family medical center (FMC) in response to obesity-related mortality. This

program used the Prochaska transtheoretical model of behavior change as a theoretical framework. The purpose of the study was to evaluate the effectiveness of the Wellness Program in advancing patients in their readiness to change nutrition and physical activity levels, helping them achieve weight loss, and improving patients' general health. Stage of change was assessed by two questions. The participants were asked to select the response that most represented their answer for the questions, "How ready are you to change your eating habits?", and "How ready are you to change your physical activity?" The intervention included 12, one-week group meetings discussing educational weight loss activities. Three of the meetings were 90-minute aerobic exercise sessions. Participants were allowed to choose from one of three diet plans, a low calorie, a low fat, and a low carbohydrate diet. Body weight, body mass index (BMI), and blood pressure were measured at each meeting. The mean body weight at baseline was 227 lbs. At week 12, the mean body weight change was -4.5 lbs (± 7.0). One-way ANOVA showed that diet effects on weight loss were essentially the same (low calorie: -4.4 lbs; low fat: -3.9 lbs; low carbohydrate: -7.8 lbs). Exercise was shown to be the major determinant of weight loss. Almost half, 49.5% of the participants did not attend any of the three exercise sessions. For those who did not attend any exercise sessions, their mean body weight change was -2.1 lbs. For those who attended one exercise session (38.5%), their mean body weight change was -5.4 lbs. Eight participants attended all three exercise sessions, and had a mean body weight change of 9.4 lbs.

Only one participant attended all 12 sessions for the program. Total weight loss for this participant was not provided. Thirty five participants attended one to three sessions, and 68 participants attended four to 11 sessions. For the participants who completed four or more sessions and the 12-week and 24-week follow-ups, they were in the preparation or action stage when compared to those participants who attended one to three sessions. Overall, those who attended more sessions and participated in more exercise classes during the 12 weeks lost more weight than those who did not. The Prochaska stages of change model indicated that from baseline, 48.9% of participants were ready to attempt change. At week 12, 56% of participants were in the maintenance stage (Turner et al., 2008). This study had a similar purpose statement to ours. The main differences were that the dietary and physical activity interventions were specific and each participant was involved in one of the intervention groups. For the WMP, a follow-up SOCS score at week 12 would likely have been beneficial and would provide information on SOCS stage advancement. According to information from these studies, sharing the SOCS information with the clients would also likely result in positive behavior changes. Changes in behavior in the 12-week WMP will likely increase effectiveness of our study. Monitoring a post-intervention SOCS score can also be a measure of success.

SOCS can help identify clients who will likely benefit from weight management advice, interventions, and trials (Tod & Lacey, 2004); it has not been shown to be true in

the case of our WMP. There was no correlation of SOCS scores to loss of body weight for the WMP; therefore, tailored interventions likely would not have been as effective as if there were a strong correlation. There was a significant weight loss in our study, but with no correlation between SOCS scores and change in body weight, we cannot link the two. A 12-week weight loss period may be too brief to allow significant weight changes to occur. However, a one to two pound weight loss per week is safe and has been carried out successfully in numerous studies (Heymsfield, 2005). Triggers to action occur slowly and the decision to change occurred over a period of time rather than instantly. Factors that inhibit and factors that promote change were identified in the study by Tod & Lacey (Tod & Lacey, 2004). Understanding how self-confidence and self-esteem relate to decision making will improve weight loss strategies for the WMP. Those participants in stages 1 and 2 have lower self-confidence and self-esteem in regard to accomplishing weight loss goals. Providing smaller challenges and more frequent goals will result in advancement to the more advanced stages of change for individuals in stages 1 and 2. Realizing that change may happen more slowly for individuals in stages 1 and 2 will prompt coaches in the WMP at TWU to set up smaller challenges for these individuals.

Individuals in the first two stages (pre-contemplation and contemplation) of the TTM are reluctant to make changes, whereas those in the three advanced stages (preparation, action, and maintenance), are more likely to participate in action-oriented

steps for behavior change. A current study examined the relationship between being at the advanced stages of weight loss, diet improvement, and exercise in primary care patients (Wee et al., 2005). Factors associated with being at advanced stages of readiness to lose weight and improve diet and exercise were also identified. One thousand patients from the Boston area were randomly selected from a hospital-based general internal medicine practice. Of the 1000 recruited patients, 366 responded and were included in the study. A telephone survey was used to collect data on height, weight, co-morbid illness, and health habits. Patient readiness to lose weight and change weight related behaviors (reduce portion size; reduce fat intake; increase fruit and vegetable intake; and increase exercise) was assessed using the TTM. For each behavior participants were classified into one of the five stages for behavior. Two more classification groups were assigned, one for those in the first two stages and another for the three advanced stages. Over half (n = 199) of the participants were in one of the three advanced stages. Of these 199 in the advanced stages of change, 61% were also at an advanced stage of readiness to improved diet and exercise. Thirty five percent of participants were at advanced stages to improve diet and 26% were at advanced stages to improve exercise, but were at pre-contemplative or contemplative stages for weight loss. Participants who were aware that weight was a possible health risk were the most likely to be at the more advanced stages of change (Wee et al., 2005). The realization of the health risk and weight relationship may have triggered these participants to move

closer to making changes; this was seen in their more advanced SOCS stage. This study addressed many of the same SOCS factors the WMP did, such as reduced portion size, reduced fat intake, increased fruit and vegetable intake, and increased exercise. By identifying health risks that each participant of the WMP has may help them advance from lower to higher stages of change.

Another qualitative study examined the perceptions and feeling of being overweight and obese, and the perceived barriers to weight loss among adults from lower socio-economic backgrounds in Sarawak, Malaysia. Focus groups were formed to assess the perceptions and feelings of being overweight and obese and barriers to weight loss. The TTM was used to assess each participant's intention to lose weight. Twenty one women and 17 men aged 25 to 60 years were recruited to take place in this study. Discussions of 35 to 75 minutes were conducted. These discussions were with little moderator involvement, and focused on open dialogue over topics of body weight that were pre-determined. Audio-recording of the discussion groups was done. All participants were in the pre-contemplation stage of change. The main identified barriers to weight loss included: lack of knowhow, failed attempts, and difficulty to resist eating. Both females and males perceived increased waist lines with shame, frustration, and being less effective at work. Ugliness was also associated with increased waist lines. Anti-overweight or anti-obesity discrimination was not experienced by any of the participants, but the negative perceptions of being

overweight or obese were self-induced. As is common with those in the pre-contemplation stage of the TTM, participants of this study experienced low self-efficacy and self-esteem. Individuals with low self-efficacy often give up when faced with failure and difficulties. Individuals with a low sense of self-efficacy avoid difficult tasks and doubt their own capabilities. Failures decrease self-efficacy. When one experiences success, self-efficacy increases. Increasing self-efficacy can progress one to the next stage of the TTM. The awareness of being overweight and obese in this group was not enough to motivate participants to lose weight. Education on weight loss methods, overcoming failure, and being able to resist overeating are practical steps to assist in weight loss for these participants, however; weight loss may not be achievable until these individuals are progressed in the TTM stages. Tailoring weight loss strategies for the stage in which the participant is in is the most effective treatment for weight loss (Chang et al, 2009). This study highlights how being aware of one's stage of change will allow for proper intervention for each participant. Behavior change will occur only after an individual is ready to move from the pre-contemplation and contemplation stages. Once one is in stage 3, specific weight loss goals can be made, but until then, motivational techniques should be used to assist in advancing stages.

Summary

Even though the WMP study did not find a correlation between SOCS and change in body weight, future WMP studies should incorporate the SOCS. The above

discussed SOCS studies indicate SOCS to be an effective tool in weight loss success. If the WMP uses SOCS in future studies and continues to find no correlation between SOCS and change in body weight, then discontinuing use of the SOCS would be a logical conclusion. At this point in time, eliminating the SOCS from the WMP would be premature since many other studies support the value of SOCS (Change, 2007; Chang et al, 2009; Johnson et al., 2009; Turner et al., 2008; Wee et al., 2005).

These studies bring to light areas of improvement for the WMP SOCS approach. Specifically tailoring weight loss strategies for the SOCS stage each client is in will likely result in advancement to more progressed SOCS stages and eventually weight loss and improved efficacy of the WMP (Change, 2007; Chang et al, 2009; Johnson et al., 2009; Turner et al., 2008; Wee et al., 2005).

Baseline and post-intervention SOCS scores were common in the reviewed SOCS studies. By collecting SOCS scores after intervention, the WMP would have been able to identify if participants advanced from one stage to another. Even if weight loss did not occur, by identifying stage progression, a level of success could have been noted. If one is in the pre-contemplative or contemplative stage, then the focus of the healthcare provider should be to advance the client to the next stage rather than focus on weight loss strategies (Chang et al., 2009). Noting small victories, such as SOCS stage advancement, promotes further stage advancement (Tod & Lacey, 2004). This approach creates a more efficient environment for subsequent change.

Most of these SOCS studies used a model that measured baseline and post-intervention SOCS scores to examine changes in SOCS stages over the intervention period. If this were incorporated into the WMP, the coach would be able to provide client tailored advice for a greater chance of weight loss success after the WMP was complete. Post-intervention SOCS scores would also allow the coach to identify if either motivation or specific behavior change would be more beneficial. Based on these studies (Chang 2007; Change et al., 2009; Johnson et al., 2008; Siero et al., 2000), standard interventions communicated in a manner that is stage-matched for each participant would increase effectiveness of the WMP. Two standard stage-matched interventions based on stages 1 and 2 and stages 3-5 should be considered for the WMP at TWU. The intervention for stages 1 and 2 would be focused on motivation and helping participants to advance stages rather than on specific weight loss strategies. For stages 3-5, interventions would center on specific weight loss strategies that are progressive and quantifiable.

Conclusion

Loss of body weight is based on many factors. Readiness to change is very important in the weight loss process. Exercise, proper nutrition, coping with stress, and self-confidence levels affect weight loss success, and are generally the main focus of weight loss programs. However, identifying which stage of change one is at can provide a health care provider with direction to lead the client in the most effective processes to

reach their weight loss goals. Understanding that those in the pre-contemplative and contemplative stages require more motivation to advance to the next stage of change, as opposed to being provided with strategies to lose weight, will make weight loss more effective and reduce wasted time and effort. By providing specific motivation based on the participant's SOCS stage should decrease discouraged participants. It is also important to be aware of triggers that promote and those that inhibit one from moving from one SOCS stage to another. Even though there was a significant weight loss in this study, focusing on SOCS scores should help improve weight loss and program effectiveness. Overall, more effective weight loss programs will lead to a reduction in overweight and obese individuals and the risk of mortality and morbidity.

The issues of overweight and obesity run deep in our society. Fighting the ubiquity of increasing weight will require effort from healthcare providers, government, and individuals. Obesity and the risks associated with it will not be reduced unless research and study is continued. Focusing on individually tailored staged-based interventions for weight loss may prove beneficial and effective in reducing obesity.

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APPENDIX A

Data Tables

Table A
Relative Co-Morbidity Risk for Being Overweight or Obese

BMI Ra		15-25 m^2			25-50 m^2		
Co-Morbid	Deaths	HR	95% CI		Deaths	HR	95% CI
Stroke	2694	0.92	0.82-1.03		3164	1.39	1.31-1.48
Diabetes	171	0.96	0.59-1.55		393	2.16	1.89-2.46
Liver disease (non-neo lastic	489	0.69	0.52-0.91		603	1.82	1.59-2.09
Upper aerodigestive cancer	685	0.49	0.39-0.61		471	0.98	0.79-1.20)
Respiratory disease*	2426	0.31	(0.28-0.35		1344	1.2	1.07-1.34
External cause	2112	0.82	0.71-0.95		1720	1.19	1.08-1.32
All causes	35256	0.79	0.77-0.82		37493	1.29	1.27-1.32

†If indicated, the relative risks calculated from the ratios of proportions (RR-Ps) were used; otherwise, the incidence rate ratios (IRRs) were used;
‡Both RR-Ps and IRRs were used
*WC measures were considered to be the better risk predictor than BMI measures
Cancer: cases, not mortality and indicated by physician diagnosis of cancer; Coronary Artery Disease: indicated by Myocardial Infarction or Angina;
Osteoarthritis: indicated by joint replacement; Chronic Back Pain: indicated by early retirement due to back pain
NA: Not available; "-" Not applicable (Guh et al., 2009)

Table C

Individual Baseline Weight, Post-Intervention Weight, SOCS Score, Weight Change, Percent Effectiveness, Quintile, and Quintile Rank Values.

ID #	Baseline Weight (kg)	Post-Intervention Weight (kg)	SOCS	Weight Change	Percent Effective	Quintile	Quintile Rank
1	119.8	123	-	-3.2	-29%	1	Slightly Effective
2	82.7	84.1	-	-1.4	-13%	1	Slightly Effective
3	81	82.3	-	-1.3	-12%	1	Slightly Effective
4	61.8	63	21	-1.2	-11%	1	Slightly Effective
5	81.4	82.3	27	-0.9	-8%	1	Slightly Effective
6	74	74.8	18	-0.8	-7%	1	Slightly Effective
7	83	83.7	31	-0.7	-6%	1	Slightly Effective
8	85	84.8	19	0.2	2%	1	Slightly Effective
9	87.9	87.7	29	0.2	2%	1	Slightly Effective
10	116.2	115.9	16	0.3	3%	1	Slightly Effective
11	81.8	81.4	27	0.4	4%	1	Slightly Effective
12	140	139.5	22	0.5	5%	1	Slightly Effective
13	87.8	87.3	20	0.5	5%	1	Slightly Effective
14	78	77.4	21	0.6	6%	1	Slightly Effective
15	106.2	105.5	27	0.7	6%	1	Slightly Effective
16	83.5	82.8	20	0.7	6%	1	Slightly Effective
17	82.7	82	24	0.7	6%	1	Slightly Effective
18	77.5	76.5	24	1	9%	1	Slightly Effective
19	85	83.9	29	1.1	10%	1	Slightly Effective
20	92	90.8	28	1.2	11%	1	Slightly Effective
21	78.5	77	27	1.5	14%	1	Slightly Effective
22	90.7	89.1	-	1.6	15%	1	Slightly Effective
23	88.5	86.6	20	1.9	17%	1	Slightly Effective

(continued)

Table C cont'd

24	70.3	68	-	2.3	21%	2	Somewhat Effective
25	73.5	70.9	25	2.6	24%	2	Somewhat Effective
26	79.1	76.4	31	2.7	25%	2	Somewhat Effective
27	114	111	21	3	28%	2	Somewhat Effective
28	73.2	69.7	15	3.5	32%	2	Somewhat Effective
29	107.3	103.8	23	3.5	32%	2	Somewhat Effective
30	80	76.4	-	3.6	33%	2	Somewhat Effective
31	94.5	89.5	16	5	46%	3	Moderately Effective
32	62.3	55.9	18	6.4	59%	3	Moderately Effective

Note. SOCS = Stages of Change Survey score. A (-) value for SOCS indicates that a SOCS survey was not completed by these individuals.

APPENDIX B

IRB Approval

TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

Institutional Review Board
Office of Research and Sponsored Programs
P.O. Box 425619, Denton, TX 76204-5619
940-898-3378 FAX 940-898-4416
e-mail: IRB@twu.edu

February 14, 2011

Dr. Nancy M. DiMarco
Institute for Women's Health

Dear Dr. DiMarco:

Re: Wellness and Sport Evaluation Program: Nursing With EASE (Protocol #: 14989)

The request for an extension of your IRB approval for the above referenced study has been reviewed by the TWU Institutional Review Board (IRB) and appears to meet our requirements for the protection of individuals' rights.

If applicable, agency approval letters must be submitted to the IRB upon receipt PRIOR to any data collection at that agency. A copy of all signed consent forms and an annual/final report must be filed with the Institutional Review Board at the completion of the study.

This extension is valid one year from February 8, 2011. Any modifications to this study must be submitted for review to the IRB using the Modification Request Form. Additionally, the IRB must be notified immediately of any unanticipated incidents. If you have any questions, please contact the TWU IRB.

Sincerely,

Kathy DeOrnellas, Ph.D.

Dr. Kathy DeOrnellas, Chair
Institutional Review Board - Denton

cc.

APPENDIX C

Quintiles of Effectiveness

Table B

Quintiles of Effectiveness Based on Percent of Body Weight Lost

Quintile	Percent Effectiveness
Slightly effective	0-20%
Somewhat effective	21-40%
Moderately Effective	41-60%
Effective	61-80%
Very Effective	81-100%

Note. Percent effectiveness is determined by dividing the average weight loss of the group by the weight loss standard, in this case, 24 lbs. or 10.9 kg.

APPENDIX D

Stages of Change Survey

Stages of Change Survey

1. Choose the best answer that describes your exercise habits or intentions. Regular exercise is for at least 30 minutes per day five days a week.

   ○ 5 I exercise regularly and have done so for longer than 6 months

   ○ 4 I exercise regularly but have only begun in the past 6 months

   ○ 3 I do some exercise but not regularly

   ○ 2 I do not exercise but am thinking of starting within the next 6 months

   ○ 1 I do not exercise and have not thought about starting in the next 6 months

2. Choose the answer that best describes your fruit and vegetable intake behavior. Note that fruit and vegetable intake is defined as 5 servings of fruits and vegetables per day.

   ○ 5 I regularly eat 5 or more fruits and vegetables per day and have done so for longer than 6 months

   ○ 4 I regularly eat 5 or more fruits and vegetables per day but have only begun in the past 6 months

   ○ 3 I sometimes eat 5 or more fruits and vegetables per day but not regularly

   ○ 2 I do not eat 5 or more fruits and vegetables per day but am thinking of starting within the next 6 months

   ○ 1 I do not eat 5 or more fruits and vegetables per day and have not thought about starting in the next 6 months

3. Choose the answer that best describes your low-fat food consumption. Note that low-fat food consumption is defined as choosing foods with reduced saturated fat and total fat.

   ○ 5 I regularly eat low-fat food every day and have done so for longer than 6 months

   ○ 4 I regularly eat low-fat food every day but have only begun in the past 6 months

   ○ 3 I sometimes eat low-fat food but not regularly

   ○ 2 I do not eat low-fat food but am thinking of starting within the next 6 months

- 1 I do not eat low-fat food and have not thought about starting in the next 6 months

4. Choose the answer that best describes your sugar intake behavior. Note that a reduced sugar intake is defined as reducing the total amount of sugar one consumes per day.
   - 5 I regularly eat a diet with less sugar daily and have done so for longer than 6 months
   - 4 I regularly eat a diet with less sugar daily but have only begun in the past 6 months
   - 3 I sometimes eat a diet with less sugar but not regularly
   - 2 I do not eat a diet with less sugar but am thinking of starting within the next 6 months
   - 1 I do not a diet with less sugar and have not thought about starting in the next 6 months
5. Choose the answer that best describes your fast food behavior. Note that healthier fast food is defined as choosing lower fat, less processed foods such as salads, fruits and vegetables as well as chicken/fish instead of hamburgers.
   - 5 I regularly choose healthier fast foods and have done so for longer than 6 months
   - 4 I regularly choose healthier fast foods but have only begun in the past 6 months
   - 3 I sometimes choose healthier fast foods but not regularly
   - 2 I do not choose healthier fast foods but am thinking of starting within the next 6 months
   - 1 I do not choose healthier fast foods and have not thought about starting in the next 6 months

6. Choose the answer that best describes your snack behavior. Note that healthier snacks is defined as choosing more fruits and vegetables, nuts and cheese as opposed to high fat, high sugar snacks.
   - 5 I regularly choose healthier snacks and have done so for longer than 6 months
   - 4 I regularly choose healthier snacks but only begun in the past 6 months

- 3 I sometimes choose healthier snacks but not regularly
- 2 I do not choose healthier snacks but am thinking of starting within the next 6 months
- 1 I do not choose healthier snacks and have not thought about starting in the next 6 months

7. Choose the answer that best describes your support seeking behavior. Note that seeking support is defined as asking family and friends for support in making healthy choices.
   - 5 I regularly seek support and have done so for longer than 6 months
   - 4 I regularly seek support but have only begun in the past 6 months
   - 3 I sometimes seek support but not regularly
   - 2 I do not seek support but am thinking of starting within the next 6 months
   - 1 I do not seek support and have not thought about starting in the next 6 months