9-6-2011

Worksite Weight Loss Intervention Utilizing Monetary Incentives and Contingency Management for Overweight and Obese Employees at Risk for Type 2 Diabetes

Santina A. Galbo
University of Connecticut - Storrs, santina.galbo@gmail.com

Worksite Weight Loss Intervention Utilizing Monetary Incentives and Contingency Management for Overweight and Obese Employees at Risk for Type 2 Diabetes

Santina Ann Galbo
Bachelor of Science, University of Connecticut, 2008

A Thesis
Submitted in Partial Fulfillment of the
Requirements for the Degree of Master in Science in Allied Health
at the
University of Connecticut
2011

APPROVAL PAGE

Master of Science Thesis

Worksite Weight Loss Intervention Utilizing Monetary Incentives and Contingency Management for Overweight and Obese Employees at Risk for Type 2 Diabetes

Presented by
Santina Ann Galbo

Major Advisor: _____
Pouran D. Faghri, MD, MS, FACSM

Associate Advisor: _____
Michael M. Copenhaver, PhD

Associate Advisor: _____
Valerie B. Duffy, PhD, RD

University of Connecticut
2011

ACKNOWLEDGEMENTS

This thesis was possible from a grant by the Center for Disease Control and Prevention (CDC): Access to project material and data was provided and approval received from the Principle Investigator and Project Director, Dr. Pouran Faghri.

First and foremost, I would like to thank God for blessing me and guiding me, without Him, I would not have gotten this far. I would like to thank my family for their constant love and support. Without you all, I would not have been able to make it through my seven years at the University of Connecticut.

I would like to thank my faculty advisor, **Dr. Pouran Faghri**, for being such a wonderful guide and support to me throughout my graduate studies. Her motivation and encouragement helped to steer my Master's thesis to a successful completion. I would also like to thank my thesis advisory committee, **Dr. Valerie Duffy**, and **Dr. Michael Copenhaver** for guiding and supporting me throughout my thesis planning and writing processes.

Last but not least, I would also like to thank all my friends and colleagues at the University of Connecticut for their continuous encouragement. Special thanks to: Jessica Ehrentruat, Nicole Benson, Kamyar Momeni, and Lindsay Ferraro for their friendship, support, and for making my graduate school days fun and memorable.

Table of Contents

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Purpose: The present study aimed to evaluate the effect of a financial incentive on weight loss and diabetes risk score (DRS) following a tailored National Diabetes Education Program (NDEP) weight loss intervention among adults who are overweight/obese and who are at risk for type 2 diabetes. An additional aim to evaluate changes in weight loss self-efficacy (WLSE), exercise self-efficacy (ESE), healthy eating score (HES) and movement through the stages of change (SOC) from pre to post intervention.

Design: Four long-term care facilities, from one corporation, were randomly assigned to either an Incentivized Program (IP) or a Non-Incentivized Program (NIP). All facility employees were asked to follow a weight loss program for 16-weeks and a 3-month follow-up, with a goal of losing 1 or 1 ½ pounds a week. All had a one-on-one hour-long consultation session with a Registered Dietitian and/or Health Educator, which included setting weekly weight loss goals. IP participants could bank $10 for every 1 or 1 ½ pounds they lost up to $160, but needed to lose a minimum weight (11 or 14 pounds) to receive any cash incentive. The IP group also could participate in "Win Big," where participant's weekly cash deposit with achieving weight loss goal was matched by the Program. IP participants who maintained the intervention weight loss at 3-months follow-up would receive an additional $100. The NIP participants received no financial incentive.

Results: Seventy-three employees completed the 16 weeks program and 3-month follow-up; 35 from the IP group and 38 from the NIP group. Most were middle-ages females with at least a high school diploma. There was a significant weight loss for the IP group at the completion of the study compare to the NIP group ($p<0.05$). The mean weight loss for IP group was (Mean ± SE) 7.40 ± 1.88 pounds and for NIP group was (Mean ± SE) 2.17 ± 1.36 pounds. The total weight loss for the IP group was 304.8 pounds and the total weight loss for NIP group was 148.4 pounds. Neither group showed a significant reduction in BMI from pre-post intervention. Diabetes risk score also showed significant reduction in the IP group compare to the NIP group using nonparametric procedure ($p<0.05$). Percentage of participants in the IP group that improved in waist circumference was 80% compared to 73% of participants who improved in the NIP group. Overall SOC and HES scores increased for both groups, while overall WLSE and ESE scores from baseline to 3-month follow-up decreased for the IP group but remained unchanged for the NIP group. The IP group had a higher percentage of participants improve in almost all chronic conditions. Participants who lost at least 5% of weight had higher percentage of participants who improved in overall SOC (p value 0.04), WLSE, ESE, HES, waist circumference, self-reported general health, energy level, and almost all chronic conditions. Percentage of participants, who lost at least 5% of weight, that improved in waist circumference was 100% compared to 67.90% of participants who improved and did not lose at least 5% of weight.

Conclusions: This study demonstrated the effectiveness of a monetary incentive in a weight loss program for individuals who are overweight and obese and at high risk for

type 2 diabetes, based on weight and DRS. Those who lost 5% of weight showed higher improvements in overall SOC, WLSE, ESE, HES, waist circumference, self-reported general health, energy level, and almost all chronic conditions. Further testing of longer-term use of monetary incentives is needed to determine whether it would lead to sustained weight loss.

Chapter 1: Introduction

The prevalence of overweight and obesity in the United States has been steadily increasing[1]. A person is considered overweight when his/her Body Mass Index (BMI) is ≥ 25, and obese when his/her BMI is ≥ 30[2]. Overweight and obesity result from an imbalance between the amount of food consumed and the amount of energy expended as a result of genetics, metabolism, behavior, environment, culture, and socioeconomic status[3]. In the last two decades, the amount of calories consumed by adults in the United States has increased while their physical activity patterns have decreased or remained the same[2-5]. This has led to a significant increase in the prevalence of overweight and obesity by 12% and 70% respectively[6]. According to the report in 2011 by The Centers for Disease Control and Prevention (CDC), two-thirds of U.S. adults are overweight, and one-third are obese[2]. With the present growth in the prevalence of overweight and obesity, 75% of adults will be overweight, and 41% will be obese by 2015[7].

It was estimated that in 2008, obesity medical care cost rose to $146 billion dollars[8]. In a report by the Rand Corporation, individuals who are obese have higher health care costs than current smokers or problem drinkers. The report denoted that, obese individuals typically spend approximately 36% more than the general population on health services and 77% more on medications, whereas the corresponding figures for current smokers are 21% and 28%, respectively, and even lower for problem drinkers[3,9]. As the direct cost for overweight and obesity has increased, so have the indirect costs. These include the value of wages lost by people unable to work because of disability, illness and premature death.

Being overweight or obese predisposes an individual, to many chronic conditions including diabetes, coronary heart diseases, cancers, depression, high blood pressure, osteoarthritis, sleep apnea, and stroke[10, 11]. According to The National Institute of Diabetes, Digestive, and Kidney Diseases (NIDDKD), losing as little as 5% of body fat, will lower the risk of many of the above mentioned chronic conditions[12]. The NIDDKD also suggests a slow and steady weight loss of 0.5 lb to 2 lbs every week, not exceeding more than 3 lbs a week, for safe weight loss[12].

Pre-diabetes currently affects 79 million U.S. adults[2]. Over the past several years, there has also been a significant increase in the reported number of individuals with type 2 diabetes. Type 2 diabetes affects the way one's body metabolizes glucose[11], and accounts for about 90-95% of all cases of diabetes. In 2007, there were 1.6 million new cases of diabetes in people 20 years of age and older[12, 13]. It is estimated that currently there are 26 million people with diabetes in the United States, of which, 7 million do not know that they have the chronic condition[2]. Making healthier lifestyle choices to reduce weight could prevent diabetes in individuals who are pre-diabetic (blood glucose levels are higher then normal but not high enough to be diagnosed as diabetes) and prevent the progression of type 2 diabetes[14]. Health promoting strategies for adopting and maintaining healthy lifestyle including, healthy eating, increasing the level of physical activity and managing a healthy weight may reduce the number of overweight and obese individuals, as well as many chronic conditions including type 2 diabetes[14-16].

The workplace has been identified as an ideal place to promote healthy lifestyle and to educate people on the adoption and maintenance of a healthy lifestyle[17]. People spend more than half of their daily awake time at work, have the same communication

system, policy and physical environment, which make change more feasible[18]. It also affords the opportunity to target a larger population, with more interventions[19]. In a National Worksite Health Promotion Survey in 2004, 26% of worksites were offering some types of health promotion program addressing overweight and obesity[20].

While there are numerous ways to implement worksite health promotion programs, one important element is using incentives to promote participation and healthy lifestyle behaviors[21]. Monetary incentives, in particular, have been found successful in attaining health behavior goals such as weight loss[21-25]. Monetary incentives may provide the motivation a person needs to change a particular behavior by altering the costs versus benefits ratio associated with that behavior. The incentives can be provided at various stages throughout the intervention, such as for participation (e.g. attending educational sessions) or for achieving goals (e.g. weight loss, lower blood pressure) [25]. Research needs to address how incentives should be utilized and how monetary amounts affect weight loss and health outcomes to identify the most effective weight loss interventions. Using incentives in the context of contingency management, which is a common strategy used to improve healthy lifestyle behaviors by reinforcing healthy or desired behaviors, may prove to be effective in treatment for weight loss[26-28].

Individual change in self-efficacy and movement in the Stages of Change from pre-contemplation to maintenance are important to the success of weight loss interventions. Self-efficacy is the perceived confidence an individual has in themself to succeed in changing a particular behavior, such as losing weight and living an overall healthier lifestyle[29-31]. Increasing self-efficacy may result in healthier behaviors and weight loss. The Stages of Change model helps identify an individual's readiness to

change for a specific behavior (e.g., weight loss and exercise) [32]. Both self-efficacy and stage of change have been recommended as key elements in the successful adoption of healthy behaviors during weight management program implementations[29-32].

Chapter 2: Present Study

Statement of the Problem

The percentage of individuals who are overweight or obese has been steadily increasing in the United States, making this issue a nation-wide epidemic. Higher rates of morbidity and mortality are associated with those who have higher BMI, compared to the general population[33]. The risk factor most closely associated with overweight and obesity is type 2 diabetes, and the prevalence of both is continuing to grow[1]. Weight loss through the adoption of healthier lifestyle behaviors, such as increasing the level of physical activity and healthy eating habits, reduces the risk for the development of type 2 diabetes[14-16].

The health care costs associated with overweight and obesity is substantial and considered a major public health and workplace issue[34]. It was estimated that in 2008, obesity medical care cost rose to $146 billion dollars[8], and in 2007, the medical cost for diabetes, which is a main risk factor for excess body weight, cost $174 billion dollars[35]. An obese individual is estimated to spend $1,429 more dollars yearly in medical spending compared to an individual of normal weight[8], and obesity related medical expenditures are estimated to cost employers an extra $75 billion dollars yearly[36, 37].

Implementing ways to help reduce the prevalence of overweight and obesity may bring a cost savings to the individual as well as the employers[17, 38]. Worksite wellness interventions have become increasingly common to help reduce overweight and obesity and related chronic conditions[36]. The workplace provides the opportunity to access a large population at a given time, allows for follow-up analysis, and the ability to modify the work environment[19]. Targeting individuals through worksite interventions provide

the chance for behavioral changes through worksite programs and policies[39]. Recent studies have shown the use of monetary incentives for weight loss to be effective at encouraging individuals to make healthier lifestyle changes and as motivation to lose weight[22-25].

When planning worksite weight loss interventions, it is important to increase awareness to help improve current lifestyle behaviors. Assessing one's current stage of change and self-efficacy is crucial for the modification of behaviors. The strength of an individual's perceived self-confidence determines how successful one will be in changing their behavior[31]. Worksite intervention programs that increase awareness, utilize monetary incentives as a motivation for weight loss, and assess individual stage of change and self-efficacy may have a higher rate of success in terms of weight loss and adoption of healthy behaviors.

Purpose

The primary purpose of the present study was to evaluate the effect of a financial incentive on weight loss and diabetes risk score (DRS) following a tailored National Diabetes Education Program (NDEP) weight loss intervention among adults who are overweight/obese (BMI $\geq$ 25 kg/m^2) and who are at risk for type 2 diabetes. Furthermore, to evaluate changes in weight loss self-efficacy (WLSE), exercise self-efficacy (ESE), healthy eating score (HES) and movement through the Stages of Change (SOC) following the intervention between the incentivized and non-incentivized groups, as well as based on 5% weight loss.

Specific Aims

1. To examine the effect of a contingency management monetary incentive on:

a. Weight loss; as indicated by: weight, BMI, waist and hip ratio
b. Diabetes Risk Score (DRS)
c. SOC, WLSE, ESE, HES, and self reported general health

2. To evaluate the effect of types of incentive (program deposit and self deposit) on achieving weight loss goals.
3. To examine the satisfaction with the incentive in the IP group.
4. To evaluate sustainability and maintenance of weight loss in both groups three months after program completion.
5. To evaluate the effect of losing at least 5% of body weight on reported SOC, WLSE, ESE, HES, general health, and chronic conditions.

Definition of Terms

1. ***Incentivized group (IP)*** is defined as employees of workplaces that received incentive for losing weight.

2. ***Non-Incentivized group (NIP)*** is defined as employees of workplaces that received no incentive for losing weight.

3. ***Weight loss self-efficacy scale (WLSE)*** is defined as *a* score produce for each participant based on the response to 20 questions related to confidence in resisting situational eating, with the highest achievable score of 80.

4. ***Exercise self-efficacy scale (ESE)*** is defined as *a* score produce for each participant based on the response to 11 questions related to overcoming exercise barriers and motivation to exercise, with the highest achievable score of 44.

5. ***Stages of Change (SOC) or Readiness to Change*** is defined as *a* score produced for each participant based on response to 7 questions related to lifestyle behaviors (be

physically active, practice good eating habits, avoid smoking or using tobacco, lose weight or maintain health weight, handle stress well, avoid alcohol or drink in moderation, and live an overall healthy lifestyle) based on movement through the stages of change identified by Prochaska and DiClemente Stages of Change Model, with the highest achievable score of 35.

6. ***Healthy Eating Score (HES)*** is defined as *a* score for each participant based on the response to 9 questions, which refer to how often the participant eats or drinks certain foods and beverages, with the highest achievable score of 36.

7. ***Lifestyle Behaviors*** is defined as self reported rate and frequency of daily physical activity and eating practices.

8. ***Physical Activity Preference*** is defined as reported exercise preferences, preferences of type of help to receive when starting an exercise program, and perceived barriers that prevent exercise.

9. ***Weight Loss Goal*** is defined as achieving individual weight goal at Week 8, Week 16, and Week 28 based on the proposed recommendation of losing 1 lb to 1.5 lbs per week (depending on participant's BMI).

10. ***Program Satisfaction*** is defined as reported perceived program flexibility, perceived program effectiveness, evaluation of the health educator, and evaluation of program materials.

11. ***Incentive Satisfaction*** for the IP group only, is defined as reported liking or disliking of the monetary incentive used and if the monetary scheme is unfair or not.

12. ***Adherence to the program*** evaluated by counting the total number of logs returned for each group

13. ***Weight loss sustainability*** is defined as maintaining weight loss at week 28th.

14. ***Pre intervention*** is indicated at week 1, which is the start of the program.

15. ***Post intervention*** is indicated at week 28, which is the 3-month follow-up of the program.

Hypotheses

1. There will be significant difference between IP and NIP groups following the program in weight loss, BMI, DRS, waist, and blood pressure
2. There will be significant differences in SOC, WLSE, ESE, and HES following the program intervention, in those who received monetary incentive.
3. There will be significant difference between those who lost at least 5% of their body weight and those who did not in:
    a. SOC, WLSE, ESE, HES, and
    b. Self-reported chronic conditions

Significance

An individual, who is overweight or obese, is at risk for developing many chronic conditions such as hypertension and type 2 diabetes. The workplace provides the opportunity to target a larger group[19], and to promote healthy lifestyle behaviors, such as increasing physical activity[40] and healthy eating practices[41, 42]. Implementing worksite interventions to help with the reduction of overweight and obesity and related chronic conditions can bring a savings to the employer[17]. Studies have shown that a BMI > 35 accounts for 37% of the obese population in the workplace, and 61% of excess costs and are less productive at work[36, 38]. Moreover, obese full-time employees cost employers approximately $73.1 billion yearly[38]. By providing interventions in the workplace that

address overweight and obesity lifestyle changes could be made therefore, improving overall quality of life and reducing health care costs for the individual and employer.

Chapter 3: Review of Literature

The following review will examine current literature in the following areas:

I. *Obesity and its health consequences*

II. *The worksite as a venue for addressing obesity*

III. *Economic incentives as a component of weight loss programs*

IV. *Weight loss self efficacy scale, exercise self efficacy scale, and Stages of Change*

V. *Summary*

I. Obesity and its health consequences

It is estimated that currently 68% of all adults in the United States are overweight or obese[12] with approximately one-third of adults obese[7, 43, 44]. In the United States the obesity rate has increased from 13% to 32% from the 1960s to 2004[7]. Flegal et al. (2010) examined the prevalence and trends of obesity in adults in the United States from 1999-2008 by analyzing data provided by the National Health and Nutrition Examination Survey (NHANES). Previous trends have suggested significant increases in the prevalence of obesity in the United States, however the prevalence of obesity does not seem to be continuing at the same rate[1]. Even though the rate of obesity seems to be steady, the prevalence of obesity for 2007-2008 was 32.2% and 35.5% for men and women respectfully[1]. Although Flegal et al. (2010) was unable to find an increase in obesity trend from 1999-2008, evidence has shown that obesity is still a major health concern, with the prevalence of obesity still high, exceeding 30% in most sex and age groups[1, 45, 46].

Overweight and obesity are associated with many chronic health problems and are the most significant contributors to ill health[47]. As obesity continues to increase, so does the rate of morbidity and quality of life affecting those involved, the healthcare system, and the community[43]. A 2003 study by Mokdad et al. evaluated the relationship of overweight and obesity and obesity related chronic health conditions by conducting a random telephone survey of 195,005 adults in the United States, who participated in the Behavioral Risk Factor Surveillance System in 2001. Overweight and obesity were identified as major contributing factors to diabetes, high blood pressure, high cholesterol, asthma, arthritis, and fair or poor health status[48]. This relationship between overweight

and obesity and chronic diseases seems to be stronger as an individual's BMI increases[48]. In a 2007 review, Kopelman concluded that excess body weight increases the risk for several diseases such as type 2 diabetes, hypertension, coronary artery disease and stroke, cancers, and osteoarthritis[47].

A prospective cohort study of 527,265 of men and women 50 to 71 years of age, with a 10-year follow-up, shows that higher BMI associates with increased risk of death[33]. Information on participants' demographics, height, weight, dietary habits, health behaviors etc., was gathered by means of a self-reported questionnaire and linked with the Social Security Administration Death Master File[33]. These results indicate that excess body weight does not only lead to chronic conditions, but may result in death[33].

Reducing body weight by 5%, through means of physical activity and making healthier lifestyle choices, has shown to decrease the incidence of diabetes by 50% in overweight or obese individuals who had impaired glucose tolerance[16, 49]. Studies have shown that losing a minimum of 5% of initial weight reduces one's risk for some obesity related chronic conditions such as type 2 diabetes and hypertension[49-53]. A 2002 review conducted by Vidal, indicated that a weight loss of 5-10% has been proven to improve the risk of developing cardiovascular disease, type 2 diabetes and hypertension[50].

In a randomized clinical trial by Wing et al. (2011), weight loss was associated with the improvement of risk factors of chronic conditions in 5,145 overweight or obese individuals from the Look AHEAD (Action for Health and Diabetes). The goal of the trial was to evaluate the effect of lifestyle interventions, in individuals who had type 2 diabetes and were overweight or obese, on their cardiovascular health[54]. Participants were divided into two groups, the intensive lifestyle intervention group (ILI) and the diabetes

supports and education group (DSE). The ILI group meet with researchers, had a caloric intake goal, a physical activity goal of 175 mins/week, and a goal to lose 10% of body weight[54]. The DSE group attended three meetings in one-year, which provided support and education on diet and physical activity[54]. Greater weight loss was observed in the ILI groups however weight loss in both groups was seen to have improvements for risk factors[54]. Weight loss after 1 year showed improvements for CVD (cardiovascular disease) risk factors and glycemic control, hypertension, and lipids[54]. Wing et al. (2011) concluded that losing 2-5% initial weight significantly improved participants' glycemic control[54].

The risk factor most closely linked with obesity is diabetes and the incidence of diabetes has been on the rise, indicating need for concern[1]. Studies have shown direct relationship between losing weight in obese individuals and reducing of type 2 diabetes[15]. Kramer et al. (2010) examined trends on BMI, waist circumference, and obesity prevalence in both people with and without type 2 diabetes. Data of the NHANES from 1976-2006 was analyzed of 4,162 adults with type 2 diabetes, and 40,376 adults without type 2 diabetes. During the 20-year period, the mean BMI increased in both adults with and without type 2 diabetes, and the mean waist circumference increased substantially in all groups[15]. Total obesity increased 58% among those adults with type 2 diabetes, and 136% among those without type 2 diabetes[15]. Mokdad et al. (2003) examined the prevalence of obesity, diabetes, and obesity-related health risk factors. Results of the study indicated there has been an increase in the prevalence of obesity and diabetes since 2000, 19.8%-20.9% and 7.3%-7.9% respectively[48], demonstrating the direct relationship between type 2 diabetes and obesity. Maskarinec et al. (2009) reported the percentage of

obese men and women who had diabetes was two and three times respectively higher than that of normal weight counterparts[55].

A study conducted by Knowler et al. (2002), compared the incidence rate of type 2 diabetes following a lifestyle change program and using medication (metformin, a drug commonly used in treatment of type 2 diabetes) in individuals that were at high risk for developing type 2 diabetes. Participants were divided into one of three categories: a placebo group, a metformin (850 mg twice daily) group, or a lifestyle modification program group (who had a 7% weight loss goal and 150 mins/week of physical activity) [16]. After almost a 2.8-year follow-up, results showed those who participated in the lifestyle modification program had less incidence of type 2 diabetes then those in the placebo or metformin groups[16]. The lifestyle modification program group experienced a reduction in the incidence of diabetes by 58%, whereas the metformin group had a reduction of 31% when both groups compared to the placebo group[16]. This study validates that lifestyle modifications reduce the incidence of diabetes more so than metformin treatment and no treatment in individuals who are at risk for type 2 diabetes[16].

The Diabetes Risk Score (DRS) is a tool used to assess an individual's risk for the development of type 2 diabetes. By understanding the risk of type 2 diabetes, individual's can be educated and encouraged to practice healthy lifestyle behaviors to reduce the risk of type 2 diabetes. Saaristo et al. (2005) evaluated the use of the diabetes risk score for undetected type 2 diabetes and abnormal glucose tolerance and metabolic syndrome. 4,622 participants were invited to participate in the study, of those, DRS and glucose tolerance data was collected for 2, 966 participants, all of which had no history of diabetes[56]. The DRS consisted of an eight question which consisted of age, BMI, waits

circumference, physical activity, daily consumption of fruits, berries or vegetables, history of antihypertensive drug treatment, history of high blood glucose, and family history of diabetes[56]. Results of this study showed the DRS to be a useful screening tool for those at high risk for type 2 diabetes, as well as to identify undetected type 2 diabetes, abnormal glucose tolerance, and metabolic syndrome[56].

Franciosi et al. (2005) evaluated the DRS to assess the utility of this instrument for identifying individuals who may be at risk for type 2 diabetes or may have impaired glucose tolerance (IGT). This study included 1,377 adults from the ages of 55-75 years old who completed both a DRS and a 2-hour oral glucose tolerance test (OGTT). Results of both, DRS and OGTT, were compared to assess one's risk for type 2 diabetes, and a cutoff on the DRS can show the optimal results for a positive risk[57]. The results showed that a DRS cutoff of 9 strongly suggests an individual being at risk for type 2 diabetes. Seventy-seven of those with DRS of 9 or higher had glucose abnormalities, indicating a DRS of 9 or higher as a good screening tool to detect those at risk for type 2 diabetes[57]. Lindstrom and colleague (2003) also found a DRS of 9 to be a good predictor for those who may need medical treatment for their diabetes. Based on the results of these studies it could be postulated that the DRS is an inexpensive instrument for screening individual's' at risk for type 2 diabetes and could be a useful alternative to fasting blood glucose measurement[57-59].

The association between overweight and obesity and related health care cost has been a major concern for many employers[60, 61]. Furthermore, being overweight or obese is a risk factor for the development of type 2 diabetes and other chronic conditions, further increasing health care concerns. In an analysis conducted by Finkelstein et al.

(2003), data collected from the 1998 Medical Expenditure Panel Survey (MEPS) and 1996 and 1997 National Health Interview Surveys (NHIS) were used to examine the medical costs. They reported the average medical spending for those who were overweight and obesity at $247 and $732, respectively; significantly higher than normal weight indiviuals[6]. Furthermore, the average obesity related medical spending was $125 for individuals who do not have insurance, $423 for those who have private insurance, $1,486 for those who have Medicare, and $864 for those who have Medicaid[6]. The U.S. annual medical expenditures for overweight and obesity was 3.7% and 5.3% respectively[6]. Based on Finkelstein et al. (2003) in 2002 the United States spent $92.6 billion dollars on medical expenses for overweight and obesity compared to $78.5 billion in 1998[6]. An updated analysis conducted by Finkelstein et al. (2009) found a $40 billion dollar increase of medical spending through 2006, as a result of the increase in prevalence of obesity[8]. It is estimated that in 2008, medical cost of obesity rose to $147 billion dollars[8].

Even though, most medical expenses are covered by private insurances, eventually some of the cost will be transmitted to employee. The amount paid for premiums and co-pays has been significantly increasing in the past 20 years, putting financial burden on employees as well[38]. Finkelstein et al. (2009) estimated that in 2006, an obese individual paid $1,429 more in medical spending, then an individual of normal weight. There is a direct association between increased prevalence of obesity and increased medical spending[8]. A study conducted by Yang and Hall (2008) examined the financial burden of overweight and obesity in the elderly. This longitudinal study used data collected from the Medicare Current Beneficiary Survey (MCBS), which collected

medical care information and health status of a representative group of Medicare benesficiaries[62]. Results of this study showed that the yearly financial cost due to overweight and obesity among the entire population could be up to $400 billion dollars[62]. Yang and Hall (2008) concluded that the prevalence of overweight and obesity is putting financial burdens on the health care system and public health insurance[62].

An employer is estimated to spend $75 billion dollars more yearly on obesity related costs[36, 37]. In a cross-sectional analysis of the 2006 Medical Expenditure Panel Survey and the 2008 National health and Wellness Survey, Finkelstein et al. (2010), evaluated the cost of obesity in the workplace. Results of this analysis indicated that medical costs and absenteeism increases as the BMI of an individual increases[38]. Obese full-time employees have shown to cost $73.1 billion dollars yearly, and employees who's BMI > 35 accounts for 37% of the obese population in the workplace, and 61% of excess costs[38]. In another study conducted by Gates et al. (2008), moderately to extremely obese employees were shown to have greater health-related work limitations, and encountered a 4.2% loss in work productivity compared to employees of normal weight. The loss of work demonstrated by an increased BMI equals to $506 dollars yearly lost of work per employee, concluding that employees with a higher BMI (> 35) are significantly less productive at work then employees of a lower BMI[36].

Implementing workplace interventions to reduce the prevalence of overweight and obesity at the workplace have been identified as an ideal approach in reducing health care cost associated with overweight and obesity, especially for those with a BMI > 35[38].

II. The worksite as a venue for addressing obesity

Workplace interventions have become increasingly common to reduce and prevent overweight and obesity and related chronic conditions[36] because it offers the opportunity to target a large population at a given time and allows for modification of the work environment[19]. The workplace provides the chance to promote healthy lifestyle such as increasing physical activity[63] and healthy eating practices[41, 42]. This is based on the fact that more that 65% of the US adults are employed in the workplace[3, 17]. The workplace provides opportunities for common method of communication and there is a possibility for environmental and policy changes to support the adopted lifestyle behaviors. Furthermore, the incentive to implement weight loss programs at the workplace is substantial due to potential decrease in the rate of absenteeism and presentisieem, while increasing the productivity of the employees[3]. Increasing productivity, and improving employee's health could have major impacts in healthcare cost and company profits[3, 64, 65]. The workplace plays a role in energy imbalance. The energy imbalance is directly related to the sedentary occupations (more behind the desk jobs) as well as long working hours which does not offer employee an opportunity to participate in after work physical activities and not being able to compensate for occupational inactivity[3]. Other factors, such as shift work, inflexible work hours, and work stress and access to unhealthy comforting foods also contribute to this negative energy balance and overweight and obesity.

In a study conducted by Gemson et al. (2008) the impact of an education and intervention program for promoting weight loss and blood pressure control at work was assessed. This intervention program utilized the 5E's framework (Evidence,

Engagement, Educating, Environment, and Evaluation) [19]. This framework involves educating individuals on health issues, then educating using evidence and behavioral counseling, and applying the framework to the appropriate environment and allowing for post-evaluation[19]. The study compared two groups: a control group and experimental group. The control group 1) received blood pressure screening, 2) Registered Nurses at tables during designated times and days, 3) completed questionnaires and then had a BP reading by one of the Nurses, 4) weighed-in, 5) received health information cards with BMI, BP, and five lifestyle modifications to reduce BP and 6) received educational brochures[19]. In addition to what the control group received, the experimental group also received 1) pedometers, 2) poster by BP screening promoting exercise, 3) the health information card also promoted physical activity, 4) the Registered Nurses also promoted physical activity, 5) body fat measured, and 6) environmental intervention occurred (fruits were displayed at employee cafeterias[19]. Significant improvements in BMI and systolic blood pressure in the experimental group over the control group were found[19]. Also, 38.3% of those in the experimental group reported partaking in physical activity by the one-year follow-up, which was 100% increase from the baseline[19]. Using a worksite intervention to help decrease BMI and blood pressure and increase physical activity can be effective[12].

In a similar study, Morgan et al. (2011) evaluated the efficacy of a worksite weight loss intervention in 110 overweight and obese male shift workers. The workers were randomly assigned to one or two groups, the intervention group called Workplace POWER (Preventing Obesity Without Eating *like* a Rabbit) program or a control group, which was a 14-week wait-list group[66]. The Workplace POWER intervention, based off

Bandura's Social Cognitive Theory[67], consisted of four components: a 75 minute informational session, a 15 minute orientation to teach participants how to access the free weight loss website which was used in the study, program booklets, and group-based financial incentives[66]. The participants were evaluated based on their waist circumference, BMI, blood pressure, resting heart rate, self-reported physical activity and dietary variable, and physical activity and dietary cognitions[66]. The Workplace POWER intervention provided significant changes in waist circumference, BMI, systolic blood pressure, resting heart rate, physical activity, sweetened beverages, and physical activity-related cognitions[66]. The worksite weight loss intervention proved to be effective in significant weight loss and changes in health behaviors[66].

Milani and colleague (2009) examined the effect of a worksite wellness intervention on cardiac risk factors and the cost effectiveness of the program of 308 employees and 31 spouses from a single employer. Participants were randomly assigned to one of two groups, the control group, received usual care (from a physician) and the active intervention group in which a worksite-based program was developed[68]. The active intervention groups' program consisted of health professional from CRET (Cardiac Rehabilitation and Exercise Training) who created onsite health education, referrals, stress management treatment, as well as other programs and services[68]. Significant improvements were found for overall quality of life, behavioral symptoms, body fat, high-density lipoprotein cholesterol, diastolic blood pressure, health habits, and total health risk for those in the active intervention group[68]. 57% of employees, who were marked as high risk at the start of the intervention, were improved to low risk by the end of the program[68]. Employees that participated in the intervention, saw a annual claim

decrease of 48% one year after intervention, as opposed to employees who did not participate in the intervention, saw no change in annual claim costs[68]. Ultimately, the worksite wellness intervention helped decrease employee health risk and annual claim costs[68].

In a review conducted by Benedict and colleague (2008) the effectiveness of worksite wellness interventions, and overall, worksite intervention groups lost significantly more weight than control groups[69]. Worksite wellness programs have shown to bring positive changes to employee food intake, such as higher fruit and vegetable and lower total fat intake[70], and provide a greater opportunity to target those in need and to bring awareness and interventions to help improve healthy behaviors. Studies have shown that worksite intervention programs have resulted in improvements of employee nutrition and physical activity[69-71], and can improve employee's work ability[72]. For worksite health promotion interventions to be successful, both the physical and psychosocial environments should be improved at the workplace[72].

An important component for employers when hosting worksite wellness programs is determining their return on investment. An employer examines the return on their investment by analyzing the cost for worksite wellness interventions (i.e. the investment) and the cost savings the intervention may bring (i.e. lower health care costs and more employee productivity). In a 1999 study conducted by Ozminkowski et al. evaluated the return on investment in 22,838 employees, who were followed for 38 months. 11,194 employees participated in the intervention, which consisted of initial screening, dividing subjects into high and low risk intervention programs, with an extensive follow-up for those in the high risk intervention program, and promoting general health education and

awareness[73]. The remaining 11,644 employees acted as the control and did not participant in the intervention. Results of the study showed that the employers' return on investment was between $4.56 and $4.73 per $1 spent on the worksite health management program[73]. The authors concluded that worksite intervention programs, which focus on helping high-risk employees, could actually result in a cost savings to the employers[73].

In another study Trogdon et al. (2007) evaluated the return on investment of workplace obesity interventions based on a return on investment stimulation model utilizing the national obesity prevalence data. Results indicated that at least a 5% weight loss reduction in employees who have excess body weight could result in an annual savings of $90 per person, which consist of savings for medical and absenteeism[74]. The authors concluded that low-cost worksite interventions are likely to result in a cost savings[74].

Baicker et al. (2010) conducted a meta-analysis of cost savings that workplace wellness programs may generate for the employers. Results of the analysis found that workplace wellness programs generated a $3.27 savings in medical costs for every $1 spent, and $2.73 savings in absenteeism costs per $1 spent on worksite wellness programs[75]. The findings suggest that the return on investment for worksite wellness programs, seem to be beneficial for budgets, increase productivity at work and overall employee health outcomes[75].

III. Economic incentives as a component of weight loss programs

Current research focuses on different interventions and motivations to get overweight and obese individuals living healthier lives by partaking in healthier behaviors. There has been a link between providing monetary incentive and individuals losing weight as well as motivating healthy behaviors. Many employers are now offering some form of monetary incentives to get employees living healthier lives. In a 2003 review conducted by Finkelstein and colleague, reported that many companies are offering interventions and monetary incentives such as bonuses, paid vacation, and health insurance rebates to motivate employees to live healthier lifestyles[25]. A study, conducted by Gabel et al. (2009), found both employers and employees are in favor of monetary incentives for participating in weight loss programs, and 70% of employees were in favor of insurance discounts or monetary incentives[22].

Another review conducted by Wall et al. (2006) concluded that monetary incentives are a promising way to help individuals modify their behaviors[21]. Similarly, a 2008 study by Volpp et al. evaluated the use of financial incentives for weight loss. The study included 57 participants aged 30-70 and a BMI of 30-40, and they were divided into three groups, a control (no monetary incentive), lottery incentive group, and a deposit group (that allowed for participant matching) [23]. Results showed that the incentive groups lost significantly more weight then the control group, and 47.4% of those in the incentive groups lost the targeted weight loss as compared to only 10.5% in the control[23]. These findings imply that monetary incentives do provide significant weight loss[23].

In a recent 2011 study by John et al. the use of financial incentives were evaluated for extended weight loss in 66 obese participants from Philadelphia Veterans Affairs Medical Center (PVAMC). Participants were asked to partake in the 32-week program, which consisted of 24-week intervention and an 8-week follow-up[76]. All participants had a consultation with a dietician and monthly weigh-ins, and then were divided into three groups[76]. The control group only consisted of the consultation and monthly weigh-ins, both incentive groups, participants deposited their own money and if weight loss was achieved their deposited was matched, however if weight loss was not achieved they lost their deposit[76]. In one of the incentive groups, participants were told that the period after the 24-week intervention was for weight-loss maintenance, and in the other incentive group they were not told[76]. At 24-weeks, the incentive groups lost more weight (8.70 pounds) then the control group (1.17 pounds), however weight was regained by the end of the program[76], with a net weight loss for the incentive and control groups to at 1.2 pounds and 0.27 pounds respectfully[76]. John et al. (2011) concluded that although the use of a financial incentive proved to be effective for weight loss during the intervention, weight loss was regained post-intervention.

Finkelstein et al. (2007) conducted a pilot study to test the effect of different levels of financial incentives on weight loss at 3 and 6 months for overweight employees. The study included three groups: group one received no incentive, group two received $7 per percentage weight loss, and group three received $14 per percentage weight loss. For the 6-month measurement, those who were receiving the $14 incentive were not receiving any incentive, and those who were originally not receiving any incentive were receiving the $14 dollar incentive, and the $7 incentive group remained the same for the

6-month measurement[24]. This was done to ensure equal chance of an incentive[24]. Results showed, at 3 months, that the no incentive group lost average of 2 pounds, the $7 incentive group lost 3 pounds, and the $14 incentive group lost 4.7 pounds, however no significant difference in weight was found between the groups at the 6-month measurement[24]. Individuals who received the $14 per percentage of weight resulted in more weight loss, more significant weight loss at 3 months, and more participation[24], indicating the use of monetary incentive for more weight loss then the absent of an incentive. A monetary incentive was proven to be an effective way to motivate employees to lose weight[24].

Results of the previous studies and reviews demonstrate the effectiveness of monetary incentives for significant weight loss[23, 24, 76] and modification of healthy behaviors[21], which may ultimately lead to the reduction of overweight and obesity.

IV. Weight loss self-efficacy sale, exercise self-efficacy scale, and Stages of Change

Self-efficacy is the belief that an individual has the self-power and control to perform and succeed in a behavior[29-31]. Self-efficacy is used in research because of the association between self-efficacy and changes in health behaviors[29]. Bandura (1977) explains that the strength of individuals own perceived confidence effects if they are successful in a situation, therefore the more the perceived self-efficacy an individual has, the more empowered he/she is for performing the act.

In 1986, Glynn and Ruderman developed and validated the eating self-efficacy sale (ESES). The ESES originally consisted of 79-item, however after testing the ESES twice among college students, the final version of the ESES scale was a 25-item scale, which ranged from 1 (no difficultly controlling eating) to 7 (most difficult controlling

eating) [77]. The 25-item survey was giving to 484 college undergraduate females, along with the ESES, the participants also filled out a "10-item questionnaire which assessed their concern for dieting and weight fluctuation" known as the Restraint Scale[77]. Seven weeks later, 85, of the original 484 students, filled out the ESES questionnaire again along with the "Tennessee Self-Concept Scale (Fitts, 1965), a 100-item questionnaire that yields a global measure of self-esteem"[77]. This portion of the study resulted in consistency reliability, test-retest reliability, and construct validity of the ESES questionnaire[77]. Another portion of this study was to determine if the ESES had predictive validity among 32 participants at weight control clinics, and participants were giving the ESES questionnaire pre, mid, and post treatment[77]. Results of this analysis showed a significant correlation between weight loss and an increase in ESES score[77]. Glynn and Ruderman (1986) showed supporting evidence of the reliability and validity, as well as the correlation between weight loss and ESES score, of the ESES questionnaire.

Sallis et al. (1988) conducted another study where eating and exercise self-efficacy scales were developed and evaluated. The scales were first developed based on 40 participants who were interviewed, and questions consisted of eating and exercise behaviors and at given different situations[78]. Once the scales were developed, 171 participants were giving the questionnaires to evaluate test-retest reliability and internal consistencies[78]. Results showed that self-efficacy was associated with eating and exercise habits[78]. The authors concluded that the eating and exercise self-efficacy scales to be reliable and valid[78].

Linde et al. (2006) examined the relationship between self-efficacy beliefs, weight control behaviors, and weight change in 349 overweight individuals. Participants took part in eight weekly one-hour sessions and active weight loss treatment was delayed until week 5[29]. Participants filled out questionnaires at baseline, and week 5 to week 8 regarding demographics, self-efficacy (eating self-efficacy and exercise self-efficacy using a 10-item scale), weight loss monitoring behaviors, how much effort put into the program and weight loss, physical activity, dietary variables, and height and weight[29]. Results showed that both eating and exercising self-efficacy were associated with weight loss behaviors, and eating and exercising self-efficacy had an effect on weight change during active treatment[29]. Linde et al. (2006) concluded that although perceived self-efficacy was associated with healthy behaviors, it could not be concluded that self-efficacy causes the action of the healthy behaviors.

In a study conducted by Warziski et al. (2008), the relationship between individual self-efficacy in healthy eating habits and weight loss over an 18-month behavioral weight loss study was examined. One hundred ninety one overweight to morbidly obese participants were randomly assigned to one of two diet plans, LOV-D or STD-D[79]. Each diet plan had set caloric restrictions based on weight and gender[52]. During the first 6 week of the program, the LOV-D group gradually eliminated meats, fish, and poultry from the diet[79]. Self-efficacy was increased in the STD-D group by verbal persuasion by staff members, good responses when weight lost was achieved, and having bad experiences when others lost more weight[79]. The STD-D group attended 1-hour intervention sessions, where the "focus was on teaching cognitive behavioral strategies for weight loss"[79]. Results showed no significant differences between weight

and self-efficacy between the different diet groups, however an increase in self-efficacy was supported with greater weight loss[79].

Rejeski et al. (2011) analyzed the weight loss, self-regulatory and eating efficacy in 288 older adults for 6 months through a weight loss self-efficacy lifestyle questionnaire. The weight loss self-efficacy lifestyle questionnaire used in this study was originally developed by Clark et al. (1991) and is a 20-item measurement used to assess an individual's self-efficacy for weight management[80]. The questionnaire uses a 10-point scale (0-not confident to 9-very confident) to rate their confidence to resist the eating during certain situations such as negative emotions, availability, social pressure, physical discomfort, and positive activities[80]. The study consisted of 3 groups: physical activity, weight loss and physical activity, and a successful aging health education program[80]. Results indicated that improvements in weight loss self-efficacy lifestyle questionnaire occurred in the group that participated in weight loss and physical activity[80]. These findings imply that changes in self-regulation and eating behavior may be related to the amount of weight that was loss[80].

A 2011 study conducted by Annesi, examined the effect of an exercise program and changes in mood, self-efficacy, and self-regulation in 137 severe obese individuals. These individuals participated in 26 weeklong exercise-support and nutrition-education treatment based off the Social Cognitive Theory[81]. All participants also had access to YMCA wellness centers[81]. The exercise support portion of the study consisted of 6 45-60 minute one-on-one meetings during the 26-week program, and the nutrition-education consisted of 6 one-hour group session during the first 14 weeks of the program[81]. Results showed mood, self-regulation for exercise, and exercise self-efficacy were significantly

associated to changes in self-efficacy for emotional eating, self-regulation for controlled eating, and overall self-efficacy for controlled eating[81]. The study concluded that weight loss through exercise was explained by means of psychologically rather then physiologically[54]. Thus indicating that weight loss programs should include improvements in self-regulation and self-efficacy, which are achievable through behavioral exercise treatments[81].

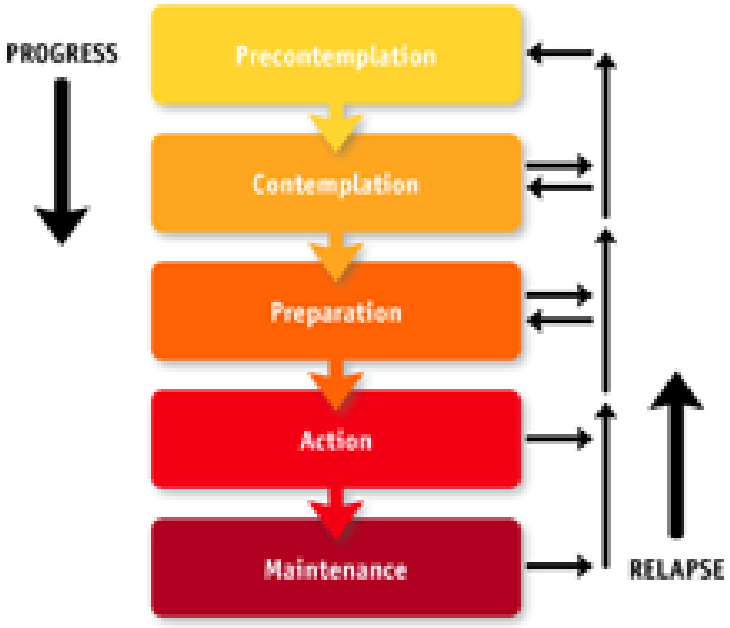
Increase in eating and exercise self-efficacy has shown to have a significant relationship with weight loss. In a recent review, Cochrane (2008) found self-efficacy was positively correlated with an individual's success in losing weight[82].

The weight loss self-efficacy scale used in the present study was developed and validated by Clark et al. (1991). The scale consists of 20 questions and five situational factors for eating, which are negative emotions, availability, social pressure, physical discomfort, and positive activities[83]. The WLSE showed to be an acceptable measure of an obese individual's self-efficacy for eating behaviors[83]. Providing an overall self-efficacy score may also help assess an individual's readiness to change[83].

In the late 1970's and early 1980's James Prochaska and Carlo DiClemente developed the Stages of Change Model (Figure 2.1), which is used to determine an individual's readiness to change for a specific behavior. This model consist of 5 stages: ***Pre-contemplation*** "no intention to take action within the next 6 months", ***Contemplation*** "intends to take action within the next 6 months", ***Preparation*** "intends to take action within the next 30 days and has taken some behavioral steps in this direction", ***Action*** "changed overt behavior for less than 6 months", ***Maintenance*** "changed overt behavior for more than 6 months"[84].

Figure 2.1

Stages of Change Model



The stages of change model has been used to help with behavioral change including weight control and exercise[32]. This model was developed to identify the process in which an individual changes towards healthy behaviors. Individuals can change towards and away from the desired behaviors at their own pace and not all individuals start off at the same stage, instead one moves to and from stages based on their experiences or environment[85].

In a recent study conducted by Johnson et al. (2008), overweight and obese individuals participated in multiple behavior interventions to examine the impact of the transtheorectical model targeting behaviors essential to healthy weight management[86]. Individuals were placed into two groups, one group was the control group and the other group was the intervention group, who received individual reports based on previous assessments. Results of this study found that the intervention group had significant

progression to Action/Maintenance stage by 24 months for healthy eating, exercise, managing emotional distress, and untreated fruit and vegetable intake[59]. Furthermore, multiple behavior intervention had a three times more impact than single behavior intervention[86]. The authors concluded that a tailored transtheorectical based model for multiple behaviors can help to improve healthy eating, exercise, managing emotional distress, and weight in overweight and obese individuals[86].

In a 10-week worksite pedometer-walking program conducted by Faghri et al. (2008), the stages of change model was utilized to increase physical activity at the workplace. The study found individuals significantly moved through the stages of change for physical activity, dietary habits, and stress management[3]. The study also found that there was also a 20% increase of individuals in the maintenance stage at the end of the program for physical activity[3]. Furthermore, the stages of change model is a useful to understand an individual's readiness to change to a specific behavior and to assess one's progress.

A worksite weight loss study conducted by Prochaska et al. (1992), showed individuals who remained in treatment moved from contemplation to action stage. With a move from contemplation to action stage, individuals also reported an increase in self-efficacy[87]. Self-efficacy increases as individuals move through the stages of change, however self-efficacy does not peak until an individual has entered the maintenance stage[87, 88]. Prochaska et al. (1992) conduced that the stages of change model helps to understand how people change.

In a study conducted by Starkin et al. (2001), 670 overweight or obese individuals completed a 16-page questionnaire. The questionnaire included constructs from the

transtheoretical model for stage of change for moderate exercise, self-reported exercise leisure, decisional balance for exercise, and exercise situational self-efficacy[89]. Results showed that individual exercise self-confidence increased from pre-contemplation to maintenance stage[89]. An individual's confidence in exercise may not completely set until the Action or Maintenance stage when an individual has had many successes at it[89].

Delahanty et al. (2006) evaluated the association between physical activity and readiness to change. Participants filled out a questionnaire, which consisted of questions regarding stage of change, physical activity, exercise self-efficacy, perceived stress, depression, and anxiety[90]. Findings of the study showed that an individual's self-efficacy was positively correlated with one's stage of change[90].

V. Summary

The previous review included the current literature related to the need for weight loss interventions in the workplace and different strategies. The review supports the need to decrease the number of individuals who are overweight or obese because of the health risks that are associated, and increase in health care costs. Including a monetary incentive for weight loss interventions has shown to be an effective approach. Understanding an individual's self-efficacy and stage of change, and utilizing contingency management, may increase weight loss, and therefore provide an effective worksite weight loss program.

Chapter 4: Methods

Design:

This study was a randomized controlled design by group. Four nursing home facilities that were all part of the same corporate organization were randomly assigned to either the experimental/ incentivized (IP) or the control/non-incentivized (NIP) groups. The physical environment, work organization and job characteristics as well as demographics of the employees were comparable at all sites.

Participants:

All employees of the four centers were invited to participate in the program. Ninety-nine employees in total participated in the program, fifty-one from the incentivized group, and forty-eight from the non-incentivized group. Seventy-three completed the entire program.

Inclusion Criteria:

1. Part or full-time employees at the facility
2. At least 18 years and older
3. Overweight or obese and at risk for type 2 diabetes based on diabetes risk score (DRS)
4. Agree to participate in the 16 weeks weight loss program with three months follow-up (for a total program of 28 weeks).
5. Score an 8 or higher on DRS assessment

Exclusion Criteria:

1. Pregnant or lactating at the time of the intervention,
2. Lost 20 pounds or more within the past 6 months,
3. Have type 1 diabetes,
4. Taking weight loss supplements,
5. Have cancer and been treated with radiation or chemotherapy in the past 5 years,
6. Individuals who have or plan to have weight loss surgery during the study period
7. Have known history of heart disease, stroke.

All of the participants signed an informed consent form approved by the University of Connecticut Institutional Review Board (IRB) (see **Appendix A**).

Instruments:

A. Diabetes Risk Score

The Diabetes Risk Score (**DRS: Appendix B**) is an assessment tool used to evaluate an individual's risk for developing type 2 diabetes. The DRS asks seven questions that are scored based on the participant's gender and response, with the highest possible score of 20. These questions include age, body mass index (BMI), waist circumference, followed by "Yes" or "No" questions: "Have you ever used drugs for high blood pressure?"; "Has a physician or any other health care provided ever tell you that you have high glucose?"; "Do you exercise or exert yourself in your spear time or at work at least 30 on minutes most days"; and "How often for you eat vegetables and fruits or berries".

Scoring

A score of 8 or higher indicates that a person is at risk for developing type 2 diabetes and thus those individuals were accepted into the program.

B. General Survey

The general survey (see **Appendix C**) asked 77 questions which gathered information about participant's demographics, self-rated overall health, stage of change, weight loss self-efficacy, exercise self-efficacy, and current exercise and eating habits. Each question provided participants with multiple responses in a Likert scale.

Scoring

Responses to each question were ranked in numerical values usually from, 1-5 in either descending (worse is higher rank and best is the lower rank) or ascending (worse is lower rank and best is the higher rank) orders dependent upon the question.

C. Stages of Change (SOC)

The SOC evaluates a participant's movement through the stage of change identified by Prochaska and DiClemente Stage of Change Model. The SOC consisted of a series of 7 questions which asked the participant to rate their readiness to change regarding physical activity, eating habits, avoid smoking, lose weight or maintain healthy weight, handle stress well, avoid alcohol, and live an overall healthy lifestyle. There were 5 responses for each question in a Likert-type scale, ***Pre-contemplation*** "No present interest in making a change" (1), ***Contemplation*** "Plan to change in the next 6 months" (2), ***Preparation*** "Plan to change this month" (3), ***Action*** "Recently started doing this month" (4), and ***Maintenance*** "Already do this regularly 6+ months" (5). These responses represent the participant's current stage of change, which ranges from pre

contemplation to maintenance. A global score for SOC was calculated. The lowest possible score was a 7 and the highest possible score was a 35.

D. Weight Loss Self-Efficacy (WLSE)

The WLSE, originally developed by Clark et al. (1991) consisted of 20 situations and ask respondents to rate their resistance to eating in each one, using a 4 point Likert-type scale, "not confident" (1), "somewhat confident" (2), "moderately confident" (3), and "very confident" (4). The situational factors consist of: Negative Emotions (for example eating when sad or anxious), Availability (for example, eating when food is readily available, such as at a party), Social Pressure (for example, eating food when others are encouraging eating), Physical Discomfort (eating when in pain or physical fatigue), and Positive Activities (eating while watching TV). The scale provides one global scale with the highest possible score of 80 (20X4).

E. Exercise Self-Efficacy (ESE)

The ESE, consisted of 11 questions, and ask respondents to rate their confidence in exercising based on different situations, using a 4 point Likert-type scale, "not confident" (1), "somewhat confident" (2), "moderately confident" (3), and "very confident" (4). The scale provides one global scale with the highest possible score of 44 (11X4).

F. Healthy Eating Scores (HES)

Healthy eating scores consisted of 9 questions, which asked respondents to answer how often they consume particular foods and/or beverages using a 4-point Likert-type scale, which ranged from "never to 1 time/week and 1-4 times/week" (1), "5-7

times/week" (2), "2 times/day" (3) and "3+ times a day" (4). The scale provides one global scale with the highest possible score of 36.

G. Physical Activity Preference

Physical activity preferences, originally developed by Booth et al. (1997) [91] asked respondents to pick the choice that closely reflected their answer for "Physical activity preference", "Type of help to receive when starting an exercise plan", and "Barriers that prevent exercise".

H. Program Satisfaction and Incentive Satisfaction Assessment

The program satisfaction assessment had three components: 1) program effectiveness and flexibility; 2) health educator's pleasantness, helpfulness, involvement, and motivation; 3) Program material's helpfulness, motivation, and being interesting. Additionally, the IP group was asked if they liked the incentives and if it was fair.

Scoring

To evaluate program effectiveness, flexibility, and satisfaction of the monetary incentive, participants were asked to chose one of the following responses: "Strongly Agree", "Agree", "Neutral", "Disagree", or "Strongly Disagree".

Participants were also asked to rate the health educator from 1-5 on how "Pleasant" (1) or "Unpleasant" (5), "Helpful" (1) or "Unhelpful" (5), "Very Motivation" (1) or "Not Very Motivating" (5), and "Actively Involved" (1) or "Passively Involved" (5) the health educator was. All participants received program materials, which they were asked to also rate from 1-5 on how "Helpful" (1) or "Unhelpful" (5), "Interesting" (1) or "Boring" (5), and "Very Motivating" (1) or "Not Very Motivating" (5).

Improvements

For questions of self-reported general health, chronic conditions, stage of change, waist circumference, as well as overall SOC, WLSE, ESE, and HES score, improvements from pre to post program intervention were calculated by using 0-1 coding. Participants received a score of 1 if their response improved from pre to post or a 0 if their response either stayed the same or decreased. Those who had a highest response at the pre and stayed the same at the post evaluation were given 1 due to the ceiling effect, were evaluated using this ranking system.

For example, SOC overall score, the highest possible score was a 35; therefore if a participant scored a 35 pre and post, he or she received a 1 since the score was the highest possible score and remained the same. If pre a participant scored a 30, and then scored a 25 post, he or she received a 0, since the score decreased. If pre a participant scored a 25, and then scored a 30 post, he or she received a 1 since the score increased. If a participant scored a 25 both pre and post, he or she received a 0 since even though the score remained the same, it was not the highest achievable score.

Overall Score

For sections in the general survey, that required an overall score to be obtained (SOC, WLSE, ESE, and HES) if a participant missed a question in that section, the previous two answers were averaged and giving an answer to the missed question. If a participant missed more then two questions in a row in that section, no score was calculated.

Procedure:

Approximately one and a half months before the kick-off of the program, the centers were randomly assigned to either the IP or the NIP group. After assignment, the research members met with administrators of each center to discuss plans for the kick off, consultations, and weigh-in scheduling. Plan for recruitment into the program was also discussed and decided that the most effective way to reach employees was through flyers around the center and in paychecks, as well as daily announcements.

Recruitments were performed at each site separately. Researchers were at each site for at least a week for the program kick-off. The goal was to recruit 30-35 participants from each center. Individuals were eligible to participate in the program if they scored an 8 or higher on the DRS and met the inclusion and exclusion criteria. Individuals were then provided a random folder, which contained their ID number, consent form, questionnaire, weight loss program contract, registration form, and a copy of the weigh-in schedule. Participants were provided with a private room and ample time to read through the consent form and the contract before signing. A member of the research team was available to answer their questions. Once all of the forms were signed and questions answered, the participant went on to a private room where his/her weight, blood pressure, BMI, and waist/hip ratio measurements were taken.

A. Intervention-"A Pound A Week Weight Loss Program"

The "A Pound A Week Weight Loss Program" was a 16-week weight loss program with a 3-month follow-up. At the kick off and following the completion of the pre-survey questionnaire each participant received an Action Plan. The information in the Action Plan was based on the Small Steps Big Rewards educational booklet from the

National Diabetes Education Program (www.ndep.nih.gov). The Action Plan encouraged participants to reflect on their lifestyle and how they wish to change. It also provided information about healthy weight and safe weight loss program. Each participant was encouraged to set up a weight goal by the time they came for their one-on-one consultation (approximately three weeks later). Each participant was provided with the option of choosing a day and time slot (one hour) that was most convenient for them within the next three weeks to attend a one and one consultation with a Registered Dietitian (RD) and/or Health Educator (HE). The three weeks window also allowed the researchers to analyze and review each participant's responses to the pre-survey questionnaire related to the level of daily physical activity, barriers to physical activity and healthy eating, types of help requested for managing weight, as well as eating habits. This information was utilized to tailor the educational material and provide an individualized consultation for each participant. At the completion of each consultation, the participant was provided with a weight loss goal based on their BMI and received 16 weekly logs for recording eating and physical activity. The logs were collected on a bi-weekly basis from each site.

Weight loss goals:

Active weight loss program: If a participant was overweight (BMI $\geq$ 25), his/her weight loss goal was to lose 16 lbs in 16 weeks (1 lb of weight loss per week). If a participant was obese (BMI $\geq$ 30), his/her weight loss goal was to lose 24 lbs in 16 weeks (1.5 lbs of weight loss per week).

Maintenance Program: Participants who met their weight loss goal were encouraged to continue to loss a pound per week after the 16 weeks intervention for the next three

months (total 28 weeks) or maintain the weight loss during the maintenance stage. Participants who did not meet their initial weight loss goal were encouraged to achieve their weight loss goal during the follow-up.

Weigh-ins: Participants in the IP group had weekly weigh-ins for the first four weeks, then bi-weekly weigh-ins for the rest of the program (Week 16) and at 28 weeks (3-month follow-up). The NIP group had weigh-ins at baseline, 8 weeks (mid-point), 16 weeks (end of program), and 28 weeks (3-month follow-up).

B. Incentive

Those in the IP group needed to lose 11-14 lbs, depending on BMI, in order to be eligible for the monetary incentive. Participants in the IP group were told that they could be eligible to receive $10 for every 1 lb or 1.5 lbs they lost up to 16 lbs or 24 lbs, therefore, receiving a maximum amount of $160. This group also had an option to do "Win Big" where the participant could deposit anywhere from $1-$5 per pound or pound and a half. For example, if a participant wanted to deposit $5 per pound or pound and a half, they would deposit $5 x 16 lbs (or 24 lbs) = $80. The disadvantage of "Win Big" was if the participant did not lose enough weight to receive the incentive, they would lose all of the deposit. The advantage, however, was if the participant lost enough weight to receive the incentive, the participant would receive the deposited money back, and the program matched his/her deposit. Therefore, if the individual deposited $80 and lost 16 lbs or 24 lbs he/she would receive the $80 back from the deposit and another $80 from the program, giving a total of an additional $160 to the participant. Refer to Table 4.1 for distribution of incentive.

Participants who were eligible to receive incentives were urged to maintain their weight loss or lose more weight by the 28-week follow-up, and if they did so, they would receive an additional $100. Participants, who were not eligible to receive the monetary incentive by the 16-week, were told if they met their initial weight loss goal by the three-month follow up, they could be eligible to receive $100 as well.

Table 4.1

	Basic Incentive $10 per 1-1.5 lbs	"Win Big" $1-$5 per 1-1.5 lbs	Study Match $1-$5 per 1-1.5 lbs	Total
16-Week	$160 (Max)	$80 (Max)	$80 (Max)	$320 (Includes $80 deposit return)
28-Week	$100 (Max)	$0	$0	$100
Total	$260	$80	$80	$420 (Includes $80 deposit return)

Data Analysis:

All analysis was conducted using SPSS version 18.0 software. For all analysis, significance was set at $p < 0.05$. Parametric and nonparametric analyses were both conducted. Descriptive, frequency, nonparametric correlational statistics, Chi-Square, and independent t-test were used to analyze the effect of the monetary incentive and 5% weight loss on: weight, BMI, waist/hip ratio, BP, DRS, self-reported general health,

SOC, WLSE, ESE, and HES, as well as adherence to the program and program satisfaction.

A. Body Weight, BMI, W/H, DRS and BP

Comparison between the IP and NIP mean weights, BMI, W/H, waist circumference, DRS, and BP were performed between Week 1 (pre-intervention) to Week 28 (post-intervention) using independent t-test and a comparison of the means. The overall mean weight loss, total weight loss and total BMI points loss from pre to post were also calculated and then compared between the IP and NIP groups, to evaluate which group obtained the highest total lost for each. The percentage of participants who improved from pre intervention to post intervention for BMI, waist circumference, and DRS was also analyzed between the IP and NIP groups.

B. Stages of Change (SOC)

The mean (± SE) SOC scores pre (Week 1) and post (Week 28) were compared between the IP and NIP groups. Improvement was obtained by a frequency table for both improvement in overall score and improvement for each individual question. Improvement analysis for overall score and individual questions were compared the IP and NIP groups as well as those who lost above and below 5% weight loss. An independent sample t-test analysis was conducted to determine the significance of the improvement between the IP and NIP groups. For each individual question, analysis was then conducted, using a chi-square analysis, to evaluate the significance of those who improved in overall score and each question and lost 5% of weight versus those who improved in overall score and each question, and lost below 5% of weight.

C. Weight Loss Self-Efficacy

The mean (± SE) WLSE scores pre (Week 1) and post (Week 28) were compared between the IP and NIP groups. The percentage of participants who improved in overall score was obtained by a frequency table, and was compared between the IP and NIP groups as well as those who lost above and below 5% weight loss. An independent sample t-test determined the significance of improvement in overall score between the IP and NIP groups as well as based on those who lost above or below 5% weight loss. Additional nonparametric correlational analysis (Spearman's rho) was conducted to examine the relationship between overall WLSE score and specific SOC questions ("Practice good eating habits", "Lose weight or maintain healthy weight", and Live and overall healthy lifestyle"). These correlations were conducted pre and post and compared among the IP and NIP groups.

D. Exercise Self-Efficacy (ESE)

The mean (± SE) ESE scores pre (Week 1) and post (Week 28) were compared between the IP and NIP groups. The percentage of participants who improved in overall score was obtained by a frequency table, and was compared between the IP and NIP groups as well as those who lost above and below 5% weight loss. An independent sample t-test determined the significance of improvement in overall score between the IP and NIP groups as well as based on those who lost above or below 5% weight loss.

Correlational analysis (Spearman's rho) was conducted between ESE overall score and practicing good physical activity habits to examine the relationship between overall ESE score and practicing good physical activity habits. These correlations were conducted pre and post and compared among the two groups. Additional correlation

analysis was conducted to examine the relationship between overall ESE score and specific SOC questions ("Be physically active", "Lose weight or maintain healthy weight", and Live and overall healthy lifestyle"). These correlations were conducted pre and post and compared among the two groups.

E. Healthy Eating Score (HES)

The mean (± SE) HES scores pre (Week 1) and post (Week 28) were compared between the IP and NIP groups. The percentage of participants who improved in overall score was obtained by a frequency table, and was compared between the IP and NIP groups as well as those who lost above and below 5% weight loss. An independent sample t-test determined the significance of improvement in overall score between the IP and NIP groups as well as based on those who lost above or below 5% weight loss.

F. Chronic Conditions, Self-Reported General Health, and Energy Level

The responses for self-reported chronic conditions and self-reported general health (obtained from a frequency table) pre (Week 1) and post (Week 28) were compared between the IP and NIP groups. Improvements in self-reported chronic conditions, general health, and energy level from pre (Week 1) to post (Week 28) were compared between the IP and NIP groups. Improvements from pre (Week 1) to post (Week 28) in self-reported general health and self-reported chronic conditions were compared between those who lost above and below 5% weight loss.

F. Weight Loss Goals

A comparison of the percentage of participants (obtained from a frequency table) of those who met their weight loss goal at week 8, week 16, and week 28 was compared between the IP and NIP groups.

G. Weight Loss Sustainability

The maintenance of weight loss was determined by weight loss throughout the 16-week program that was either maintained or continued from Week 16 to the 3-month follow-up at Week 28.

H. "Win Big"

A mean weight loss comparison (mean ± SE) of individuals who deposited money, and participated in "Win Big" and those who participated in the program's incentive. The amount of participants who participated in "Win Big" was also calculated as well as those who doubled their deposit. This analysis was conducted using a frequency table.

I. Adherence to the Program

A count and comparison of how many weekly logs were returned by each group.

J. Program Satisfaction and Incentive Satisfaction

Both the IP and NIP groups received a short survey at Week 8, Week 16, and Week 28, to evaluate their overall program satisfaction and incentive satisfaction (for IP group only). Frequency of responses for each question were compared from Week 16, and Week 28 to examine any improvement or non-improvement in program satisfaction in both groups, which was then compared between the IP and NIP groups. The frequencies for each response were obtained for week 16, and week 28, and "strongly agree" and "agree" were combined, and "disagree" and "strongly disagree" were also combined. Program materials and health educator responses were just reported at the week 16 mark.

K. Physical Activity Preferences

Frequency table was obtained for each group pre (Week 1) and post (Week 28). Then the top three preferences for each question were gathered and compared pre and post among the two groups.

Chapter 5: Results

Demographics:

A total of 99 employees registered for the program, however 73 participants completed the program, of which, 35 from the IP group and 38 were from the NIP group. Table 5.1 depicts the characteristics of the participants at baseline.

Table 5.1

Participant Demographics		**Incentivized** *(n= 35)*	**Non-Incentivized** *(n= 38)*
Gender	Male	**8.80%**	**10.80%**
	Female	**91.20%**	**89.20%**
Education	Less than High School	**0%**	**0%**
	High School	**57.20%**	**41.70%**
	College/Professional	**37.10%**	**55.50%**
	Post-Graduate	**5.70%**	**2.80%**
Biometrics (Mean ± SE)	Age (yrs)	**41.74 ± 1.69**	**49.72 ± 1.69**
	Height (in)	**64.89 ± 1.08**	**64.61 ± 1.03**
Race	Hispanic (Answered Yes)	**2.90%**	**6.30%**
	White	**40.0%**	**55.3%**
	African American/Black	**54.30%**	**34.20%**
	Asian	**0%**	**0%**
	American Indian/Alaska Native	**0%**	**2.6%**
	Native Hawaiian/Pacific Islander	**0%**	**0%**
	Prefer Not To Respond	**2.9%**	**0%**
Job Title	Administration/Clerical	**0%**	**10.50%**
	CAN/GNA	**45.70%**	**26.30%**
	CMA	**0%**	**0%**
	LPN	**11.40%**	**18.4%**
	RN	**5.70%**	**18.40%**
	Housekeeping/Laundry	**0%**	**7.90%**
	Dietary	**11.40%**	**2.60%**
	OT/PT	**5.70%**	**0%**
	Recreation	**2.90%**	**5.30%**
	Social Work	**2.90%**	**0%**
	Other	**11.40%**	**7.90%**

The results are presented based on the proposed specific aims.

Specific Aims:

1. ***To examine the effect of a contingency management monetary incentive on:***

   - Weight loss; as indicated by: weight, BMI, and Waist/Hip ratio

   - Diabetes Risk Score (DRS)

   - Stage of Change (SOC), Weight Loss Self-Efficacy (WLSE), Exercise Self-Efficacy (ESE), Healthy Eating Score (HES), and Self-Reported General Health

1a. Weight Loss

The study evaluated changes at three time periods: baseline, 16 weeks, and a three-month post program follow-up. Evaluations were for both total weight loss and percent weight loss. The IP group's weight loss and percent weight loss were significant at week 16. Furthermore, both weight loss and percent weight loss were significantly higher from baseline to three months for the IP group than in the NIP group. Since a number of the scores were not normally distributed, but were skewed (BMI and the diabetes risk score), Wilcoxon rank sum tests were also calculated.

Figure 5.1 depicts the change in weight for the IP and NIP groups pre-intervention and post-intervention (Week 1 to Week 28).

Figure 5.1

Mean Weight Pre and Post Incentivized vs. Non-Incentivized

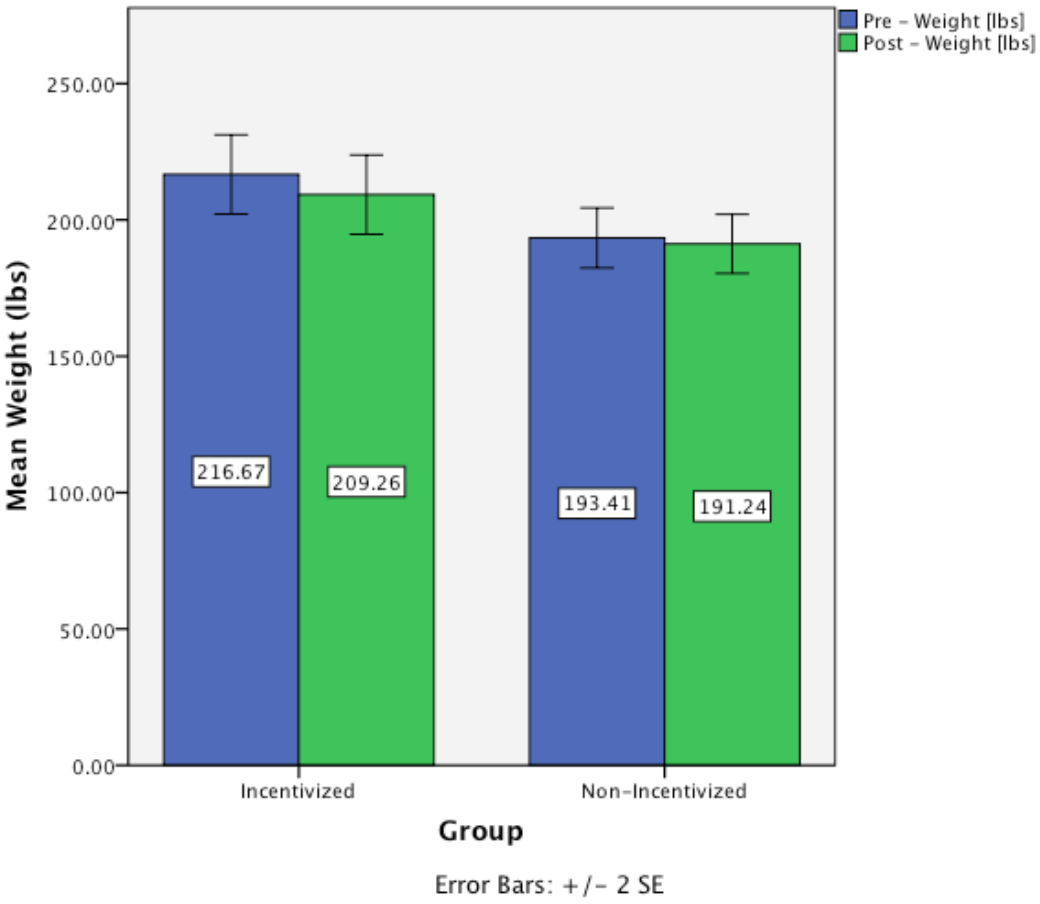
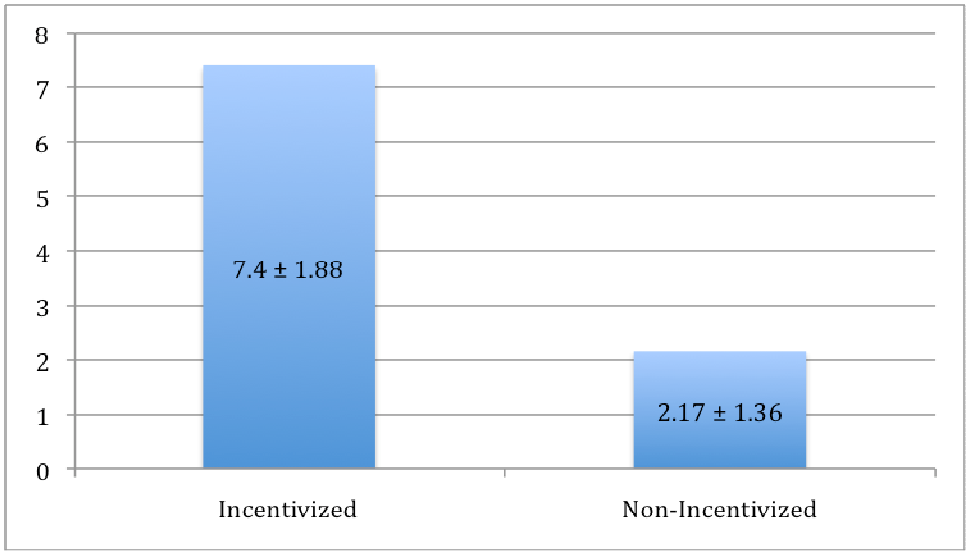


Figure 5.2 depicts the mean weight loss for IP and NIP groups.

Figure 5.2

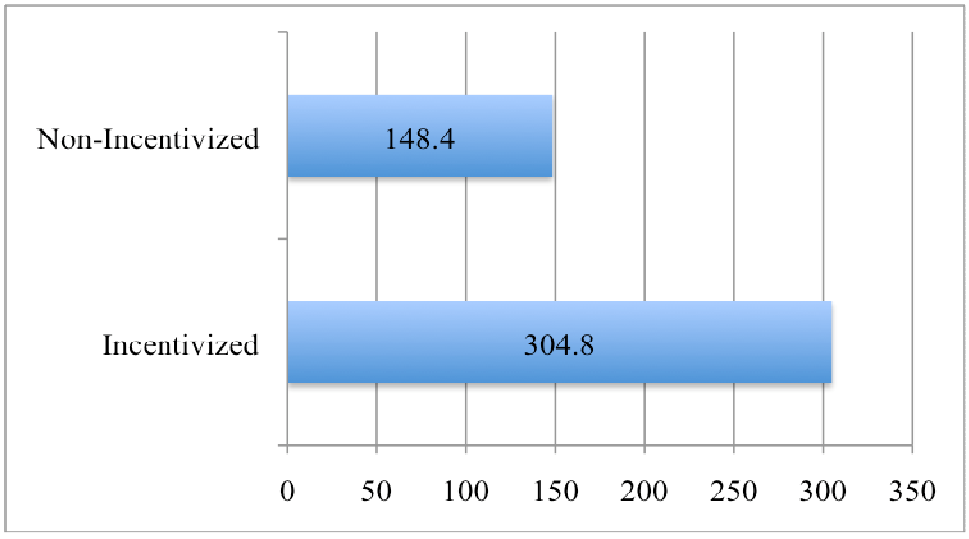
Incentivized vs. Non-Incentivized Mean Weight Loss ± SE



The total weight loss for the IP group was 304.8 pounds (35 participants) and the total weight loss for NIP group was 148.4 pounds (38 participants), as depicted in Figure 5.3.

Figure 5.3

Incentivized vs. Non-incentivized Total Weight Loss (lbs)



1b. Body Mass Index (BMI)

BMI reduction was also marginally significant (p=0.06) at the end of the program (baseline vs. 16 weeks) based on the nonparametric method but not at the baseline vs. three-month comparison. Mean BMI pre and post (Week 1 and Week 28) for both the IP and NIP groups are depicted in Figure 5.4.

Figure 5.4

Mean BMI Pre and Post Incentivized vs. Non-Incentivized

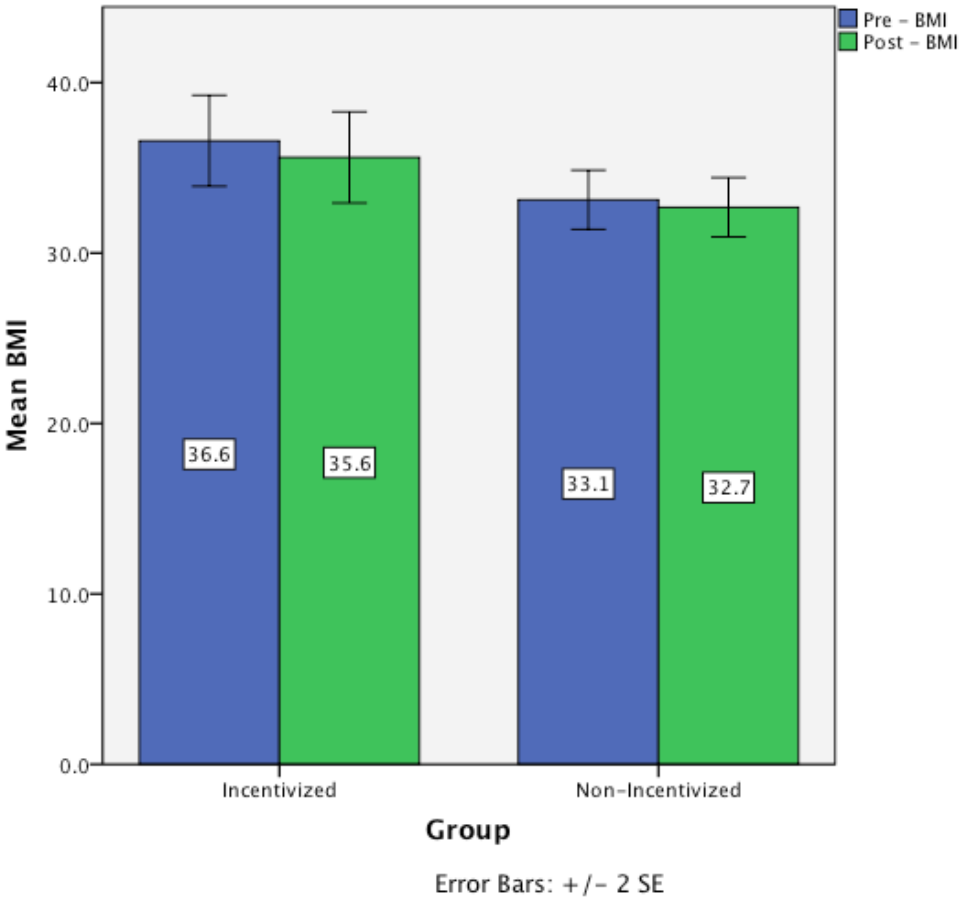


Figure 5.5 depicts the percentage of participants who improved in BMI score from pre to post in both the IP and NIP groups.

Figure 5.5

Percentage of Participants Who Improved in BMI Pre to Post Incentivized vs. Non-Incentivized

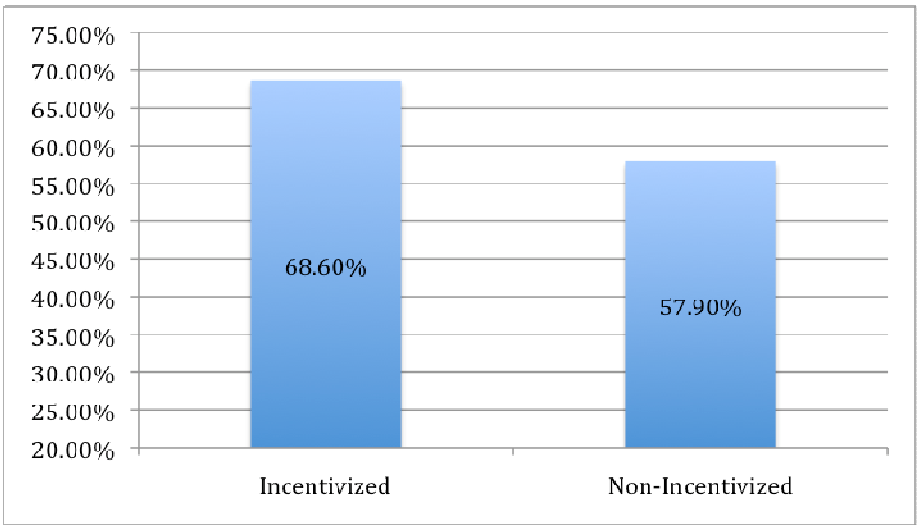
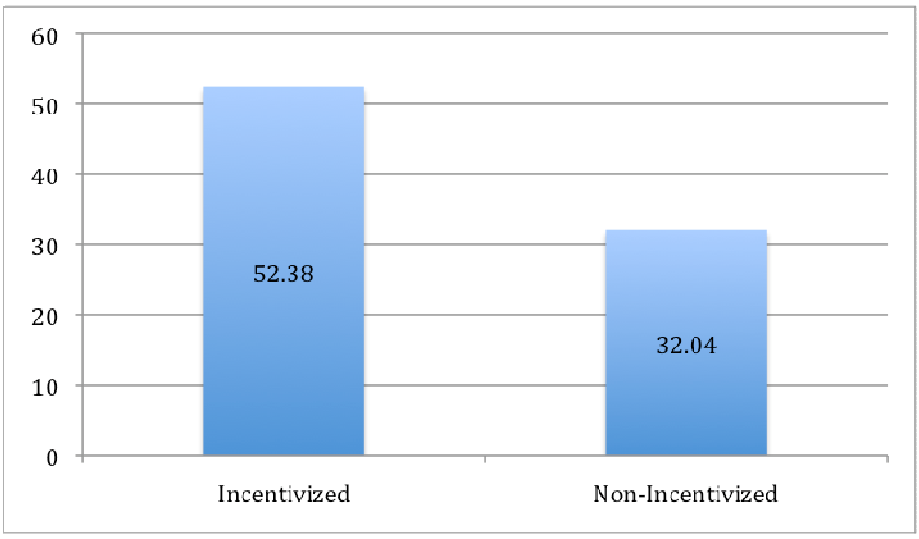


Figure 5.6 depicts the total BMI lost in both the IP and NIP groups.

Figure 5.6

Incentivized vs. Non-Incentivized Total BMI Lost

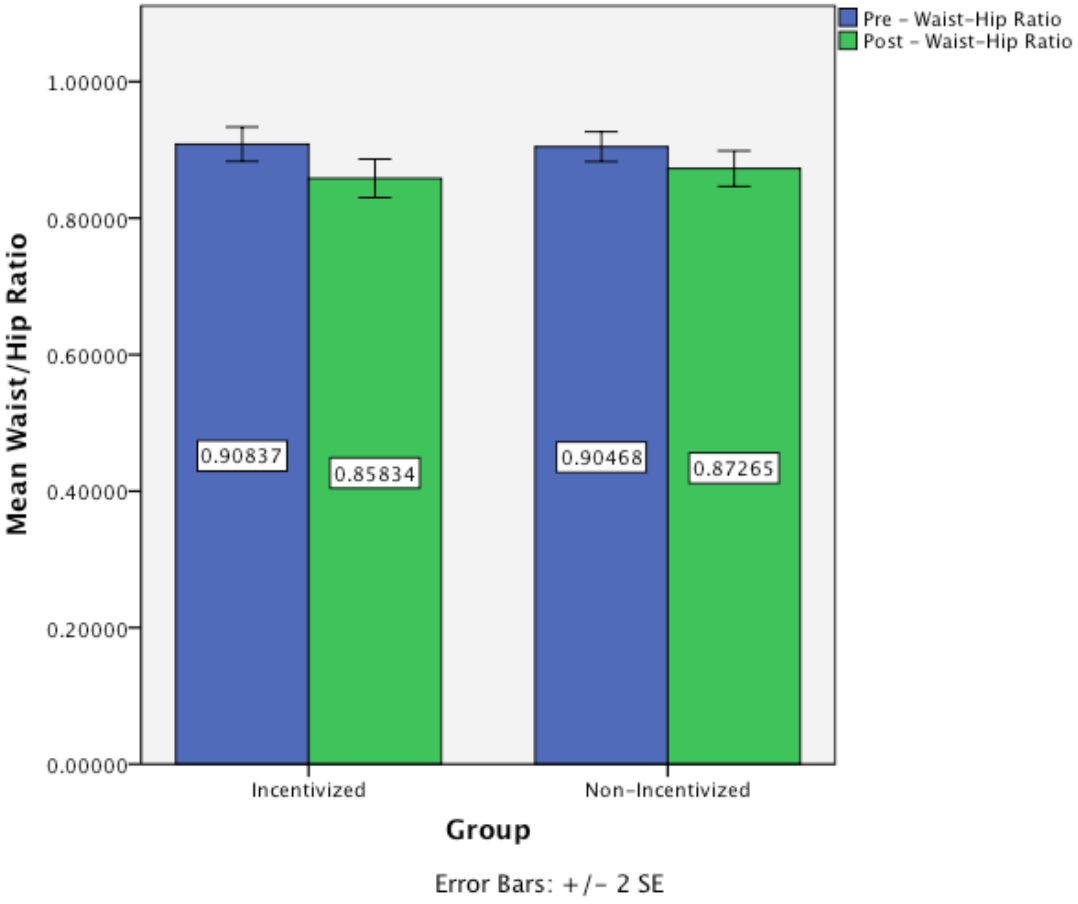


1c. Waist/Hip Ratio

Participant's W/H was taken at Week 1and Week 28. As shown in Figure 5.7, there was no significance in mean W/H pre and post for both the IP and NIP groups.

Figure 5.7

Mean Waist/Hip Ratio Pre and Post Incentivized vs. Non-Incentivized



Waist circumference was also analyzed separately. Table 5.2 shows the mean waist circumference between the groups pre and post (Week 1 and Week 28).

Table 5.2

Mean Waist Circumference Incentivized vs. Non-Incentivized Pre and Post

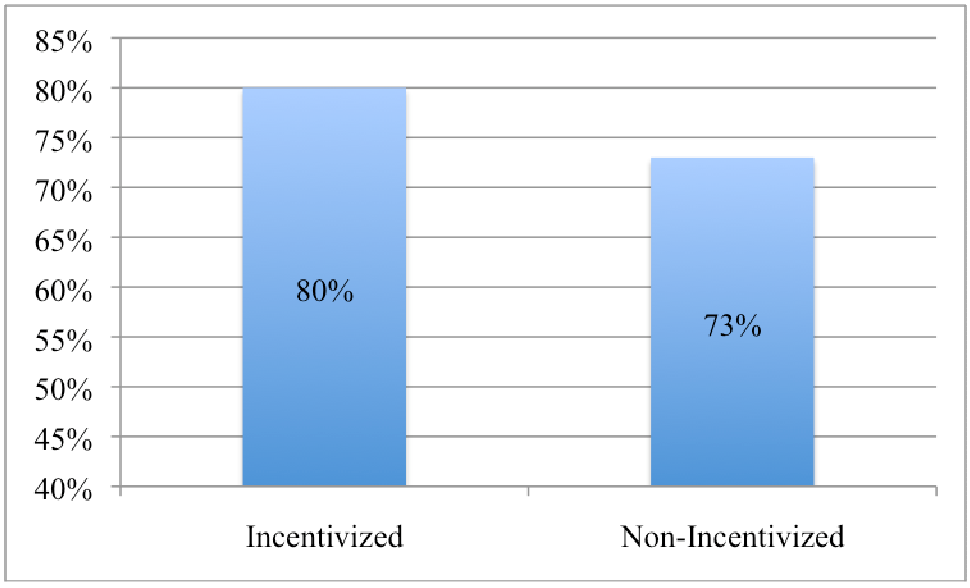
Waist Circumference			
		Pre	**Post**
Incentivized	*Mean ± SE*	42.58 ± 1.00	40.44 ± 1.01
Non-Incentivized	*Mean ± SE*	41.11 ± 0.82	39.57 ± 0.92

The percentage of participants in IP and Non-IP groups who showed improvement in waist circumference (as defined by greater than XX inches) was roughly equivalent as shown in Figure 5.8.

Figure 5.8

Percentage of Participants Who Improved in Waist Circumference Pre to Post

Incentivized vs. Non-Incentivized



1d. Diabetes Risk Score (DRS)

Mean DRS pre and post (Week 1 and Week 28) for both the IP and NIP groups are depicted in Figure 5.9.

Figure 5.9

Mean DRS Pre and Post Incentivized vs. Non-Incentivized

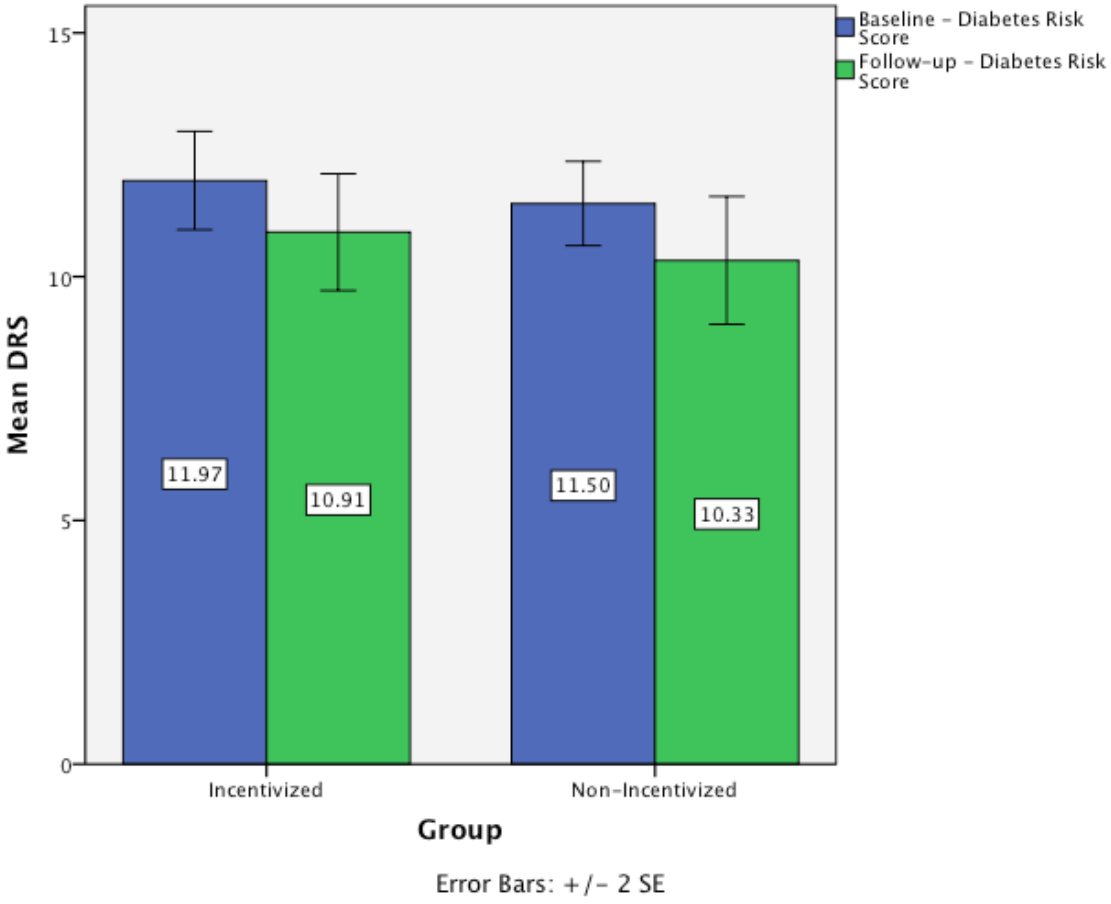
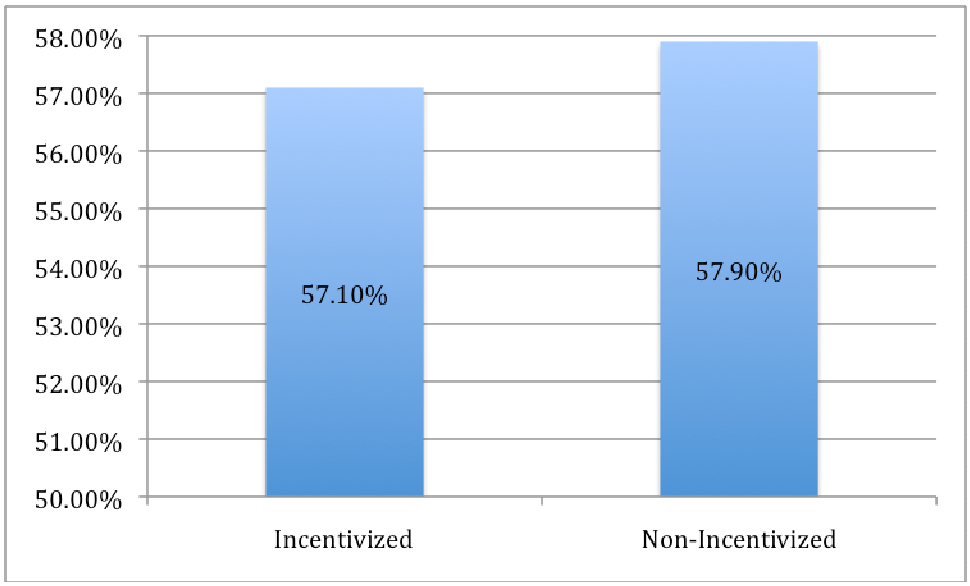


Figure 5.10 depicts the percentage of participants who improved in DRS score from pre to post (Week 1 to Week 28) in both the IP and NIP groups.

Figure 5.10

Percentage of Participants Who Improved in DRS Pre to Post Incentivized vs. Non-Incentivized

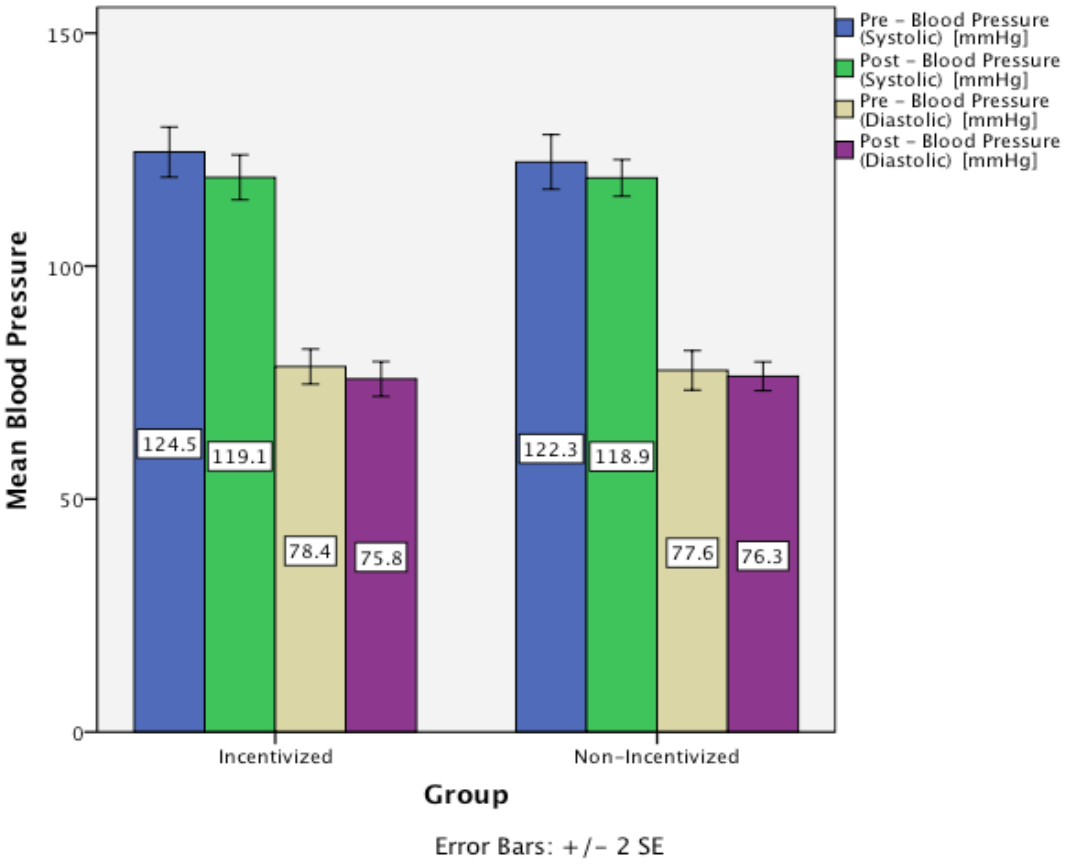


1e. Blood Pressure (BP)

Blood pressure was evaluated independently pre-post intervention for both groups. Systolic and diastolic BP dropped for both the IP and NIP groups (significant $p<0.05$). The drop tended to be greater in the incentive group, but not enough to be statistically significant. Mean systolic and diastolic BP pre and post for both the IP and NIP groups are depicted in Figure 5.11.

Figure 5.11

Mean Systolic and Diastolic Blood Pressure Pre and Post Incentivized vs. Non-Incentivized



1f. Stages of Change (SOC)

Both groups showed significant improvement in the average readiness to change scores (Table 5.3) from Week 1 to Week 28.

Table 5.3

Incentivized and Non-Incentivized Readiness to Change Mean Scores

Readiness to Change			
		Pre	**Post**
Incentivized	*Mean ± SE*	27.06 ± 0.81	29.41 ± 0.98
Non-Incentivized	*Mean ± SE*	26.53 ± 0.89	28.87 ± 1.24

Stage of change was higher on average in the IP, but not significantly in any comparison to the NIP. An independent sample t-test showed no significant difference between the groups.

1g. Weight Loss Self-Efficacy (WLSE)

The results of mean overall WLSE score pre and post (Week 1 and Week 28) between the IP and NIP groups are depicted in Table 5.4.

Table 5.4

Incentivized and Non-Incentivized WLSE Mean Scores

Weight Loss Self-Efficacy			
		Pre	**Post**
Incentivized	*Mean ± SE*	64.19 ± 2.12	60.74 ± 2.45
Non-Incentivized	*Mean ± SE*	63.41 ± 1.97	64.49 ± 2.49

Average weight Loss Self-Efficacy (WLSE) scores were comparable at the start of the program for both the IP and NIP groups (Table 5.3), however, the IP group had a significant drop in the WLSE score at the completion of the program ($p < 0.05$) whereas

the score increased slightly for the NIP group.

Additional, correlations between overall WLSE score and SOC questions "Practice good eating habits," "Lose weight or maintain healthy weight," and "Live an overall healthy lifestyle" were examined (Table 5.5) at Week 1 and Week 28. Non-parametric Spearman's rho correlational analysis was conducted.

Table 5.5

Incentivized and Non-Incentivized Correlation Between WLSE Score and SOC Questions

Correlations Between WLSE Score and SOC Questions					
		Incentivized Pre	***Incentivized Post***	***Non-Incentivized Pre***	***Non-Incentivized Post***
Practice Good Eating Habits	Spearman's rho	-0.005	***0.362***	0.237	***0.417***
	Sig. (2-tailed)	0.980	***0.037***	0.177	***0.011***
Lose Weight or Maintain Healthy Weight	Spearman's rho	0.136	0.276	0.182	***0.404***
	Sig. (2-tailed)	0.449	0.115	0.289	***0.016***
Live an Overall Healthy Lifestyle	Spearman's rho	0.142	***0.359***	0.087	0.278
	Sig. (2-tailed)	0.424	***0.037***	0.614	0.111

There were significant correlations between WLSE and SOC for practicing good eating habits and losing weight or maintaining healthy weight, for NIP group at the completion of the study. The relationships were significant for practice good eating habits

and living overall healthy lifestyle for IP group at the completion of the program.

1h. Exercise Self-Efficacy (ESE)

Exercise Self-Efficacy (ESE) was comparable at the start of the program (Week 1) for both the IP and NIP groups (Table 5.6); however, as with the WLSE scores, the IP group had a significant drop in the ESE at the completion of the program, Week 28, ($p < 0.05$) whereas the NIP group showed a slight but non-significant improvement.

Table 5.6

Incentivized and Non-Incentivized ESE Mean Scores

Exercise Self-Efficacy			
		Pre	**Post**
Incentivized	*Mean ± SE*	31.42 ± 1.39	28.43 ± 1.76
Non-Incentivized	*Mean ± SE*	31.40 ± 1.37	32.88 ± 1.45

Additional, correlations between overall WLSE score and SOC questions "Be Physically Active," "Lose weight or maintain healthy weight," and "Live an overall healthy lifestyle" were examined (Table 5.7) at Week 1 and Week 28. Non-parametric Spearman's rho correlational analysis was conducted.

Table 5.7

Incentivized and Non-Incentivized Correlation Between ESE Score and Stage of Change Questions

Correlations Between ESE Score and Stage of Change Questions					
		Incentivized Pre	***Incentivized Post***	***Non-Incentivized Pre***	***Non-Incentivized Post***
Be Physically Active	Spearman's rho	0.082	***0.585***	0.319	0.291
	Sig. (2-tailed)	0.663	***0.000***	0.062	0.081
Lose Weight or Maintain Healthy Weight	Spearman's rho	0.112	***0.373***	0.235	0.099
	Sig. (2-tailed)	0.542	***0.027***	0.182	0.567
Live an Overall Healthy Lifestyle	Spearman's rho	0.076	***0.382***	-0.132	0.091
	Sig. (2-tailed)	0.677	***0.023***	0.442	0.605

There were significant correlations between ESE and SOC for being physically active, and living overall healthy lifestyle for IP group at the completion of the study. None of these relationships were significant for the NIP group.

Further examinations were preformed to detect the relationship between ESE and self-reported physical activity practice, using non-parametric Spearman's rho at Week 1 and Week 28. Results indicated a significant relationship between ESE and reported current level of physical activity pre and post for the IP group. The relationships were not significant for the NIP group. ESE was significantly correlated with mild physical activity post intervention for the IP group. ESE was significantly correlated for moderate

and vigorous activity pre and post for IP group and only for vigorous activity post intervention for the NIP group. The results of the correlations are depicted in Table 5.8.

Table 5.8

Incentivized and Non-Incentivized Correlation Between ESE Score and Practicing Good Physical Activity Habits

Correlations Between ESE Score and Practicing Good Physical Activity Habits					
		Incentivized Pre	***Incentivized Post***	***Non-Incentivized Pre***	***Non-Incentivized Post***
Current Level of Physical Activity	Spearman's rho	0.241	***0.636***	0.116	0.114
	Sig. (2-tailed)	0.169	***0.000***	0.499	0.514
Participate in Mild Physical Activity	Spearman's rho	0.271	***0.446***	0.073	0.243
	Sig. (2-tailed)	0.121	***0.007***	0.672	0.167
Participate in Moderate Physical Activity	Spearman's rho	***0.515***	***0.541***	***0.517***	0.182
	Sig. (2-tailed)	***0.004***	***0.001***	***0.001***	0.302
Participate in Vigorous Physical Activity	Spearman's rho	***0.560***	***0.610***	***0.449***	***0.392***
	Sig. (2-tailed)	***0.001***	***0.000***	***0.002***	***0.020***

1i. Healthy Eating Score (HES)

The responses to a series of 9 questions about participants' frequency of eating or drinking specific foods or beverages were calculated to generate a Healthy Eating Score (HES). There were 5 responses for each question that were giving numerical values, this

way an overall score could be calculated. The lowest possible score was a 9 and the highest possible score was a 45. The results are depicted in Table 5.9.

Table 5.9

Incentivized and Non-Incentivized Healthy Eating Mean Scores

Healthy Eating Score			
		Pre	**Post**
Incentivized	*Mean ± SE*	23.74 ± 0.64	25.02 ± 0.64
Non-Incentivized	*Mean ± SE*	24.35 ± 0.68	25.63 ± 0.69

Higher scores were reported for the IP group at the completion of the study, however the difference was not significant. An independent sample t-test found no significant differences between the groups.

1j. Self-Reported General Health

Table 5.10 depicts self-reported general health pre and post between the incentivized and non-incentivized groups.

Table 5.10

Self-Reported General Health Incentivized vs. Non-Incentivized Groups

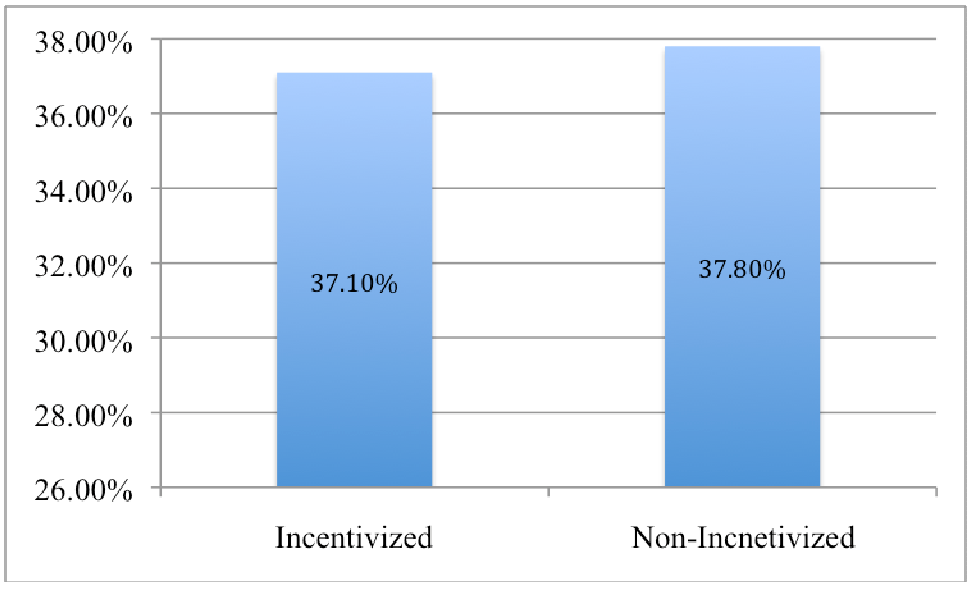
Self-Reported General Health Pre and Post				
	Incentivized Pre	**Incentivized Post**	**Non-Incentivized Pre**	**Non-Incentivized Post**
Excellent	5.70%	11.40%	10.80%	8.10%
Very Good	25.70%	25.70%	32.40%	45.90%
Good	42.90%	45.70%	48.60%	43.20%
Fair	22.90%	17.10%	8.10%	2.70%
Poor	2.90%	0%	0%	0%

A chi-square analysis found no significant differences between the groups pre and post intervention, however the percentage of participants who reported health as “Fair” or “Poor” significantly dropped at the completion of the study in both groups. Post-intervention, in the IP group, the percentage of individuals that rated their health “Excellent” doubled, whereas there was a drop for the NIP group post intervention for those who rated their health as “Excellent” and “Good”

The NIP participants were skewed towards significantly higher scores than the IP group at baseline (chi square = 12.9, $p < 0.01$). Both groups tended to move to higher ratings at post intervention in comparison of the distribution of rating from pre to post intervention (p values between 0.14 and 0.21). There were equal percentages of individuals who improved their self-reported health in both groups (Figure 5.12).

Figure 5.12

Incentivized vs. Non-Incentivized Improvement in Self-Reported Health



1k. Chronic Conditions

Table 5.11 depicts percentage of participants to responded "yes" to the following chronic conditions: "Elevated Blood Sugar", "High Blood Pressure/Hypertension", "Elevated Cholesterol", and "Low Back Disease or Spine Problems" pre and post intervention. There were no significant differences between the groups pre and post.

Table 5.11

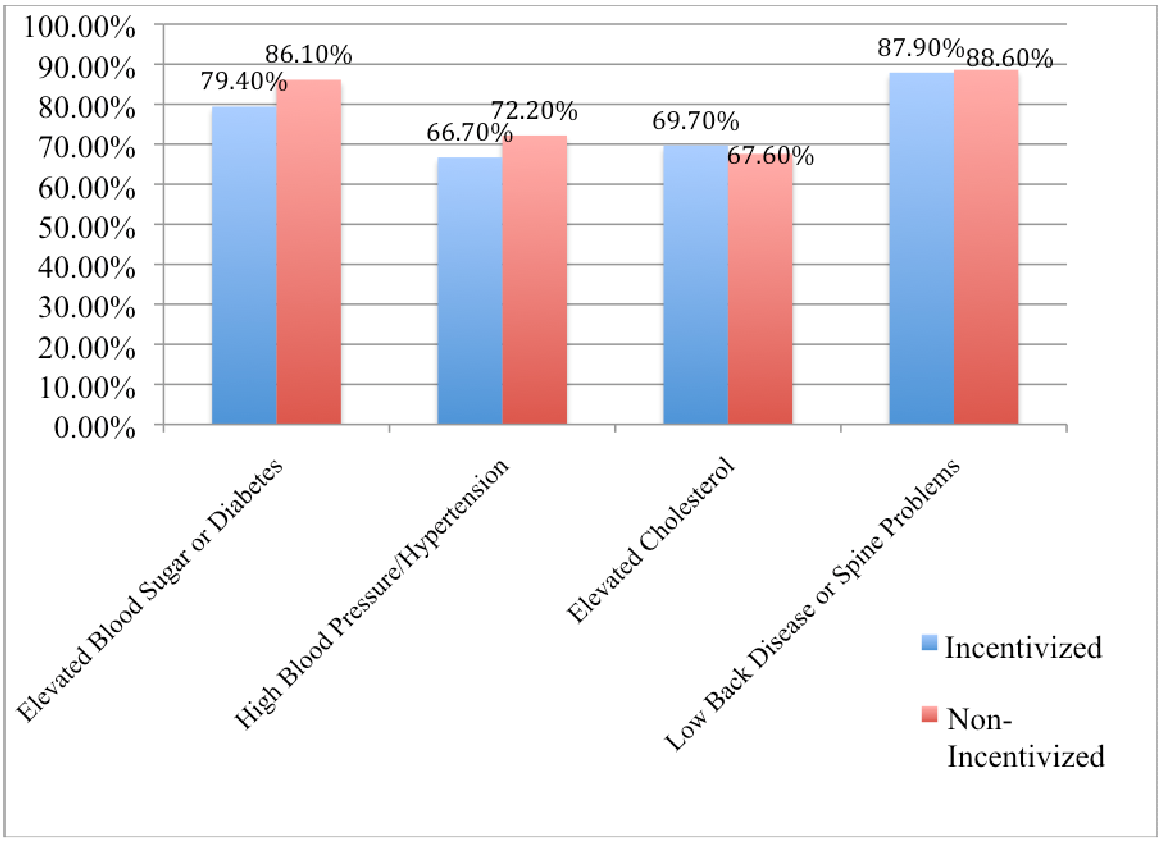
Incentivized vs. Non-Incentivized Chronic Conditions Pre and Post

Chronic Conditions Pre and Post				
	Incentivized Pre	**Incentivized Post**	**Non-Incentivized Pre**	**Non-Incentivized Post**
Elevated Blood Sugar or Diabetes	14.70%	20%	16.70%	13.50%
High Blood Pressure/Hypertension	33.30%	34.30%	30.60%	27.80%
Elevated Cholesterol	32.40%	29.40%	33.30%	31.40%
Low Back Disease or Spine Problems	3.00%	14.30%	13.90%	11.10%

Figure 5.13 depicts the percentage of participants who improved in chronic conditions for participants in the incentivized and non-incentivized groups. Results show that improvements for self-reported chronic conditions were comparable between both groups.

Figure 5.13

Incentivized vs. Non-Incentivized Improvement in Chronic Conditions

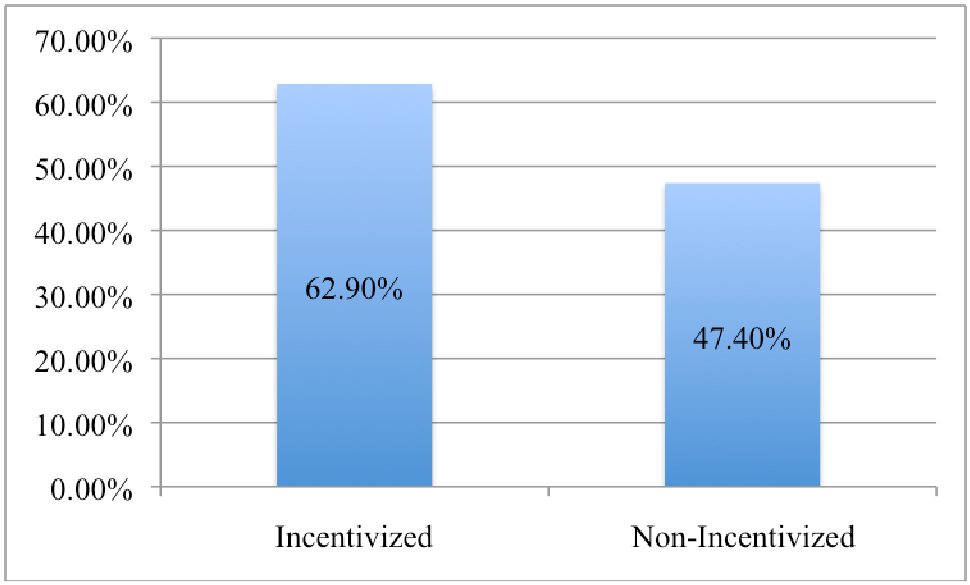


ll. Energy Level

Figure 5.14 depicts the percentage of participants who improved in energy level from pre to post between the IP and NIP groups. The IP group improvement was significantly higher than NIP group.

Figure 5.14

Percentage of Participants Who Improved in Energy Level Incentivized vs. Non-Incentivized



2. To evaluate the effect of types of incentive (program incentive and self deposit) on achieving weight loss goals.

The IP group had the option to partake in an additional incentive program, "Win Big." This program required the participant to deposit money and if their weight loss goal was met, their deposit would be matched from the program. Table 5.12 depicts the percentage of participants that were involved in this additional incentive and those who matched their deposit for meeting their weight loss goal.

Table 5.12

Incentivized Group "Win Big" Program Percentage of Participants Involved

"Win Big" Additional Optional Incentive		
	Number of Participants	**Percentage of Participants**
Eligible	35	
Deposited	16	45.70%
Doubled Deposit	4	25%

Table 5.13 depicts the mean weight loss from week 1 to week 28 and week 16 to week 28 for those who participated in the "Win Big" program and those who did not participate.

Table 5.13

Mean Weight Loss Between "Win Big" Participants and Those Who Did Not Participate

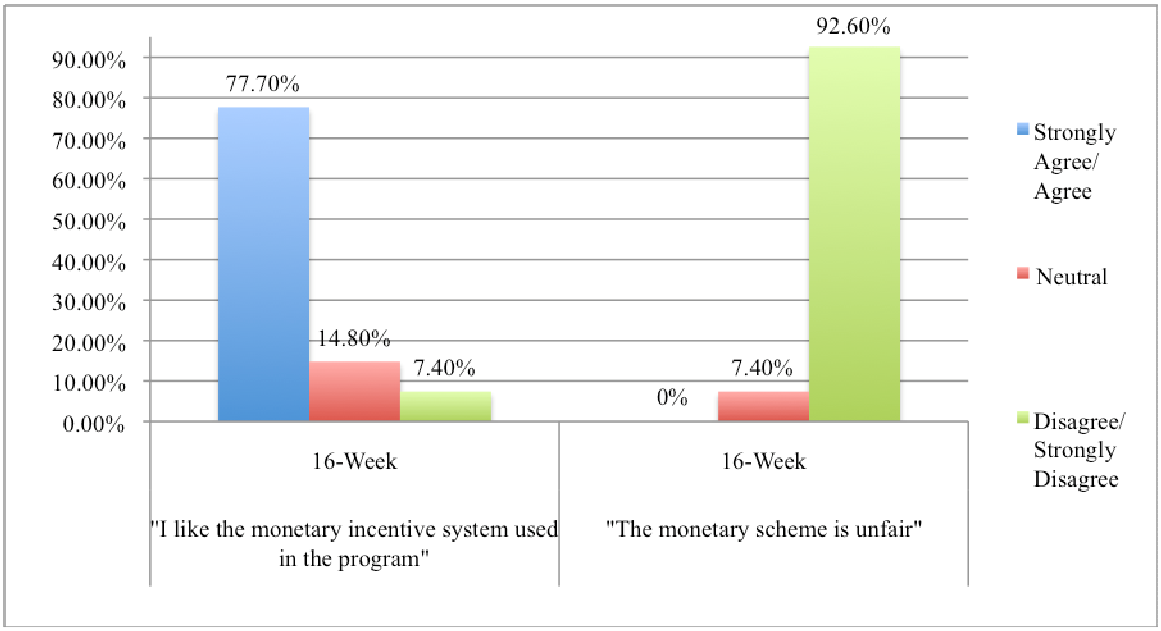
Mean Weight Loss Based on Deposit (Yes or No)		
	Yes Deposit (n = 16)	**No Deposit (n = 19)**
Mean Weight Loss (Week 1-Week 16) ± SE	7.88 ± 3.07	5.76 ± 1.57

3. To examine the satisfaction with the incentive in the IP group.

At week 8, week 16, and week 28, the IP group answered two questions regarding the satisfaction of the incentive; results are depicted in Figure 5.15.

Figure 5.15

Incentive Satisfaction (Incentivized Group Only) at Week 16

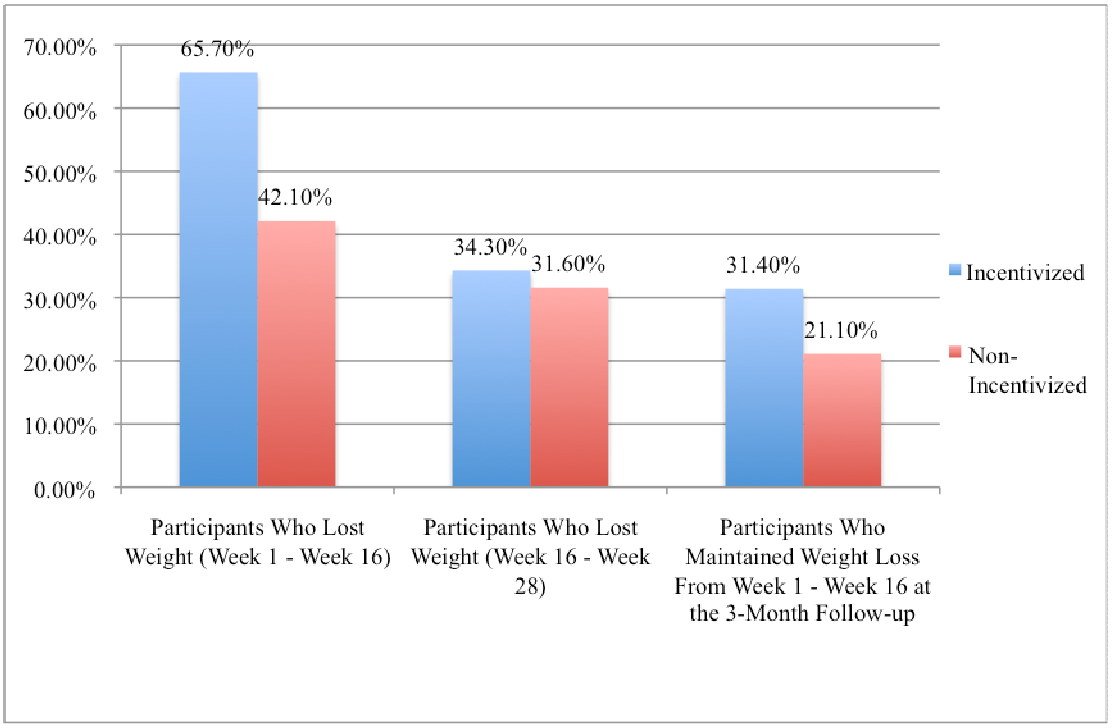


4. To evaluate sustainability and maintenance of weight loss in both groups three months after program completion.

Evaluation of maintenance of weight loss was calculated using the frequency of participants who maintained weight loss, from Week 1 to Week 16, at the 3-month follow-up. Figure 5.16 shows the percentage of participants who lost any weight Week 1 to Week 16, the percentage of participants who lost any weight Week 16 to Week 28, and the percentage of participants that maintained weight loss from Week 1 to Week 16 at the 3-month follow-up.

Figure 5.16

Percentage of Participants Weight Loss From Week 1-Week 16 and Week 16 to Week 28 and Maintained Weight Loss by the 3-Month Follow-up Incentivized vs. Non-Incentivized



5. Evaluate the effect of losing at least 5% of body weight on SOC, WLSE, ESE, HES, and self reported general health.

5a. DRS, BMI, and Waist Circumference

Figure 5.17 depicts the percentage of participants who improved in DRS from pre to post between those who lost above and below 5% weight loss. Based on an independent sample t-test, participants who lost more then 5% weight had a significant improvement in DRS ($p > 0.054$).

Figure 5.17

Percentage of Participants who Improved in DRS Pre to Post Below 5% Weight Loss vs. Above 5% Weight Loss

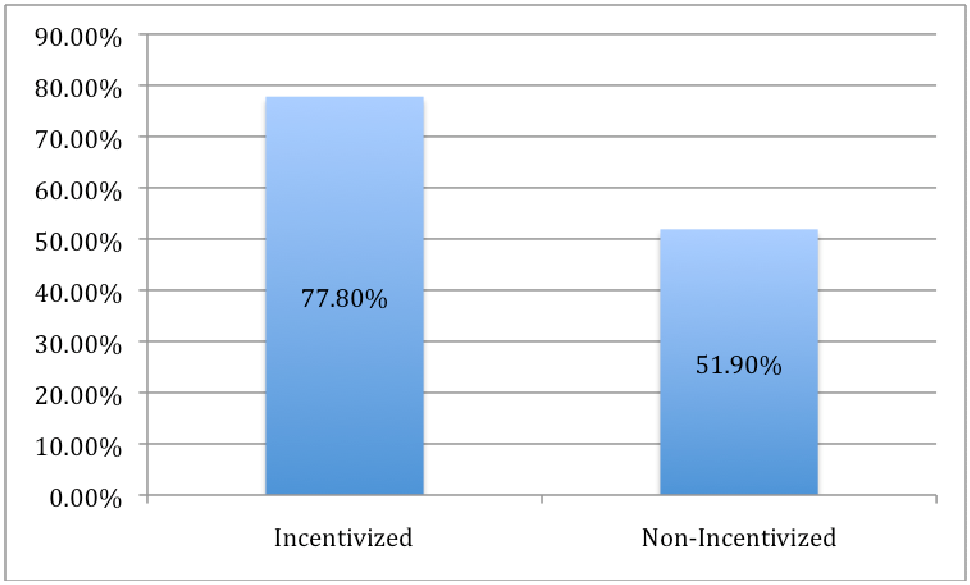


Figure 5.18 depicts the percentage of participants who improved in BMI from pre to post between those who lost above and below 5% weight loss. Based on an independent sample t-test analysis, participants who lost more then 5% weight had a significant improvement in BMI ($p > 0.010$).

Figure 5.18

Percentage of Participants who Improved in BMI Pre to Post Below 5% Weight Loss vs. Above 5% Weight Loss

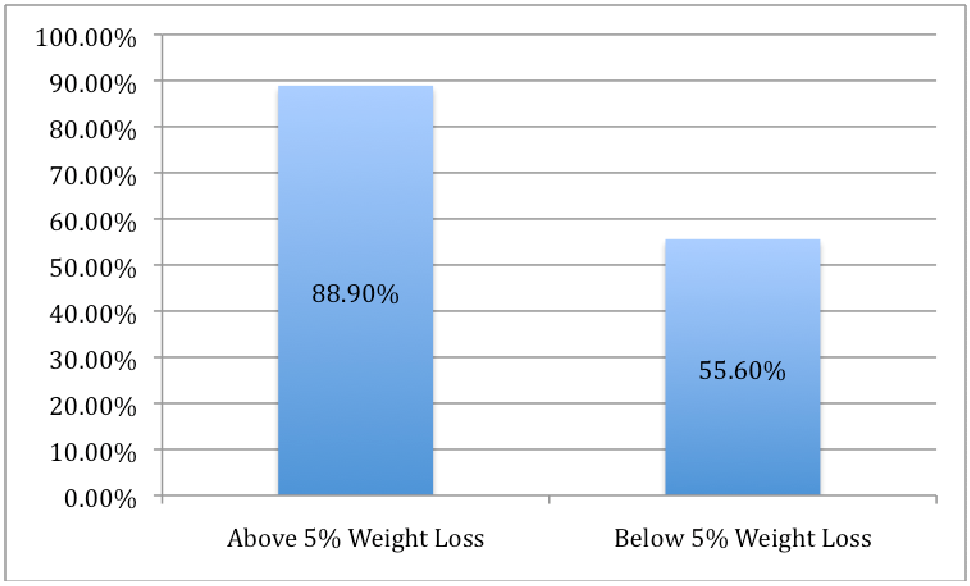
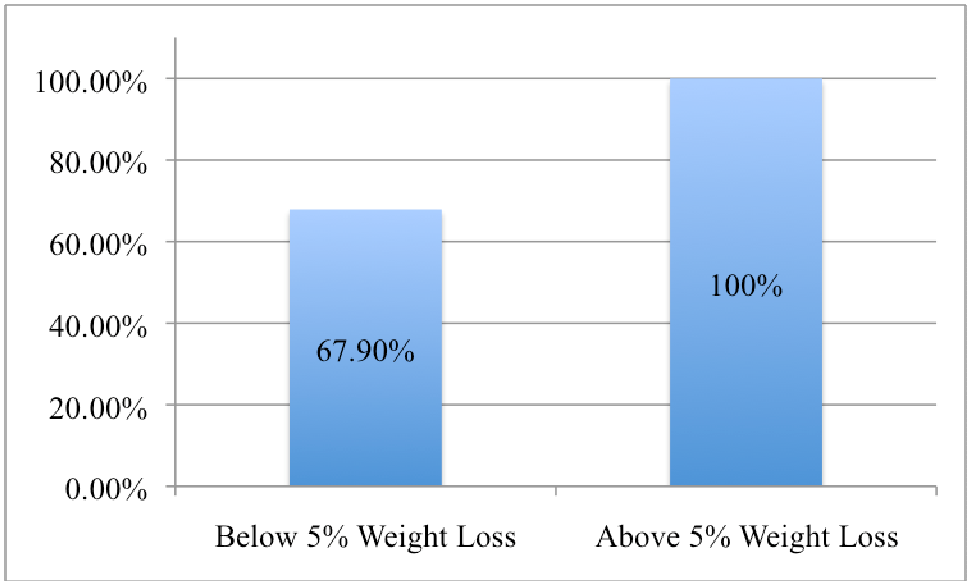


Figure 5.19 depicts the percentage of participants who improved in waist circumference from pre to post between those who lost above and below 5% weight loss. Based on an independent sample t-test analysis, participants who lost more then 5% weight had a significant improvement in waist circumference ($p > 0.004$).

Figure 5.19

Percentage of Participants who Improved in Waist Circumference Pre to Post Below 5% Weight Loss vs. Above 5% Weight Loss

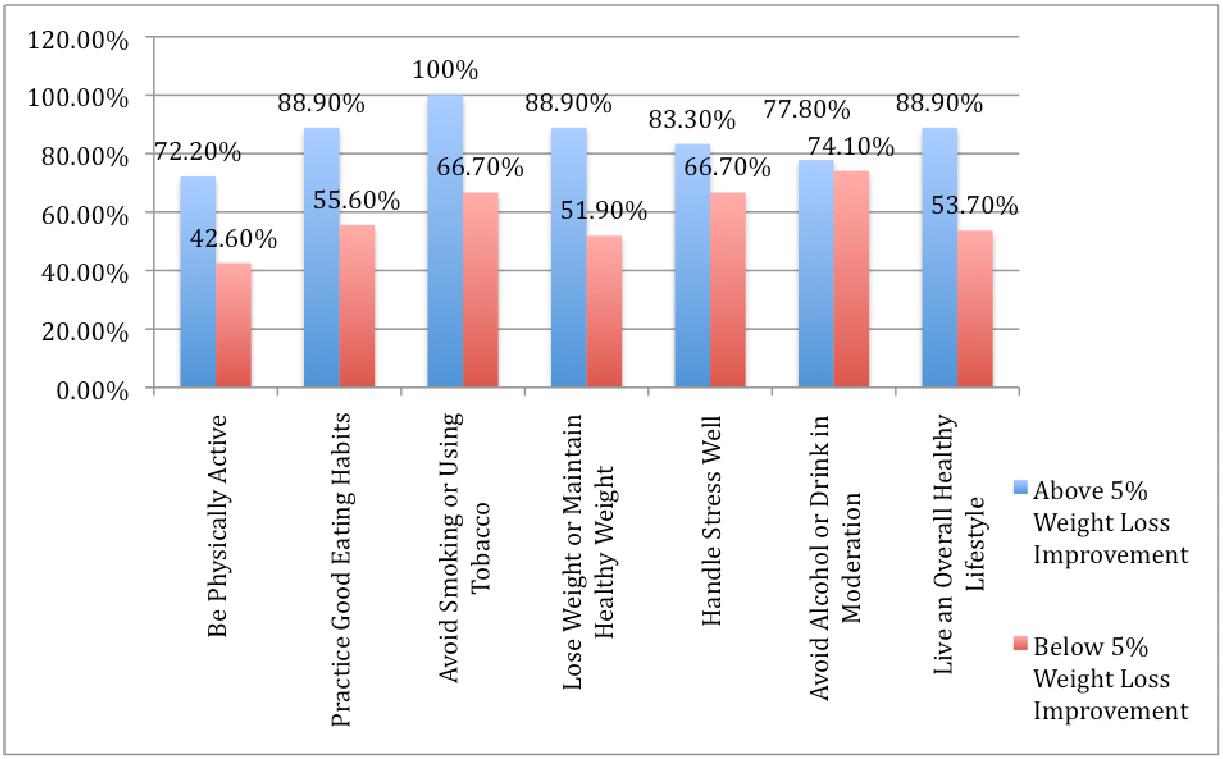


5b. Stage of Change (SOC)

SOC data was dichotomized based on those who lost at least 5% of their weight at the completion of the program, to examined if losing 5% of weight moved participants through the stages of change for each SOC individual question. Improvements were calculated for each individual question comparing Week 1 to Week 28 by conducting a chi-square analysis. The improvements were significant for those who lost at least 5% of their weight. Figure 5.20 shows the improvement percentages for individuals who lost above and below 5% weight loss.

Figure 5.20

Improvement Based on 5% Weight Loss



A chi-square analysis found "Be Physically Activity" to be significant ($p > 0.029$), "Practice Good Eating Habits" to be significant ($p > 0.011$), "Avoid Smoking or Using Tobacco" to be significant ($p > 0.005$), "Lose Weight or Maintain Healthy Weight" to be significant ($p > 0.005$), and "Live an Overall Healthy Lifestyle" to be significant ($p > 0.008$).

SOC overall score was examined based on those who lost at least 5% of their weight at the completion of the program. Improvement was calculated for the overall score by comparing Week 1 to Week 28, and is depicted in Table 5.14 as well as the p values and improvement percentages for individuals who lost below and above 5% weight loss by using an independent t-test for analysis.

Table 5.14

Improvement Based on 5% Weight Loss

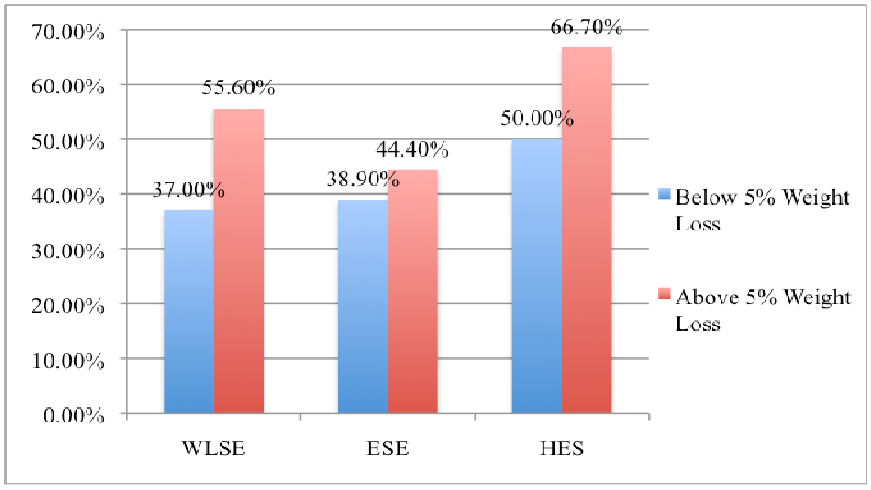
Stage of Change Overall Score Improvement		
Below 5% Weight Loss Improvement	**Above 5% Weight Loss Improvement**	**Significance**
50.0%	77.8%	0.040*

5c. Weight Loss Self-Efficacy (WLSE), Exercise Self-Efficacy (ESE), and Health Eating Score (HES)

WLSE, ESE, and HES overall scores were examined based on those who lost at least 5% of their weight at the completion of the program. Improvement percentages for individuals who lost below and above 5% weight loss was calculated for the overall score for comparing Week 1 to Week 28, and is depicted in Figure 5.21. Those who lost at least 5% of weight had higher percentage of participants who improved in overall WLSE, ESE, and HES scores then those who lost less then 5% weight.

Figure 5.21

Improvement Based on 5% Weight Loss

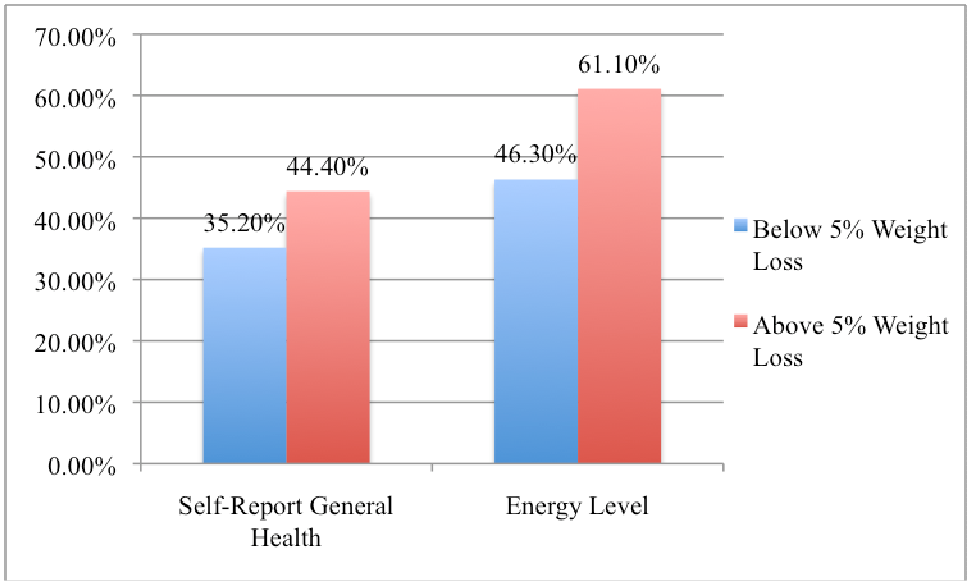


5d. Self-Reported General Health and Energy Level

Self-reported general health and energy level were examined based on those who lost at least 5% of their weight at the completion of the program. Improvement was calculated, comparing Week 1 to Week 28, and is depicted in Figure 5.22 for the improvement percentages for individuals who lost below and above 5% weight loss. Those who lost at least 5% of weight had higher percentage of participants who improved in self-reported general health and energy level then those who did not lose 5% of weight.

Figure 5.22

Improvement Based on 5% Weight Loss



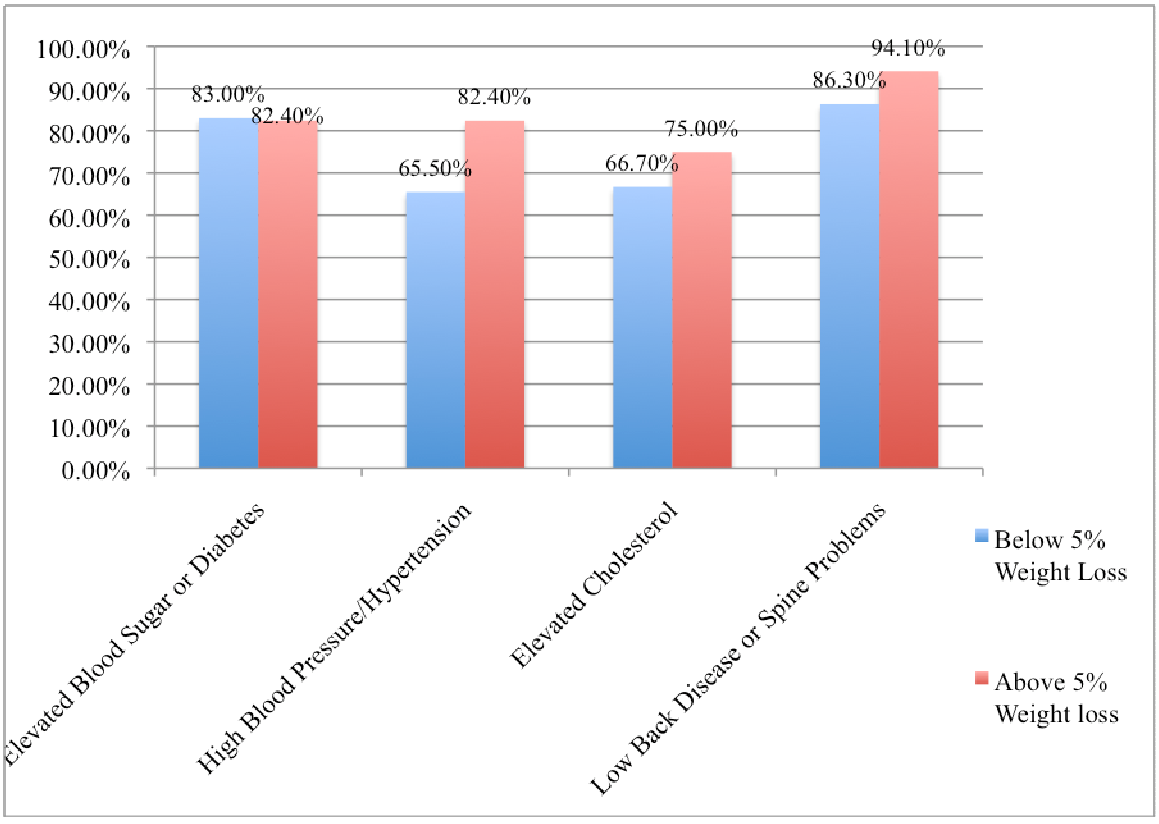
5e. Chronic Conditions

Chronic conditions "Elevated Blood Sugar", "High Blood Pressure/Hypertension," "Elevated Cholesterol," and "Low Back Disease or Spine Problems" were examined based on those who lost at least 5% of their weight at the completion of the program. Improvement was calculated, comparing Week 1 to Week 28, and is depicted in Figure 5.23 as well as the improvement percentages for individuals

who lost below and above 5% weight loss. Those who lost at least 5% of weight had higher percentage of participants who improved in "High Blood Pressure/Hypertension," "Elevated Cholesterol," and "Low Back Disease or Spine Problems," then those who did not lose 5% of their initial weight. The percentage of participants who improved in "Elevated Blood Sugar/Diabetes" were similar between the two groups.

Figure 5.23

Improvement Based on 5% Weight Loss



Further analysis was conducted and is presented in the preceding sections.

Physical Activity Preferences:

Analysis was also conducted for physical activity preferences based on the top three responses to physical activity preferences, type of help to receive when starting an exercise plan, and barriers that prevent an individual from exercising.

Table 5.15 shows the top three preferences of physical activity for both the IP and NIP groups pre and post.

Table 5.15

Incentivized vs. Non-Incentivized Top Three Physical Activity Preferences Pre and Post

Top 3 Physical Activity Preferences				
	IP Group Pre	**IP Group Post**	**NIP Group Pre**	**NIP Group Post**
1	Walking (80.0%)	Walking (85.7%)	Walking (81.6%)	Walking (84.2%)
2	Gym (31.4%)	Gym (31.4%)	Gym (34.2%)	Gym (26.3%)
3	Jogging (17.1%)	Swimming (29.0%)	Cycling (15.8%)	Swimming (24.0%)

Table 5.16 shows the top three preferences of type of help to receive when starting an exercise plan.

Table 5.16

Incentivized vs. Non-Incentivized Top Three Preferences of Type of Help to Receive When Starting an Exercise Plan Pre and Post

Top 3 Preferences of Type of Help to Receive When Starting an Exercise Plan				
	IP Group Pre	**IP Group Post**	**NIP Group Pre**	**NIP Group Post**
1	Advice from Health Professional (40.0%)	People to Exercise With (48.6%)	Advice from Health Professional (57.9%)	People to Exercise With (55.3%)
2	Exercise Video (34.3%)	Advice from Health Professional (34.3%)	People to Exercise With (55.3%)	Exercise Video (36.8%)
3	People to Exercise With (34.3%)	Exercise Video (28.6%)	Exercise Video (36.8%)	Advice from Health Professional (26.3%)

Table 5.17 shows the top three barriers as to why an individual is prevented from exercising for both the IP and NIP groups pre and post.

Table 5.17

Incentivized vs. Non-Incentivized Top Three Barriers as to Why an Individual is Prevented From Exercising Pre and Post

Top 3 Barriers as to Why an Individual is Prevented From Exercising				
	IP Group Pre	**IP Group Post**	**NIP Group Pre**	**NIP Group Post**
1	Never Persist (48.6%)	Never Persist (31.4%)	No Time (47.4%)	No Time (31.6%)
2	Lazy (28.6%)	Lazy (31.4%)	Never Persist (42.1%)	Never Persist (31.6%)
3	No Energy (28.6%)	No Time (22.9%)	Lazy (21.1%)	Already Have Adequate Exercise (21.1%)

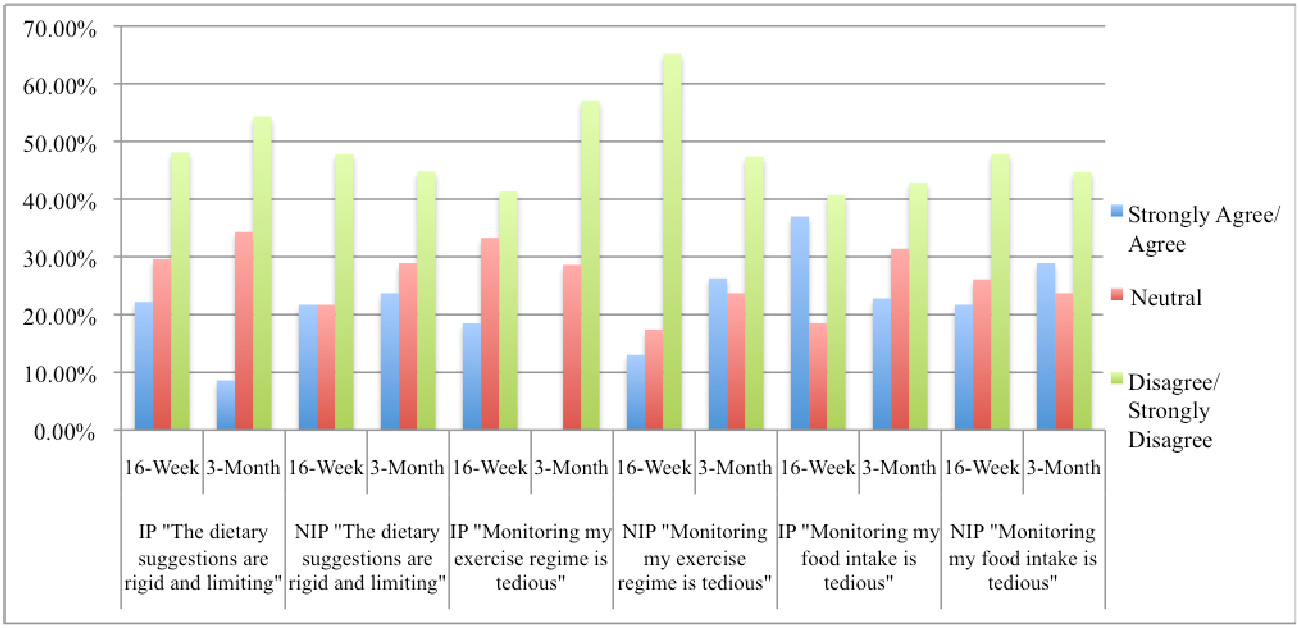
Program Satisfaction and Adherence:

Program Satisfaction

At week 8, week 16, and week 28, each participant completed a short survey, which asked questions about perceived program flexibility (Figure 5.24 And Figure 5.25), perceived program effectiveness (Figure 5.26), evaluation of the health educator (Figure 5.27 IP verses NIP group), program materials (Figure 5.28 IP verses NIP group).

Figure 5.24

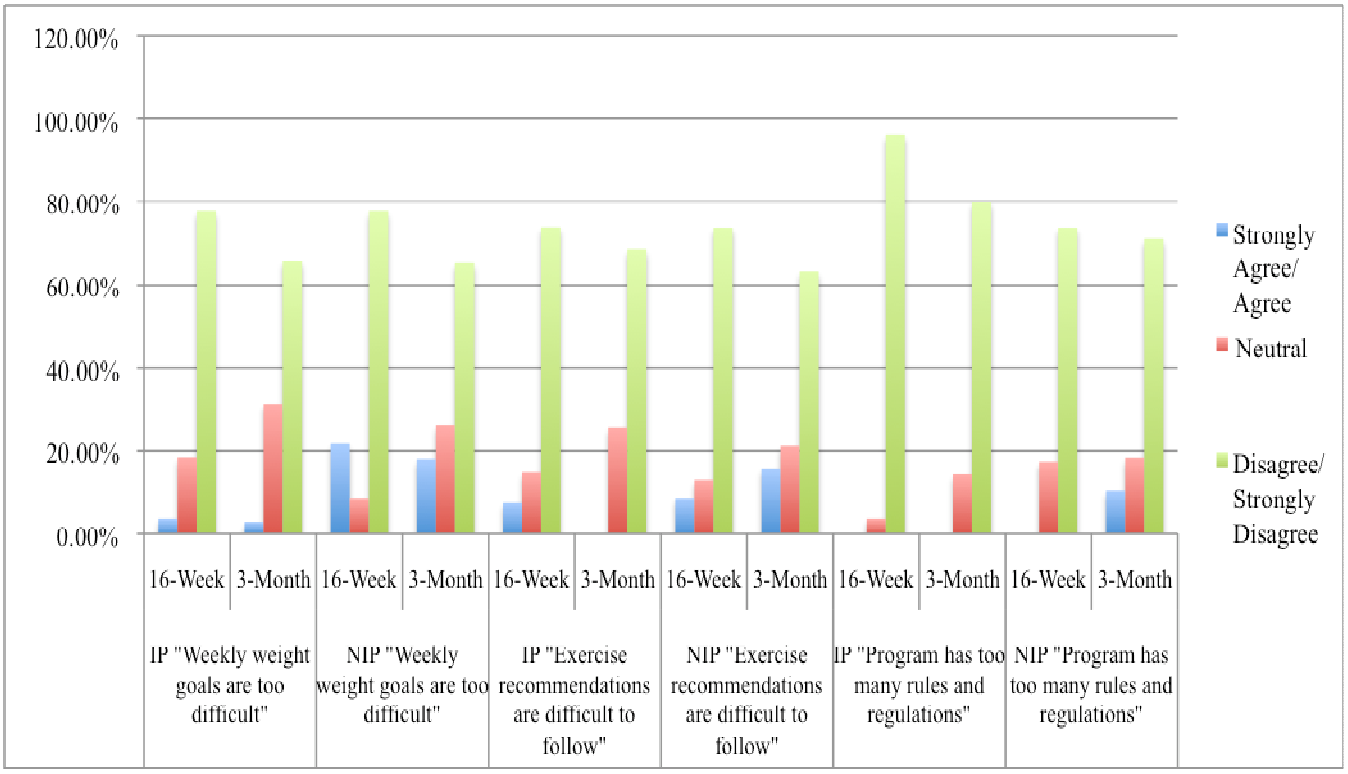
Incentivized vs. Non-Incentivized Perceived Program Flexibility



Evaluation for perceived program flexibility was based on "The dietary suggestions are rigid and limiting", "Monitoring my exercise regime is tedious", and "Monitoring my food intake in tedious". Evaluation from week 16 to the 3-month follow-up and between the groups stayed the same, however for "Monitoring my exercise regime is tedious", the NIP group in the beginning evaluated the exercise regime not to be tedious, but by the end, the exercise regime became more tedious.

Figure 5.25

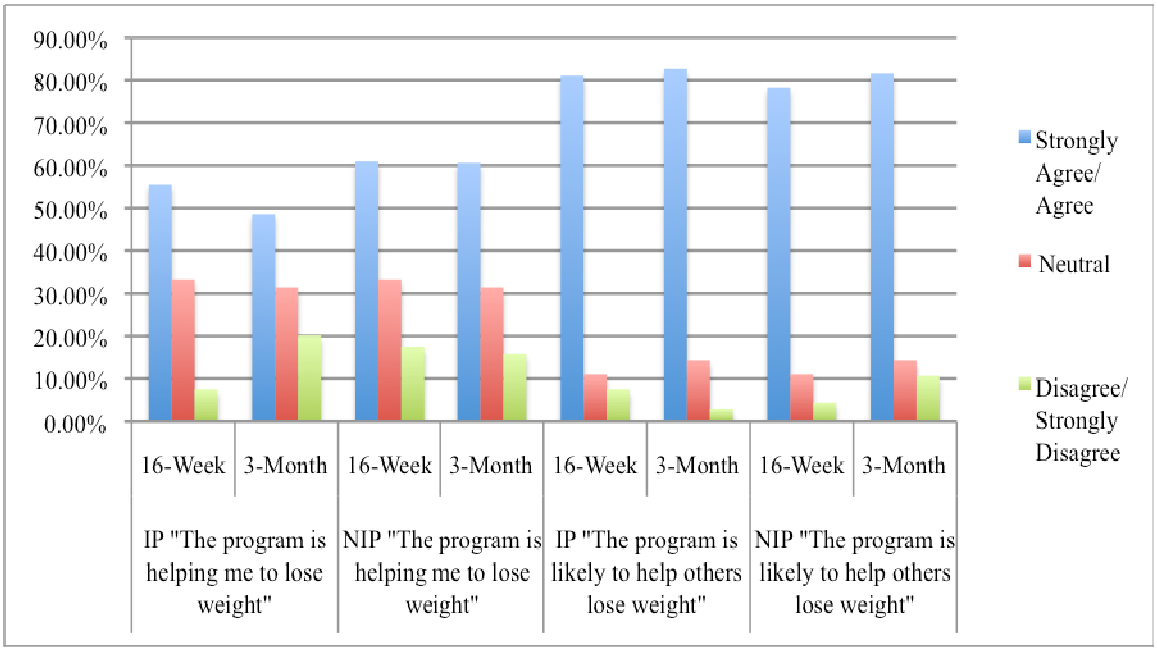
Incentivized vs. Non-Incentivized Perceived Program Flexibility



For perceived program flexibility based on “Weekly weight goals are difficult”, “Exercise recommendations are difficult to follow”, and “Program has too many rules and regulations”, the responses were similar between the 16 week and 3-month follow and between the groups.

Figure 5.26

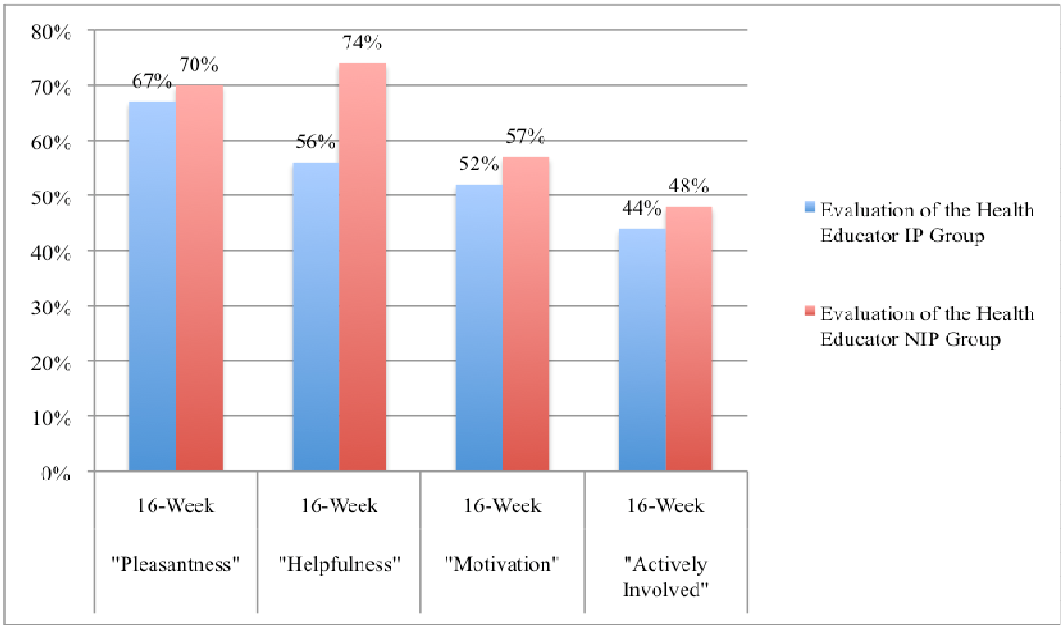
Incentivized vs. Non-Incentivized Perceived Program Effectiveness



Perceived program effectiveness was based on "The program is helping me to lose weight" and "The program is likely to help others lose weight". The responses are similar between the IP and NIP groups from the 16 week to 3-month follow-up. A common trend found in both groups was that participants rated "The program is likely to help others lose weight" higher then "The program is helping me to lose weight".

Figure 5.27

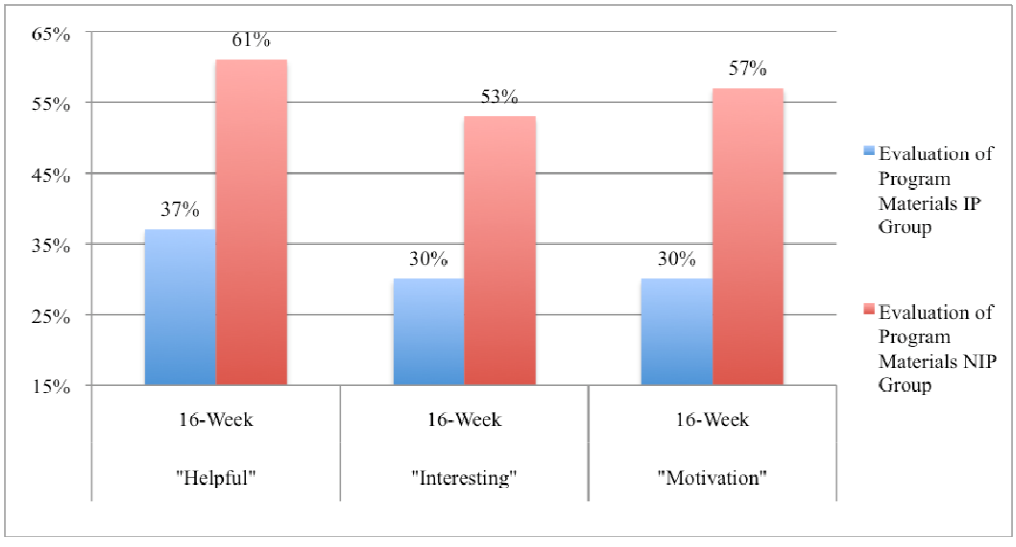
Incentivized vs. Non-Incentivized Groups Evaluation of Health Educator at Week 16



Responses for the rating of the Health Educator were comparable between the groups.

Figure 5.28

Incentivized vs. Non-Incentivized Groups Evaluation of Program Materials at Week 16



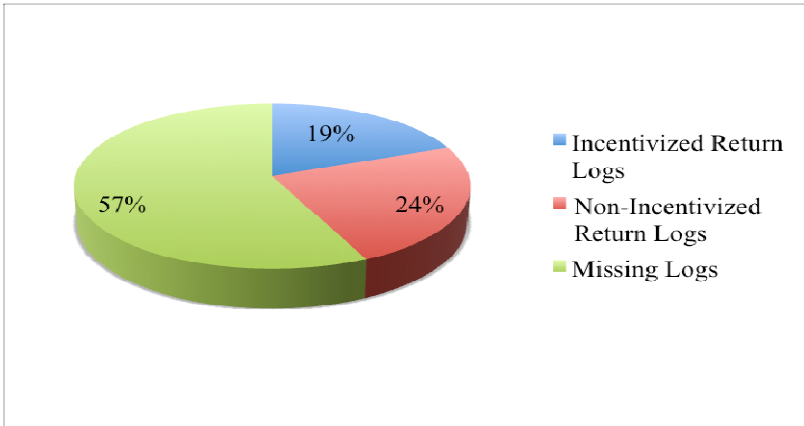
Evaluation of the Program Materials was rated higher in the NIP group.

Adherence To The Program

Participants were required to fill out weekly logs, which were collected bi-weekly. Figure 5.29 depicts the overall percentage of weekly logs that were returned to the program for both the IP and NIP groups.

Figure 5.29

Overall Percentage of Weekly Log Returns



The percentage of logs that were returned was comparable between the groups.

Table 5.18 shows the percentage of participants in each group that met their projected weight loss goals at Week 8, Week 16, and Week 28. A participant's weight loss goal was based on the assumption of 1 or 1 ½ pounds loss a week (depending on BMI) for the duration of the 16 week program as well as the 3-month follow-up.

Table 5.18

Incentivized vs. Non-Incentivized Percentage of Participants Who Met Weight Loss Goals at Week 8, Week 16, and Week 28

Achievement of Weight Loss Goals		
	Incentivized	**Non-Incentivized**
Week 8	11.40%	5.30%
Week 16	5.70%	0%
Week 28	0%	0%

Participants in the IP group had higher percentage of participants who met their weight loss goals at Week 8 and Week 16. No participants in either group met their weight loss goal at the 3-month follow-up.

Chapter 6: Discussion

The proposed hypotheses of this study are presented and argued based on the results in the following sections.

Hypothesis 1: There will be significant difference in weight loss, BMI, DRS, waist/hip ratio, and blood pressure following program between IP and NIP groups.

A total of 99 employees initially participated in the weight loss program, of which 73 completed the program, 35 from the IP group and 38 from the NIP group. Majority of the participants in both groups were middle-aged females, all with at least a high school diploma. NIP group had higher number of participants with a college education as compared to the IP group. There were no differences between those who dropped out of the program and those who continued based on age, gender, and body weight. There were no significant differences between the groups and both groups seemed to be a good representation of the workplace.

The results indicated that the IP group had significantly higher percent weight loss and mean weight loss (7.40 ± 1.88 pounds and total weight loss was 204.8 pounds) compare to the NIP group (with a mean weight loss of 2.17 ± 1.36 pounds and total weight loss was 148.4 pounds). These results of our study are supported by study by Volpp et al. (2008), in which the researchers used incentive for a workplace weight loss program[23]. Participants were divided into one of three groups: a control group (no incentive), a lottery group (eligible for daily lottery prizes if weight loss goal was met) and a deposit group (where participants could deposit anywhere from $0.01 to $3 for every day of the month and if weight loss goal was met, the study matched their deposit). Significant weight loss was observed in the incentive groups (mean weight loss at 16

weeks was 13.1 and 14.0 pounds for lottery and deposit contract groups respectfully) compared to the control group (mean weight loss at 16 weeks was 3.9 pounds) [23].

In our study, participants who participated in the "Win Big" option of the program showed a higher mean weight loss at 16 weeks (7.88 ± 1.88) versus those who did not participate in the deposit option (5.76 ± 1.36). This observation is also consisted with findings by Volpp and colleagues, where the deposit group lost more mean weight than the lottery group. In a 2007 study by Finklestein et al. the effect of different levels of monetary incentives were evaluated on weight loss at 3 and 6 months[24]. The study included three groups; group one received no incentive, group two received $7 per percentage weight loss, and group three received $14 per percentage weight loss[24]. For the 6-month measurement, those who were receiving the $14 incentive were not receiving any incentive, and those who were originally not receiving any incentive were receiving the $14 dollar incentive, and the $7 incentive group remained the same for the 6-month measurement[24]. This was done to ensure equal chance of an incentive[24]. They reported higher weight loss in the incentive groups than non-incentive groups, with the highest weight loss in the incentive group, which received $14 per percentage of weight loss at the 3-month measurement, however showed no significant difference in weight at the 6-month measurement[24]. In our study those who participated in the "Win Big" self-deposit incentive lost a higher mean weight then those who participated in the regular incentive program, agreeing with Finklestein et al. (2007) that higher incentive amounts resulted in greater weight loss. The findings of our study are agreeing with these previous research studies, which have stated the use of monetary incentives to be effective in significant weight loss[23, 24, 76]. Since the use of incentives have been shown

to be effective at encouraging individuals to lose weight and to modify current lifestyle behaviors[21-25, 76], employers are utilizing them to promote healthier behaviors in the forms bonuses, paid vacations, and insurance rebates[25].

A more recent study by John et al. (2011), financial incentives were evaluated for extended weight loss in 66 obese participants from Philadelphia Veterans Affairs Medical Center (PVAMC), who were asked to in the 32-week program, which consisted of 24-week intervention and an 8-week follow-up. The control group only consisted of the consultation and monthly weigh-ins, both incentive groups, participants deposited their own money and if weight loss was achieved their deposited was matched, however if weight loss was not achieved they lost their deposit[76]. In one of the incentive groups, participants were told that the period after the 24-week intervention was for weight-loss maintenance, and in the other incentive group they were not told[76]. At 24-weeks, the incentive groups lost more weight (8.70 pounds) then the control group (1.17 pounds), however weight was regained by the end of the program[76], with a net weight loss for the incentive and control groups to at 1.2 pounds and 0.27 pounds respectfully[76]. In our study higher total weight loss was observed in the IP group over the NIP group agreeing with the findings in the study by John et al. John et al. (2011) concluded that although the use of a financial incentive proved to be effective for weight loss during the intervention, weight loss was regained post-intervention. At the three-month follow-up in our study, no significant weight loss was observed for the IP group, when the main incentive was gone, however our study found a different conclusion then John et al. (2011) in that not all weight loss was regained at the three-month follow-up. This is because participants in the IP group could receive an additional $100 if initial weight loss

was maintained, so although participants did not continue to lose weight, weight loss was maintained due to the additional $100 incentive.

Contingency management has been recommended as an effective strategy to improve healthy lifestyle behaviors in alcohol and drug treatments[26-28]. Barry and colleagues (2009) identified three key components to contingency management, which are: identifying the target behavior, how to measure the behavior, and provide reinforcement for the behavior. Barry and colleagues concluded that since contingency management seems to be effective for substance abuse, it is thought to also be an effective treatment for weight loss[27].

The costs associated with overweight and obesity and related chronic conditions not only affect the individual, but the employers as well[28]. Employers have taken notice of the extra expenditures related to overweight and obesity, and many workplaces are currently hosting incentive based health promotion programs to help employees live healthier lifestyles[25]. In a cross-sectional analysis of the 2006 Medical Expenditure Panel Survey and the 2008 National health and Wellness Survey, Finkelstein et al. (2010), evaluated the cost of obesity in the workplace. Results of this analysis indicated that medical costs and absenteeism increases as the BMI of an individual increases[38]. Obese full-time employees have shown to cost $73.1 billion dollars yearly, and employees who's BMI > 35 accounts for 37% of the obese population in the workplace, and 61% of excess costs[38].

Since the medical costs associated with overweight and obesity are high in the workplace, many employers are hosting worksite wellness interventions, however making sure the return on investment of the interventions proves to be beneficial to the company. Baicker et al. (2010) found that workplace wellness programs generated a

$3.27 savings in medical costs for every $1 spent, and $2.73 savings in absenteeism costs per $1 spent on worksite wellness programs[75]. Suggesting that the return on investment for worksite wellness programs, are beneficial for the employers in terms of budget and employee productivity[75].

A 2010 study conducted by Palmeira et al. evaluated the effect of a 4-month behavioral obesity treatment program, with a 12-month follow-up, on body image and psychological well-being in 142 overweight or obese women. For the first four months (main intervention), participants attended 15 weekly meetings, which last 120 minutes. The meetings were based off the "LEARN weight management program", which included information and practical applications in areas of exercise and diet behaviors[92]. The meetings also utilized cognitive and behavioral skills such as contingency management[92]. After the main intervention, participants were divided into one of three groups, a control group (no further contact), a monthly meeting maintenance group, or a monthly meeting and two structured weekend exercise sessions[92]. Results showed that during the main treatment, body image variables (body size dissatisfaction, body shape concerns, body attractiveness, and physical self-worth) and psychological well-being (self-esteem, depression, and total mood disturbance) have improved substantially[92]. The weight losses have strong associations with changes in body attractiveness, body size, and total mood disturbance[92]. Palmeria et al. (2010) concluded that cognitive related strategies, such as contingency management, utilized in obesity treatment with weight loss, could result in long-term success despite weight loss[92]. In our study, the use of a cognitive related strategy (contingency management utilizing monetary incentives) resulted in greater weight loss, thereby agreeing with Palmeria et al. that cognitive related strategies could result in long-term success.

Obese and overweight individuals are at higher risk for developing type 2 diabetes. Losing weight has been associated with reducing blood glucose and reducing the risk of type 2 diabetes[2]. Diabetes currently affects 26 million people, however 7 million are unaware that they have the disease[2]. Type 2 diabetes is the direct results of unhealthy lifestyle. According to the CDC, individuals who have type 2 diabetes are recommended to eat healthy (diet low in fat and carbohydrate), be physically active, and frequently test their glucose levels[2]. Many individuals who have type 2 diabetes may require medical intervention, orally or through insulin injections or both[2]. Studies have shown that weight loss can help prevent the risk of type 2 diabetes and help with the management of type 2 diabetes[16, 93]. The IP group dropped significantly in DRS score. This finding has major implication on the prevalence of type 2 diabetes in overweight and obese individuals and the effectiveness of weight loss in lowering the risk for diabetes. The DRS assesses one's risk for the development of type 2 diabetes, implying a reduction in DRS score reduces one's risk for the development of type 2 diabetes.

A study conducted by Knowler et al. (2002) compared the incidence rate of type 2 diabetes in a group of individuals that were at high risk for developing type 2 diabetes comparing a lifestyle change program or using diabetes medication (metformin). Participants were divided into one of three group: a placebo group, a metformin (850 mg twice daily) group, or a lifestyle modification program group, which consisted of a goal of 7% weight loss and at least 150 minutes of physical activity per week[16]. Results showed those who participated in the lifestyle modification program had less incidence of type 2 diabetes then those in the placebo or metformin groups, and experienced a reduction in the incidence of diabetes by 58%, whereas the metformin group had a

reduction of 31% when both groups compared to the placebo group[16]. This study validates that lifestyle modifications seem to reduce the incidence of diabetes more so than metformin treatment and no treatment in individuals who are at risk for type 2 diabetes[16].

In a similar study, Fujimoto et al. (2007) evaluated the risk of type 2 diabetes after changes in body size and shape in 758 overweight or obese individuals with impaired glucose tolerance. The study divided participants into three groups, a placebo, a medication (metformin: 850 mg twice daily), and a lifestyle modification group (weight goal of 7% weight loss and physical activity goal of 150 minutes per week) [93]. Participants were measured at baseline and at 1-year, and results showed the lifestyle modification group reduced visceral fat whereas metformin treatment had no effect in both men and women[93]. The study showed that the lifestyle modification group decreased risk of type 2 diabetes through significant decreases in body weight, BMI, and waist circumference[93]. These findings are similar to those found in the study conducted by Knowler et al. (2002) and in our study in which lifestyle modifications (weight loss and physical activity) decrease an individual's risk for the development of type 2 diabetes. In our study weight loss and a reduction in risk for type 2 diabetes (as indicated by the DRS) were observed.

Our study showed significant reduction in both the systolic and diastolic BP for both the IP and NIP groups (significant $p < 0.05$) following the intervention. The drop was more in the incentive group, but not enough to be statistically significant. The drop in blood pressure observed supports the statement by Harsha and colleagues that there is a positive association between weight loss and a reduction in blood pressure[94].

Moreover, losing weight and increasing physical activity have been associated with significant reduction in the other chronic conditions. A 2007 study conducted by Welty et al. evaluated the effect of an onsite dietitian counseling on weight loss and lipid levels in an outpatient physician's office. Eighty patients participated and were told to exercise 30 minutes a day and to follow the DASH (Dietary Approaches to Stop Hypertension) dietary guidelines[95]. Participants had a follow-up with a dietician and physician followed by an additional follow-up with the physician[95]. The first follow-up mean was 1.76 years, while the second follow-up mean was 2.6 years[95]. Results indicated that those who lost weight and followed the dietary and physical activity recommendation had reduction in blood pressure, diabetes, metabolic syndrome, lipid, and smoking[95]. The maximum weight loss was 10.8 lbs and a decrease in systolic blood pressure was from 129 to 126 mm Hg, and for diastolic blood pressure from 79 to 75 mm Hg[95]. In our study the systolic blood pressure was reduced from 124.5 and 122.3 to 119.5 and 118.9 and diastolic blood pressure was reduce from 78.4 and 77.6 to 75.2 and 76.3 in IP and NIP respectively. The above study supports the findings in our study, indicating that a reduction in weight could have a beneficial effect on blood pressure thereby reducing the risk of hypertension. A 2003 review by Neter et al. provided support that weight loss is closely associated with the treatment and prevention of high blood pressure/hypertension. Overall those who lost more than 5 kg of weight experienced larger systolic and diastolic blood pressure reductions[96], and it was concluded that 1 kg of weight loss may result in 1-mm Hg decrease in blood pressure[94, 96].

H***ypothesis 2: There will be significant improvement in SOC, WLSE, ESE, and HES following program intervention, in those who received monetary incentive.***

Weight Loss Self-Efficacy (WLSE) was comparable at the start of the program for both the IP and NIP groups; however, the IP group had a significant drop in the WLSE score at the completion of the program ($p < 0.05$). These numbers remained the same for the NIP group. There were significant correlations between WLSE and SOC for practicing good eating habits and losing weight or maintaining healthy weight for NIP group at the completion of the study. The relationships were significant for practice good eating habits and living overall healthy lifestyle for IP group at the completion of the program.

Exercise Self-Efficacy (ESE) was also comparable at the start of the program for both the IP and NIP groups; however, the IP group had a significant drop in the ESE at the completion of the program ($p < 0.05$). There were also significant correlations between ESE and SOC for being physically active, losing weight or maintain healthy weight, and living overall healthy lifestyle for IP group at the completion of the study. No significant correlations were found for the NIP group at the completion of the study.

Some of the previous research suggests higher self-efficacy following the intervention for those who lost weight[79, 97, 98]. These results are inconsistent with our results when comparing overall WLSE and ESE scores between the IP and NIP groups. Even though the NIP group's self-efficacy scores did not change the IP group's self-efficacy scores dropped, while their weight loss was significantly higher that the NIP group. From these results it could be postulated that when providing incentive as a mechanism for behavior change, the reward from the incentive might be the driving force for losing weight not self-efficacy. This is best explained by the attribution theory, in which attribution for success and failure have two internal factors and two external

factors, which are ability and effort (internal), and task difficulty and luck (external) [99, 100]. In this study, the monetary incentive acted as the external factor for success over the internal factor of one's perceived self-efficacy. The theory also suggests feedback is important factor for success/failure[100, 101]. In fact since the IP group, was receiving feedback regarding weight goal on a weekly and bi weekly basis, they felt it is harder to lose weight and meeting the weight loss goal than the NIP group, who were not provided with feedback. However during their feedback, the participants in the IP group were updated on their current monetary incentive status. Participants in the IP group continue to believe they will be able to lose the weight without contemplating the hardiness and amount of expected weight loss goal.

In a 1999 meta-analysis conducted by Deci et al. reviewed experiments examining the effects of extrinsic rewards on intrinsic motivation. The review found that all forms of rewards played a higher role then an individual's intrinsic motivation[102]. Deci et al. 1999, also found positive feedback improved an individual's behavior and interest. These findings are consistent with findings in our study. In our study the reward (i.e. monetary incentive) played a higher role in individual's weight loss, for the IP group, over their intrinsic motivation (i.e. self-efficacy). Also by providing individuals in the IP group weekly and bi-weekly feedback, during the weigh-ins, on their current weight and monetary status, kept their healthier lifestyle behaviors and interest in the program ongoing.

Another potential reason for the IP group losing significant weight without changing their self-confidence is the effect of self-monitoring. Previous research has also showed that self-monitoring to be effective in weight loss. In a study conducted by Baker

and Kirshenbaum (1993), the relationship between self-monitoring and weight control was examined. The weight loss was more significant for those who were closely monitored and weight regulated[103]. Not monitoring at all was negatively associated with weight change, however those who were consistently monitored lost more weight[103]. Based on our results and those of Baker and Kirshenbaum it appears that the change in WLSE and ESE in the IP group was due to weight monitoring and the challenge of meeting specific weight loss goals. Participants might find meeting weight loss goals to be more challenging than they thought it would be. In the IP group, the incentive might have acted as a self-monitoring tool and encourage weight loss[104]. On the other hand, the NIP group was still in the notion of losing weight and having time to lose the weight. Some refer to this phenomenon as "*false hope syndrome"*, in which people make an attempt to change some aspects of their life by self-change[104]. They usually believe that they can and are confident that they can meet their goal, however through the process they find that meeting the set goal is challenging and hard to achieve, thus they usually regress to previous behaviors. Polivye and Peter (2002) called this cycle of failure and renewed effort as a "*false hope syndrome*"[104]. The "*false hope syndrome*" is usually characterized by making unrealistic goals and underestimating, the expected, amount, ease, and consequences of self-change attempts and they keep trying repeatedly despite apparently overwhelming odds[104].

Ironically, when the NIP group was asked, "Monitoring my exercise regime is tedious", when it was originally evaluated (at Week 8) that the exercise regime was not tedious, however by the completion of the program (Week 28), monitoring the exercise

regime became more tedious to maintain in contrast to reporting an increase in overall score in WLSE and ESE. These results further support the *"false hope syndrome"*.

In a recent article written by Hongu and colleagues, 2011, the authors stress the importance of focusing on behavioral changes and not just solely weight loss when implementing weight loss programs. Using behavioral change strategies such as self-efficacy and self-management may help individuals adopt healthy behaviors, and establish more realistic goals, which will be maintained even after the conclusion of a weight loss program[105].

The results of the correlational analysis between SOC questions and WLSE and ESE score post intervention is supported by a 1992 worksite weight loss study conducted by Prochaska et al. where results showed that as participants moved from contemplation to action stage they increase their level of self-efficacy for practicing healthy behavior. Prochaska's SOC is based on the notion that self-efficacy increase as individuals move through the stages of change, however self-efficacy does not peak until an individual has entered the maintenance stage[87, 88]. An individual's self-efficacy increases as his/her stage of change increases[106].

In a study conducted by Starkin et al. (2001) 670 overweight or obese individuals completed a questionnaire, which included constructs from the transtheoretical model as well as self-reported exercise. Results showed that individuals' exercise self-confidence increased from pre-contemplation to maintenance stage[89]. An individual's confidence in exercise may not completely set until the Action or Maintenance stage when an individual has had many successes at it[89]. Findings were similar in our study, as participants moved through the stages of change, their exercise self-efficacy increased.

Although individuals in the IP group decreased in overall ESE score, their movement through the stages of change for being physically active, losing weight or maintain healthy weight, and live an overall healthy life style were associated with their confidence in exercise (i.e. overcoming exercise barriers).

Overall ESE score was also correlated with practicing good physical activity habits; "Current level of physical activity", "Participate in mild physical activity", "Participant in moderate physical activity", and "Participate in vigorous physical activity" post intervention. Significant correlations between overall ESE score and "Current level of physical activity", "Participate in mild physical activity", "Participate in moderate physical activity", and "Participate in vigorous physical activity" were found for the IP group post intervention. The only significant correlation for the NIP group, post intervention, was "Participate in vigorous physical activity" and overall ESE score. Although the overall ESE score for IP group dropped from pre to post intervention, significant correlations were found for all physical activity habit questions when correlated with overall ESE score. The IP group increased physical activity levels, which lead to greater weight loss. Our results are supported by a 2011 study conducted by Annesi, in which individuals who participated in exercise activities had significant improvements in mood, body image, and exercise self-efficacy. However, Annesi, 2011, concluded that the association between exercise and weight loss was explained psychologically rather than physiologically[81]. This claim is opposite of what was observed in our study. Participants in the IP group exhibited greater weight loss but lower ESE (psychological), however greater physical activity was reported by the IP group (physiological).

In another study conducted by Delahanty et al. (2006), 274 participants completed a questionnaire, which consisted of questions regarding stage of change, physical activity, exercise self-efficacy, perceived stress, depression, and anxiety. Findings of the study showed that physical activity level was associated with higher readiness to change and higher exercise self-efficacy[90]. Findings also showed that an individual's self-efficacy was positively correlated with one's stage of change[90]. Our findings were similar to those reported in this study, individuals in the IP group showed positive correlations with physical activity and self-efficacy as well as stage of change and self-efficacy.

Hypothesis 3: There will be significant difference in SOC, WLSE, ESE, HES, and reduction in self-reported chronic conditions between those who lost at least 5% of their body weight and those who did not.

Losing as low as 5% of body weight has been reported to reduce or even eliminate the chronic conditions associated with obesity[107]. In the present study we evaluated if losing at least 5% of body weight will have an effect on measured variables, more importantly, on overall SOC, WLSE, ESE, and HES. The results show that those who lost as least 5% of their body weight have more improvements in overall SOC (77.8%), WLSE (55.6%), ESE (44.4%), and HES (66.7%) than those who lost less then 5% of weight loss. The overall stage of change score was significantly higher in those who lost 5% of their body weight.

In a study conducted by Warziski et al. (2008), participants who lost 5% of weight have significant improvements in self-efficacy[79]. In a 1977 article written by Bandura, the author explains the theoretical framework of self-efficacy. Bandura (1977) explains those who lost more weight, perceived them self as more successful, and therefore were

more confident, increasing their self-efficacy[31]. A 2008 review conducted by Cochrane, self-efficacy positively correlates with an individual's success in losing weight, and therefore, increasing self-efficacy will help those who are overweight and obese. Many studies have reported the association between self-efficacy and weight loss, indicating that more weight loss results in higher self-efficacy[79, 97, 98]. These findings are supported in our study which found participants who lost at least 5% weight loss had higher percentage of participants improved in self-efficacy verses those who lost less then 5% weight loss.

The SOC questions of "Be physically active", "Practice good eating habits", "Avoid smoking or using tobacco", "Lose weight or maintain healthy weight", "Handle stress well", "Avoid alcohol or drink in moderation", and "Live an overall healthy life style" were analyzed for improvement in response were analyzed and compared between those who lost more then 5% weight and those who lost less then 5% weight. Results showed that those who lost more then 5% of weight had higher improvements in all seven questions, with significant improvements for "Be physically active", "Practice good eating habits", "Avoid smoking or using tobacco", "Lose weight or maintain healthy weight", and "Live an overall healthy life style". These results indicate that those who lost at least 5% of weight did move through the stages of change, more then those who lost less the 5% of weight.

Procheska et al. (1982) explains that individuals move to and from the different stages at different times based on their environment and experiences. In a 2008 study conducted by Faghri et al., the stage of change model was found to be effective to increase physical activity, dietary habits, and stress management in the workplace. Our

findings are consistent with these previous researches, indicating the association of weight loss with movement through stages of change[32].

The contrasting results in our study for WLSE and ESE and SOC when comparing the IP and NIP versus when comparing the percentage of weight loss irrespective of incentive need further evaluation and explanation. It appears that when incentives are used to encourage weight loss and self-monitoring and feedback is provided, weight loss happens irrespective of self-efficacy. However, when contingency management and monetary rewards is not present, increasing individual self-efficacy through processes of change suggested by Prochaska and Bandura is reasonable.

The National Institute of Diabetes Digestive and Kidney Disease (NIDDKD) suggest that losing at least 5% of body fat will help lower one's risk for several chronic conditions[12]. Significant reductions in DRS were observed for those in the incentivized group and those who lost more then 5% weight. Participants who lost at least 5% of weight had higher percentage of participants who improved in "High Blood Press/Hypertension", "Elevated Cholesterol", and "Low Back Disease or Spine Problems" post intervention.

In a 1992 review conducted by Dattilo and Kris-Etherton, results found dieting and losing weight (about 5% of body weight) was a successful way to "normalize" cholesterol levels in individuals who are overweight[52]. Studies have also shown that losing as little as 5% weight loss can help reduce risk of chronic conditions such as type 2 diabetes and hypertension[49-53]. In a recent study conducted by Wing et al. (2011), weight loss was associated with the improvement of risk of chronic conditions in overweight or obese individuals with type 2 diabetes. Weight loss after 1 year showed improvements

for CVD (cardiovascular disease) risk factors and glycemic control, hypertension, and lipids[54]. Losing 2-5% initial weight had significant improvement for glycemic control[54]. Overall, our findings are supported by previous studies, and illustrate that modest weight loss and adoption of healthy behaviors can lead to improvements in chronic conditions.

Physical Activity, Program Satisfaction and Adherence

Physical Activity

Physical activity was based on physical activity preferences, type of help to receive when starting an exercise plan, and barriers as to why an individual is prevented from exercising. For physical activity preferences, walking as a form of physical activity seemed to be overwhelming the number one form of physical activity preferred by participants. Swimming was not preferred by either group pre intervention, however by post intervention, it made the top three physical activity preferences for both the IP and NIP groups. When analyzing responses to type of help to receive when starting an exercise plan, by post-intervention, having people to exercise with was the top preferred form of help to receive when starting an exercise program for both groups, followed by advice from health professional and exercise video. For barriers that prevent an individual from exercising, no major changes occurred from pre to post in either group for the top barriers as to why an individual is prevented from exercising. However post intervention, one of the top three in the NIP group was "Already have adequate exercise". The top three seem to be "Never Persist", "No Time" and "Lazy" as to barriers why an individual is prevented from exercising. The IP group rated "Never Persist" as the top barrier that prevents from exercising pre and post, indicting low self-efficacy.

The findings in our study on physical activity for physical activity preferences, advice to receive when starting an exercise plan, and barriers that prevent from exercising are similar to those found by Booth et al. (1997). In a 1997 pilot study conducted by Booth et al., 2, 298 Australian adults were randomly given a fitness questionnaire, which consisted questions on physical activity preferences, type of help to receive when starting an exercise plan, and perceived barriers that prevent an individual from exercising. Consistent with findings in our study, walking was the top preferred form of physical activity by participants, followed by swimming[91]. Booth et al. found medical advice from health professional and exercising with a group to be the top preferred forms of help to receive when starting an exercise plan, these findings were also observed in our study. Booth et al. found the top perceived barrier to exercise that, was no time, which also made one of the top three barriers in our present study. The consistency in physical activity preferences, help to receive when starting an exercise plan, and perceived barriers that prevent from exercising, help understand the perceived preferences and barriers, which can then be tailored to each individual avoiding the "one-size-fits-all" stratergy[91].

Program Satisfaction

Evaluation of the program is important for future research. As part of the formative evaluation of the program, program satisfaction was divided into four categories: "Perceived Program Flexibility", "Perceived Program Effectiveness", "Evaluation of the Health Educators", and "Evaluation of the Program Materials". Both groups were similar in their satisfaction in all four categories and generally remained the same for program satisfaction. A 2010 study conducted by VanWormer et al. examined the effect of program satisfaction for a weight loss intervention. The study consisted of

78 obese employees who were divided into two groups: the first group started treatment right away, the second group started treatment 6-months later[108]. Treatment consisted of telephone counseling, as well as a home monitoring scale, and instructions on self-weight daily[108]. Results showed more weight loss and increase in healthy behaviors, such as diet and exercise, and high satisfaction with the program, indicating that one's success in a weight loss intervention determines their satisfaction with the program[108]. For participants to promote the program and suggest it to others, program structure and treatment is important in this evaluation[108]. VanWormer et al. concluded that overall health progress determined program satisfaction and program structure predicted program recommendations to others[108].

When examining the responses for "Perceived Program Effectiveness" for the questions "This program is likely to help me lose weight" and "This program is likely to help other lose weight", a decrease was observed from week 8 to week 28 for the question "This program is likely to help me lose weight" for both groups, but an increase for "This program is likely to help others lose weight" for both groups from week 8 to week 28. Participants of the IP group generally had a larger decrease for "The program is likely to help me lose weight" than the NIP group, returning to the matter of self-efficacy. Self-efficacy is the belief that one has in themself to succeed in a particular behavior[29-31], in this case weight loss. Based on the responses, the IP group had less confidence that this program was likely to help them lose weight, even though more weight loss was observed in this group. Ironically they were very satisfied with the program approach and indicated that this program will help others to lose weight.

For the evaluation of the Health Educator the NIP and IP groups were comparable. The evaluation of the Program Materials however, the NIP group showed higher ratings then the IP group. The results are an indication that there was no discrimination or bias between the IP and NIP groups as the results of health educator communication of material and or the type of health information provided. Demonstrating that this was a good program with accurate and equivalent communication system and program information for both group for an effective approach. As previously mentioned, it is important for the health professionals to build a relationship with participants and to be active listners[109]. When developing program materials, it is important to use materials that are of an interest to the participants[110].

Improvements were seen from week 8 to week 28 on the satisfaction of the incentive for the IP group. This finding is in accordance with a recent study conducted by Gabel et al. (2009), which found monetary incentives to be favorable by both the employee and employees when participating in weight loss programs. They reported that 70% of employees were in favor of insurance discounts or monetary incentives[22]. The IP group in our study reported that the incentive program was fair and they ranked it high in their liking and choice of the program.

Program Adherence

Program adherence was based on achieving weight loss goals and percentage of weekly logs returned. No significant differences were found for achieving weight loss goals between the IP and NIP groups. The NIP group had a slightly higher percentage of return of the weekly logs versus the IP group. In this study, we identified using the weekly logs as a way of self-monitoring and keeping with the program, however, there

were no specific protocol in place to encourage and demand return of the weekly logs. One reason was that we did not want to contaminate the independent variable for the study, which was using the incentives. Encouraging and demanding the weekly logs could have acted as an intervention. We therefore concluded that better measures of adherence might be needed and weekly logs alone could not be used as a measure for adherence to the program. In a review conducted by Delahanty (2010) it was stated that in order to keep adherence to a program it is important to "build rapport and a trusting relationship through attentive listening"[109]. Further, according to a recent study conducted by van Wier et al. (2011), a way to increase program adherence and effectiveness is to use program materials or techniques that are of interest to the participants[110]. The evaluation of our program showed that both the IP and NIP group rated the health educator to be fair, knowledgeable and effective (active listeners) and program material highly effective and interesting.

Summary

The overall results of our study are t supported by previous studies, which have examined the use of monetary incentives on weight loss, the effect of weight loss on type 2 diabetes, and the effect of 5% weight loss on improvements in chronic conditions and self-reported general health. The results that were not supported by findings of previous studies were the decrease in self-efficacy for the IP although larger amounts of weight loss were observed, however explained through the "*false hope syndrome*". Overall our study showed the potential successfulness of an incentivized worksite weight loss program based on improvements that were observed and program satisfaction.

Limitations

Relatively low statistical power due to a small sample size could be a limitation of the study since some of the significance was close to p value of 0.05, and increasing the sample size could have made these changes more obvious. Another limitation is the current economic status of many workplaces. Due to economic problems, there were many lay off's, which is the primary reason for dropouts in our study.

Strengths

A worksite weight loss program is strongly recommended as it allows researchers to target an at risk population at one time. A monetary incentive is also strongly recommended when conducting a worksite weight loss program, as it provides an additional incentive to participants to participant in the program and lose weight.

Chapter 7: Conclusion

Recently there has been a high prevalence of individuals who are overweight or obese, which has led to an increase in weight loss interventions programs. These programs aim to bring awareness to individual's risks and to increase knowledge to help make healthier lifestyle choices. The ideal place to conduct weight loss programs would be in the workplace, because typically, most people spend half of their awake time at work[18], and allows the direct contact with individuals and provides means of communication and support[17, 111, 112]. The workplace also provides the opportunity to address unhealthy behaviors and promote healthier behaviors[111]. Conducting interventions in the workplace also provide the opportunity to increase employee work ability (job satisfaction and absenteeism) and decrease health costs[111].

The risk of type 2 diabetes is significantly higher in people who are overweight or obese, which is the main reason for consistent increase in the prevalence of overweight and obesity and type 2 diabetes. Mokdad et al. (2003) found the prevalence of obesity since 2000 increased from 19.8% to 20.9% and an increased prevalence in diabetes from 2000 was 7.3% to 7.9%. Overweight and obesity also bring increased health care cost to the individual, employer, and the country. It is estimated that by 2030 total costs associated with overweight and obesity would be $956.9 billion US dollars, which would account for 16-18% of total health care costs[113].

Previous studies have shown that the use of a monetary incentives for worksite weight loss interventions have seem to have a positive impact, and cost benefit, for both the employees and employers. To help address the issues of overweight and obesity, individuals need to become more aware of the risks that having excess body weight can

bring to one's health. To help individuals who are overweight and obese, it is important to understand their current knowledge and needs, in order to give the proper tools to make healthier lifestyle changes.

Studies have reported an association between self-efficacy and weight loss[79, 97, 98]. By increasing an individual's self-worth or confidence, he/she will have the tools needed to lose weight. In a recent review conducted by Cochrane, 2008, it was concluded that self-efficacy is correlated with an individual's success in changing lifestyle behaviors. However, researchers should be aware of the phenomenon of *"false hope syndrome"* and its association with eluding self-efficacy if the weight loss goal is not achieved. Incorporating other means of self-monitoring and self-regulation beyond increasing ones self-efficacy is justified based on our study. Monetary incentives appear to be favored by both the employees and employers when overweight and obesity is being addressed through workplace interventions. Monetary incentives in the context of contingency management may act as self-monitoring, while individuals move through the stages of change from pre action to action and to maintenance and increase their self-efficacy for losing weight.

When implementing weight loss interventions in the workplace, it is important to help individuals make better lifestyle changes by understanding their current stage of change and level of self-efficacy. Incentivized weigh loss programs at the workplace appear promising, future research should evaluate this approach by increasing sample size as well as the length of the program in order to evaluate weight loss suitability and program adherence. In this study we did not make any environmental change at the work place. Environment play a major role in individual employee's life style behavior--- from

having healthy food options to having job flexibility to participate in physical activity as well as organizational support to participate in weight loss program without being penalized by employer. Recognizing individual physical activity preferences, preferred help to receive when starting an exercise plan, and perceived barriers that prevent from exercising, may help health professionals understand the perceived preferences and barriers for each individual. Physical activity preferences and barriers can then be tailored to each individual avoiding the "one-size-fits-all" stratergy[91]. Future research should address the effect of environment in one's lifestyle habits and choices and evaluate the suitable changes.

Chapter 8: References

1. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and Trends in Obesity Among US Adults, 1999-2008. *JAMA : the journal of the American Medical Association.* 2010;303(3):235.

2. Center for Disease Control and Prevention, 2011. cdc.gov.

3. Faghri P, Omokaro C, Parker C, Nichols E, Gustavesen S, Blozie E. E-technology and Pedometer Walking Program to Increase Physical Activity at Work. *Journal of Primary Prevention*. 2008;29(1):73-91.

4. Atlantis E, Chow C, Kirby A, Fiatarone Singh MA. Worksite intervention effects on physical health: a randomized controlled trial. *Health Promot Internation*. 2006;21(3):191-200.

5. United States. Surgeon-General's Office. The Surgeon General's call to action to prevent and decrease overweight and obesity. . Updated 2001.

6. Finkelstein EA, Fiebelkorn IC, Wang G. National Medical Expenditures Attributable To Overweight And Obesity: How Much, And Who's Paying? *HEALTH AFFAIRS - MILLWOOD VA THEN BETHESDA MA-*. 2003;22:8.

7. Wang Y, Beydoun MA. The obesity epidemic in the United States--gender, age, socioeconomic, racial/ethnic, and geographic characteristics: a systematic review and meta-regression analysis. *Epidemiol Rev*. 2007;29:6-28.

8. Finkelstein E.A., Trogdon J.G., Cohen J.W., Dietz W. Annual medical spending attributable to obesity: Payer-and service-specific estimates. *Health Aff.Health Affairs*. 2009;28(5):w822-w831.

9. Sturm R. DataWatch: The Effects Of Obesity, Smoking, And Drinking On Medical Problems And Costs. *Health affairs.* 2002;21(2):243.

10. LEONG KS, WILDING JP. Obesity and diabetes. *CLINICAL ENDOCRINOLOGY AND METABOLISM*. 1999;13:221-238.

11. Mayo Clinic 2011. mayoclinic.com.

12. National Institute of Diabetes, Digestive, and Kidney Disease, 2011. niddk.nih.gov.

13. National Institute of Health, 2011. nih.gov.

14. American Diabetes Association 2. diabetes.org.

15. Kramer H., Cao G., Dugas L., Luke A., Cooper R., Durazo-Arvizu R. Increasing BMI and waist circumference and prevalence of obesity among adults with Type 2 diabetes: The National Health and Nutrition Examination Surveys. *J.Diabetes Complications Journal of Diabetes and its Complications*. 2010;24(6):368-374.

16. Knowler WC, Barrett-Connor E, Fowler SE, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med*. 2002;346(6):393-403.

17. Katz DL, O'Connell M, Yeh MC, et al. Public health strategies for preventing and controlling overweight and obesity in school and worksite settings: a report on recommendations of the Task Force on Community Preventive Services. *MMWR.Recommendations and reports : Morbidity and mortality weekly report.Recommendations and reports / Centers for Disease Control*. 2005;54(RR-10).

18. Dishman RK, Oldenburg B, O'Neal H, Shephard RJ. Worksite Physical Activity Interventions. *American journal of preventive medicine.* 1998;15(4):344.

19. Gemson DH, Commisso R, Fuente J, Newman J, Benson S. Promoting weight loss and blood pressure control at work: impact of an education and intervention program. *J Occup Environ Med*. 2008;50(3):272-81.

20. Linnan L, Bowling M, Childress J, et al. Results of the 2004 National Worksite Health Promotion Survey. *Am J Public Health*. 2008;98(8):1503.

21. Wall J, Mhurchu CN, Blakely T, Rodgers A, Wilton J. Effectiveness of monetary incentives in modifying dietary behavior:a review of randomized, controlled trials. *Nutr Rev*. 2006;64(12):518-31.

22. Gabel JR, Whitmore H, Pickreign J, et al. Obesity And The Workplace: Current Programs And Attitudes Among Employers And Employees. *Health affairs.* 2009;28(1):46.

23. Volpp KG, John LK, Troxel AB, Norton L, Fassbender J, Loewenstein G. Financial Incentive-Based Approaches for Weight Loss: A Randomized Trial. *JOURNAL-AMERICAN MEDICAL ASSOCIATION*. 2008;300(22):2631-2637.

24. Finkelstein EA, Linnan LA, Tate DF, Birken BE. A pilot study testing the effect of different levels of financial incentives on weight loss among overweight employees. *J Occup Environ Med*. 2007;49(9):981-9.

25. Finkelstein EA, Kosa KM, Kosa KM. Use of Incentives to Motivate Healthy Behaviors among Employees. *Gender Issues*. 2003;21(3):50-59.

26. Madden GJ. BOOK REVIEW - Ammunition for fighting a demand-side war on drugs: A review of contingency management in substance abuse treatment. *Journal of applied behavior analysis.* 2008;41(4):645.

27. Barry D, Clarke M, Petry NM. Obesity and Its Relationship to Addictions: Is Overeating a Form of Addictive Behavior? *American Journal on Addictions*. 2009;18(6):439-451.

28. Higgins ST, Petry NM. Contingency management. Incentives for sobriety. *Alcohol Res Health*. 1999;23(2):122-7.

29. Linde JA, Rothman AJ, Baldwin AS, Jeffery RW. The impact of self-efficacy on behavior change and weight change among overweight participants in a weight loss trial. *Health psychology : official journal of the Division of Health Psychology, American Psychological Association*. 2006;25(3):282-91.

30. Edell BH, Edington S, Herd B, O'Brien RM, Witkin G. Self-efficacy and self-motivation as predictors of weight loss. *Addict Behav*. 1987;12(1):63-6.

31. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev*. 1977;84(2):191-215.

32. Prochaska JO, Velicer WF, Rossi JS, et al. Stages of change and decisional balance for 12 problem behaviors. *Health psychology : official journal of the Division of Health Psychology, American Psychological Association*. 1994;13(1):39-46.

33. Adams KF, Schatzkin A, Harris TB, et al. Overweight, obesity, and mortality in a large prospective cohort of persons 50 to 71 years old. *N Engl J Med*. 2006;355(8):763-78.

34. van Baal PH, Polder JJ, de Wit GA, et al. Lifetime medical costs of obesity: prevention no cure for increasing health expenditure. *PLoS medicine*. 2008;5(2).

35. American Diabetes Association. Economic costs of diabetes in the U.S. In 2007. *Diabetes Care*. 2008;31(3):596-615.

36. Gates D.M., Brehm B.J., Gillespie G.L., Succop P., Sommers B.D. Obesity and presenteeism: The impact of body mass index on workplace productivity. *J.Occup.Environ.Med.Journal of Occupational and Environmental Medicine*. 2008;50(1):39-45.

37. Bungum T, Satterwhite M, Jackson AW, Morrow JR Jr. The relationship of body mass index, medical costs, and job absenteeism. *Am J Health Behav*. 2003;27(4).

38. Finkelstein E.A., DiBonaventura M.D., Burgess S.M., Hale B.C. The costs of obesity in the workplace. *J.Occup.Environ.Med.Journal of Occupational and Environmental Medicine*. 2010;52(10):971-976.

39. Williams AE, Vogt TM, Stevens VJ, et al. Work, Weight, and Wellness: the 3W Program: a worksite obesity prevention and intervention trial. *Obesity (Silver Spring, Md.)*. 2007;15.

40. Tricia R Prodaniuk, Ronald C Plotnikoff, John C Spence, Phillip M Wilson. The influence of self-efficacy and outcome expectations on the relationship between perceived environment and physical activity in the workplace. *International Journal of Behavioral Nutrition and Physical Activity*. 2004;1(1).

41. Proper KI, Hildebrandt VH, Van der Beek AJ, Twisk JW, Van Mechelen W. Effect of individual counseling on physical activity fitness and health: a randomized controlled trial in a workplace setting. *Am J Prev Med*. 2003;24(3):218-26.

42. Addley K, McQuillan P, Ruddle M. Creating healthy workplaces in Northern Ireland: evaluation of a lifestyle and physical activity assessment programme. *Occupational Medicine*. 2001;51(7):439-449.

43. Dixon J.B. The effect of obesity on health outcomes. *Mol.Cell.Endocrinol.Molecular and Cellular Endocrinology*. 2010;316(2):104-108.

44. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA : the journal of the American Medical Association*. 2006;295(13):1549-55.

45. Shuger SL, Barry VW, Sui X, et al. Electronic feedback in a diet- and physical activity-based lifestyle intervention for weight loss: a randomized controlled trial. *The international journal of behavioral nutrition and physical activity*. 2011;8.

46. Skouby SO. Hormonal contraception in obesity, the metabolic syndrome, and diabetes. *Ann N Y Acad Sci*. 2010;1205(1):240-244.

47. Kopelman P. Health risks associated with overweight and obesity. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. 2007;8:13-7.

48. Mokdad AH, Ford ES, Bowman BA, et al. Prevalence of Obesity, Diabetes, and Obesity-Related Health Risk Factors, 2001. *JOURNAL- AMERICAN MEDICAL ASSOCIATION*. 2003;289:76-79.

49. Dall TM, Fulgoni VL, Zhang Y, Reimers KJ, Packard PT, Astwood JD. Potential Health Benefits and Medical Cost Savings From Calorie, Sodium, and Saturated Fat Reductions in the American Diet. *American Journal of Health Promotion American Journal of Health Promotion*. 2009;23(6):412-422.

50. Vidal, Correspondence. Updated review on the benefits of weight loss. *Int J Obes*. 2002;26(11):S25-S28.

51. Klein S, Burke LE, Bray GA, et al. Clinical implications of obesity with specific focus on cardiovascular disease: a statement for professionals from the American Heart

Association Council on Nutrition, Physical Activity, and Metabolism: endorsed by the American College of Cardiology Foundation. *Circulation*. 2004;110(18):2952-67.

52. Dattilo AM, Kris-Etherton PM. Effects of weight reduction on blood lipids and lipoproteins: a meta-analysis. *Am J Clin Nutr*. 1992;56(2):320-8.

53. Goldstein DJ. Beneficial health effects of modest weight loss. *International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity*. 1992;16(6):397-415.

54. Wing RR, Lang W, Wadden TA, et al. Benefits of modest weight loss in improving cardiovascular risk factors in overweight and obese individuals with type 2 diabetes. *DIABETES CARE -ALEXANDRIA VA-*. 2011;34(7):1481-1486.

55. Maskarinec G, Grandinetti A, Matsuura G, et al. Diabetes prevalence and body mass index differ by ethnicity: the Multiethnic Cohort. *Ethn Dis*. 2009;19(1):49-55.

56. Saaristo T, Peltonen M, Lindström J, et al. Cross-sectional evaluation of the Finnish Diabetes Risk Score: a tool to identify undetected type 2 diabetes, abnormal glucose tolerance and metabolic syndrome. *Diabetes & vascular disease research : official journal of the International Society of Diabetes and Vascular Disease*. 2005;2(2):67-72.

57. Franciosi M, De Berardis G, Rossi MC, et al. Use of the diabetes risk score for opportunistic screening of undiagnosed diabetes and impaired glucose tolerance: the IGLOO (Impaired Glucose Tolerance and Long-Term Outcomes Observational) study. *Diabetes Care*. 2005;28(5):1187-94.

58. Lindström J, Tuomilehto J. The diabetes risk score: a practical tool to predict type 2 diabetes risk. *Diabetes Care*. 2003;26(3):725-31.

59. Griffin SJ, Little PS, Hales CN, Kinmonth AL, Wareham NJ. Diabetes risk score: towards earlier detection of Type 2 diabetes in general practice. *DIABETES METABOLISM RESEARCH AND REVIEWS*. 2000;16:164-171.

60. Finkelstein E, Fiebelkorn C, Wang G. The costs of obesity among full-time employees. *Am J Health Promot*. 2005;20(1).

61. Ostbye T, Dement JM, Krause KM. Obesity and workers' compensation: results from the Duke Health and Safety Surveillance System. *Arch Intern Med*. 2007;167(8):766-73.

62. Yang Z., Hall A.G. The financial burden of overweight and obesity among elderly Americans: The dynamics of weight, longevity, and health care cost. *Health Serv.Res.Health Services Research*. 2008;43(3):849-868.

63. Tricia R Prodaniuk, Ronald C Plotnikoff, John C Spence, Phillip M Wilson. The influence of self-efficacy and outcome expectations on the relationship between perceived environment and physical activity in the workplace. *International Journal of Behavioral Nutrition and Physical Activity*. 2004;1(1).

64. Partnership for Prevention (Organization). *Healthy workforce 2010 : an essential health promotion sourcebook for employers, large and small.* Washington, D.C.: Partnership for Prevention; 2001.

65. Chan CB, Ryan DA, Tudor-Locke C. Health benefits of a pedometer-based physical activity intervention in sedentary workers. *Prev Med*. 2004;39(6):1215-22.

66. Morgan PJ, Collins CE, Plotnikoff RC, et al. Efficacy of a workplace-based weight loss program for overweight male shift workers: The Workplace POWER (Preventing Obesity Without Eating like a Rabbit) randomized controlled trial. *Prev Med*. 2011;52(5):317-325.

67. Bandura A,. *Social foundations of thought and action : a social cognitive theory.* Englewood Cliffs, N.J.: Prentice-Hall; 1986.

68. Milani R.V., Lavie C.J. Impact of Worksite Wellness Intervention on Cardiac Risk Factors and One-Year Health Care Costs. *Am.J.Cardiol.American Journal of Cardiology*. 2009;104(10):1389-1392.

69. Benedict MA, Arterburn D. Worksite-based weight loss programs: a systematic review of recent literature. *Am J Health Promot*. 2008;22(6).

70. Ni Mhurchu C, Aston LM, Jebb SA. Effects of worksite health promotion interventions on employee diets: a systematic review. *BMC Public Health*. 2010;10.

71. Anderson L.M., Quinn T.A., Chattopadhyay S., et al. The Effectiveness of Worksite Nutrition and Physical Activity Interventions for Controlling Employee Overweight and Obesity. A Systematic Review. *Am.J.Prev.Med.American Journal of Preventive Medicine*. 2009;37(4):340-357.

72. Kuoppala J., Lamminpaa A., Husman P. Work health promotion, job well-being, and sickness absences - A systematic review and meta-analysis. *J.Occup.Environ.Med.Journal of Occupational and Environmental Medicine*. 2008;50(11):1216-1227.

73. Ozminkowski RJ, Dunn RL, Goetzel RZ, Cantor RI, Murnane J, Harrison M. A return on investment evaluation of the Citibank, N.A., health management program. *Am J Health Promot*. 1999;14(1).

74. Trogdon J., Finkelstein E.A., Reyes M., Dietz W.H. A return-on-investment simulation model of workplace obesity interventions. *J.Occup.Environ.Med.Journal of Occupational and Environmental Medicine*. 2009;51(7):751-758.

75. Baicker K, Cutler D, Song Z. Workplace wellness programs can generate savings. *Health Aff (Millwood)*. 2010;29(2):304-11.

76. John LK, Troxel AB, Troxel AB, Fassbender JE, Fassbender JE, Volpp KG. Financial Incentives for Extended Weight Loss: A Randomized, Controlled Trial. *Journal of General Internal Medicine*. 2011;26(6):621-626.

77. Glynn SM, Ruderman AJ. The development and validation of an Eating Self-Efficacy Scale. *Cogn Ther Res Cognitive Therapy and Research*. 1986;10(4):403-420.

78. Sallis JF, Pinski RB, Grossman RM, Patterson TL, Nader PR. The development of self-efficacy scales for healthrelated diet and exercise behaviors. . Updated 1988.

79. Warziski M, Sereika S, Styn M, Music E, Burke L. Changes in self-efficacy and dietary adherence: the impact on weight loss in the PREFER study. *J Behav Med*. 2008;31(1):81-92.

80. Rejeski W.J., Mihalko S.L., Ambrosius W.T., Bearon L.B., McClelland J.W. Weight loss and self-regulatory eating efficacy in older adults: The cooperative lifestyle intervention program. *J.Gerontol.Ser.B Psychol.Sci.Soc.Sci.Journals of Gerontology - Series B Psychological Sciences and Social Sciences*. 2011;66 B(3):279-286.

81. Annesi JJ. Behaviorally supported exercise predicts weight loss in obese adults through improvements in mood, self-efficacy, and self-regulation, rather than by caloric expenditure. *The Permanente journal*. 2011;15(1):23-7.

82. Cochrane G. Role for a sense of self-worth in weight-loss treatments: Helping patients develop self-efficacy. *Can.Fam.Phys.Canadian Family Physician*. 2008;54(4):543-547.

83. Clark MM, Abrams DB, Niaura RS, Eaton CA, Rossi JS. Self-efficacy in weight management. *J Consult Clin Psychol*. 1991;59(5):739-44.

84. Glanz K, Lewis FM, Rimer BK. *Health behavior and health education : theory, research, and practice.* San Francisco: Jossey-Bass Publishers; 1990.

85. Prochaska JO, DiClemente CC. Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy: Theory, Research & Practice Psychotherapy: Theory, Research & Practice*. 1982;19(3):276-288.

86. Johnson SS, Paiva AL, Cummins CO, et al. Transtheoretical Model-based multiple behavior intervention for weight management: Effectiveness on a population basis. *Preventive medicine.* 2008;46(3):238.

87. Prochaska JO, Norcross JC, Fowler JL, Follick MJ, Abrams DB. Attendance and outcome in a work site weight control program: processes and stages of change as process and predictor variables. *Addict Behav*. 1992;17(1):35-45.

88. Prochaska JO, Velicer WF, Guadagnoli E, Rossi JS, DiClemente CC. Patterns of Change: Dynamic Typology Applied to Smoking Cessation. *Multivariate Behavioral Research*. 1991;26(1):83-107.

89. Sarkin J, Johnson S, Prochaska J, Prochaska J. Applying the Transtheoretical Model to Regular Moderate Exercise in an Overweight Population: Validation of a Stages of Change Measure. *Prev Med*. 2001;33(5):462-469.

90. Delahanty LM, Conroy MB, Nathan DM. Psychological Predictors of Physical Activity in the Diabetes Prevention Program. *JOURNAL- AMERICAN DIETETIC ASSOCIATION*. 2006;106(5):698-705.

91. Booth ML, Bauman A, Owen N, Gore CJ. Physical activity preferences, preferred sources of assistance, and perceived barriers to increased activity among physically inactive Australians. *Prev Med*. 1997;26(1).

92. Palmeira A.L., Branco T.L., Martins S.C., et al. Change in body image and psychological well-being during behavioral obesity treatment: Associations with weight loss and maintenance. *Body Image Body Image*. 2010;7(3):187-193.

93. Fujimoto WY, Jablonski KA, Bray GA, et al. Body size and shape changes and the risk of diabetes in the diabetes prevention program. *Diabetes*. 2007;56(6):1680-5.

94. Harsha D.W., Bray G.A. Weight loss and blood pressure control (Pro). *Hypertension Hypertension*. 2008;51(6):1420-1425.

95. Welty FK, Nasca MM, Lew NS, Gregoire S, Ruan Y. Effect of onsite dietitian counseling on weight loss and lipid levels in an outpatient physician office. *Am J Cardiol*. 2007;100(1):73-5.

96. Neter JE, Stam BE, Kok FJ, Grobbee DE, Geleijnse JM. Influence of weight reduction on blood pressure: a meta-analysis of randomized controlled trials. *Hypertension*. 2003;42(5):878-84.

97. Roach JB, Yadrick MK, Johnson JT, Boudreaux LJ, Forsythe III WA, Billon W. Using self-efficacy to predict weight loss among young adults. *JOURNAL- AMERICAN DIETETIC ASSOCIATION*. 2003;103(10):1357-1359.

98. Bartfield J.K., Ojehomon N., Huskey K.W., Davis R.B., Wee C.C. Preferences and self-efficacy for diet modification among primary care patients. *Obesity Obesity*. 2010;18(2):430-432.

99. Weiner, B., Frieze, I., Kukla, A., Reed, L., Rest, S., & Rosenbaum, R. M.. Perceiving the cause of success and failure. *New York: General Learning Press*. 1971.

100. Nicholls JG. Causal attributions and other achievement-related cognitions: Effects of task outcome, attainment value, and sex. *Journal of Personality and Social Psychology Journal of Personality and Social Psychology*. 1975;31(3):379-389.

101. Weiner B. Theories of motivation: From mechanism to cognition. *Chicago: Markham*. 1972.

102. Deci EL, Koestner R, Ryan RM. A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychol Bull*. 1999;125(6):627-68.

103. BAKER R, KIRSCHENBAUM D. Self-monitoring may be necessary for successful weight control*. *Behavior Therapy Behavior Therapy*. 1993;24(3):377-394.

104. Polivy J, Herman CP. If at first you don't succeed. False hopes of self-change. *Am Psychol*. 2002;57(9):677-89.

105. Hongu N, Kataura MP, Block LM. Behavior Change Strategies for Successful Long-Term Weight Loss: Focusing on Dietary and Physical Activity Adherence, Not Weight Loss. *Journal of Extension*. 2011;49(1).

106. Robinson A.H., Norman G.J., Rock C.L., Patrick K., Sallis J.F., Calfas K.J. Validating stage of change measures for physical activity and dietary behaviors for overweight women. *Int.J.Obes.International Journal of Obesity*. 2008;32(7):1137-1144.

107. Blackburn G. Effect of degree of weight loss on health benefits. *Obes Res*. 1995;3.

108. VanWormer JJ, Martinez AM, Cosentino D, Pronk NP. Satisfaction with a weight loss program: what matters? *Am J Health Promot*. 2010;24(4).

109. Delahanty L.M. An expanded role for dietitians in maximising retention in nutrition and lifestyle intervention trials: Implications for clinical practice. *J.Hum.Nutr.Diet.Journal of Human Nutrition and Dietetics*. 2010;23(4):336-343.

110. Van Wier M.F., Dekkers J.C., Ariens G.A.M., et al. Effectiveness of phone and e-mail lifestyle counseling for long term weight control among overweight employees. *J.Occup.Environ.Med.Journal of Occupational and Environmental Medicine*. 2011;53(6):680-686.

111. Merrill RM, Aldana SG, Garrett J, Ross C. Effectiveness of a workplace wellness program for maintaining health and promoting healthy behaviors. *J Occup Environ Med*. 2011;53(7):782-7.

112. Neville B.H., Kumpfer K.L., Merrill R.M. Longitudinal outcomes of a comprehensive, incentivized worksite wellness program. *Eval.Health Prof.Evaluation and the Health Professions*. 2011;34(1):103-123.

113. Wang Y., Beydoun M.A., Caballero B., Liang L., Kumanyika S.K. Will all Americans become overweight or obese? Estimating the progression and cost of the US obesity epidemic. *Obesity Obesity*. 2008;16(10):2323-2330.

Appendix A:

Consent Form for Participation in a Research Project
University of Connecticut

Principal Investigator: Pouran D. Faghri, MD, MS, FACSM

Study Title: Incentivized Weight Loss Program for Overweight and Obese Employees at the Workplace

Invitation to Participate
We wish to thank you for taking the time and coming here today. You are invited to participate in a descriptive research study run by the University of Connecticut funded by the Center for Disease Control.

You are eligible for this study because you are a full-time employee of GHCC, at least 18 years old, at high risk for type 2 diabetes [illegible] of 10 or higher, and are willing to comply with the study by [illegible]

You may not participate in this study if [illegible] or lactating, or if you have recently lost more than 20 pounds [illegible] type 1diabetes, are taking weight loss medication, have had [illegible] therapy or radiation in the past 5 years, have or plan to have weight loss surgery [illegible] study period, have a known history of heart disease, stroke, or type 2 diabetes.

Description of the Program and Procedure
This is a one day descriptive research study, in which we are collecting data on your health, anthropometrics, and attitude and behaviors pertaining to health. As part of your participation you must sign a contract and complete the data collection survey.

Questionnaires: You will also be asked to complete a questionnaire which will ask about your job, your health or other personal characteristics. Completing this questionnaire will take approximately 20 minutes. Upon completion of the survey, anthropometric data collection, and consent form you will receive a $10.00 monetary incentive for your help in this study.

Risk and Inconveniences
There are so significant risks involving participation in this study. Your personal information will be classified, and it will not be released. As per our filing of your information, the computer database you will be part of will be locked with a password, and your hard copy of this survey will be secured in a safe locked file cabinet.

Benefits

Appendix B:

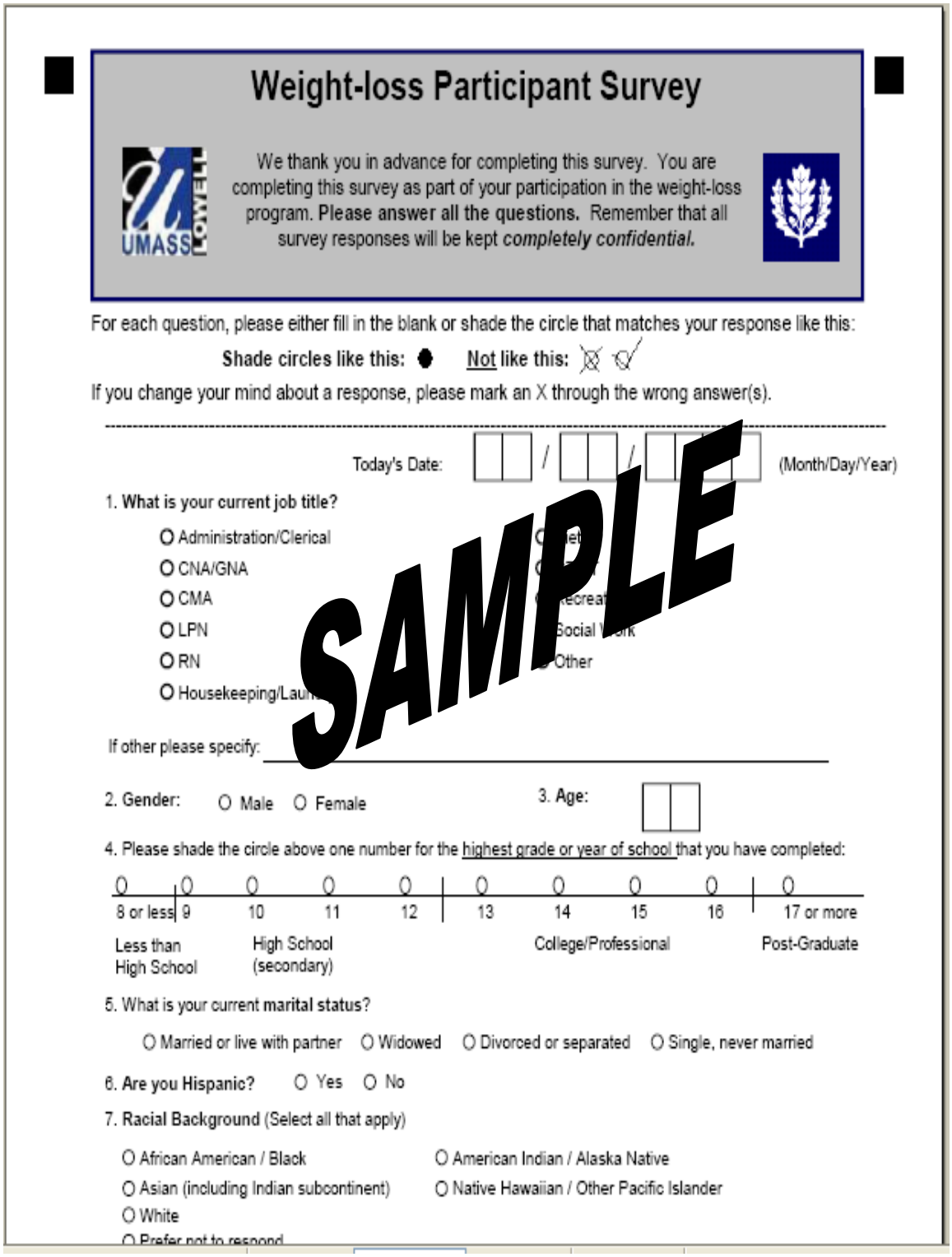
A Pound A Week
Weight Loss Challenge

Diabetes Risk Score	ID #	
	Name	

Variables		Score	Scoring
Age (years)	☐ 45 to 54		2
	☐ Over 55		3
BMI	☐ Over 25 to below 30		1
	☐ Over (and equal) 30		3
Waist circumference (cm / inches)	☐ Men, 94cm to 102cm (37 inches to < 40 inches)		3
	☐ Men, ≥ 102cm (≥ 40 inches)		4
	☐ Women, 80cm to 88cm (> 31.5 inches to < 35 inches)		3
	☐ Women, ≥ 88cm (≥ 35 inches)		4
Have you ever used drugs for high blood pressure?	☐ No		0
	☐ Yes		2
Has a physician or other health care provider ever told you that you have high blood glucose?	☐ No		0
	☐ Yes		3
Do you exercise or exert yourself in your spare time or at work at least 30 minutes on most days?	☐ No		2
	☐ Yes		0
How often do you eat vegetables and fruits or berries?	☐ Every day		0
	☐ Not every day		1
TOTAL Score			

SAMPLE

Appendix C:



Weight-loss Participant Survey

We thank you in advance for completing this survey. You are completing this survey as part of your participation in the weight-loss program. **Please answer all the questions.** Remember that all survey responses will be kept ***completely confidential.***

For each question, please either fill in the blank or shade the circle that matches your response like this:

Shade circles like this: ● **Not like this:** ⊗ ✓

If you change your mind about a response, please mark an X through the wrong answer(s).

Today's Date: ☐☐ / ☐☐ / ☐☐☐☐ (Month/Day/Year)

1. **What is your current job title?**

- O Administration/Clerical
- O CNA/GNA
- O CMA
- O LPN
- O RN
- O Housekeeping/Lau
- O Recreat
- O Social Work
- O Other

SAMPLE

If other please specify: _____

2. **Gender:** O Male O Female

3. **Age:** ☐☐

4. Please shade the circle above one number for the highest grade or year of school that you have completed:

O	O	O	O	O	O	O	O	O	O
8 or less	9	10	11	12	13	14	15	16	17 or more
Less than High School		High School (secondary)				College/Professional			Post-Graduate

5. What is your current **marital status?**

O Married or live with partner O Widowed O Divorced or separated O Single, never married

6. **Are you Hispanic?** O Yes O No

7. **Racial Background** (Select all that apply)

- O African American / Black
- O American Indian / Alaska Native
- O Asian (including Indian subcontinent)
- O Native Hawaiian / Other Pacific Islander
- O White
- O Prefer not to respond