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I, Michelle A Koford , hereby submit this original work as part of the requirements for the degree of Master of Science in Health Education (Exercise & Fitness).

It is entitled:

A Retrospective Study of the Effects of an Incentive Based Fitness and Well Being Intervention Has on Body Fat Loss and Cardiovascular Fitness at a Corporate Work Site

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A Retrospective Study of the Effects of an Incentive Based Fitness and Well Being Intervention Has on Body Fat Loss and Cardiovascular Fitness at a Corporate Work Site

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By

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Abstract

The purpose of this study was to examine if a worksite location has a potential for implementing a successful incentive based weight loss intervention within overweight employees. This study also examined the effects an incentive based weight loss intervention has on the fitness and wellbeing of employees from pretest to posttest. The following primary research questions were examined in this study: 1) Is there a significant change in body fat of employees from pretest to posttest? 2) Is there a significant change in cardiovascular fitness between pretest to posttest?. The following secondary research questions were examined in this study: 1) Is there a significant change in resting heart rate from pretest to posttest? 2) Is there a significant difference in the body fat percentage lost between females and males? 3) Is there a significant difference in the body fat percentage lost between different age groups?. Participants of this study were current employees of a corporate worksite who were interested in losing weight (N=49). Paired sample t-tests and independent sample t –tests revealed that there was a significant decrease in body fat and a significant increase in cardiovascular fitness from pretest to posttest among participants. Testing also reveled a significant decrease in resting heart rate from pretest to posttest, a significant difference in the amount of body fat percentage lost between females and males, with females losing a significant greater amount, and no difference in body fat lost between age groups. Health educators and fitness specialists when designing and implementing wellbeing and weight loss interventions within a corporate worksite should consider findings.

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Introduction

Background and Significance

In recent years, there has been a remarkable increase in the prevalence of overweight and obesity in the US population. According to the American Heart Association (AHA) and The American College of Sports Medicine (ACSM) more than 66% of the adult population is considered overweight and 35% is considered to be obese (2014; 2010). This high percentage is a call for concern for health professionals as many preventable chronic conditions have shown to be related to obesity, including cardiovascular disease (CVD), stroke, type 2 diabetes, high blood pressure, and certain types of cancers (CDC, 2013; Bruno, M., Touger-Decker, R., Byham-Gray, L., & Denmark, R., 2011). Body fat percentage values have been used to define overweight in men and women as between 21-24% and 31-36%, respectfully. Obesity has been defined in men and women as having a body fat percentage greater than 24% and greater than 37%, respectfully (Jeukendrup & Gleeson, 2010). Besides being a health risk factor, being overweight or obese can increase health care costs (Linde et al., 2012). The Centers for Disease Control and Prevention (CDC) estimated annual medical costs of obesity in the U.S. to be approximately $147 billion in 2008 whereas the individual medical costs of obesity was approximately $1500 higher than those of normal weight (2013).

Multiple factors have been reported to contribute to overweight and obesity with diet and physical inactivity being two of the most prevalent. Concerning nutrition, the daily calorie consumption of many Americans has increased over the past few decades, with many meals coming from fast food chains and being highly processed (Nash, 2003). The current recommendations for physical activity by ACSM is to participate in 150-250 minutes of moderate-intensity physical activity per week. It has been reported by Healthy People 2020 that

more than 80 percent of Americans do not meet the guidelines for physical activity (2013). In addition, The President's Council on Physical Fitness and Sports (U.S.) reported 25 percent of Americans as being physically inactive (1996).

Many barriers have been cited as preventing Americans from participating in physical activity including but not limited to: lack of time, lack of self-motivation, lack of confidence in their ability to be physically active, lack of support, and lack of facilities to perform physical activity (CDC, 2011). In addition, many Americans spend the majority of their time at an occupation that is sedentary. Anderson et al., (2009) reported innovation and technology in many industries have reduced the number of workers in physical occupations and increased the number of workers in sedentary positions. To minimize the factors related to the increase in obesity, there is a need for an increase in exercise programs which target well-being interventions in the workplace that focus on promoting healthy weight and preventing diseases related to obesity.

To address the epidemic of obesity and decrease the occurrence of chronic conditions there is a need for the assessment and management of weight among Americans. The workplace has the potential for being a successful location for program implementation as many Americans spend a large amount of their day at work. In addition, a large body of evidence now supports interventions focusing on the decrease of weight and/or CVD risk factors among employees is effective (Thorndike, 2011: Salinardi et al., 2013). The National Heart, Lung, and Blood Institute (NHLBI) has stated that losing 5-10% of your current body weight during a six-month period will lower your risk for CVD and other chronic conditions (2006). In addition to weight reduction, it has also been stated by many organizations that increasing physical activity can have benefits for lowering the risk of many chronic conditions including CVD, type 2 diabetes,

breast and colon cancer, and depression (US Department of Health and Human Services, 2013). The AHA is pushing for an increase in worksite wellness programs, and in its 2009 policy statement on Worksite Wellness Programs for Cardiovascular Disease Prevention, stated support for increasing worksite wellness programs that reduce the risk of CVD and improving the quality of life of employees (Carnethon et al., 2009)

Worksite wellness programs are not only good for employees but also directly benefit employers. Thorndike found 60% of employees receive their health insurance from their employers (2011) whereas Carnethon et al. (2009), found 25-30% of the medical costs for employers come from employees who have chronic conditions. Employers should also be concerned, as past epidemiologic research on workplace conditions have reported a correlation between greater BMI and long work hours and work related stress (Shulte et al., 2007). Obesity within the workplace has also been shown to be associated with more frequent absenteeism, sick leave, and workplace injury (Linde et al., 2012). These factors all point to a need for a change within the structure of the workplace and the implementation of more worksite wellness programs.

Worksite wellness programs have been around for decades, but only recently has there been a surge in the amount of programs focused on obesity reduction and decreasing CVD risk factors. Worksites have been shown to be effective for the implementation of well-being interventions as they can offer both social support and a friendly meeting place. Interventions focusing on behavior change have been shown to be effective in the worksite setting. In a multi-component worksite intervention using a pre-existing cardiac rehabilitation and exercise training program ½ of participants that were originally categorized as having high-risk health status dropped down to low-risk from pre-to post test (Milani, R. V., & Lavie, C. J., 2009). Face-to-

face counseling was reported to be successful at promoting an increase in physical activity in an intervention based on the transtheoretical model. The intervention had a focus on behavior change in physical activity and spanned over 9-months and concluded a significant increase in physical activity levels in the intervention group compared to the control (Proper et al., 2003). These studies are important for future research as the results proved that training initiatives which focus on behavior change appear to impact employee health and the cost of insurance for employers.

It is also important to mention wellness interventions that have not been successful at bringing significant results. In a study done by French et al. focusing on environmental factors of a worksite, it was reported that there was no significant change in BMI or physical activity from pre- to post-test (2010). Linde et al. focused on environmental changes and the prevention of weight gain and found that there was no significant change in body mass in intervention groups compared to control (2012). The current literature supports using behavior change with physical activity and/or diet change have been successful tools for aiding in weight loss and decreasing CVD risk factors. The limitations from these studies was the lack of focus on behavior change and to much focus on environment change. that none demonstrating the benefits of one-on-one personal training and incentives to aid in employee weight loss. The need for such research is great as more companies begin to utilize such facilities and begin implementing weight loss incentivized interventions within the worksite setting.

The purpose of this study was to examine the effectiveness of a incentivized weight loss intervention among employees at a corporate worksite. Specifically1) Is there a significant change in body fat of employees from pretest to posttest? 2) Is there a significant change in aerobic fitness from pretest to posttest? 3) Is there a significant change in resting heart rate from

pretest to posttest? 4) Is there a significant difference in the body fat percentage lost from pretest to posttest based on sex and age?

Methods

Participants

Participants in the present study were current employees of Proctor & Gamble (P&G) in Cincinnati, Ohio. To participate in the incentivized intervention participants had to meet three criteria. Inclusion criteria included working for the P&G Brand, "Olay", not currently engaging in physical activity on a regular basis, and willing to participate in the intervention. Employees of P&G Brand "Olay" were sent an email detailing the wellbeing program and those who were first to reply and met all criteria were selected. There was an enrollment cap of 50 participants. Being overweight or obese was not required to participate.

Procedures

The intervention was held at an onsite gym at the corporate worksite for a total of twelve weeks. The program occurred for ten weeks with two additional weeks for pretesting and posttesting. Each week, participants met with a personal trainer and received weekly general dietary information emails. In addition, there was a one-time nutrition consultation with a Registered Dietitian. An optional component of the program included participating in the Heart Mini-Marathon or Flying Pig 5K. All services for the intervention were paid for by P&G including the entry fees for the races.

This intervention included incentives with "two winners" being selected based on demonstrating physical fitness improvements and the greatest percentage of weight loss. Incentives included a membership to the onsite fitness center and a gift basket of Olay products worth $500.00.

Instrumentation

The pretesting and posttesting consisted of a series of tests that have been selected by Preventive Health Systems based on professional standards (ACSM) and their proven accuracy, applicability, accessibility, and reliability. The dependent variables in the intervention included resting measures of resting heart rate and resting blood pressure, body composition using a Bod Pod, cardiovascular assessment evaluated through a three minute step test, muscular strength assessment based on a hand grip score, and evaluation of musculoskeletal flexibility based on a sit and reach test. Before coming to the testing site participants were asked to wear workout clothes, not consume any caffeinated beverages or food, were prohibited from smoking or chewing gum containing nicotine for three hours prior to the assessment, not to take all regularly prescribed medications, and to avoid exercise 24 hours before and after the assessment. Personal trainers documented all test measures, which were then tracked in an Excel file.

Analysis

All data was analyzed using the SPSS statistical software package (Version 21.0). Frequencies, distributions, means, ranges, and standard deviations were used to describe employees' demographic characteristics. Paired sample t-tests and independent sample t –tests were used to answer the research questions. A priori, the alpha level was set at .05.

Results

A total of 49 employees participated in this study. The age of participants ranged from 22 to 58 years (Table 1) with a mean age of 37.69 ±10.264. Of those that participated, 15 (30.6%) were male and 34 (69.4%) were female.

Of those who participated in pretest measures 91.83% completed the study. The body weight of participants at pretest ranged from 96-264 Ib. with a mean of 165.29 ±41.160 (Table

2). Posttest results of body weight ranged from 94-262 Ib. with a mean of 156.989 ±39.4037. These results show a total difference of 8.301 lb. from pretest to posttest among participants. Regarding cardiovascular endurance (recovery heart rate), the pretest results ranged from 56-146 with an average of 102.35 ±20.514 (Table 2). Posttest results of the same test resulted in a range of 54-127 with an average of 93.38 ±16.074. This demonstrates a drop of 8.94 from pretest to posttest among employees. Concerning resting heart rate (RHR), individuals at pretest ranged from 52-94 bpm at pretest and 54-127 bpm at posttest (Table 2). The mean of the RHR at pretest was 74.02 ±11.136 and at posttest was 71.31 ±9.83, showing a 2.71 bpm drop in RHR. The body composition of participants ranged from a body fat percentage of 13.3%-51% at pretest with a mean of 31.22 ±8.4045 (Table 2). At posttest, the range for body composition was 13%-40% with a mean of 29.07 ±7.372. The difference between pretest to posttest was 2.152% from pretest to posttest.

We observed significant change in body composition, cardiovascular endurance, and resting heart rate form pre to posttest. At pretest, the mean of body composition was 30.31 ±7.944 (Table 3). After the intervention there was a significant decrease in body fat to 29.07 ±7.372 ($t = 6.217$, df = 43, $p < 0.001$). For Resting Heart Rate, the mean from pretest to posttest was 72.82 ±10.599 and 71.31 ±9.830 respectfully ($t = 5.079$, df = 44, $p < 0.001$). The mean cardiovascular endurance at pretest was 100.16 ±19.069 and at posttest was 93.38 ±16.074 (t =6.523, df = 44, $p < 0.001$).

When comparing differences among sexes (Table 4), results indicated that females (M ±SD = -1.5107 ±1.41608) lost .85 Ib. of body fat more then men (M ±SD = -0.6593 ±1.41608) during the duration of the study (t =2.062, df = 42, $p < .045$). Also, when comparing age among participants of the study (Table 4), participants ages 36 years and older (M ±SD = -1.5414 ±

.99877) had a higher body fat loss of 0.60 lb. compared to those who were 22 to 35 years of age (M ±SD = -.9382 ±1.54738), (t =1.536, df = 42, p < 0.132).

Discussion

Engaging in physical activity will positively impact one's health. Research indicates that increasing physical activity can result in weight loss and reduce CVD risk factors (Proper et al., 2003). However the number of Americans who do not participate in physical activity is alarming, as 80% of Americans do not reach the minimum guidelines for physical activity (Health People 2020, 2013).

With this in mind, the purpose of this study was to examine the effects of a well being intervention at a corporate worksite has on employees' examining body fat, cardiovascular fitness, and resting heart rate from pretest to posttest, and if there were a significant different in body fat percentages lost based on sex and age. Results indicated that there was a significant decrease in body fat from pretest to posttest among participants. There was a significant increase in the cardiovascular fitness of participants and a significant decrease in resting heart rate from pre- to posttest. In addition, when comparing differences is fat body lost among sexes, females were able to lose significantly more weight than males.

Concerning decreases in body fat, the current study results are supported by previous reports of physical activity and weight loss. The *American Journal of Preventative Medicine* reported a 9 month intervention focusing on behavior change in physical activity using the Patient Assessment and Counseling for Exercise and Nutrition (PACE) program (Proper et al., 2003). Though the focus of this intervention was not on weight loss, the study produced similar results with a significant change in both body fat and cardiovascular fitness. Another study, focusing on the use of pedometers to increase physical activity found a significant change in

BMI of participants from pretest to posttest (Chan, C. B., Ryan, D. A. J., & Tudor-Locke, C. 2004). Of the research studies that are available many studies are similar to Chan, C. B., Ryan, D. A. J., & Tudor-Locke, C. study which report on change in BMI, but few studies are similar to the current study and the Proper et al. study examining change in body fat within the corporate setting. Thus, additional research is needed to examine changes in this variable. The present study found a significant improvement in cardiovascular fitness from pretest to posttest; this is an important finding as few other studies have focused on change in cardiovascular fitness in regards to worksite interventions (Proper et al., 2003). Also, few studies have focused on change in heart rate from pre- to posttest and how it can affect employee health. The results of this study are important to note as changes in cardiovascular fitness have been cited as a benefit to decreasing CVD risk factors and decreasing cardiovascular mortality (President's Council on Physical Fitness and Sports (U.S.), United States. Public Health Service. Office of the Surgeon General, & National Center for Chronic Disease Prevention and Health Promotion (U.S.), 1996). Also having a lower resting heart rate has been linked to cardiovascular fitness and improved cardiac function (Mayo Clinic, 2012). The changes reported from this study in both cardiovascular fitness and resting heart rate are important for future studies in that changes in these measures could be linked to improved employee health in regards to CVD risk factors.

Regarding sex, the present study found significant differences. Females lost significantly more body fat then males. Factors that could have affected this difference could be that females may be more motivated to lose weight during an incentivized weight loss competition. Additional factors that could have lead to females losing more body fat was the fact that there were more females then males in the study or the females may have had more to lose. Future

research should examine reasons why females lost more weight than males including social factors and differences between sexes.

Concerning the amount of body fat lost based on age, there were no significant differences between groups based on age. Although it was not significant, the age group that ranged from 36-58 lost more weight than the group whose age ranged from 22-35. Factors related to this could be that the older age group had more weight to lose, may have more concerned with nutrition, or were more responsive to the study intervention. Additional research is warranted that examines reasons why the older group lost more weight than the younger age group. Incorporating food logs for dietary intake analysis and adding additional background variables to the instrument may be needed.

The intervention findings indicate positive effects in change in body fat percentage, change in cardiovascular fitness, and change in resting heart rate based on the fact that the intervention involved persistent physical activity and was motivated by incentives. Participants trained with a personal trainer once a week, holding participants accountable for working out. Previous to the beginning of the intervention participants had been engaging in no physical activity and therefore by increasing physical activity to one or more days a week there was a empirical improvement in physical health and fitness. Having the intervention be incentive based was also a motivating factor to workout more frequently as the winner of the challenge was chosen based on who became the most fit from pretest to posttest. Other worksites could use the results of this wellbeing intervention to base future interventions on increasing physical activity and focusing on fitness and less on weight loss as many interventions are based only on losing weight.

Limitations

Though this study had many significant changes, it is important to note the limitations of the study. The study lasted 10 weeks and had no long-term posttest follow up. As such, it is unclear if the intervention had a lasting effect on participants. Furthermore, the study had a limited number of participants, 49 total. A larger sample size and the inclusion of a control group would improve the quality of the evaluation. It also would have been beneficial to include weekly dietary logs to help determine if the results were based only on exercise or if diet was also involved in the results seen. Lastly, the study was strictly volunteer. Participants may have been self-motivated and interested in physical activity, which contributed to the positive results of this study.

Conclusion

In conclusion, based on the analysis done by this study several recommendations can be offered. This study demonstrates that a corporate worksite can be a successful location for wellbeing interventions that impact body fat and cardiovascular fitness. A program that focuses on personalized training within a corporate fitness center can affect an individual's health significantly even if the physical activity training is completed just one time per week. Future research is necessary to examine long-term effects of the intervention. Future research may also include additional variables regarding changes in cardiovascular fitness and resting heart rate with in the worksite population.

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Table 1
Participant Characteristics

Demographics	**Range**	**Frequency**	**M (SD)**
Age (years)	22 - 58	--	37.69 (10.264)
Sex Male Female	-- --	15 34	1.69 (.466)

N = 49

Table 2
Descriptive Statistics from Pretest to Posttest

	Range	M (SD)
Body Weight Pretest (N = 49) Posttest (N = 45)	 96-264 94-262	 165.29 (41.160) 156.989 (39.4037)
Cardiovascular Endurance (Recovery Heart Rate) Pretest (N = 49) Posttest (N = 45)	 56 - 146 54-127	 102.35 (20.514) 93.38 (16.074)
Resting Heart Rate (bpm) Pretest (N = 49) Posttest (N = 45)	 52-94 50-127	 74.02 (11.136) 71.31 (9.830)
Body Composition Pretest (N = 49) Posttest (N = 45)	 13.3-51 13-40	 31.222(8.4045) 29.07 (7.372)

Table 3
Changes in Body Composition, Resting Heart Rate, and Cardiovascular Endurance from Pretest to Posttest

	M (SD)	t	df	*p*
Body Composition				
Pretest (N = 49)	30.31 (7.944)	6.217	43	.000
Posttest (N = 45)	29.07 (7.372)			
Resting Heart Rate				
Pretest (N = 49)	72.82 (10.599)	5.079	44	.000
Posttest (N =45)	71.31 (9.830)			
Cardiovascular Endurance (Recovery Heart Rate)				
Pretest (N = 49)	100.16 (19.069)	6.523	44	.000
Posttest (N = 45)	93.38 (16.074)			

N = 49

Table 4
Body Fat Lost by Sex and Age

Body Fat Lost	M (SD)	t	df	*p*
Sex				
Male	-.6593 (.88409)	2.062	42	.045
Female	-1.5107 (1.41608)			
Age				
22-35	-.9382 (1.54738)	1.536	42	.132
36-58	-1.5414 (.99877)			

N = 49