

The Efficacy of Re-Engaging in an Employer Sponsored Weight Loss Program

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Objective: To examine the clinical benefit of re-engaging in a corporate weight loss program. **Methods:** Participants ($N=9885$, 72% women) from two large employers. The primary outcome was percent weight change (mean, 95% confidence interval [CI]) across two identical courses using a general linear model analysis. Secondary and tertiary outcomes included the use of financial incentives and those re-engaging in the course between 330 and 450 days, respectively. **Results:** We observed no significant effect for financial incentives. The entire cohort exhibited: significant weight loss after Course 1 (-4.93% , 95% CI, -5.04 , -4.81), weight regain between Course 1 and Course 2, weight loss after Course 2 (-2.30% , 95% CI, -2.40 , -2.23), resulting in significant net weight loss (-4.55% , 95% CI, -4.74 , -4.36) that was consistent for both sexes. **Conclusion:** There is clinically beneficial benefit ($\geq 3\%$) to re-engaging in a corporate weight loss program when re-engagement occurs approximately 1 year later.

Keywords: corporate health, digital health, online, prevention, web-based, weight loss

The health risks and associated medical expenses of obesity are well documented.¹ According to the World Health Organization 39% of adults (39% of men and 40% of women) aged 18 years and over were overweight and 13% were obese (11% of men and 15% of women) in 2016.² These figures carry with them an increased prevalence of heart disease, stroke, type 2 diabetes, and certain cancers.³ According to recent Centers for Disease Control statistics, the estimated annual medical costs of obesity in the United States is approximately \$147 billion annually, whereby the associated medical costs per obese individual is \$1429 higher than normal weight individuals.³ Fortunately, obesity is largely modifiable and the Behavioral Weight Loss Interventions to Prevent Obesity-Related Morbidity and Mortality in Adults: US Preventive Services Task Force Recommendation Statement (USPSTF) reported on evidence for the effectiveness of such efforts with the following conclusions.⁴ First, there is adequate evidence to conclude that intensive, multicomponent behavioral interventions in adults with obesity can lead to clinically significant improvements in weight status and reduce the incidence of type 2 diabetes among adults with obesity and elevated plasma glucose levels. Second, there is further evidence to suggest that behavior-based weight loss maintenance interventions are of moderate benefit. Finally, the harms associated with intensive, multicomponent behavioral

interventions in adults with obesity are small to none.⁴ Therefore, the continued exploration of corporate efforts to combat obesity are warranted within the workplace.

Current guidelines state that clinically significant weight loss occurs with more than or equal to 5%,^{5,6} with more recent guidelines now stating that a weight loss of more than or equal to 3% is clinically beneficial⁷ and that the maintenance of these achievements are important to health care initiatives.^{8,9} For example, studies such as Look Ahead and Diabetes Prevention Program (DPP) trials have focused on the behavioral components following an initial intervention. In DPP, a behavioral lifestyle approach focused on reducing calories and increasing physical activity, showing an approximate 4% weight loss over 2.5 years, accompanied by a reduced risk for developing diabetes in high-risk individuals.^{10,11} The Look Ahead trial used a multi-phase intervention aimed at achieving and sustaining a 7% weight loss by having individuals attend one individual and three group exercise classes, as well as replacing two meals and one snack a day with liquid shakes and meal bars for 6 months.¹² This was followed by behavioral interventions from month 7 to 12, telephone, mail, or E-mail contacts in years 2 to 4 and refresher groups and motivational campaigns three times yearly to help participants offset potential recidivism after year 4 “After 4 years, participants were offered monthly individual visits and refresher groups.” Overall, participants achieved an 8.6% weight loss after year 1 and maintained an ~5% weight loss at year 4, and 6.0% at the end of intervention (~9.7 years).¹³ In previous work by our group, we have demonstrated that worksite initiatives using a commercially available program is effective in reducing a number of mortality risk factors, such as metabolic syndrome and hypertension, in men and women.^{14,15} Both of these reports also showed an improvement in associated risk factors including total, low density lipoprotein and high density lipoprotein (HDL) cholesterol, triglycerides, and glucose. Similar findings to our previous reports have also been shown by Merrill et al¹⁶ who found clinically significant improvements in various health parameters in underweight and obese individuals continuously employed workers from 2007 to 2009.

While intervention strategies have the potential to impact weight initially, many experience regain are be unable to maintain their lost weight.^{17,18} To this end, The Clinical Guidelines on the Evaluation and Treatment of Overweight and Obesity in Adults define successful weight maintenance as maintaining less than 3 kg of weight regain over a 2-year period¹⁹ and The Institute of Medicine defines successful weight loss maintenance as losing at least 5% of initial body weight and keeping weight below this threshold for least 1 year.²⁰ The workplace offers a unique opportunity to examine the availability of continual access to programming as a means of behavioral reinforcement accompanying efforts to promote weight loss amongst employees. Our primary outcome was net weight loss percentage following participation in two online weight loss courses with approximately 1 year between classes. As a secondary outcome, we examined the impact of time between classes on weight regain, and the effects of financial incentives on weight loss. We hypothesize that re-engagement with an online weight loss program within the workplace will result in clinically beneficial weight loss defined as more than or equal to 3%.⁷

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Clinical Significance: Weight loss programming is often beset by recidivism. Online worksite programs offer employees the opportunity of retaking said programs and may serve as a behavioral reinforcement tool. Our study demonstrates re-engaging in such a program aids weight loss effort and results in both clinically beneficial (3%) and significant (5%) weight loss.

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METHODS

Participants and Recruitment

The current report describes our analysis of individuals having a BMI more than or equal to 25 kg/m² in 9885 employees from two large state government agencies. Participants were assessed before and after participating in two voluntary behaviorally oriented, commercialized weight loss courses for employees. One university offered a \$150 incentive for class participation and is described in the Statistics section below. Our study was reviewed by an ethics committee (Chesapeake IRB, Columbia, MD) and determined not to require IRB oversight according to the tenets of the US Department of Health and Human Services regulations at 45 CFR 46. Data were fully de-identified and did not contain employee names, respective places of employment, or the city/state of their residence.

Course Curriculum

Participants volunteered through their employer to participate in a corporate weight loss course (Naturally Slim, Inc., Dallas, TX), which is composed of 10 weekly classes, followed by 7 bi-weekly and 6 monthly maintenance classes for a total of 52 weeks using a Specific, Measurable, Attainable, Realistic, Time-based (SMART) behavioral goal-setting practices.^{21,22} We have presented an outline of course topics on Table 1. Participants were recruited via e-mails delivered by their employer, mailers, and flyers placed at the worksites. Depending on availability participants could volunteer to start the second class at any point after completing the first class. During their employment, employees could enroll in subsequent weight loss classes if they so desired.

Curriculum for both courses remained the same and focused on elements found in standard behavioral health programs such as self-monitoring, goal setting, stimulus control, modification of eating habits and problem solving, focusing on mindful, healthy eating, and understanding hunger signals. Participants were encouraged to partake in moderate intensity physical activity, primarily walking, per National Institute for Health consensus development panel on physical activity.²³

While the classes do not eliminate or focus on a specific food group or macronutrient, per se, emphasis is placed on reducing carbohydrate and sugar intake, particularly refined sugar, and maintaining a protein intake of 25% to 30% of total calories. Maintenance lessons were available after the 10 weeks focused on reinforcing the foundations skills learned and providing additional information on maintaining weight loss. Promoting activity and healthy handling of emotions are some of the concepts emphasized to help with weight loss during the maintenance portion of the class. Curriculum lessons used a web-based distance-learning platform and participants can watch their lessons any place with Internet access. New lessons were delivered weekly during the foundations portion and further divided into multiple segments so participants could watch them separately based on individual convenience and did not have to be watched continuously. All participants were examined via a self-reporting questionnaire regarding their awareness of metabolic risk factors as communicated to them by their personal physician which specifically asked, “Has a health care provider ever told you have: (1) high blood pressure, (2) low HDL-C, (3) NAFLD, (4), osteoarthritis, (5) pre-diabetes, (6) sleep apnea, (7) high triglycerides, (8) Type 2 diabetes or (9) gestational diabetes (Table 2).”

TABLE 1. Program Class Characteristics

Weeks 1–10 (Weekly)		Weeks 11–17 (Bi-weekly)		Last 6 months (Monthly)	
Class	Topic	Class	Topic	Class	Topic
One	Mindful eating and portion control Stimulus control Medical considerations and weight loss	One	Eating management plan review	One	Reinforcement
Two	Stop eating cues Introduction to physical activity	Two	Problem solving	Two	Review: exercise
Three	Stress and emotions Mindless eating Goal setting and problem solving Physical activity	Three	Emotional needs	Three	Maintenance
Four	Hidden sugar Mindful activities Energy balance	Four	Emotions and eating Connecting with your feelings	Four	Tips for continued success
Five	Nutrition 101 Stress management Physical activity and weight maintenance	Five	Physical activity Healthy aging	Five	Types of physical activity
Six	Weight fluctuations Food cravings versus easily accessible food CDC exercise recommendations	Six	Power of connecting Weight loss sabotage	Six	Continuing your journey
Seven	Emotions and eating Importance of self-monitoring Making exercise a habit	Seven	Keeping the weight off		
Eight	Grocery shopping and meal-planning Metabolic syndrome Cognitive behavioral techniques				
Nine	Serving sizes Social support Dealing with saboteurs				
Ten	Review of eating skills and tools Maintaining motivation Long-term action plan				

CDC, Centers for Disease Control.

TABLE 2. Characteristics of the Study Participants

	All	Women	Men
N	9885	7092	2793
Age	48.74 (11.35)	48.50 (11.23)	49.33 (11.64)
Weight, kg	95.75 (21.47)	92.00 (20.2)	105.27 (21.6)
BMI	33.42 (7.03)	33.79 (7.4)	32.46 (5.4)
Self-reported health characteristics			
High blood pressure	41%	38%	49%
Low HDL	28%	25%	33%
NAFLD	4%	4%	3%
Osteoarthritis	27%	30%	22%
Pre-diabetes	14%	15%	11%
Sleep apnea	20%	16%	29%
High triglycerides	27%	24%	32%
Type 2 diabetes	9%	9%	10%
Gestational diabetes	N/A	7%	N/A
Body weight (kg) by course start and finish			
Start of Course 1	95.75 (21.47)	92.00 (20.21)	105.27 (21.64)
End of Course 1 ^{*,†}	91.01 (21.09)	87.51 (20.09)	99.91 (20.96)
Start of Course 2 ^{*,†}	93.43 (21.69)	89.77 (20.51)	102.72 (21.83)
End of Course 2 ^{*,†}	91.31 (21.30)	87.86 (20.28)	100.07 (21.31)

Data are mean (SD) or percent (%).

HDL, high density lipoprotein; NAFLD, non-alcoholic fatty liver disease.

*Represents statistically significant from baseline.

†Significantly sex difference ($P < 0.001$).

STATISTICS

The primary outcome for our analysis was weight change expressed as the mean (kg) and percent change after completing Course 1, weight change between the end of Course 1 and the start of Course 2, change in weight between the start and end of Course 2,

and net weight change across the aforementioned assessment periods. Weight change as a percentage was calculated as mean (post class – class start and percent change [(class end – class start)/class start × 100] and in the case of the interim assessment, [(Course 1 end – Course 2 start)/Course 1 end × 100]; Fig. 1). Our secondary outcomes included the use of financial incentives offered

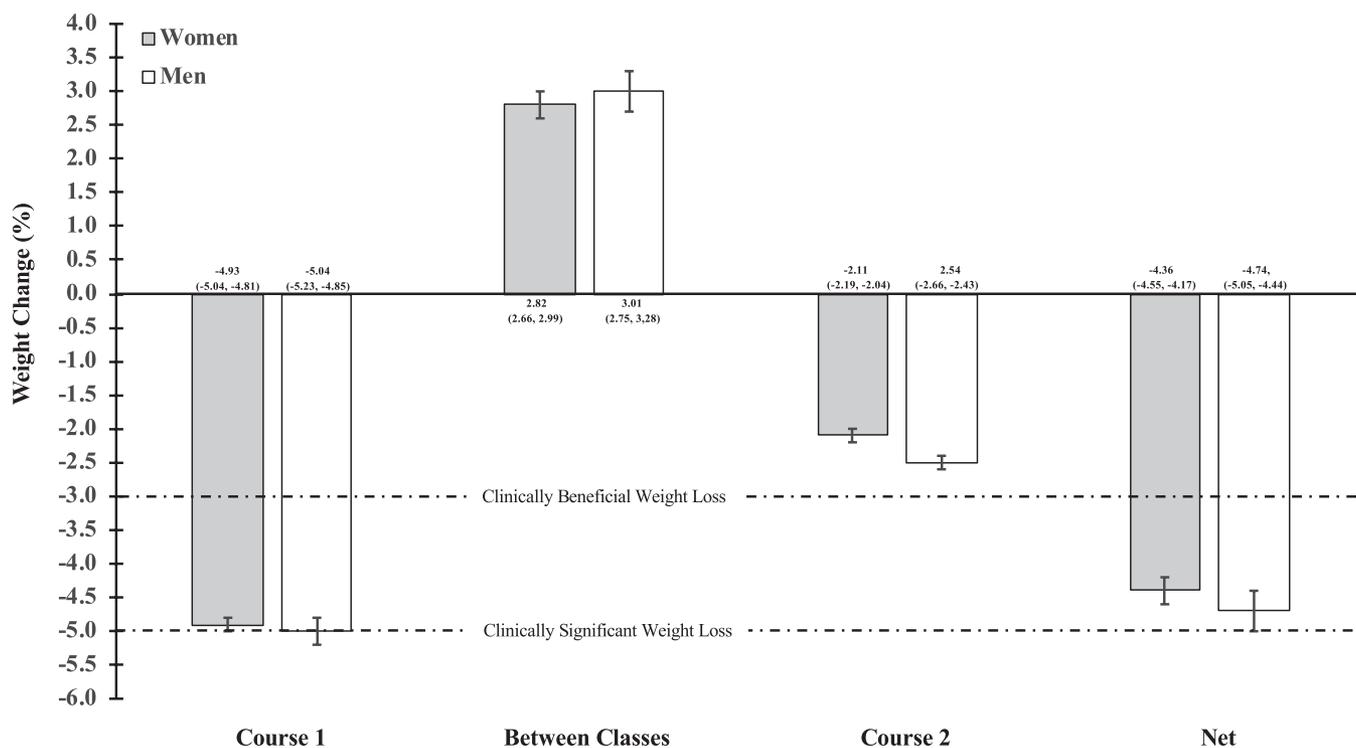


FIGURE 1. Weight change for participants following two classes. The dashed lines represent clinically beneficial (3%) and clinically significant (5%) weight loss. Data are mean percent change (95% CI). CI, confidence interval.

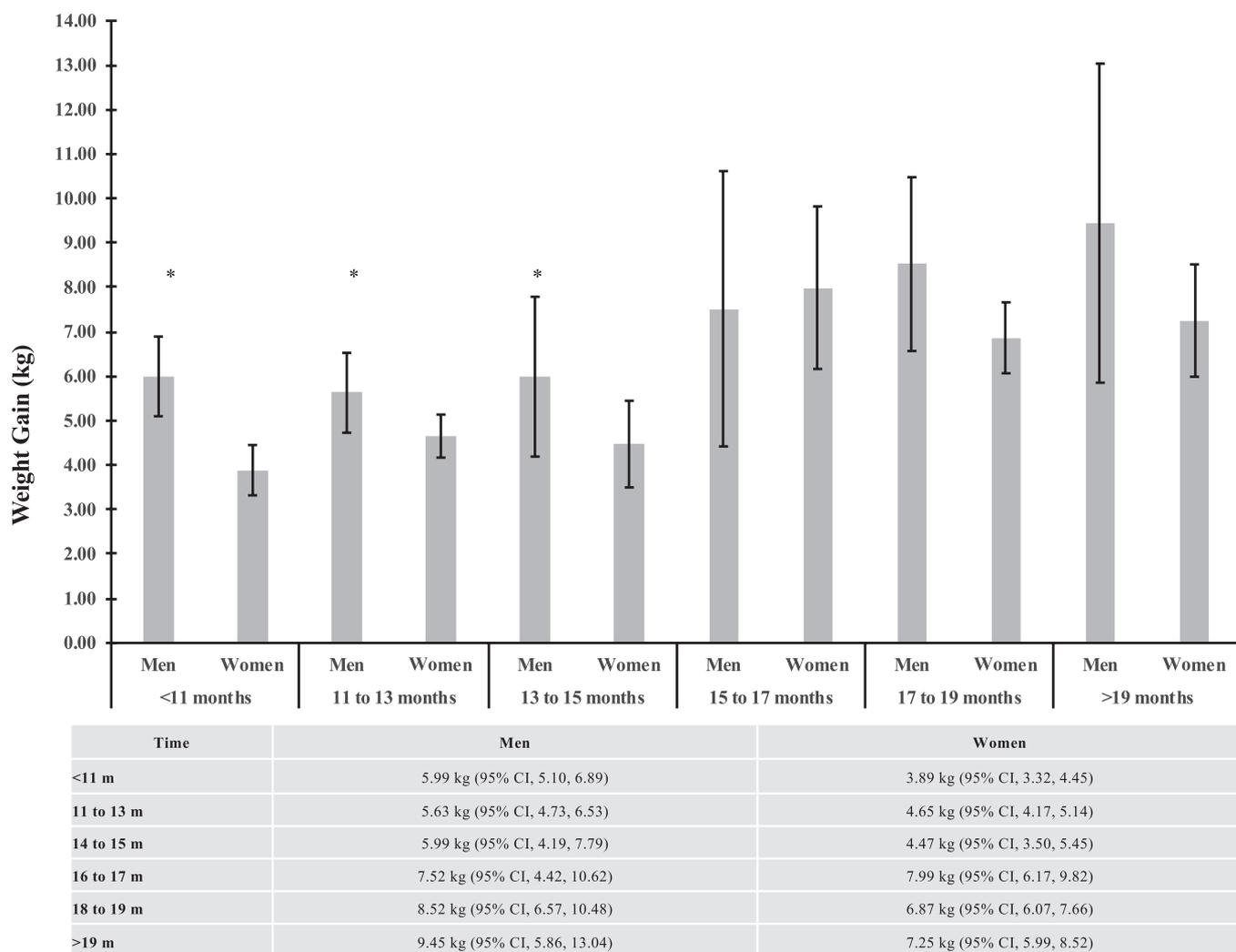


FIGURE 2. Characteristics of weight regain versus time epochs following Course 1. (*) Represents significant sex differences ($P < 0.001$). Data are mean change (95% CI). CI, confidence interval.

by one company and an analysis of weight regain associated with specific time intervals were: less than 11 months, 11 to 13 months, 14 to 15 months, 16 to 17 months, 18 to 19 months, and more than 19 months (Fig. 2). Based on this analysis of monthly epochs, we performed a post-hoc tertiary/exploratory analysis to examine the weight loss characteristics of those individuals re-engaging in the course between 330 and 450 days from completing Course 1 (mean, 375 days). All analyses were performed using General Linear Models (GLM). Finding no statistical effects for receiving a financial incentive, we herein report the findings of the cohort omitting stratification by financial incentive. All reported P values are two-sided. Data reported as mean (SD), mean change (95% CI), or N (%) unless otherwise noted. For readers unfamiliar with the interpretation of confidence intervals, values crossing zero are not considered statistically significant, while those not crossing zero are considered statistically significant. Lastly, we will use and have defined clinically significant weight loss as more than or equal to 5%^{5,6} clinically beneficial weight loss as more than or equal to 3%.⁷

RESULTS

Overall, we examined 9885 participants (7092 women, 2793 men) averaging in age of 49 (SD, 11) years and weighing 95.7 kg

(21.5) kg. The average BMI for the cohort was 33.4 (7.0) kg/m². Self-reported health characteristics the whole cohort are as follow: high blood pressure (41%), low HDL-C (28%), non-alcoholic fatty liver disease (4%), osteoarthritis (27%), pre-diabetes (24%), sleep apnea (20%), high triglycerides (27%), and type II diabetes (9%). Further stratification by sex for these characteristics are presented in Table 2. The average time between Course 1 and Course 2 was 372 (154) days: 387 (138) days for women, 356 (170) days for men and ranged from 56 to 945 days. Overall, we observed statistically significant weight loss for the combined cohort following Course 1, statistically significant weight regain between Course 1 and Course 2, statistically significant weight loss after Course 2, equating to a statistically significant net weight loss following both classes (all, $P < 0.001$). We have presented specific sex findings below.

Primary Outcome

When expressed in absolute terms (kg), men demonstrated statistically significant weight loss following Course 1 (−5.36 kg [95% CI, −5.55, −5.17]) followed by a period of statistically significant weight regain (2.81 kg [95% CI, 2.58, 3.04]) between classes. After Course 2 men exhibited statistically significant weight loss again (−2.65 kg [95% CI, −2.76, −2.54]) for a net weight loss

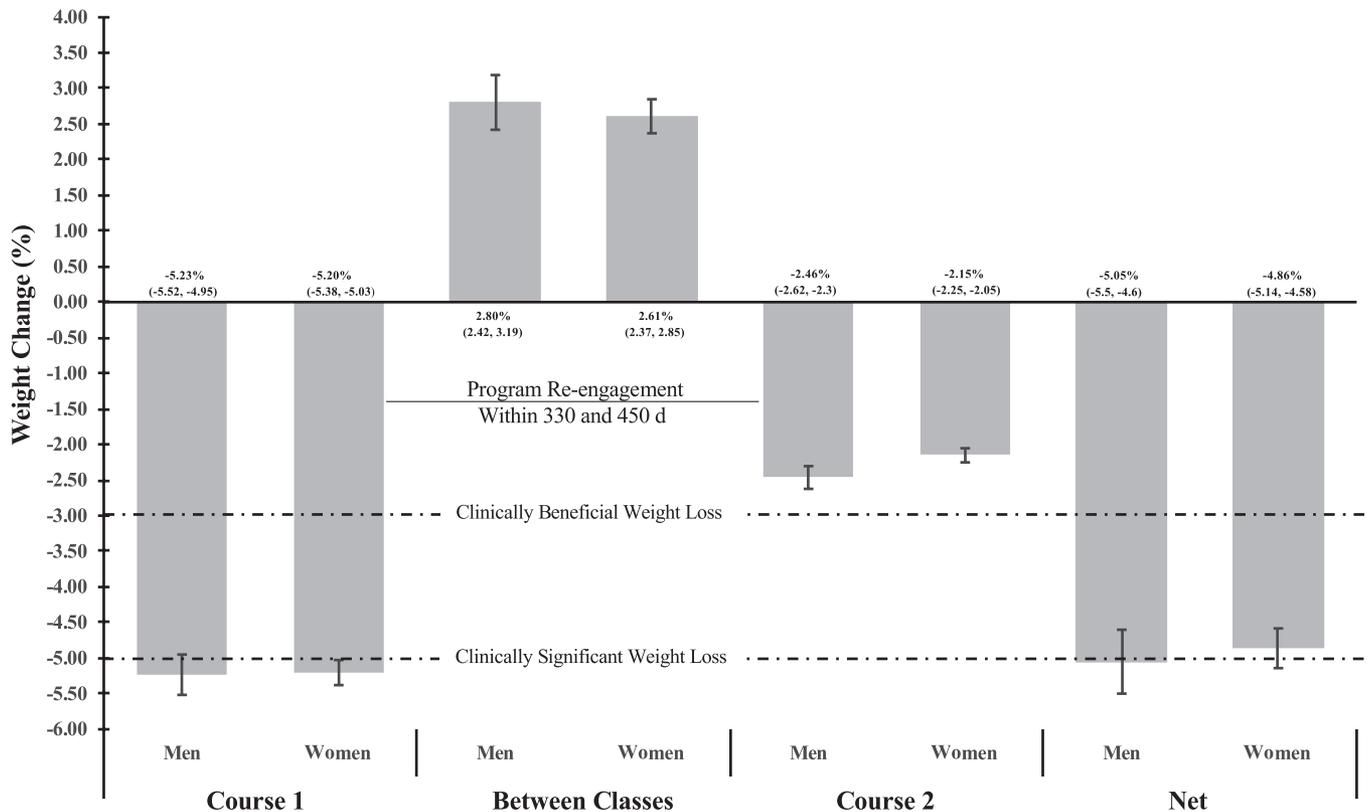


FIGURE 3. Sub-group ($N=4787$) analysis of weight change for participants re-engaging Course 2 between 330 and 450 days from completing Course 1 (mean, 375 days). The dashed lines represent clinically beneficial (3%) and clinically significant (5%) weight loss. Data are mean percent change (95% CI). CI, confidence interval.

(-5.19 kg [95% CI, -5.49 , -4.90]) over the study period. Women exhibited similar results, demonstrating statistically significant weight loss following Course 1 (-4.49 kg [95% CI, -4.61 , -4.34]), followed by statistically significant weight regain (2.26 kg [95% CI, 2.12 , 2.41]) between classes. After Course 2, women lost statistically significant weight again (-1.91 kg [95% CI, -1.98 , -1.84]) for a net weight loss (-4.13 kg [95% CI, -4.32 , -3.95]). We have presented the relative changes (%) in weight in Fig. 1.

Secondary Outcomes

We observed statistically significant weight regain that effectively plateaued through 15 months after completing Course 1 (men ~ 2.61 kg, women ~ 1.95 kg), followed by a further statistically significant increases in weight starting at 15 months and persisting up to and through 19 months (Fig. 3). For this latter analysis, we observed statistically significant sex differences for the time epochs of less than 11 months, 11 to 13 months, and 13 to 15 months (all, $P < 0.001$); however, no further statistically significant sex effects were observed after 15 months despite a continued statistically significant increase in weight. To further explore this pattern, only those individuals ($N = 4787$; 72% women) completing two classes between 330 and 450 days (mean, 375 days, Fig. 2).

Tertiary Outcomes

Within our subgroup analysis, both men and women achieved statistically significant weight loss when Course 2 was retaken between 330 and 450 days (Fig. 3). In absolute terms (kg), the results for men were statistically significant changes in weight following: Course 1 (-5.36 kg [95% CI, -5.54 , -5.17]), between classes (2.81 kg [95% CI, 2.58 , 3.04]), Course 2 (-2.65 kg [95% CI,

-2.77 , -2.53]), Net (-5.19 kg [95% CI, -5.49 , -4.90]). Our findings in women demonstrated the same statistically significant pattern: Course 1 (-4.90 kg [95% CI, -4.61 , -4.34]), between Classes (2.26 kg [95% CI, 2.11 , 2.41]), Course 2 (-1.91 kg [95% CI, -1.98 , -1.83]), Net (-4.13 kg [95% CI, -4.32 , -3.95]).

DISCUSSION

Our analysis demonstrates that a commercial, web-based, worksite course that targets weight loss is effective in reducing weight when employees are given continued access to the course. In brief, participants lost weight following the Course 1, experienced modest weight regain between Course 1 and Course 2, lost weight again following Course 2, resulting a statistically significant net loss in weight loss after program re-engagement. Thus, we accept our research hypothesis that re-engagement with an online weight loss program within the workplace will result in clinically beneficial weight loss. Our sub-group analysis showed that those taking their second class between 330 and 450 days experienced a net effect resulting in clinically significant or near clinically significant weight loss for men and women, respectively. Our tertiary/exploratory analysis, suggests that the weight regained between classes is consistent through ~ 15 months, increasing further after 15 months, and thru and beyond 19 months. Our results are comparable to the two largest, multi-year studies, Look Ahead and Diabetes Prevention Program (DPP).

In the Look Ahead trial, individuals participated in a multi-phase intervention targeting an initial and sustainable weight loss of more than 7%. Subsequent intervention phases included (a) participation in one individual and three group exercise classes in addition to replacing two meals and one snack a day with liquid shakes and

meal bars (6 m) and (b) one individual and two group meetings per month and continue to replace one meal per day accompanied by a more intensive behavioral intervention (months 7 to 12). In years 2 to 4, treatment was provided mostly on an individual basis via monthly site visits, as well as contact by telephone, mail, or e-mail. Finally, short-term (6 to 8 weeks) refresher groups and motivational campaigns were offered three times yearly to help participants reverse small weight gains and after 4 years, participants were offered monthly individual visits and refresher groups.¹² This approach proved successful weight loss for the lifestyle intervention portion of Look Ahead participants demonstrated an 8.6% weight loss at year 1, a maintenance of nearly ~5% at 4 years, and 6.0% at the end of intervention at approximately 9.7 years.¹³

When examining all DPP participants, individuals in the lifestyle arm demonstrated significant weight loss after one year (~7 kg); yet, demonstrated continual regain through year four, where participants remained ~2 kg lower than at trial entry through year 10. These results differed somewhat by age category.²⁴ Despite the observed overall weight regain, it should be noted that adults generally gain weight at a rate of 0.45 to 0.91 kg/yr^{25,26}; ergo, DPP was effective at attenuating weight gain over a decade of study. The strengths of Look Ahead and DPP are their strong clinical approaches. A question that requires further examination is the effectiveness of behavioral based programs within corporate health care.

Several reports support the premise that weight loss programs are effective when conducted in-person, as well as programs using web-based or telephonic-based programs.^{27–29} In 2001, Tate et al,³⁰ demonstrated the effectiveness of a structured Internet behavioral weight loss program in 91 healthy, overweight adult hospital employees aged 18 to 60 years with a body mass index of 25 to 36 kg/m². In their randomized, controlled trial lasting more than 6-months, one group ($n = 32$) received one personal weight loss lesson and access to a Web site with organized links to Internet weight loss resources. Another group ($n = 33$) received additional behavioral procedures. At the study's conclusion, the behavioral therapy group lost (mean [SD]) 4.0 (2.8) kg after 3 months and 4.1 (4.5) kg after 6 months, while those in the Internet based group smaller weight loss changes: 1.7 (2.7) kg at 3 months and 1.6 (3.3) kg at 6 months. Despite the relatively small sample size, those undertaking a structured behavioral treatment program with weekly contact and individualized feedback demonstrated better weight loss compared with those given links to educational Web sites only. In 2010, Touger-Decker et al³¹ reported on the effectiveness of a 12-week workplace intervention using an In-person and Internet-based delivery approach. All participants received identical interventions with dietitian visits at baseline and weeks 6, 12, and 26. Overall, no significant treatment effects were observed between treatment approaches and both groups demonstrated significant weight body-fat, and energy intake at week-12. While this study utilized a dietitian, the findings reinforce the use of on-line programming within the workplace. With respect to workplace weight loss programming via a commercial program, Hortsman et al,³² recently reported findings from 96 companies and 437,215 eligible adults. In their report they observed that in the first 12 months of programming, those attending at least one session achieved a weight loss of 2.8, with 23% achieving a weight loss of more than or equal to 5%. Further, active participants ($n = 38,836$) achieved a weight loss of 3.5% and 29% of those participants achieved a weight loss of 5%. Finally, program completers ($n = 27,164$) achieved an average weight loss of 4.3% body weight, with 36% of the cohort achieving a weight loss of 5%.

Limitations

Our study is not without limitations. Limitations to our study include the lack of a control group, an absence of dietary records,

and actual clinical measurements relative to self-reported risk factors versus a primary care detailed risk factor assessment. Subsequently, we cannot report on clinical risk factor follow-up results. However, previous research from our group using similar programming in a different cohort has demonstrated a statistically significant reduction in hypertension, metabolic syndrome, and associated risk factors. For example, in 2015, we demonstrated in 3880 individuals a significant reduction in the prevalence of metabolic syndrome in men (26%) and women (30%) categorized by BMI determined weight categories following a 10-week weight loss program.¹⁴ This same program was followed by our 2017 report demonstrating a significant reduction in the prevalence of hypertension in 5998 employees from 93 companies for individuals achieving clinically significant weight loss.¹⁵ Both of these reports demonstrated an improvement in various risk factors including total, low density lipoprotein, and HDL cholesterol, triglycerides, and glucose concentrations. Our exploratory analysis is likely to be under-powered to determine the true clinical utility of taking a third class. However, the net pattern for effectiveness is consistent to our overall findings and will be a matter of continued interest to our group. Lastly, we did not explore the potential mechanisms or the behavioral motivation behind our results. Recently, Feldman et al³³ examined participants within a weight and found that participants at the action stage of physical activity, on average, lost weight as did those in the precontemplation stage of physical activity when compared with a maintenance group, ultimately concluding that readiness for change for activity may be a predictor of weight change, and may predict the likelihood of achieving clinically significant weight loss. A strength of our study is that we examined a large cohort of individuals demonstrating a net weight of clinically significant or near clinically significant weight loss. Additionally, we were able to show the financial incentive utilized by one company had no significant effect on our study results that participants may have been more intrinsically motivated regarding their desire to lose weight. Finally, it is important to emphasize the practical benefit of our findings. In 2013, Kushner and Ryan⁹ concluded, that individuals who are overweight or obese undertake comprehensive lifestyle treatment by intensive intervention via a clinician's office or by referral to a registered dietitian or commercial weight loss program. The paper further suggests that treatment strategies include face-to-face or telephonic strategies for maintenance; yet make no mention of web-based delivery methodologies. In the current study, we have demonstrated that a web-based commercial weight loss program was successful for initially losing weight loss and that the weight loss achieved is minimally, clinically beneficial, often approaches or achieves clinical significance.

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