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Research Article

Motivation for Participating in a Weight Loss Program and Financial Incentives: An Analysis from a Randomized Trial

Melissa M. Crane,[1] Deborah F. Tate,[2] Eric A. Finkelstein,[3] and Laura A. Linnan[1]

[1] *Department of Health Behavior, UNC Gillings School of Global Public Health, The University of North Carolina at Chapel Hill, 1700 Martin Luther King Jr. Boulevard, Campus Box 7294, Chapel Hill, NC 27514, USA*
[2] *Departments of Health Behavior and Nutrition, UNC Gillings School of Global Public Health, The University of North Carolina at Chapel Hill, 1700 Martin Luther King Jr. Boulevard, Campus Box 7294, Chapel Hill, NC 27514, USA*
[3] *Duke-NUS Graduate Medical School Singapore, Singapore 169857*

Correspondence should be addressed to Melissa M. Crane, mmcrane@email.unc.edu

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This analysis investigated if changes in autonomous or controlled motivation for participation in a weight loss program differed between individuals offered a financial incentive for weight loss compared to individuals not offered an incentive. Additionally, the same relationships were tested among those who lost weight and either received or did not receive an incentive. This analysis used data from a year-long randomized worksite weight loss program that randomly assigned employees in each worksite to either a low-intensity weight loss program or the same program plus small financial incentives for weight loss ($5.00 per percentage of initial weight lost). There were no differences in changes between groups on motivation during the study, however, increases in autonomous motivation were consistently associated with greater weight losses. This suggests that the small incentives used in this program did not lead to increases in controlled motivation nor did they undermine autonomous motivation. Future studies are needed to evaluate the magnitude and timing of incentives to more fully understand the relationship between incentives and motivation.

1. Introduction

In today's obesogenic environment, losing weight through behavioral means can be a difficult task that requires a high level of self-monitoring, making healthy choices in the face of more desirable choices, and working against longstanding eating and physical activity habits. To overcome these barriers and successfully lose weight, high levels of motivation for weight loss and participation in a weight loss program are required. There is some evidence to suggest that this motivation drops during the course of a weight loss attempt. For example, adherence to weight loss recommendations such as self-monitoring, typically start at a high level and drop over time [1]. One possible way to help encourage participants to continue the behaviors needed for weight loss after motivation has waned is to provide financial incentives for weight loss.

Financial incentives have been used as a way to encourage individuals to take part in preventative health behaviors, such as weight loss. A review by Kane et al. [2] found that for a variety of preventive health behaviors, introducing financial incentives led to an increase in positive health behaviors. Looking specifically at weight loss, financial incentives have often been used in one of two ways. First, researchers have used behavioral deposit contracts. In these programs, participants are asked to deposit a set amount of money to participate in the program. They can earn the money back if they reach the study weight loss goal(s). The results from these studies have been generally positive in the short term (e.g., [3]). Another approach for using financial incentives is to provide an incentive, such as money or entry into a lottery for money, to the participant for meeting a specified target or for each pound lost (i.e., there is no deposit required). Finkelstein and colleagues [4] used this approach and tested

different levels of payment for weight loss ($5, $7, and $14 per percent of initial weight lost) as well as different payment schedules (consistent, early payment only, late payment only). The findings suggested that weight loss was associated with the magnitude of payment at the first follow-up visit and was associated with retention at the second follow-up. Finally, a study published in 2008 compared the effect of behavioral contracts (deposits were matched by the study), to a lottery for a financial reward, to a no financial incentive condition [5]. During the 16-week study, weight losses were greater in both of the financial incentive arms compared to the control arm. For a more comprehensive review of financial incentives and their role in weight loss, please see [6].

Despite the short-term positive outcomes when using financial incentives, controversy surrounding the long-term impacts of these incentives remains. Much of this controversy stems from the Cognitive Evaluation Theory (CET) by Deci and Ryan [7]. This theory suggests that providing tangible external rewards for a behavior that is interesting will lead to a reduction in intrinsic motivation for the behavior. This theory was developed in response to a number of laboratory studies that compared the intrinsic motivation of individuals doing a task that is considering interesting, such as completing a word puzzle, in exchange for a reward to individuals completing the same task without the reward. A consistent finding in these studies was that when participants had prior knowledge that they would receive a reward for completing the activity, their intrinsic motivation for the task was lower than the comparison group's who were not given rewards [8]. This conclusion held in cases where rewards were task contingent (i.e., participants were rewarded for doing the task) as well as when rewards were performance contingent (i.e., participants had to complete the task at a certain level to receive the reward). Deci and colleagues suggest that the decrease in intrinsic motivation is a reaction caused by shifting the focus from doing the activity for the purpose of self-improvement and because it is interesting to a focus on earning the reward. The proposition of rewards decreasing intrinsic motivation is a part of the meta theory developed by Deci and Ryan: Self-Determination Theory [9]. This broader theory suggests that for a behavior to be instigated and continued, an individual must feel that they are doing a behavior to better themselves, and they are inspired to carry out the behavior of their own will. In other words, the person is autonomously motivated. Conversely, if an individual engages in a behavior in reaction to outside forces (i.e., they are demonstrating controlled motivation), the behavior is not likely to be continued. The authors suggest that practitioners who are interested in helping others to change behavior should do so in a manner that encourages participants to maintain high levels of autonomy.

Despite the popularity of CET, there are critics who believe the utility of this theory is limited to specific circumstances. For example, Eisenberger and colleagues responded to Deci and Ryan's theory suggesting that the meta-analysis published in 1999 overstated the reach of the undermining effect of rewards. Specifically, they argue that undermining occurs mostly for task contingent rewards and that performance contingent rewards can actually increase intrinsic motivation [10]. More recent work suggests the tenants of CET hold true but only for those who have control-oriented causal orientation (i.e., those who view their behavior as highly influenced by forces outside of themselves) [11]. These studies, along with the limited conditions under which the CET theory has been tested (viz., in laboratory settings), lead to a need to test CET in alternative contexts. Specifically, it is important to test this theory in a situation where incentives may be used to promote long-term behavior change.

If CET extends to health behaviors, use of financial incentives may be problematic because autonomous motivations for weight loss, exercise, and continuing in the weight loss program have all been found to be associated with weight loss success during weight loss programs. Williams and colleagues found that autonomous motivation to remain in a weight loss program measured early in a weight reduction program was predictive of weight loss at 23-month follow-up [12]. Similarly, Webber and colleagues found that autonomous motivation for participating in a weight loss program measured shortly after a weight loss program began was predictive of overall weight loss in a 16-week intervention [13]. Interestingly, neither autonomous motivation for participating in the weight loss program measured prior to the program beginning nor controlled motivation measured at any time were predictive of weight loss in this study. Other studies have found that autonomous motivation for exercise is also associated with greater weight losses [14, 15]. Finally, researchers found that a behavioral weight loss intervention developed to enhance autonomous motivation was more successful than a health education control group [16].

As a result of autonomous motivation consistently predicting weight loss success, there is a need to understand whether the CET proposition regarding changes in motivation that occur after an external reward is given holds true in weight loss programs when financial incentives are used. Some argue that intrinsic motivation, as described by SDT, is not relevant to health behaviors because these behaviors are not inherently interesting [15]. However, exercise, a major predictor of weight loss [17], can be interesting, and intrinsic motivation for exercise has been found to be associated with weight loss [18]. Therefore, research is needed to understand which types of tasks CET can be applied to and in what contexts. Despite the uncertainty regarding how interesting weight loss behaviors really are, offering financial incentives could still be construed by participants as controlling, therefore, leading to decreases in autonomous motivation. If this is the case, the shift in internalized motivation seen in studies of interesting behaviors could extend to health behaviors, making offering financial incentives detrimental once the incentives end. In other words, providing a financial incentive may undermine autonomous motivation for participating in a weight loss program and instead lead to increases in controlled motivation. This shift then may lead to limited maintenance of weight loss behaviors beyond the formal weight loss program.

This paper tested the extension of CET and SDT to financial incentives for weight loss within a worksite weight loss program. This extension was tested in two ways. First, it tested whether there were decreases in autonomous or increases in controlled motivation for participating in a weight

loss program among participants randomized to receive an offer of a financial incentive as compared to those who were randomized not to receive an offer of a financial incentive. Secondly, this study investigated whether there are decreases in autonomous motivation for participating in a weight loss program among individuals who lost weight and were randomized to receive an incentive as compared to those who lost weight and were randomized to an intervention that did not receive a financial incentive. This study also investigated whether there were differential increases in controlled motivation among the same groups. Because the incentive in this study was performance contingent, not everyone who was offered an incentive ultimately received payment. Presumably, if there is a negative effect of a financial incentive, it may be strongest for those who actually receive the incentive as opposed to those who only receive the offer. Studying both the offer and the receipt of the incentive will provide maximal insight into the effects of the incentives on motivation for participating in a weight loss program.

2. Methods

Data for this analysis are from the "WAY (Worksite Activities for You) to Health" research study, a large group randomized, worksite-based intervention trial. This trial was designed to test the effects of two minimal intensity weight loss interventions compared to a "usual care" healthy dining program among overweight/obese employees at 17 community college worksites from the North Carolina Community College System. All participating campuses had access to the Winner's Circle Dining Program (WC), a program focused on increasing access to healthier food options at work [19].

2.1. Study Design. Overweight employees at campuses enrolled in the research study received one of the following interventions: Winners Circle (WC) only (not included in this analysis), WC + Web-based weight loss program (WEB), or WC + WEB + cash incentives for weight loss (Web plus Incentives; WPI). For colleges assigned to the WEB and WPI groups, the employees were offered the opportunity to access a self-directed study website which included behavioral weight control lessons, an online study progress tracking system, and weekly tips. This intervention was modeled after the self-directed weight loss intervention described by Tate and colleagues but involved no ongoing professional E-mail support [20]. For participants randomized to WPI, the website was identical to the WEB condition but also showed a personalized incentive chart showing exactly how much the participant would earn (cash incentive) for the weight loss achieved at each follow-up measurement when his/her baseline weight was compared to follow-up weight. Participants were offered $5.00 for each 1% of their initial body weight lost at the 3-, 6-, and 12-month assessment visits, up to 10%. Thus, a participant could earn a maximum cash incentive of $150 over the duration of the study if he/she lost 10% of baseline weight at 3 months and maintained that weight loss at the 6- and 12-month follow-ups. This level of incentive was chosen because it was identified during pilot work as being a feasible level of payment to be offered as part of an employer sponsored weight loss program. To maximize retention, all participants who completed follow-up assessment visits received a stipend of $5, $10, and $20 for the 3-, 6-, and 12-month assessments, regardless of weight loss status. Using the language of Deci and Ryan, the incentives provided for weight loss would be considered performance-contingent rewards, while the stipends for completing the assessments would be considered task-contingent [7].

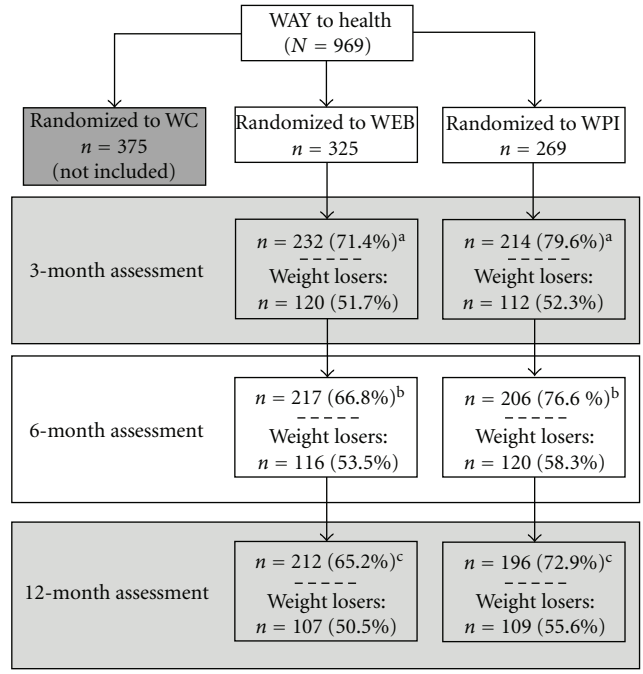

Figure 1: Participant flow diagram. Note. Randomizations numbers refer the number of cases who were randomized to intervention groups and reminded eligible throughout the study. The top values for each subsequent assessment point represent the number of individuals for whom their objective weight and/or TSRQ values are available. The bottom values report the number of individuals who had lost at least 0.5% of their initial body weight. The lower percentage is the proportion of the returning participants who lost weight during that assessment period. [a]$\chi^2 = 4.82$, $df = 1$, $P = 0.03$; [b]$\chi^2 = 6.91$, $df = 1$, $P = 0.009$; [c]$\chi^2 = 3.99$, $df = 1$, $P = 0.05$.

The study protocol for WAY to Health was approved by the IRB at the University of North Carolina Chapel Hill and Research Triangle Institute.

2.2. Participants. This analysis includes only data from participants from community colleges randomized to the WEB and WPI intervention arms of the WAY (Worksite Activities for You) to Health trial (see Figure 1). This decision was made because the focus of this study is on comparing the effect of the offer or receipt of incentives on motivation. Because the WEB and WPI group vary only on the presence of incentives, comparing these two groups provides a clear comparison in which to test this study's hypotheses. The effect of incentives on motivation was investigated in two ways. First, the impact of the *offer* of incentives was investigated using participants who were randomized into either

Table 1: Baseline demographic characteristics.

	All participants ($N = 594$)	WEB ($n = 325$)	WPI ($n = 269$)	P value
Age (years; M ± SD)	47.68 ± 9.72	47.61 ± 10.03	47.75 ± 9.35	0.86
Weight (kg)	92.87 ± 20.27	93.83 ± 20.75	91.71 ± 19.66	0.21
BMI (kg/m^2)	33.50 ± 6.59	33.36 ± 6.58	33.65 ± 6.62	0.60
Autonomous motivation	5.66 ± 0.95	5.63 ± 1.00	5.68 ± 0.88	0.55
Controlled motivation	2.24 ± 1.05	2.26 ± 1.07	2.21 ± 1.02	0.59
College education or higher (n, %)	369 (62.1%)	204 (62.8)	165 (61.3)	0.74
Female	463 (77.9)	237 (72.9)	226 (84.0)	<0.001
Married	413 (69.5)	230 (70.8)	183 (68.0)	0.52
White/Non-Hispanic	487 (82.0)	268 (82.5)	219 (81.4)	0.86

*Note. Values are mean ± standard deviation. No responses were given for specific demographic questions: education status ($n = 28$), gender ($n = 28$), marital status ($n = 29$), and race ($n = 31$).

the WEB or WPI intervention groups and attended the follow-up assessments at 3, 6, and/or 12 months. Second, in order to investigate changes in motivation over time from *receipt* of an incentive apart from changes in motivation caused by weight loss, the second set of analyses will utilize data only from individuals who lost weight at either the 3-month or 6-month assessment. Weight losers were defined as participants who lost a minimum of 0.5% of their initial body weight (the minimum weight loss that was eligible for an incentive within the WPI intervention).

Ten community colleges were randomized into the WEB and WPI study arms. Within these groups, there were 5 colleges assigned to each condition. The sample includes 594 individuals who remained eligible for the duration of the study. Bivariate analyses were used to test for differences in baseline demographic and anthropomorphic characteristics and motivation variables between the WEB and WPI groups. The WEB and WPI were similar at baseline, although WPI contained more women than WEB ($\chi^2 = 14.52$, $df = 1$, $P < 0.001$; see Table 1). Participants from WPI group were more likely to return for follow-up assessments than those from the WEB group (P's ≤ 0.05). Returning participants in the WEB and WPI groups were demographically similar (all P's > 0.06), with the exception of gender. Similar to the overall group composition, there were more women in the returning WPI group than the WEB group (3 months: $\chi^2 = 7.23$, $df = 1$, $P = 0.007$; 6 months: $\chi^2 = 9.08$, $df = 1$, $P = 0.003$; 12 months: $\chi^2 = 4.67$, $df = 1$, $P = 0.03$).

Among the weight losers ($n = 300$), there were significantly more women in the WPI group (90.2%) than the WEB group at the 6-month assessment (79.1%, $\chi^2 = 5.26$, $df = 1$, $P = 0.02$). For the remaining variables, there were no significant differences between the groups (all P's > 0.15). Because of the difference in gender representation of the groups, gender was entered as a covariate in all analyses.

2.3. Measures. Study staff, blinded to treatment condition, collected objective weight measurements at the start of the program and at months 3, 6, and 12. Participants were weighed with shoes off, wearing light street clothing using a digital scale (Tanita BWB, 800). Measurements were recorded to the nearest tenth of a pound. Weight change was computed by subtracting the baseline weight from the weight at each follow-up assessment visit.

Motivation for participating in a weight loss program was measured using the Treatment Self-Regulation Questionnaire [21] and was completed at the same time points as the weight measurements. This questionnaire assesses motivation for starting, or continuing, participation in a weight loss program via the participant's endorsement of statements of autonomous and controlled motivation. An example item from the autonomous subscale is "I have remained in this program because I feel like it is the best way to help myself." The controlled subscale included items such as "I have remained in the program because others would have been angry at me if I did not." Responses to these items were given on a scale of 1 ("Not at all true") to 7 ("Very true") and were averaged to indicate a summary assessment of autonomous and controlled motivation. At baseline, participants completed the full TSRQ assessing motivation to begin a weight loss program; a subset of items assessing motivation to continue in a weight loss program were used at later assessments to reduce participant burden. The autonomous motivation subscale included 6 items at baseline and 3 items thereafter. The internal consistency of this scale at the four time points ranged from 0.63 to 0.78 (Cronbach's coefficient alpha). The controlled motivation subscale included 12 items at baseline and 5 items thereafter. The internal consistencies of these scales were also acceptable with values between 0.66 and 0.88.

2.4. Statistical Analysis. The primary aim of this analysis was to test whether the offer or receipt of an incentive would lead individuals to show differential changes in autonomous and controlled motivation for remaining in a weight loss program. For the first set of analyses, the motivation to remain in a weight loss program of individuals who were randomized to receive an offer of a financial incentive were compared to those in the same program but were randomized not to receive the offer of the incentive. It was hypothesized that among those who were offered a financial incentive (WPI), autonomous motivation would decrease at a greater rate than those who were not offered an incentive (WEB). Conversely, controlled motivation was hypothesized to increase in WPI at a greater rate than in WEB. The second set of analyses compared the motivation of individuals who received an incentive for weight loss relative to individuals who also lost weight but were randomized to a condition that did not provide an incentive. Again it was hypothesized that WPI would show greater decreases in autonomous motivation after the receipt of the incentive than WEB. Controlled motivation was expected to increase in WPI compared to WEB. To test

these hypotheses, PROC MIXED was used to test mixed effect regressions. The first level of the models included the individual growth curves and the time varying covariate weight loss (kilograms of weight loss). The second level included gender as a control variable, the dummy variable for intervention group, and the interaction term between month and the intervention group. A third level of the model was tested that would account for the nesting of employees within the worksite. However, this model was ultimately rejected because there was too little variance at the third level to estimate random intercepts. The final model tested used the following equations:

$$\begin{aligned}
\text{Level 1}: \; & Y_{ij} = \beta_{0j} + \beta_{1j}(\text{Month})_{ij} + \beta_{2j}(\text{Weight Change})_{ij} \\
& + r_{ij}, \\
\text{Level 2}: \; & \beta_{oj} = \gamma_{00} + \gamma_{01}(\text{Intervention})_j + \gamma_{02}(\text{Female})_j \\
& + \mu_{0j}, \\
& \beta_{1j} = \gamma_{10} + \gamma_{11}(\text{Intervention}), \\
& \beta_{2j} = \gamma_{20}.
\end{aligned} \tag{1}$$

In this model, fixed effects were estimated for changes by time (Month) and intervention group while controlling for the effect of weight loss and the dummy coded control variable for gender. The cross-level interaction term (indicated by Υ_{11}) was tested to assess if the effect of the intervention group varied over time. The only random effect included in the model was for the intercept. If support were found for the hypotheses about autonomous motivation decreasing more in the WPI group, the coefficient for the Intervention × Month interaction (Υ_{11}) would be significant and negative. If support for the controlled motivation hypotheses were found, the Intervention × Month coefficients in those analyses would be positive.

The above model was tested separately for autonomous and controlled motivation. The analyses of changes in motivation after receiving an incentive included motivation measured at the current and the subsequent assessment (i.e., weight losers at 3 months were used to assess changes in motivation between 3 and 6 months). Data analysis was completed using SPSS version 19 and SAS software version 9.2.

3. Results

The scores on the autonomous and controlled motivation scales were first examined in a cross-sectional manner. There was a significant difference between the WEB and WPI groups at 3 months ($t(df = 407) = -2.17$, $P = 0.03$), where the WPI group reported higher levels of autonomous motivation (see Table 2). At 6 months, the difference was marginally significant ($t(df = 368) = -2.01$, $P = 0.05$) but the difference was not significant at 12 months ($t(df = 333) = -0.98$, $P = 0.33$). There were no significant differences by intervention group on controlled motivation at any time (P's > 0.29). Although this comparison of means provides some evidence that the WPI group that was offered incentives did not have autonomous motivation for remaining in a weight loss program that was significantly lower nor controlled motivation that was higher from WEB, it does not account for individual changes in motivation over time. Therefore, the effect of the offer of incentives was analyzed over time using longitudinal methods.

Table 2: Motivation by intervention group.

	WEB	WPI	P value
Autonomous motivation			
3 Months	5.13 ± 1.24	5.39 ± 1.13	0.03
6 Months	5.51 ± 1.34	5.77 ± 1.13	0.05
12 Months	5.31 ± 1.42	5.46 ± 1.34	0.33
Controlled motivation			
3 Months	2.26 ± 1.04	2.36 ± 1.11	0.35
6 Months	2.24 ± 0.95	2.22 ± 0.98	0.78
12 Months	2.19 ± 1.16	2.32 ± 1.05	0.29

*Note. Values are mean ± standard deviation.

Between baseline and the end of the intervention, there was a significant decrease in autonomous motivation for participating in a weight loss program (see Table 3, $P < 0.001$). Autonomous motivation decreased approximately 0.03 units per month during the intervention. There were no differences between the WEB and WPI groups on autonomous motivation throughout the study ($P = 0.42$). There were also no differences in changes between the groups over time (Intervention × Month, $P = 0.83$). This indicates that any changes in autonomous motivation over time were not related to the intervention group assignment. As suggested by prior studies, weight loss was significantly associated with changes in autonomous motivation such that, all other things being equal, on the 7-point scale, a one-kilogram weight loss was associated with a 0.08 unit increase in autonomous motivation ($P < 0.001$). Finally, women reported having autonomous motivation for participating in the weight loss program 0.34 units higher than men ($P < 0.001$).

Similar to autonomous motivation, controlled motivation for remaining in a weight loss program was associated with weight loss. For controlled motivation, a one-kilogram weight loss was associated with an increase in controlled motivation of 0.02 units (see Table 4; $P = 0.005$). There were no changes in controlled motivation over time ($P = 0.19$). No differences between intervention groups were found ($P = 0.96$), and there were no differences in changes in controlled motivation between the groups ($P = 0.30$). Controlled motivation did not differ between men and women ($P = 0.84$).

Next, the effect of *receiving* an incentive was tested using the subsample of weight losers. As shown in Table 3, there was a significant increase in autonomous motivation between 3 and 6 months such that all other things being equal, there was an increase of 0.13 units of autonomous motivation for each additional month of the intervention ($P = 0.003$). Among weight losers, there were no significant differences in the level of autonomous motivation between the WEB and WPI groups ($P = 0.07$). Additionally, there was no significant group by time interaction ($P = 0.94$).

Table 3: Changes in autonomous motivation.

Assessments	All participants BL, 3, 6, 12		3-Month weight losers 3, 6		6-Month weight losers 6, 12	
Fixed Effects	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Intercept	5.13***	0.09	5.33***	0.18	5.30***	0.19
Month	−0.03***	0.01	0.13**	0.04	−0.00	0.02
Intervention	0.06	0.07	0.24	0.13	0.16	0.15
Intervention by month	0.00	0.01	−0.00	0.06	−0.03	0.03
Weight change (negative values represent losses)	−0.08***	0.01	−0.08***	0.02	−0.08***	0.02
Female (Reference: male)	0.39***	0.10	0.25	0.18	0.45*	0.20
Random effects (variance components)						
Intercept	0.36***	0.04	0.47***	0.10	0.71***	0.11
Residual	0.92***	0.04	0.74***	0.08	0.62***	0.07
Goodness of fit						
−2LL	4604.3		1096.3		1068.9	
AIC	4620.3		1112.3		1084.9	
BIC	4655.0		1139.5		1112.2	
Number of observations	1530		370		359	
Number of subjects	566		222		222	

*Significant at $P < .05$; **significant at $P < .01$; ***significant at $P < .001$.

Table 4: Changes in controlled motivation.

Assessments	All participants BL, 3, 6, 12		3-Month weight losers 3, 6		6-Month weight losers 6, 12	
Fixed effects	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Intercept	2.26***	0.09	2.42***	0.16	2.24***	0.18
Month	−0.01	0.01	0.06	0.03	−0.00	0.02
Intervention	0.00	0.08	−0.15	0.13	−0.01	0.14
Intervention by month	−0.01	0.01	−0.06	0.05	0.03	0.02
Weight change (negative values represent losses)	−0.02*	0.01	−0.01	0.02	−0.01	0.01
Female (reference: male)	−0.02	0.10	−0.08	0.17	0.04	0.19
Random Effect (variance component)						
Intercept	0.52***	0.05	0.60***	0.09	0.72***	0.09
Residual	0.57***	0.03	0.47***	0.05	0.33***	0.04
Goodness of fit						
−2LL	4153.3		1018.1		938.0	
AIC	4169.3		1034.1		954.0	
BIC	4204.0		1061.4		981.3	
Number of observations	1529		370		359	
Number of subjects	566		222		222	

*Significant at $P < .05$; **significant at $P < .01$; ***significant at $P < .001$.

Weight loss was associated with autonomous motivation, where each additional kilogram of weight loss was associated an increase of 0.08 of reported autonomous motivation ($P < 0.001$), all other things being equal. In 3-month weight losers, autonomous motivation did not differ between men and women ($P = 0.15$). The same pattern of results was found for when weight losers at 6 months were used to assess changes in autonomous motivation between 6 and 12 months, although in this analysis, women reported higher autonomous motivation than men ($P = 0.03$).

Similar to the analyses run for autonomous motivation, the effect of receiving an incentive on controlled motivation was first assessed using weight losers at 3 months examining changes in controlled motivation between 3 and 6 months (see Table 4). There was a trend for controlled motivation to increase over time ($P = 0.09$); however, this did not reach statistical significance. There were no significant differences by intervention treatment group ($P = 0.24$) nor were there any differences by intervention groups over time ($P = 0.72$). Unlike autonomous motivation, changes in controlled motivation were not related to changes in weight ($P = 0.72$), and there were no differences by gender ($P = 0.65$).

Finally, data from weight losers at 6 months was used to assess changes between 6 and 12 months on controlled motivation for participation in a weight loss program. The pattern of results was identical to those with 3-month weight losers.

4. Discussion

Although research has been conducted using financial incentives to encourage weight loss, no study to date has looked at the effect of these incentives on motivation. This paper addresses this gap by testing whether the assertions of the CET extend to motivation for participating in a weight loss program within a program offering financial incentives. The results of this study compared a group randomized to receive a financial incentive for weight loss with a group randomized not to receive the incentives. Comparisons were made based on the *offer* of the incentive, as well as comparisons within a subset of the groups who were eligible to receive the incentives. The results suggest that neither the offer nor the receipt of a small incentive for weight loss leads to decreases in autonomous motivation or increases in controlled motivation for participating in a weight loss program.

Additionally, this study found that weight loss was consistently associated with changes in autonomous motivation to continue participating in the weight loss program. These results support past research suggesting that autonomous motivation measured after the weight loss program begins is a predictor of overall weight losses in both short [13] and longer weight loss interventions [12]. In this analysis, motivation was assessed at months 3 and 6 of a one-year trial. Moreover, this repeated finding suggests that focusing on improving autonomous motivation for weight loss during a weight loss attempt may be beneficial. Similar results for controlled motivation for participation were only found when examining individuals who did and did not lose weight. This is not as consistent with prior studies as the finding for autonomous motivation. Williams and colleagues found controlled motivation measured by the TSRQ was associated with BMI change at the end of a weight loss intervention, but it was not associated with weight loss maintenance [12]. Webber and colleagues found controlled motivation was not associated with overall weight losses in a shorter term study [13]. Clearly, more research is needed before conclusions about the relationship between controlled motivation for participating in a weight loss program and weight loss can be solidified.

In this study, there were no statistically significant relationships found between receiving an offer of a financial incentive and changes in motivation nor were there relationships found for those who actually received an incentive. There are several plausible explanations for these findings. First, the incentives paid for weight losses in this study were small and perhaps inadequate to lead to changes in motivation for weight loss program participation. In this study, the maximum incentive for weight loss was \$150. Although some individuals received this maximum incentive, the actual mean payment across the three assessment visits was \$18.90 (median = \$15). For most participants, this is less than the attendance stipend (e.g., \$15 at 6 months or \$20 at 12 months). This may have diluted the effect of the incentive as a motivator for continuing efforts to lose weight.

A second plausible explanation for the lack of changes in motivation related to the incentives is the delay between the behaviors required for weight loss and the payment of the incentive. In this study, incentive payments were made during the study assessment visits at months 3, 6, and 12 of the intervention. By comparison, in the study by Volpp and colleagues, where mean payments were \$273 during a 16-week program, the incentives were provided either weekly (in the lottery condition) or monthly (in the contract condition; [5]). The longer lag between the behavior change and the receipt of the incentive may have forced participants in this study to rely more on other sources of motivation rather than the incentives. Further research into the perceived value, the amount, and the timing of cash incentives, as well as their impact on motivation for weight loss, will help clarify this relationship.

Another possibility is that changes in motivation may have occurred, but the measurement of motivation was too distal from when the incentive was received for the change to be detected. In other words, changes in motivation may have occurred immediately after the incentive was received but then dissipated between then and the next measurement. No research to date has investigated the duration of impact that financial incentives may have on motivation, but prior weight loss studies have found that the effect of incentives disappears during weight loss maintenance [22]. Future studies may want to include more observations of motivation to explore this relationship.

Finally, the lack of significant relationships between the incentives and motivation in this paper may be a result of insufficient sample size. The analyses presented in this paper have adequate power to detect effect sizes equal to or greater than $d = 0.23$ for the analyses investigating the offer of incentives and effect sizes greater than $d = 0.54$ for the analysis of receiving the incentives (estimated using the "Optimal Design" software [23]). The effect sizes for changes in motivation between the intervention groups over time ranged from 0.004 to 0.08 (very small to small effects [24]). These effects could be statistically significant if the sample size was much larger.

There are several strengths of this study. This study is the first to look at the relationship between financial incentives for weight loss and motivation to participate in a weight loss program. This is an important area for exploration

because there is strong support from both employees and employers for using incentives within worksites to promote weight loss among employees [25], and theory suggests that use of such incentives may decrease autonomous motivation. This study utilized data from a worksite weight loss program of a similar intensity to what may be offered in employer sponsored weight loss programs. With these similarities, the results can be generalized to other worksite-based weight loss programs. Additionally, the amount of the incentives offered was decided upon based on the results of a survey of employers. The incentives used in this study were similar in magnitude to what employers may be willing to pay as part of an independent worksite weight loss program. Additionally, the demographics of this sample are similar to the demographics of participants in other worksite health promotion programs, namely, that the sample was predominately white, college-educated women [26]. Thus, results may be generalizable to the typical worksite-based weight loss program participants within some, but not all, worksites. This study was also large enough to allow for a secondary analysis restricted to individuals who lost weight. By focusing only on participants who lost weight within these two groups, any changes in motivation triggered by weight losses would have been similar across groups. Finally, weight loss in this study was measured using standardized protocols with in-person weights and the assessment of motivation included reliable/valid measures of motivation.

Despite these strengths, there are limitations that need to be considered. First, because this study focused on changes in motivation for participating in a weight loss program over time, it only included participants who completed the study questionnaires and excluded those with incomplete data. This may have introduced bias into the analyses where only participants who were highly motivated to lose weight, or earn incentives, completed follow-up assessments. Additionally, only one measure of motivation for participating in a weight loss program was used in this study (Treatment Self-Regulation Questionnaire). This reliable measure assesses overall motivation for participating in a weight loss program but does not specifically assess money as a motivator. Additionally, not all items of this measure were included in order to reduce participant burden. Future research may want to consider using additional measures of motivation for weight loss as well as motivation to participate in a weight loss program.

5. Conclusions

This is the first study to investigate the relationship between financial incentives and motivation for participating in a weight loss program. In this sample, there was no relationship between either the offer or the receipt of an incentive for achieving weight losses and subsequent changes in either autonomous or controlled motivation for participating in a weight loss program. These results may generalize to other worksite programs offering incentives of similar magnitude. Further research is needed to investigate this relationship using other measures of motivation (e.g., including directly assessing the motivation for money as a catalyst for changing behavior). Additional research to identify how the amount of the incentive and the timing of the incentive payments influence motivation, and ultimately weight loss, will make an important contribution to the field of obesity research.

Conflict of Interests

The authors declare that they have no competing interests.

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