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Financial Incentives and Weight Control

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Abstract

This paper reviews research studies evaluating the use of financial incentives to promote weight control conducted between 1972 and 2010. It provides an overview of behavioral theories pertaining to incentives and describes empirical studies evaluating specific aspects of incentives. Research on financial incentives and weight control has a history spanning more than 30 years. Early studies were guided by operant learning concepts from Psychology, while more recent studies have relied on economic theory. Both theoretical orientations argue that providing financial rewards for losing weight should motivate people to engage in behaviors that produce weight loss. Empirical research has strongly supported this idea. However, results vary widely due to differences in incentive size and schedule, as well as contextual factors. Thus, many important questions about the use of incentives have not yet been clearly answered. Weight-maintenance studies using financial incentives are particularly sparse, so that their long-term efficacy and thus, value in addressing the public health problem of obesity is unclear. Major obstacles to sustained applications of incentive in weight control are funding sources and acceptance by those who might benefit.

Introduction

The theoretical rationale for the use of incentives to facilitate weight loss comes from two primary sources. One is the operant learning theory most notably associated with B. F. Skinner (Skinner, 1938). Operant learning theory focuses on the interactive relationships between behavior and the environment over time. Stated simplistically, the core principles are reward and punishment. Behavior that produces rewards tends to be repeated more frequently over time (reinforcement), while behavior that produces negative consequences (punishment) tends to be repeated less frequently over time. Extensive study of operant learning in controlled laboratory settings, mostly with animals, has established a number of key subprinciples. Two key principles are: 1) Immediate consequences are more powerful in influencing behavior than delayed consequences and thus, new behavior is established most quickly when it is rewarded immediately and often, and 2) behaviors already established can be maintained well with less frequent rewards and thus less cost.

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The second body of theoretical work that has guided the use of incentives for promoting weight loss is behavioral economic theory. Behavioral economics includes many principles from operant theory; for example, people tend to behave in ways that maximize their economic return (reward) and that the timing of those returns has an important influence on behavior. Classical economic theory makes some assumptions about human behavior that behavioral economists have clearly noted to be incorrect when applied to individual decision-making. For example, decision-making is always rational, and people accurately perceive the likely outcomes of their behaviors; both are inconsistent with common human foibles, such as excessive risk-taking in games of chance and difficulty with saving for the future. Nevertheless, classical economic theory has clear strong points. Use of a common metric for valuing behavioral monetary outcomes is particularly effective in that it allows comparisons of outcomes across different behaviors and provides a formal way to quantify the present value of delayed rewards, both of which are convenient for formal modeling and prediction. In addition, economic concepts like elasticity of demand provide a quantifiable way to talk about individual differences in preferences for different outcomes and contextual factors that influence behavior / consequence relationships.

Both operant theory and behavioral economic theory predict that changing the immediate consequences of body weight or behaviors determining body weight will result in changes of behaviors and changes in weight over time. Introducing monetary rewards for weight loss should lead to enhanced weight-loss behavior and weight loss itself. Similarly, reducing monetary rewards for weight loss should lead to reduced weight loss-behavior, slower weight loss or even regain over time. Although these principles are simple in concept, the complexity of the relationship between weight-related behaviors and weight, as well as intrinsic rewards associated with weight-related behaviors, makes the question of how best to use financial rewards or punishments to control body weight complicated as well. Two major complexities are: 1) Change in body weight is the cumulative consequence of many different behaviors over time rather than the consequence of a single behavior and 2) weight change is inherently slow. Therefore, ultimate rewards valued by the weight loser; i.e., reduced health risk factors and more attractive appearance, are delayed for lengthy periods of time, even with excellent adherence to behavioral advice.

Additional intrinsic factors complicate matters further. Weight-loss behaviors often produce negative short-term consequences—the pleasure of eating is reduced, short-term biological satiation mechanisms are too weak to provide reliable short-term feedback on whether foods currently being eaten are producing the desired energy intake goals; and negative outcomes produced by obesity, such as poor health outcomes, are so long-delayed—weeks or years—that they have limited influence on current behavior. In the presence of plentiful food and the absence of requirements for significant physical activity, the average American experience is a small but consistent positive energy balance of 4–8% and weight gain averaging 1–2 pounds per year.

Experimental studies of financial rewards in weight loss date from the 1960's. The seminal publications on theory by Ferster, Nurnberg and Levitt (Ferster, et al., 1962) and the first case studies by Richard Stuart (Stuart, 1967) are generally accepted as the initial inspiration. In the early 1970's, a number of randomized studies evaluated the effects of financial incentives on weight loss. These studies were relatively short in length, and the specific incentive used was typically a deposit contract, a procedure in which an individual wishing to lose weight deposits money with a therapist who returns the money according to weight loss progress (technically negative reinforcement in operant terminology). The popularity of the deposit contract as a reward mechanism in these early studies was in part driven by the belief that overweight people lacked self-control skills and that creating deposit contracts is

a self-control skill. Economic theorists have posited that negative reinforcement is more potent than positive reinforcement. (Kahneman and Tversky, 1979).

Early studies on financial incentives and weight loss had mixed results, likely due to small sample sizes, variability in the size of incentive and how incentives were administered, and the quality of weight loss instruction provided. Figures 1 and 2 show results of two representative studies in this early period. In the first study (Harris and Bruner, 1971), individuals were randomized to one of two 12-week intervention programs. Both groups received instruction in weight loss methods. Individuals in one group were required to sign a financial incentive contract in which they committed 50 cents or \$1 for each pound they wished to lose. A portion of this pre-treatment financial deposit was returned weekly depending on weight loss progress. At 12 weeks the instruction-only group lost an average of 3.2 kg, whereas the financial-incentive group lost significantly more, an average of 6.1 kg.

The second example study (Abrahms and Allen, 1974) randomized 49 women to one of four groups: 1) Waiting list control, 2) nonspecific group discussion, 3) group discussion plus instructions to self-monitor caloric intake and to keep daily intake below 1200 kcal and 4) all of the above plus the return of a \$10 deposit at a rate of \$1.35/lb, with a \$2/lb bonus for each pound above 10 pounds. Average weight losses at 8 weeks were 0, 3.6, 5.9, and 5.9 kg, respectively (see figure 2). All treatments were significantly better than the control group, and self-monitoring and goal-setting were superior to group discussion with or without incentives. Comparing this study with the Harris study suggests that financial incentives for weight loss are beneficial when weight loss instruction is non-specific, but more specific, quantitative instruction on how to lose weight makes the benefits of financial incentives less clear, at least over relatively short time periods and with small incentives.

After these early beginnings, behavioral research on weight loss methods expanded in several different directions, including increasing treatment length and evaluating different types of behavioral instructions to facilitate weight loss (e.g. very low calorie diets); but financial incentives received little additional attention with the notable exception of a series of research projects by Jeffery and colleagues between 1978 and 1993. The methods for these studies were similar. Recruitment was through mass media. Entry requirements for participants included age > 18 years, at least 50 lbs overweight, good health, and willingness to commit money to be used in a deposit contract for weight loss. Participants met with a therapist weekly in small groups for a period of active treatment, the duration of which ranged from 10 to 25 weeks. Instructions on how to lose weight included keeping daily food and exercise diaries, and calculating energy intake and expenditure. Energy intake goals were assigned to keep intake about 1000 kcal per day below estimated weight maintenance needs. Exercise goals were about 1000 kcal per week. Group sessions were comprised of a weigh-in, giving cash rewards based on weight results and discussing a variety of behavioral strategies to facilitate reaching intake and expenditure goals. Most of these studies included no treatment follow-ups beyond the period of active treatment.

Figures 3 through 8 show study results. Figure 3 describes the results of an initial 10-week study in which a larger than typical monetary deposit (\$200) was returned to study participants in weekly increments for one of three outcomes: 1) weight loss (\$10/lb), 2) attendance at treatment sessions (\$20/wk), or 3) turning in self-report behavior diaries indicating that energy intake goals were met (\$20/wk) (Jeffery, et al., 1978). Weight losses in the 3 groups at 10 weeks were 5.0 kg in the attendance-reward group, 8.7 kg in the calorie-reward group, and 10.0 kg in the weight-reward group. The attendance group lost less than the calorie and weight groups, which did not differ from each other.

The next study in the series addressed two questions—incentive size and individual incentives versus group incentives (Jeffery, et al., 1983). The study had a 3×2 factorial design with three levels of incentive size as one factor and individual-versus-group incentives as the other. Eligible prospects were offered, at random, a weight loss program requiring a financial commitment of \$30, \$150 or \$300. All conditions were provided the same weight loss program content. Financial incentives for achieved weight loss were \$1, \$5, or \$10 per pound over a period of 20 weeks depending on the original deposit. The targeted weight loss goal was 30 lbs (13.6 kg). Figures 4 and 5 show the effects of different contract sizes on enrollment rates and weight losses after 20 weeks. Larger contracts produced significantly larger weight losses (figure 4). At two years of follow-up, however, all groups gained weight, and mean weight losses did not differ by incentive amount. Requiring a larger financial commitment for the study also significantly reduced enrollment rate. About 70% as many individuals agreed to participate for \$300 as agreed for \$30 (figure 5).

Group-versus-individual contracts in the same study were structured as follows: Study participants in the individual contract group each had their own contract with financial incentives given for individual weight losses. In group-contract conditions financial incentives were based on group average weight loss, rather than individual weight loss. At the end of treatment, weight losses in the group contract conditions were significantly larger than those in the individual contract condition (figure 6). The significant differential between group and individual incentive conditions was maintained through two years of no-treatment follow-up. A careful examination of the distribution of initial weight losses also suggested an interaction effect between the type of contract and an unmeasured, individual difference variable. The group contract had little effect on “good” weight losers; i.e., the portion of people reaching goal weight was similar. However, the group contracts appeared to be beneficial among “poor” losers; i.e., the number of people losing less than 10 lbs was significantly less in the group contract conditions. Group contingencies significantly reduced the number of early treatment failures, which apparently translated into more durable long-term mean effects at two-year follow-up.

The temporal pattern of weight loss in all these and other weight loss studies of this era was similar. Rate of weight loss was fastest at the beginning of treatment and slowed gradually over time. After about 6 months, mean weight losses stop and are followed by slow regain. This pattern is seen in all treatments, including those with financial incentives. The result was that few participants reached their personal weight loss goals, and after a few years most had regained most of their initial weight losses. Both operant theory and economic theory predict that behaviors reinforced or motivated by financial incentives will deteriorate after incentives are removed. Thus, the phenomenon is not surprising. A growing literature on weight loss maintenance has shown that continuing conventional weight loss counseling for longer time periods does not prevent weight regain.

Jeffery and colleagues have done the only three studies known by this author that have examined the effectiveness of different financial incentive structures in maintaining weight losses. The first examined whether or not a different temporal distribution of financial incentives could better sustain weight loss efforts during the treatment period itself. The underlying rationale was that the effort required to lose weight is often initially motivated by intrinsic factors—the novelty of the experience, therapist encouragement, the positive feedback of weight decrease, improvements in mobility, reduced health risk indicators like blood pressure, and positive social feedback. With time, however, the power of these “natural rewards” declines, and the benefits of further weight losses and effort are no longer as salient or motivating. This phenomenon has been described as *habituation* (Epstein, 2009). Following this line of reasoning, it is plausible that financial incentives for weight

loss might be more effective if focused primarily within the time period when most people find it most difficult to sustain weight loss; i.e., after they have lost some of their desired weight. A study constructed to test this hypothesis randomized participants to a 16-week weight loss program with 1 of 3 financial incentive conditions (Jeffery, et al., 1984).

All participants were required to deposit \$150. Men were assigned a 30-pound weight loss goal and women a 20-pound weight loss goal. A commitment-only group had their deposits returned in full at the first treatment session. A constant-contract condition was rewarded \$30 for each 5-pound increment in group average weight loss. Those in an increasing contract group were rewarded the following amounts for each 5-pound increment of group weight loss—\$5, \$10, \$20, \$40, and \$75. As shown in figure 7, at the end of active treatment the best weight losses were seen in the increasing contract condition, followed by the constant-contract and commitment-only group (all groups significantly different). These results support the concept that declining rates of weight loss over time are indeed related to loss of motivation and that motivation can be improved by increasing financial rewards over time.

The second study by Jeffery, et al. addressing long-term incentives for weight loss was a randomized trial focused on the use of different financial incentives to support weight maintenance in individuals who had already lost weight (Kramer, et al., 1986). Study participants initially received a 16-week weight loss program that required a \$195 contract incentive deposit, \$75 of which was used during initial 16-week weight loss phase and \$120 of which was used as an incentive for a weight maintenance phase. Entry into the weight-maintenance phase was limited to individuals who had lost at least 10% of their body weight in the weight-loss phase. Those failing to qualify had their maintenance incentives returned.

The maintenance program consisted of monthly group meetings with a problem-solving format. Participants were randomized to 1) a control group receiving a full refund of their deposit and no follow-up treatment, 2) a group receiving \$10 for each of 12 monthly treatment sessions attended, and 3) a maintenance-contract group in which \$10 was returned at each session that weight was at or below their end-treatment weight with permanent forfeiture of \$10 if their weight was above end-of-program weight. The results of this study were not very encouraging. All three maintenance groups gained significant weight in the year following initial weight loss, and there was no difference between the groups in average weight regain. A marginally significant difference was found in the proportion of individuals who achieved the goal of perfect maintenance in the follow-up year (32% weight contract, 28% attendance contract and 14% control, $p=.10$).

A third study (figure 8) with data on long-term incentive effects used external financial incentives (positive reinforcement) rather than deposit contracts (negative reinforcement), and for a much longer time (Jeffery et al., 1993a). Study participants volunteered for an 18-month weight loss study examining both financial incentives and meal replacements in a crossed design and a no-treatment control group. Each participant was given a weight loss goal of 30, 40 or 50 pounds depending on their initial body weight. Treatment included weekly meetings for 6 months with content similar to other behavior therapy studies in this series, followed by 12 months of monthly meetings with weekly individual contacts for weighing, and incentive and food distribution. The incentive program used direct cash payments paid by the study. Participants could earn up to \$25 per week based on progress made toward reaching their target weight-loss goals each week. Unlike the deposit incentive protocols described above, however, incentives were not paid for successive increments of weight loss but rather for cumulative loss. For example, if a participant achieved two-thirds of their weight loss goal in any given week, she/he received two-thirds of the possible \$25 reward, regardless of what was accomplished in the previous week or month. Thus cash

rewards could be and were earned during periods of weight maintenance and even weight regain. Results of this study show that the effectiveness of this weight loss treatment in encouraging weight loss was limited to the first 6 months. Meal replacements had a positive effect on weight loss for the first 6 months but no longer (data not shown). Financial incentives did not improve initial or long-term weight loss. Although the study did not have a group in which treatment was terminated at 6 months, comparison with other studies suggests that neither recurring financial incentives nor recurring meal replacements had any impact on weight regain trajectories.

Clinical research on financial incentives and weight loss waned in the early 90's. However, before turning to more recent research, a final project completed at that time merits attention (Jeffery et al., 1993b), as this study anticipates some of the current interest in financial incentives in employer health plans. This study differed from others by this group in that, rather than a clinical trial with individual randomization, the study was a group-randomized trial in which entire companies were randomized to treatment and comparison groups. The study involved 32 worksites from an urban area with a total employee population of about 25,000. Sixteen worksites were randomized to treatment, and sixteen to no treatment. Treatment included both smoking cessation and weight loss components; only the weight loss components are presented here.

A voluntary weight loss program was offered to the entire workforce of the intervention work sites every 6 months. Records kept by intervention staff assessed effectiveness of the programs during implementation. The main focus of the study was the overall effects on entire worksites, wherein all employees were weighed on site, at baseline and at the end of two years. The intervention programs were comprised of six biweekly classes led by professional health educators strongly encouraging self-monitoring of diet and physical activity, calorie counting, goal-setting and behavioral strategies. Participation was voluntary, but required participation in a deposit-contract, financial-incentive plan administered through the company payroll system. Employees chose their own weight loss goals with some safety constraints. They also chose their own monetary incentives, which were deducted from biweekly paychecks, with a minimum of \$5 per pay period but no maximum. Over the course of 2 years, 2041 employees participated in this program (16% of all employees and approximately 40% of overweight employees). Approximately two-thirds of participants enrolled the first time programs were offered, with lesser numbers subsequently. Average weight loss in the 6-week classes was 2.2 kg; however, no significant effects on average employee weight or the prevalence of obesity was seen at two years. This study suggests that incentive programs in worksites are feasible and that employees will participate. Efficacy in addressing public health issues is questionable.

A modest upsurge in research on financial incentives for weight loss has been seen recently. These new studies are primarily from behavioral economists and tend to have a similar structure as research performed by psychology researchers in the 70's, relatively small studies of short durations, and limited follow-up. Most have used positive incentives and typically have utilized more up-to-date technologies than earlier studies, such as Internet communication for education and weight assessments having the potential for reducing program costs. The three of these projects thought to be the most creative are described below.

Figure 9 shows the results of a 3-month randomized study (Finkelstein, et al., 2007). Three employee groups received non-specific instructions on how to lose weight, combined with no incentive, \$7 incentive for each 1% weight loss, or \$14 incentive for each weight loss. Incentives were from external resources rather than from participant resources. The results generally replicated the earlier work using deposit contracts. Larger incentives were

associated with greater weight loss than no incentive, although only the larger of the two incentives was statistically significant.

Figure 10 shows the results of a study by Volpp and colleagues with a 4-month treatment program and 3 months of no-treatment follow-up (Volpp, et al., 2008). The study had three treatment arms: 1) Minimal treatment control, 2) “deposit contract” and 3) “lottery”. The intervention program was unique in that contact with study staff was largely electronic. Each participant received an individual counseling session with a dietitian to teach weight loss principles. Follow-up clinic visits were held monthly to weigh participants and distribute financial rewards. Participants in the two intervention arms were in daily electronic contact with study staff. They received individually crafted target weight-loss trajectories, specifying weights to be achieved to receive their incentives. Participants weighed themselves daily and reported their weights by phone. Incentives were calculated daily. Payments were made at monthly visits, providing participants could verify that their current weight was at or below their most recent self-reported weight. Deposit-contract participants specified an amount to commit to their weight loss incentive each month, and these amounts were matched by the study. There were bonus possibilities as well. Thus, the incentives were of mixed type.

Individuals in the “lottery” condition were eligible for financial reward lotteries daily if they met their weight goals. Some lottery prizes were large with low odds of winning (1 in 100), and others were smaller with better odds of winning (1 in 4). This latter reward schedule has some similarity to popular public lotteries, but with weight loss required for playing. Finally, there was a cash bonus for losing 20 lbs in the 4-month treatment for both incentive conditions. The results of this study were again quite similar to earlier deposit contract studies. Weight losses at 4 months were significantly better in both incentive conditions than in the control group; however, weight regain was observed in both groups during the 3-month follow up after incentives were discontinued. Only the “lottery” group remained significantly better than controls at follow-up.

The final study to be discussed is from a recent multi-center trial conducted in Germany by Luley and colleagues (Luley, et al., 2010). This study recruited families with an obese parent and an obese child through mass media advertising. They were randomized to 1 of 8 treatment conditions in a $2 \times 2 \times 2$ factorial design. The three factors were 1) one of two different diets, 2) electronic telemonitoring of weight progress or not, and 3) financial incentives. The incentive component consisted of a 5 Euro incentive payment for each 1 % weight loss in adults and each 1 % change in child BMI percentile. After 6 months, parents receiving financial incentives for weight loss had lost significantly more weight (6.9% versus 3.4%) than those who did not receive incentives independent of other treatment elements. Financial incentives had no effect on child weight change.

Discussion

Drawing firm conclusions from existing research literature on the practical value of using financial incentives to promote weight loss and maintenance in specific real life situations is difficult. Clearly, enough studies show positive effects of financial incentives on weight loss outcomes to make a compelling case for financial incentives improving weight outcomes. Existing research, however, has important limitations. Incentive contingencies have varied widely. Rewards vary in amount, source, frequency of administration, temporal distribution over time, and certainty. In addition, there have been group contingencies and combinations of incentives. Specific targets for reward have also varied, including absolute weight, weight change since baseline, weight change since last observation, and various behaviors that contribute to weight. However, none of these dimensions has been explored thoroughly, and

a careful reading of the methods used in existing studies suggests that they differ in enough ways that generalizations across studies must be made very cautiously.

Laboratory research on reinforcement clearly suggests that frequent reinforcement is best for supporting initial change in behavior but that irregular reinforcement may be more efficient or even better for supporting maintenance. No studies specifically examining either of these issues are in the present literature, and very few studies are found that examine the use of financial incentives in maintenance. This is particularly problematic given that improved maintenance is central to both successful weight loss therapy and weight gain prevention. Existing research certainly suggests that incentives focused on weight change are more effective when people receive clear and effective instructions for how to lose weight. What constitutes necessary or sufficient instruction is unclear. Another important issue that has received almost no attention is whether financial incentives for weight control are useful at all in people who are not interested in losing weight. All existing research has been done with volunteers who clearly are interested in weight loss. Limited information is available on how popular financial incentives would be in weight loss therapies, compared to equivalent programs without incentives; and whether increased efficacy of incentives compared to no incentives would produce better or worse population outcomes when lower participation rates are considered.

With the caveats noted above, what do we know about the use of financial incentives in weight loss, and what is the future of research in the field? Financial incentives clearly increase the effectiveness of weight loss programs in the short term. Larger and increasing incentives are better, negative reinforcement procedures like deposit contracts are more effective than positive reinforcement, and group contracts are more effective than individual contracts. Weight losses induced by financial incentives are equally vulnerable to regain as are weight losses without use of incentives once treatment is withdrawn, but not more so. It is not yet clear what financial contingencies might promote long-term maintenance of weight loss.

Weight loss maintenance is a critical issue for chronic disease prevention. Maintenance incentive programs in which the size of financial awards increase as the duration of behavior maintenance increases (with the amount resetting to baseline in the event of a behavioral lapse), have been shown to be cost-effective in maintaining abstinence from drugs. (Higgins, et al., 1991). Similar procedures would be worth exploring in weight maintenance; however, the feasibility of applying such contingencies to the entire obese population seems low. Health care providers are increasingly giving discounts for participation in weight loss or exercise programs to encourage these activities. However, little or no research has been published to evaluate population reach or effectiveness in reducing weight or improving fitness.

Negative reinforcement procedures might also have benefits for weight loss maintenance. However, for ethical reasons, it seems unlikely that they could be applied systematically in settings other than those where weight control and physical fitness are job requirements (e.g., sports or the military). As noted above, deposit contracts were originally conceptualized as a self-control procedure. It is not believed that the market for weight control programs with this feature has been evaluated. Given the popularity of games of chance, however, it is intriguing to speculate whether mixed incentive programs that combine personal financial commitments, chances for matching funds and cash prizes, and significantly improved odds of winning with weight loss, might have potential for creating an experience that many would find interesting enough to sustain efforts at weight control over longer periods.

A final issue that deserves comment in the overall discussion of financial incentives and weight loss is the potential effectiveness of environmental policies that would broadly alter the consequences of behaviors related to body weight, rather than directly rewarding weight outcomes for individuals. This might be done, for example, by subsidizing the cost of healthy foods and physical activity while imposing taxes on products thought to promote weight gain (i.e. energy dense foods, sugar sweetened beverages and TV sets). Such measures are already being introduced in the US and elsewhere and more seem likely in the future. The effectiveness of cigarette taxation in the struggle to reduce tobacco use has been documented well enough to target similar initiatives at unhealthy food products as public health measures. To date, several published studies show that large price changes clearly have an impact on food purchases (Jeffery et al., 1994 and French, et al., 1997); and one policy evaluation study has indicated that, even at the low level at which excise taxes are currently being applied, effects on population body weight are in the expected direction (Fletcher, et al., 2010). Experimental research on these policies is difficult, however, and it seems likely that decisions concerning implementation are likely to be made without much empirical data. Again, settings such as the military, which allow controlled applications of such “natural” incentives for healthier behavior choices, may provide additional research opportunities.

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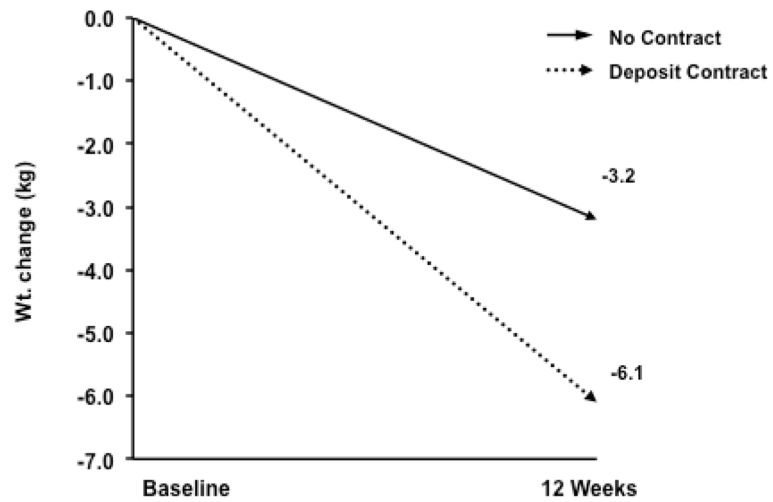


Figure 1.

Effects of No Contract and Deposit Financial Contract on Weight Loss.
Harris and Bruner, 1972.

A self-control study involving the use of behavior modification techniques was compared with a with a contract system and attention-placebo control group. Department of Educational Foundations, University of New Mexico, Albuquerque NM, 1971.

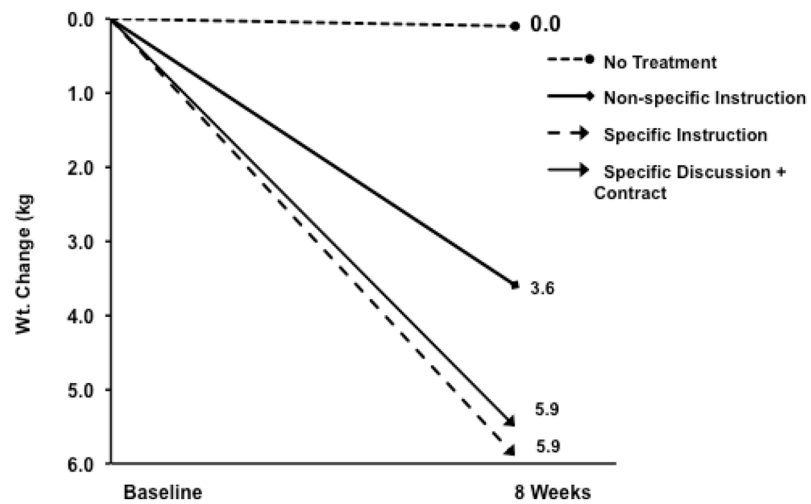


Figure 2. Effects on Weight Loss of No Treatment, Non-specific Instruction, Specific Instruction, and Specific Instruction plus Deposit Financial Contract. Abrahms and Allen, 1974.

A data analysis facilitated by NSF grant GJ-9 to the University Computer Center. 49 overweight women participated in a study comparing relative effectiveness of financial remuneration, situational eating management and social pressure procedures in a weight reduction program. University of Connecticut Research Foundation. 1973.

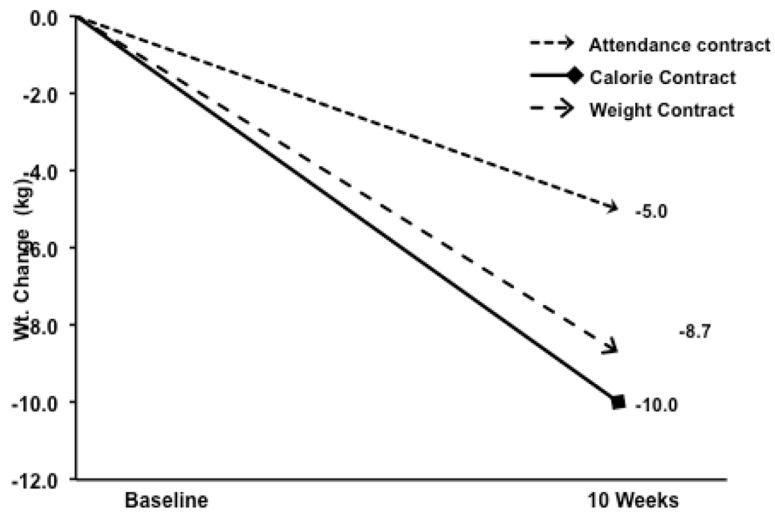


Figure 3. Effects on Weight Loss of larger Financial Contracts for Attendance, Behavior Change and Weight Change.

Jeffery, Thompson and Wing, 1978.

31 severely obese adults participated in three behavioral weight control groups utilizing powerful monetary contracts. Stanford Heart Disease Prevention Program, Stanford University, Palo Alto CA. 1977.

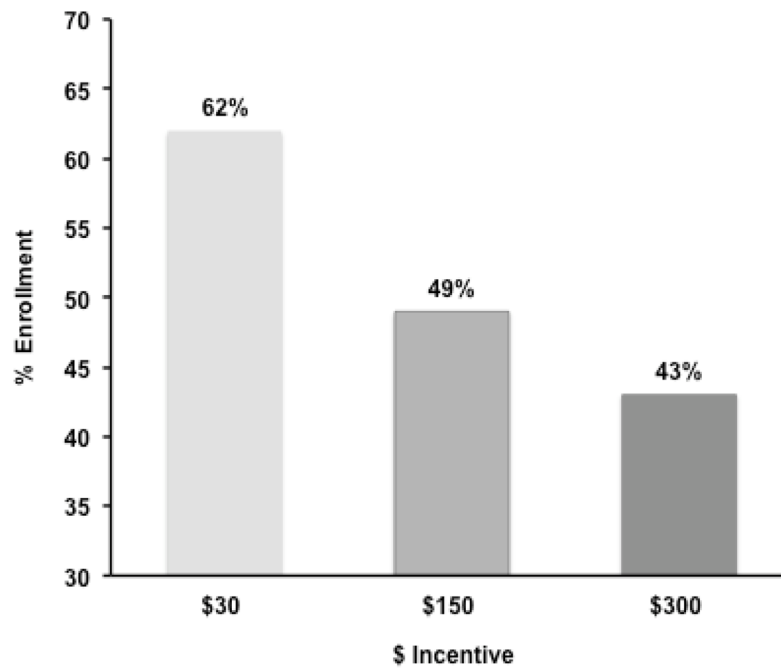


Figure 4.
Effects of Varying Financial Contract Amounts on Willingness to Enroll in Treatment.
Jeffery, Bjornson-Benson, 1984
60 women and 55 men recruited participated in a weight loss reduction program with financial contracts. Eligibility criteria included weight \geq 20 lb (women) or \geq 30 lb (men) above ideal and absence of medical or behavioral contraindications. University of Minnesota, Division of Epidemiology, School of Public Health, Minneapolis, MN. 1983.

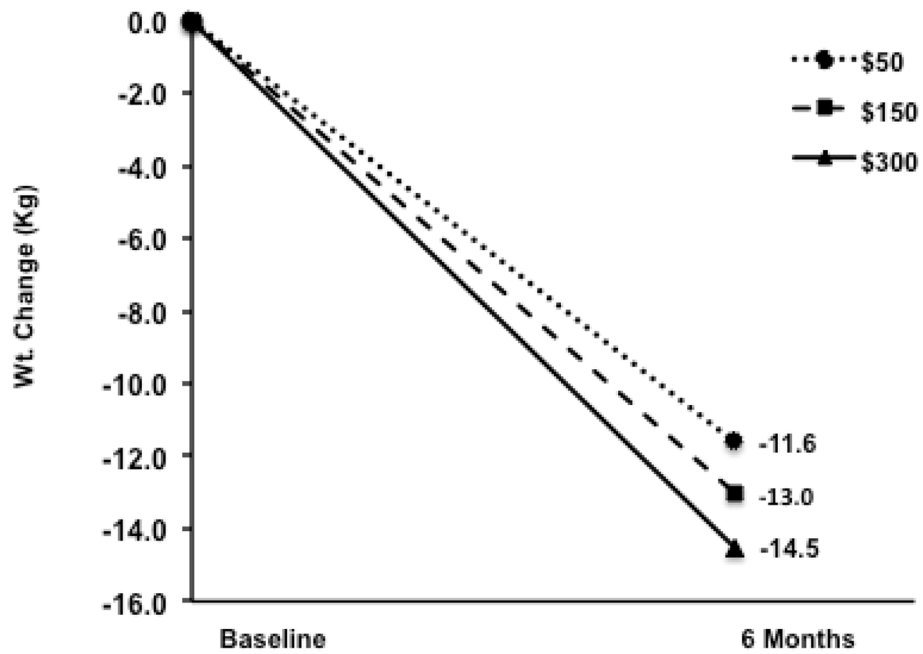


Figure 5.
Effects of Varying Financial Contract Amounts on Weight Loss.
Jeffery, Bjornson-Benson, 1984
60 women and 55 men recruited participated in a weight loss reduction program with financial contracts. Eligibility criteria included weight \geq 20 lb (women) or \geq 30 lb (men) above ideal and absence of medical or behavioral contraindications. University of Minnesota, Division of Epidemiology, School of Public Health, Minneapolis, MN. 1983.

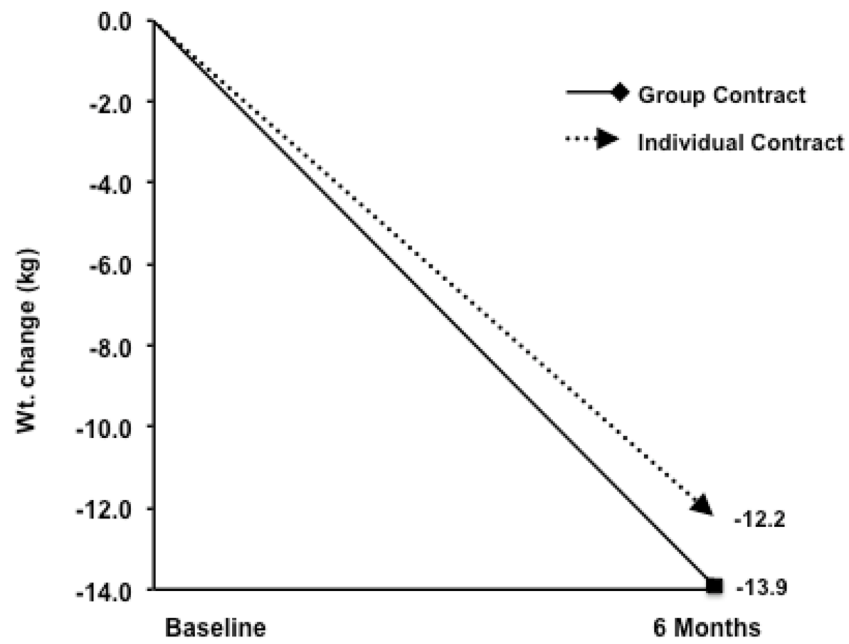


Figure 6.
Effects of Group and Individual Financial Contracts on Weight Loss.
Jeffery, Gerber, et al, 1983
89 overweight men were assigned randomly to 1 of 6 treatment groups for weight reduction. All groups participated in a 15-week behaviorally oriented program. Each involved a monetary contract in which participant deposits were returned contingent on weight loss. Laboratory of Physiological Hygiene, School of Public Health, University of Minnesota, Minneapolis, MN. 1981–83.

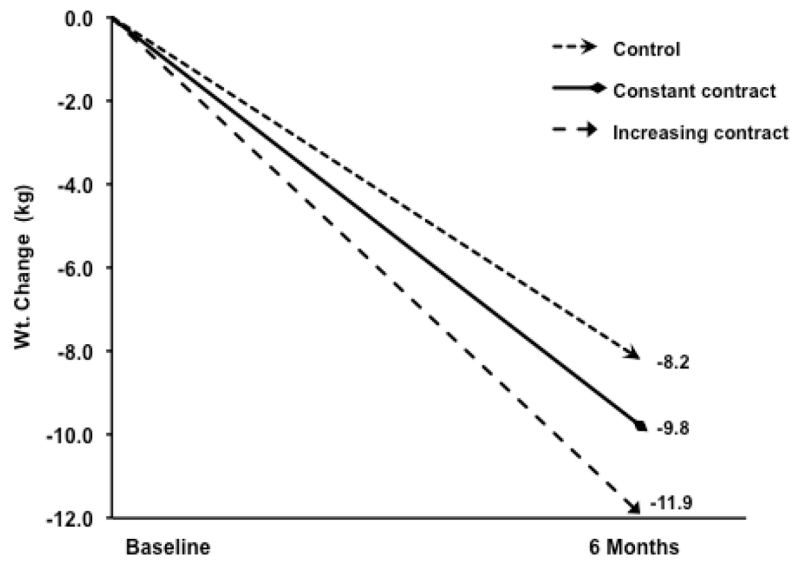


Figure 7.
Effects of Constant and Increasing Financial Contracts on Weight Loss.

Jeffery, Bjornson-Benson, et al, 1984

60 women and 55 men recruited participated in a weight loss reduction program with financial contracts. Eligibility criteria included weight \geq 20 lb (women) or \geq 30 lb (men) above ideal and absence of medical or behavioral contraindications. University of Minnesota, Division of Epidemiology, School of Public Health, Minneapolis, MN. 1983 .

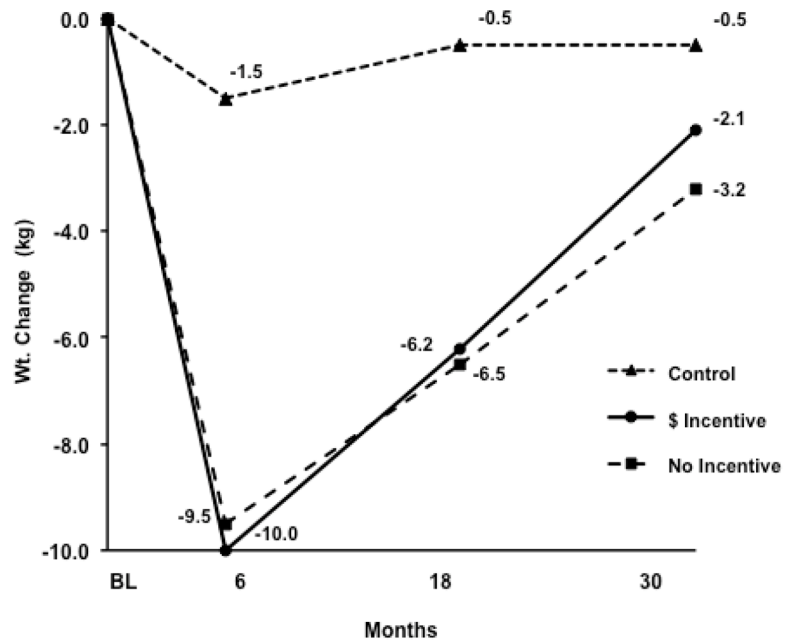


Figure 8.
Effects of External Financial Incentives on Weight Loss.
Jeffery, Wing, et al, 1993.

Participants in this study were 101 men and 101 women recruited from two urban communities (Pittsburgh, PA and Minneapolis-St. Paul, MN) Individuals 25–45 years of age, required to be 14–32 kg overweight according to 1993 insurance industry standards, and were randomized within center and sex to 1 of 5 treatment groups.

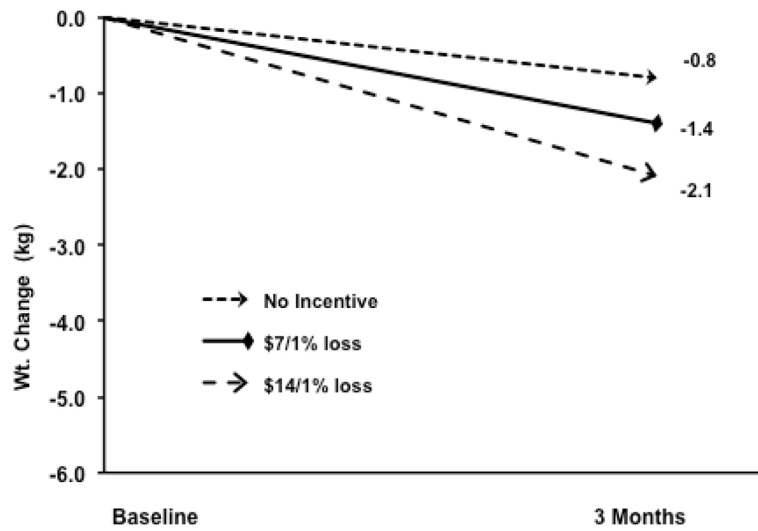


Figure 9.
Effects of Varying Financial External Incentive Amounts on Weight Loss.
Finkelstein, Linnan, et al. 2007.
Pilot study 2006, Research Triangle Park, NC and the University of North Carolina at
Chapel Hill, support from the Centers for Disease Control and Prevention
(P30CD000138-01 and RO1-D-DP000102).

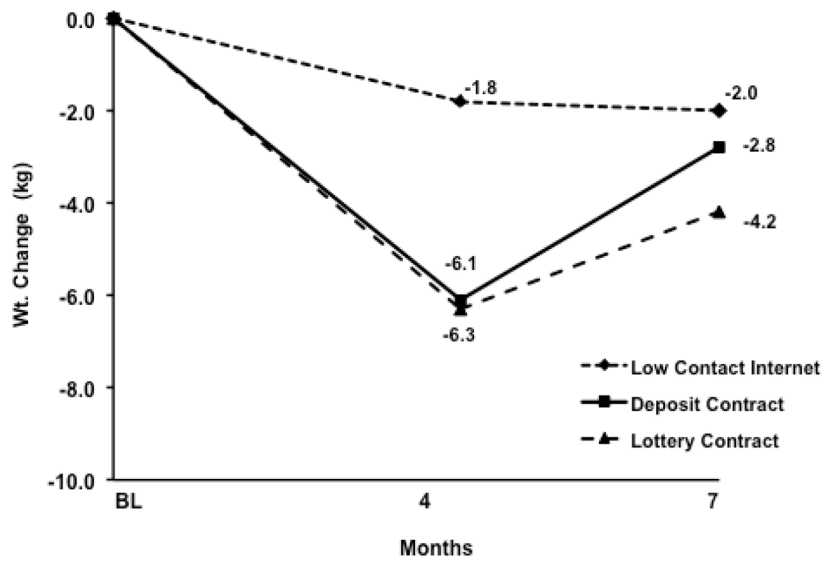


Figure 10. Effects of Deposit Contracts and Lottery Financial Contracts on Weight Loss. Volpp, John, et al, 2008. Participants (57 healthy participants aged 30–70 yrs with a BMI of 30–40 randomized to 3 weight loss plans) were recruited May–August 2007 at the Philadelphia VA Medical Center, Pennsylvania, and were followed up through June 2008