Incentives to Exercise

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Abstract: Can incentives be effective when trying to encourage the development of good habits? We investigate the effect of paying people a non-trivial amount of money to attend an exercise facility a number of times during a one-month period. In two separate studies, we find that doing so leads to a large and significant increase in the average post-intervention attendance level relative to the control group. This result is entirely driven by the impact on people who did not previously attend the gym on a regular basis, as the average attendance rates for people who had already been using the gym regularly are either unchanged or diminished. In our second study, we also obtain biometric evidence that this intervention improves important health indicators such as weight, waist size, and pulse rate. Thus, even though personal incentives to exercise are already in place, it appears that providing financial incentive to attend the gym regularly for a month serves as a catalyst to get some people past the threshold of actually getting started with an exercise regimen. We argue that there is scope for financial intervention in habit formation, particularly in the area of health.

Keywords: Exercise, Field experiment, Habit formation, Incentives

JEL Codes: A13, B49. C93, D0

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INTRODUCTION

On September 18, 2006, New York Mayor Michael Bloomberg announced a new policy he called "conditional cash transfers." He said that the plan was designed to address the simple fact that the stress of poverty often causes people to make decisions - to skip a doctor's appointment or to neglect other basic tasks that often only worsen their long-term prospects. Conditional cash transfers give them an incentive to make sound decisions instead. The intention was to provide conditional cash transfers to families of at-risk youngsters to encourage parents and young people to engage in healthy behavior, to stay in school, stay at work, and stay on track to rise out of poverty. Bloomberg also argued that the return on such investments is necessarily delayed, but that this is a clear path out of the cycle of poverty. Mr. Bloomberg's last comment is about changing peoples' habits. He believes that the cost (estimated at $42 Billion) of the program is worth the benefit of this improvement in habits.

Whether or not Mr. Bloomberg is correct in his assessment, an underlying issue is whether we can construct mechanisms to induce better decision-making. As DellaVigna and Malmendier (2006) have nicely demonstrated, people make poor choices regarding membership options at a health club: people who choose to pay a flat monthly fee for membership in a gym pay more than if they would have chosen to pay a fixed cost per visit (see also Ariely and Shampan'er, 2006). So perhaps the incentives to exercise that are already present are ineffective or insufficiently salient. But can we improve on these existing incentives? Can we go beyond the mere identification of behavioral mistakes, and consider the issue of how a welfare maximizer would react if aware of his or her own bias?[1]

[1] For a similar attempt in other economic areas, see the Thaler and Benartzi (2004) "Save More Tomorrow" plan. In a sense, this can be seen as complementary to the behavioral industrial-organization agenda, which considers how firms might react to consumer biases in product design, advertising, etc. See Ellison (2006) for a summary of the relevant literature, as well as related studies by Heidhues and Koszegi (2005, 2006).

In this vein, the goal of the current paper is to test the conjecture that financial incentives can be used to develop or foster good habits. Habits are an important feature of our daily life. However, people often follow a routine without much ongoing consideration about the costs and benefits of the constituent elements of this routine.[2]

One such habit is that of regular physical exercise. The physical benefits of exercise are undeniable, as adequate exercise is associated with better health in many respects. In particular, obesity has become a prominent health issue; the 1999-2000 National Health and Nutrition Examination Survey reported that a startling 64.5% of American adults, or more than 120 million people, were overweight or obese, the highest level ever recorded. The problem appears to be worsening: Adult obesity rates rose in 31 states from 2006 to 2007, according to the 2007 report from the Trust for America's Health; rates did not decrease in any states. A new public opinion survey featured in the report finds 85 percent of Americans believe that obesity is an epidemic. This increased prevalence of obesity is paralleled by an increase in inactivity. Most jobs today are sedentary and overweight people are even more likely to report being inactive.

Regular exercise combined with limiting calorie intake was shown to be the most effective in reducing body mass (Anderson, 1999). Exercise provides health benefits even if people do not lose weight (Lee, Blair and Jackson, 1999). There are also psychological benefits to exercising: People who exercise regularly are likely to be less depressed, have higher self-esteem, and have an improved body image (Brownell, 1995). Regular exercise may also reduce stress and anxiety (Kayman, Bruvold and Stern, 1990).

The literature discusses four main barriers to activity (Anderson, 1999): Lack of time, embarrassment at taking part in activity, inability to exercise vigorously, and lack of enjoyment of exercise. The traditional approach in economics involves providing financial incentives for

[2] See Ariely et al. (2003) for the problematic interpretation of some incentives.

people to engage in (or refrain from) various activities. But since strong (non-financial) incentives regarding habitual behavior are already in place without any intervention appearing to be necessary,[3] can there be much scope for intervention in the incentive structure?

We discuss below two main hypotheses regarding the outcome of using of incentives to shape habits. The first is the "crowding-out" hypothesis, according to which paying people for an activity (such as exercising) might destroy their intrinsic motivation to perform the task once the incentives are removed (Deci, 1971, Gneezy and Rustichini, 2000a,b, Frey and Jegen, 2001). The alternative hypothesis is "habit-formation" behavior. The main idea here is that one's utility from consumption depends on one's past consumption (Becker and Murphy, 1988).

If it is possible to induce a beneficial habit, the policy implications are major. In this paper we undertake financial interventions, conducting two field studies in which we paid university students to attend the university's gym. In the first of our studies, we compare the behavior of three groups. All groups were given a handout regarding the benefits of exercise. One group had no further requirements; people in the other two groups were paid $25 to attend the gym once in a week, and people in one of these two groups were then paid an additional $100 to then attend the gym eight more times in the following four weeks.

We are able to observe attendance before the intervention, during the intervention, and for a period of at least seven weeks after the end of the intervention. The main result is that post-intervention attendance is more than twice as high for the high-incentive group as for the no-incentive group. This difference does not decline at all during the time following payment, suggesting that the effects do have some degree of persistence. There is very little difference

[3] That people are aware that exercise is beneficial is evidenced by the fact that Americans spend billions of dollars annually on diet books, exercise equipment, and weight-loss programs (Andersen, Blair and Cheskin, 1997).

between the behavior of the no-incentive and low-incentive groups, while there is a significant difference between the behavior of the low-incentive and high-incentive groups.

In our second study, we also compare the behavior of three groups. We invited people to a first meeting in which we took their biometric measures and gave them the handout regarding the benefits of exercise. They were paid $75 for this part, and were then invited to come twice more, 4 weeks later and 16 weeks later, so that we could obtain their biometrics information. They were promised $50 for each of the two later meetings.

We randomly divided the participants into three groups. There were no additional requirements for the people in the control group. Participants in the second group were required to attend the gym once during the one-month intervention period, and participants in the third group were required to attend the gym eight times during the intervention period. We find a significant and persistent increase in attendance rates for people in the third group, and this increase is entirely driven by people who had not been regular gym attendees (at least once per week) originally, but remained regular attendees after the intervention period was over. We also find improvement in the biometric measures for the third group relative to the other groups.

Our results indicate that it may be possible to encourage the formation of good habits by offering monetary compensation for a sufficiently long baseline period, as doing so appears to move some people past the 'threshold' needed to engage in an activity. It may often be the case that there is initial resistance to commencing a beneficial regimen, as the start-up costs loom large. However, if people are 'walked through' this process with adequate financial incentives to try the regimen regularly for a while, perhaps good habits will develop.

Note that the observation that exercising is a habitual behavior suggests that people who are interested in exercising more should try to commit themselves to exercise for a while. By

doing so they affect not only their current well-being but also their future utility, by making future exercise more beneficial.[4] This type of self-enforcing mechanism is a possible explanation of the DellaVigna and Malmendier (2006) study. As a self-control mechanism, people may choose the more expensive plan because it reduces the marginal cost of attending to zero, and they believe that this will encourage them to attend the gym in the future.

Potential applications are numerous, as much of the population seems to be aware of the benefits of some activity, but incapable of reforming without some assistance. For example, in education, Angrist, Lang, and Oreopoulos (2007) offer merit scholarships to undergraduates at a Canadian university; they have some success in improving performance, but mixed results overall.

A recent literature in economics ties habits and self-control. Laibson (1997) and O'Donoghue and Rabin (1999) discuss present-biased (hyperbolic) preferences as an explanation for persistent bad habits and addictions.[5] Bernheim and Rangel (2004) present a model in which use among addicts may be a mistake triggered by environmental cues, which addicts may then try to avoid. In a related vein, Bénabou and Tirole (2004) develop a theory of internal commitments, wherein one's self-reputation leads to self-regulation and this 'willpower' enables one to maintain good behavior.

1. THE FIELD EXPERIMENTS

In our first study, we invited students (from an e-mail list of people interested in participating in experiments) at the University of Chicago to the laboratory. There was no mention of physical fitness or exercise in the recruiting materials. All participants were

[4] Becker and Murphy (1988) identify conditions under which past consumption of a good raises the marginal utility of present consumption; Becker (1992) applies this to habit formation. This is discussed in more detail below.
[5] See Frederick, Loewenstein, and O'Donoghue (2002) for a comprehensive review of empirical research on intertemporal choice, as well as an overview of related theoretical models.

promised payment if, and only if, they came to the laboratory once on a given date and again a week later. The 120 students we signed up were assigned randomly to one of the three treatments described below. All students there received a membership in the campus athletic facility as part of their fees. Each person was asked to sign a consent form allowing us to get the computerized report (based on the magnetic swipe-card used to enter the gym) of his or her visits to the gym during the academic year, so we were able to obtain records concerning past attendance at this facility for all of our participants. Everyone was given a handout about the benefits of exercise; this is shown in the Appendix. Forty of these people participated in a different experiment, which was completely unrelated to exercising; this was the control group.[6]

The other 80 participants (in different sessions) were told that they would receive $25 to visit the gym at least once during the following week and then to return to the lab to answer questions. They were told that we would be checking their computerized records: Each time a person enters the gym his or her card is swiped and this is recorded in the system. Upon returning to the lab in the following week, participants were randomly assigned to one of two treatments. For half of them this was the end of the experiment; the other half was promised an additional $100 for attending the gym at least eight times during the next four weeks. All participants in the latter group achieved this goal and returned after the month was over. At the end of the academic year we retrieved the computerized records for each of the 120 participants.

Our second study was conducted at UCSD. All students registered at this university receive a membership in the campus athletic facility as part of their tuition. Again, everyone was asked to sign a consent form allowing us to get the computerized report of their gym visits, so we were able to obtain records concerning past attendance at this facility for all of our participants.

[6] This was a marketing experiment studying the effect of coupons on product choice.

In all, 159 first and second year undergraduate students were recruited from the general campus population using email lists.[7] All participants were paid $175 (in installments, to motivate people to show up each time) to go to a meeting room at the Business School three times (once in January, once after about a month, and once after about five months) for biometric tests. They were also asked to keep an exercise log for five weeks and to complete a questionnaire. There were no further requirements for the 39 people in the control group; the 57 people in the second group were additionally required to go to the gym at least once in the next month, while the 60 people in the third group were additionally required to go to the gym at least eight times in the next month. By paying the same amount of money to all participants we control for the possibility that it was the monetary payment, rather than a habit acquired by our requiring multiple gym visits, that caused the effects we observed in our first study.

Participants who replied to the email were invited for an individual meeting and were given the exercise handout and a questionnaire. We then measured the individual's height, weight, body fat percentage, waist, pulse, and blood pressure.[8] We collected the exercise logs, which showed the number of days of exercise and a brief description of the kinds of exercise in both the gym and otherwise, at the second measurement appointment. The appointments for the second and third meetings were arranged by email.

[7] Three participants did not show up to all meetings, and were excluded from the data.

[8] To measure the waist circumference, the research assistant placed a tape measure around the abdomen just above the hip bone. The tape was snug and was kept parallel to the floor. Body fat percentage was measured with a conventional scale that uses the Bioelectrical Impedance method. A low-level electrical current is passed through the body and the "impedance" is measured. The result is used in conjunction with weight to determine body fat percentage. Unfortunately, the body's impedance level can be altered by many factors besides body fat, such as the amount of water in the body, skin temperature and recent physical activity. Hence, this is a noisy measure of actual body fat. Pulse and blood pressure were measured using an automatic monitor.

Hypotheses

The standard null hypothesis is that our financial intervention will not affect behavior after the end of the intervention. We formalize this as:

Hypothesis 0: *Participants will visit the gym with the same frequency after the incentives are removed as before the incentives were introduced.*

We also test two competing hypotheses regarding the effect of this incentive. The first hypothesis is the *crowding out* effect. Studies indicate that, in some situations, providing rewards may be counter-productive, as providing an extrinsic motivation for a task or activity may crowd out existing intrinsic motivation.[9] The formal statement of the hypothesis is:

Hypothesis 1: *Participants will visit the gym <u>less</u> frequently after the incentives are removed as compared to before the incentives were introduced.*

According to this hypothesis, participants are intrinsically motivated to exercise. Any extrinsic intervention, such as paying them to go to the gym, may be counter-productive in the long run by destroying the intrinsic motivation to exercise. According to this process, before the introduction of the incentives participants exercised either because it was good for them or because they simply enjoyed it. After the incentives are introduced, they may instead feel that they exercise just for the money.

Even if the incentives are large enough to motivate people to go to the gym while in force (see Gneezy and Rustichini, 2000a and Heyman and Ariely, 2004 for the effect of the size of the incentive), the hypothesis is that after the incentives are removed participants will stop attending the gym because intrinsic motivation is crowded out.

[9] For early demonstrations in psychology, see Deci (1971) and Lepper and Greene (1978). See Frey and Jegen (2001), and Gneezy and Rustichini (2000a, b) for demonstrations in economic settings. Bénabou and Tirole (2003) present a formal model of this issue. Fehr and Falk (2002) provide a more general framework of the psychology of incentives.

The competing hypothesis is that people who were paid to attend the gym for some period would attend the gym more frequently even after the incentives are removed.

Hypothesis 2: *Participants will visit the gym <u>more</u> frequently after the incentives are removed as compared to before the incentives were introduced.*

One motivation for this hypothesis is "habit formation." Becker and Murphy (1988) identify a necessary and sufficient condition for a good to be habitual near a steady state:

$$(\beta + 2\delta)U_{cs} > \delta U_{ss},$$

where δ is the depreciation rate on past consumption, β is the rate of preference for the present, c is a consumption good, S is the stock of consumption capital, $U_{cs} = \partial^2 U / \partial c \, \partial S$ and $U_{ss} = \partial^2 U / \partial S^2$.[10] In words, an increase in one's current consumption of c increases one's future consumption of c if and only if one's behavior displays adjacent complementarity.[11,12]

Habits may be harmful or beneficial, to the extent that they decrease or increase future utility. The marginal utility of today's consumption is correlated with historical consumption; changes today may have only a small effect in the short run, but increasingly large effects in the long run. In this view, "experiences influence … desires and choices partly by creating habits, addictions, and traditions" (Becker, 1992, p. 335).

If exercising is a form of habitual behavior, providing incentives to go to the gym for a while may increase future utility from exercising. If the marginal utility of consumption today is positively correlated with historical consumption, than this period in which people were given financial incentives to go to the gym could also induce people to go to the gym more often in the future. Hence, we call this hypothesis *habit formation*.

[10] See Becker and Murphy (1988, pp. 679-680) for the derivation. We use the Becker (1992, p. 343) formulation.
[11] This term was first introduced Ryder and Heal (1973). An example on p. 5 is: "A person with adjacent complementarity [who expects to receive a heavy supper] would tend to eat a light breakfast and a substantial lunch," while this would be reversed with distant complementarity.
[12] In fact, past consumption of the good raises the marginal utility of present consumption whenever $U_{cs} > 0$.

2. RESULTS

Figures 1a and 1b graphically presents the rate of gym attendance before and after the intervention period for Study 1 and Study 2, respectively. "Before" refers to the period before the first lab visit, while "After" refers to the period after any incentives were removed.[13]

Figure 1a
Average Weekly Gym Visits (Study 1)

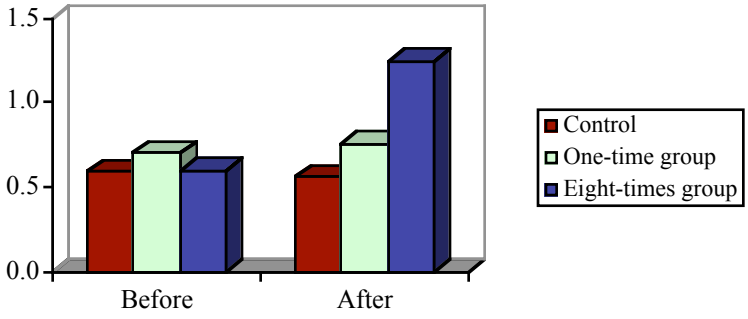
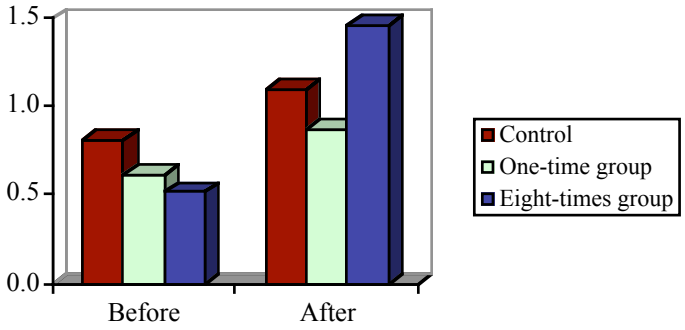


Figure 1b
Average Weekly Gym Visits (Study 2)



In Study 1, the baseline averages were 0.59, 0.70, and 0.60 visits per week for the control group, the group required to attend only one time (henceforth the "one-time group"), and the group required to attend the gym eight additional times (henceforth the "eight-times group"),

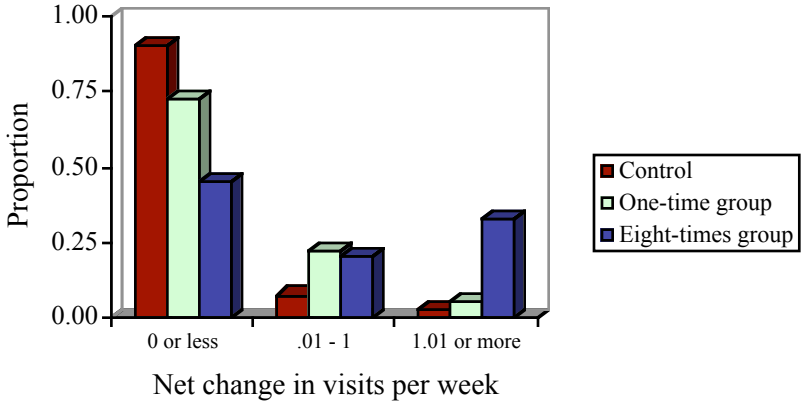
[13] We compare the same weeks in Study 1; however, since the intervention period ended earlier for the group required to attend only once than for the group required to attend eight more times, the actual post-intervention period is slightly different. However, robustness checks show no qualitative difference for different specifications.

respectively, in the eight weeks before the first lab meeting.[14] After the end of the intervention, in the same order, participants averaged 0.56, 0.76, and 1.24 visits per week. Thus, we see an average increase of 0.64 visits (107% of the baseline) for the eight-times group, compared to a modest increase for the one-time group, and a slight decline in gym visits for the control group.

The baseline averages in Study 2 were 0.81, 0.62, and 0.52 visits per week per person for the control, one-time, and eight-times groups, respectively, in the 12 weeks before the first lab meeting.[15] These averages were 1.10, 0.87, and 1.46 for the 13 weeks after the end of the intervention.[16] Thus, we see the attendance rates increased by 0.29 (36%), 0.25 (40%), and 0.94 (181%) for the control group, the one-time group, and the eight-times group, respectively.

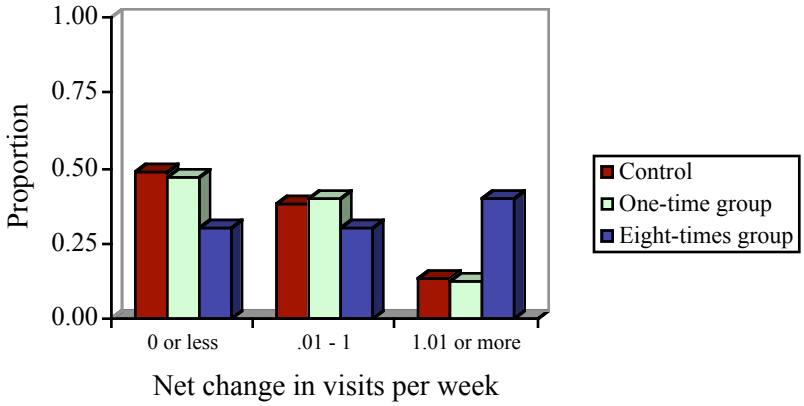
We can also examine changes on an individual basis, as shown in Figures 2a and 2b:

Figure 2a
Change in Gym Visits, by Individual (Study 1)



[14] We use "eight-times group" for consistency with Study 2, even though people in this group were actually required to attend nine times overall.
[15] We exclude the three weeks of Winter break from these calculations.
[16] We exclude two weeks around Spring break from these calculations.

Figure 2b
Change in Gym Visits by Individual (Study 2)



In Study 1, we see that in fact nearly one-third of all participants in the eight-times group (13 people of 40) increased their average number of gym visits by more than one per week, while only two participants in the one-time group, and one participant in the control group did so. The test of the equality of proportions (see Glasnapp and Poggio 1985) finds a very significant difference between the high-incentive and no-incentive treatments, as well as between the two incentive treatments ($Z = 3.53$ and 3.15 for the respective comparisons, both significant at $p < 0.001$). There is no difference between the one-time group and the control group ($Z = 0.59$).

In Study 2, forty percent of all participants in the eight-times group (24 people of 60) increased their average number of gym visits by more than one per week, while only 12% of the participants (7 people of 57) in the one-time group, and 13% of the participants (5 people of 39) in the control group did so. The test of the equality of proportions finds a very significant difference between the eight-times and control groups, as well as between the eight-times and

one-time groups ($Z = 3.40$ and 2.90 for the respective comparisons, both significant at $p < 0.002$).[17] There is no difference between the control and one-time groups ($Z = 0.07$).

We can view a cross-section of the population by categorizing people before the intervention as regular attendees (at least one visit per week) or non-regular attendees. From the standpoint of public policy, it may well be more useful to target people who rarely (if ever) attend the gym and convert them into regular attendees than to increase the visitation rate for people who already attend the gym regularly. The effect of requiring multiple visits on the people who were not regular attendees is also particularly relevant for testing habit formation.

In Study 1, there were 27 people in the eight-times group who had not been attending the gym regularly; 12 of these people (44%) became regular attendees after being paid to go to the gym for a month; these 12 people represent 30% of the sample population. The average change for people who had not been regular attendees was 0.98 visits. In contrast, the average change for the 13 people who were already regular attendees was -0.07. Thus, the entire effect of the incentive for the eight-times group comes from those people who had not been regular attendees.

In Study 2, forty-nine of 60 people in the eight-times group had not been attending the gym regularly; 26 of these people (53%) became regular attendees; these 26 people represent 43% of the sample population. The average change for people who had not been regular attendees was 1.20 visits. In contrast, the average change for the 10 people who were already regular attendees was -0.20. Thus, as in Study 1, the entire effect in the eight-times treatment comes from those people who had not been regular attendees.

Table 1 illustrates the gym attendance rates before and after any intervention for the different groups in Study 1 and Study 2, by previously regular or non-regular attendees:[18]

[17] A Chi-square test using these three categories shows a significant difference between the distributions in the eight-times treatment versus the other two treatments ($\chi^2_2 = 8.49$ and $\chi^2_2 = 11.66$, $p < 0.012$ and $p < 0.001$, respectively).

Table 1: Mean weekly gym attendance rates

		Ex-ante regular attendees			*Ex-ante* non-regular attendees		
		Before	After	Change	Before	After	Change
Study 1	Control	1.844 (0.296)	1.774 (0.376)	-0.070 (0.206)	0.058 (0.036)	0.046 (0.023)	-0.012 (0.020)
	One required visit	1.866 (0.165)	1.827 (0.211)	-0.040 (0.204)	0.077 (0.040)	0.181 (0.094)	0.104 (0.106)
	Eight required visits	1.644 (0.127)	1.571 (0.304)	-0.073 (0.264)	0.102 (0.044)	1.085 (0.234)	0.983 (0.231)
Study 2	Control group	2.433 (0.419)	2.677 (0.465)	0.244 (0.417)	0.250 (0.047)	0.560 (0.168)	0.310 (0.160)
	One required visit	2.051 (0.191)	2.491 (0.583)	0.440 (0.537)	0.193 (0.039)	0.395 (0.079)	0.202 (0.080)
	Eight required visits	1.901 (0.402)	1.706 (0.786)	-0.195 (0.411)	0.204 (0.038)	1.405 (0.170)	1.201 (0.171)

Standard errors are in parentheses.

In Study 1, we see that there is no real effect on the attendance rates of those people who were already regular attendees; in fact, there is a slight downward drift in all treatments. Similarly, there is a slight downward drift for *ex-ante* non-regular attendees in the control group. We do observe a small increase in attendance for non-regulars in the one-time group; however, by far the largest effect is observed for non-regulars in the eight-times group.

We see that in no treatment of Study 2 is there a significant effect on the attendance rates of those people who were already regular attendees. There is an upward trend for *ex-ante* non-regular attendees in both the control group and the one-time group; this is significant with two-tailed tests for the one-time group and nearly so for the control group. However, by far the largest effect is observed for non-regulars in the eight-times group.

We also note that the change for regular attendees in the eight-times group is actually negative, and in contrast to the modest upward trend for regular attendees in the control and one-time groups. This difference-in-difference is marginally significant (Wilcoxon ranksum test; $Z =$

[18] For the purposes of analysis, we exclude the weeks of spring and winter break, as attendance rates were, perforce, extremely low during these weeks and thus not really representative. In any case, our results are qualitatively unchanged when these weeks are included.

1.34, $p = 0.090$ on a one-tailed test), it does suggest the possibility that of the intrinsic motivation of regular attendees was crowded out (Hypothesis 1).

One might expect that simply requiring people to become familiar with the gym by going through the initial set-up might lead to benefits. Perhaps this partially explains the small increase in the attendance rate for non-regular attendees. But if this were the full explanation, there should be little difference between any groups who were required to attend at least once, since they all went the gym and incurred the set-up costs. Yet we see that the increase in gym attendance, in both studies, is significantly and substantially larger for non-regular attendees in the eight-times group than in the other groups.

Thus, we see support for Hypothesis 2 over Hypothesis 0 when people who had not regularly attended the gym were required to make multiple visits (obviously we cannot test Hypothesis 2 against Hypothesis 1 for those people who had not attended the gym before the intervention, as their attendance rate cannot decrease). On the other hand, Hypothesis 0 appears to hold for the other treatments. Hypothesis 1 is generally rejected, although perhaps not for the people in Study 2 who were initially regular gym attendees.

It is not surprising that the financial incentives lead to a strong effect during the incentive period. But how persistent are the post-intervention effects – do these appear to be diminishing over time? Figures 3a and 3b shows that there is very little change in attendance rates once the intervention is over. We see little if any change over the remaining time for any group.[19]

[19] Both studies necessarily ended at the end of the school year, as our permission to gather these data did not extend to the next academic year. The gaps in the Figures reflect the low-usage periods mentioned in Footnote 18.

Figure 3a - Avg. Gym Visits over Time (Study 1)

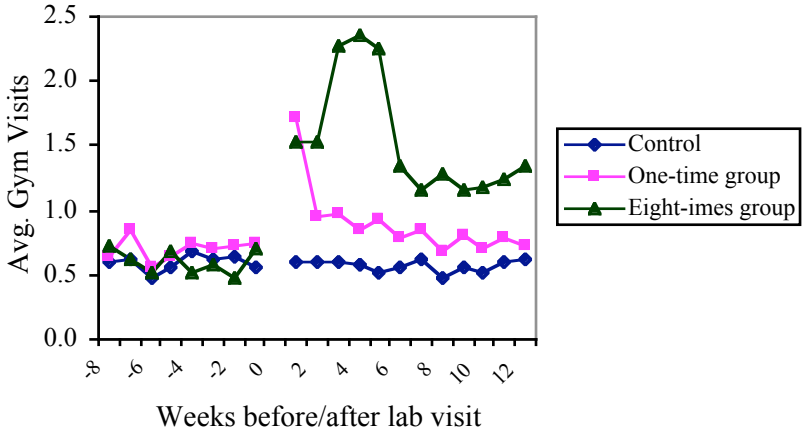
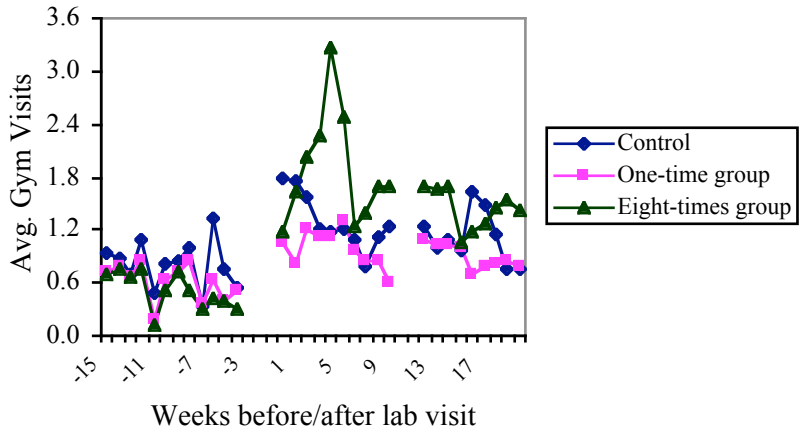


Figure 3b: Avg. Gym Visits over Time (Study 2)



A natural concern is the decay rate of the post-intervention attendance for the eight-times group. A regression on the gym attendance for this group in Study 1 over the time of the post-intervention period shows that the average gym attendance *increases* by the insignificant rate of .004 per period, so we see no signs of decay in gym attendance over time after the intervention. A similar regression for study 2 shows that the average gym attendance drops by the insignificant rate of .010 per period. Given that the increase over the pre-intervention rate for

this group was 1.201, the benefits would erode in 120 weeks with a linear decline (and, of course, more slowly with a constant percentage decrease from week to week).

Regression analysis

We supplement our descriptive results and nonparametric statistics with some Tobit regressions that account for the left-censoring problem. These are presented in Table 2:

Table 2 – Tobit regressions for Gym Attendance Rate after Intervention

Independent Variables	Study 1 (1)	Study 1 (2)	Study 2 (1)	Study 2 (2)
Attendance before	1.262*** [0.154]	1.434*** [0.205]	1.045*** [0.112]	1.195*** [0.140]
One-time group	0.292 [0.358]	0.184 [0.450]	-0.022 [0.289]	-0.043 [0.307]
Eight-times group	1.320*** [0.350]	1.874*** [0.404]	0.884*** [0.284]	1.234*** [0.294]
Male	0.135 [0.280]	0.153 [0.268]	-0.031 [0.249]	-0.114 [0.240]
One-time*regular		0.198 [0.589]		0.230 [0.480]
Eight-times*regular		-1.527*** [0.533]		-1.664*** [0.480]
Constant	-1.243** [0.366]	-1.362*** [0.386]	-0.020 [0.250]	-0.114 [0.252]
# Observations	120	120	156	156
Pseudo R^2	0.211	0.241	0.140	0.164

The control-group attendee is the omitted variable in these regressions. *** indicates significance at the 1% level, two-tailed tests

The regressions confirm our earlier discussion. Specification (1) of Study 1 indicates that only when eight visits are required do we observe a significant increase in post-intervention gym attendance; specification (2) shows that the effect largely vanishes for *ex ante* regular attendees

who were required to visit the gym eight times. Specification (1) of Study 2 also indicates that only when eight visits are required do we observe a significant increase in post-intervention gym attendance; specification (2) shows that the effect vanishes entirely (going slightly in the other direction) for *ex ante* regular attendees who were required to attend eight times. Note that we find no significance for gender in any regression.[20]

Biometric and questionnaire data

As mentioned earlier, in Study 2 we gathered data on each participant's weight, body fat percentage, waist size, pulse rate, and blood pressure. Table 3 summarizes these data:

Table 3: Biometric data averages – Study 2

	Control				One-time				Eight-times			
	1st	2nd	3rd	Diff	1st	2nd	3rd	Diff	1st	2nd	3rd	Diff
Body fat %	25.7 (1.54)	25.6 (1.55)	27.1 (1.62)	1.41 (0.42)	21.6 (1.07)	22.0 (1.11)	21.8 (1.14)	0.29 (0.33)	26.9 (1.09)	26.7 (1.09)	26.1 (1.07)	-0.78 (0.21)
Pulse rate	78.0 (1.86)	80.3 (1.80)	81.9 (2.12)	3.90 (2.08)	81.8 (1.69)	79.9 (1.52)	80.1 (1.59)	-1.75 (1.73)	80.2 (1.47)	81.7 (1.48)	79.0 (1.81)	-1.25 (1.78)
Weight (kg.)	61.8 (2.03)	61.5 (1.95)	62.4 (1.91)	0.57 (0.55)	59.8 (1.60)	60.0 (1.56)	60.4 (1.60)	0.59 (0.21)	64.0 (1.54)	64.0 (1.51)	63.7 (1.52)	-0.34 (0.25)
Waist (in.)	34.3 (0.63)	34.1 (0.58)	34.3 (0.62)	0.07 (0.36)	33.0 (0.47)	32.9 (0.46)	32.8 (0.48)	-0.10 (0.27)	35.0 (0.42)	34.7 (0.41)	34.3 (0.44)	-0.72 (0.23)
BMI	22.7 (0.64)	22.6 (0.61)	23.0 (0.61)	0.23 (0.19)	21.7 (0.45)	21.8 (0.44)	21.9 (0.45)	0.22 (0.07)	23.2 (0.40)	23.2 (0.39)	23.1 (0.39)	-0.12 (0.09)
Systolic BP	122 (1.82)	123 (2.37)	127 (2.14)	5.23 (1.71)	121 (2.01)	125 (2.04)	123 (1.83)	2.32 (1.88)	122 (1.90)	125 (1.85)	125 (1.76)	1.78 (1.99)
Diastolic BP	74.0 (1.22)	75.9 (1.14)	76.8 (1.18)	2.87 (1.22)	75.8 (1.44)	75.6 (1.11)	76.8 (1.20)	1.07 (1.23)	74.7 (1.07)	76.3 (1.08)	77.3 (1.25)	2.58 (1.33)

Standard errors are in parentheses. Body mass index (BMI) is calculated using the following formula:
BMI= (weight in kilograms)/(height in meters)^2

[20] Consistent with the habit-formation story, we find a significant correlation between gym attendance during and after the intervention for the eight-times groups in both Study 1 and Study 2 ($r = 0.6035$ and $r = 0.6802$ in the respective studies; both correlation coefficients are significant at $p < 0.0001$).

Despite the modest change in levels, we find significant differences across treatments in the change in these levels over time for body fat percentage, weight, waist size, BMI, and pulse rate.[21] Table 4 shows the results of Wilcoxon ranksum tests across groups, using individual data.

Table 4: Biometric data: *Z*-statistics for changes over time– Study 2

	Control vs. Eight-times	One-time vs. Eight-times	Control vs. One-time
Body fat %	4.809*** (0.000)	3.537*** (0.000)	1.706* (0.088)
Weight (kg.)	2.714*** (0.007)	2.815*** (0.005)	0.496 (0.620)
BMI	2.771*** (0.006)	2.823*** (0.005)	0.583 (0.560)
Waist (in.)	1.822* (0.039)	2.001** (0.006)	0.266 (0.791)
Pulse rate	2.057** (0.040)	0.033 (0.974)	2.170** (0.151)
Systolic BP	1.698* (0.090)	0.130 (0.897)	1.726* (0.0846)
Diastolic BP	0.620 (0.535)	-0.448 (0.654)	1.406 (0.160)

***,**,* indicates significance at the 1%, 5%, 10% levels on Wilcoxon ranksum tests.
p-values are in parentheses.

Overall, with the exception of the blood-pressure measures, we see that the eight-times group improved significantly in their biometric measures relative to both the control group and, with the further exception of the pulse rate, the one-time group. Thus, it appears that there are real health benefits that accrue from paying people to go to the gym eight times in a month. There are also some differences between the control and one-time group, but these tend to have lower significance levels; perhaps there is a slight benefit from merely requiring one visit.[22]

[21] We include for convenience both weight and BMI, even though the latter is purely a function of weight if the height is constant.

[22] We do measure the amount of gym and non-gym exercise in Study 2 by requiring participants to keep exercise journals during the intervention period. The people in the control group reported exercising on an average of 8.08 days, with 79% reporting going to the gym during this time and 26% reporting non-gym exercise. Participants in the one-time group reported exercising on an average of 4.91 days, with 100% reporting going to the gym during this time and 33% reporting non-gym exercise. People in the eight-times group reported exercising on an average of 8.58 days, with 100% reporting going to the gym during this time and 22% reporting non-gym exercise.

We asked people to fill out a questionnaire at the first meeting, with questions involving the frequency of exercise, whether people wished to exercise more, whether people thought that being paid money to go to the gym would increase the amount they exercise, and, if so, whether this would have a long-term effect. Other questions pertained to the GPA, to happiness with respect to social life and academic performance, and to the extent a change was needed in their lives. Table 5 gives the summary statistics for each question:

Table 5: Questionnaire summary statistics – Study 2

	Control	One-time	Eight-times	Aggregate
Exercise frequency (per week)	2.391 (0.257)	2.202 (0.264)	2.058 (0.187)	2.194 (0.136)
Wish to exercise more (yes = 1)	0.821 (0.062)	0.807 (0.053)	0.883 (0.042)	0.840 (0.029)
Money helps (yes = 1)	0.872 (0.054)	0.789 (0.040)	0.825 (0.043)	0.824 (0.028)
If so, long-term effect (yes = 1)	0.875 (0.052)	0.744 (0.063)	0.767 (0.058)	0.790 (0.034)
GPA	3.324 (0.064)	3.077 (0.065)	3.267 (0.067)	3.211 (0.039)
Happiness with social life (1-7)	5.949 (0.107)	5.948 (0.107)	6.017 (0.087)	5.974 (0.065)
Happiness with academic affairs (1-7)	5.590 (0.171)	5.246 (0.153)	5.433 (0.133)	5.404 (0.087)
Change needed in life (1-7)	4.500 (0.247)	4.456 (0.194)	4.783 (0.178)	4.594 (0.116)

Standard errors are in parentheses.

The immediate issue is whether these questions help to predict the frequency of gym attendance after the intervention period. First, the reported exercise frequency is significantly positively correlated ($r = 0.285$, $p = 0.003$) with later gym attendance, just as is the exercise frequency prior to the intervention period. Neither a desire to exercise more, nor a belief that being paid to attend the gym helps, nor a belief that there will be a long-term effect has much to do with an actual increase in gym-attendance frequency ($r = 0.007$, $r = -0.070$, and $r = 0.051$, respectively; none of these correlations is at all close to being significant). Similarly, there is no

significant correlation between the change in gym attendance and one's happiness with one's social life, one's happiness with one's academic performance, or the perception that a change in life is needed ($r = 0.017$, $r = -0.006$, and $r = 0.097$, respectively). Thus, our results are robust to whether or not one wishes to exercise more, believes that being paid will help (and whether there will be a long-term effect), is happy regarding social life and academic performance, or thinks a change is needed in life.

3. CONCLUSION

Some of us have too many bad habits, such as smoking, and too few good ones, such as exercising. Could incentives be used to "improve" one's habit formation – reducing the bad ones and increasing the good ones?

This is an important public-policy question that comes to mind when discussing, e.g., incentives to get an education. A major argument made by opponents of using monetary incentives in education is the risk of crowding out of intrinsic incentives. Strong and robust evidence shows that the introduction of extrinsic incentives can alter the meaning of the interaction, and hence be counter-productive. In education, it might result in focusing the attention on test scores, instead of a more holistic approach in which test scores are only one component. A particular concern arises regarding the long-term effect of the monetary intervention. Even if incentives are effective while present, after they are removed people may revert to effort levels even lower than the initial ones.

In this paper we chose to test the effect of such extrinsic incentives on behavior that is easier to evaluate than education, because the goal is better defined. Exercising is relatively easy to measure and is almost always beneficial. In each of our two studies we paid one group to go to the gym for several weeks, and we observed the gym attendance for this group and all others

after the incentives (if any) were removed. Two competing predictions regarding the long-term effect on exercising can arise from the existing literature. The use of incentives might weaken the intrinsic motivation to engage in exercise, such that when the incentives are removed people would exercise less than before. Alternatively, the period of time during which people were induced to exercise might be sufficient to induce the formation of a habit that will remain even after the removal of the incentives.

We find a positive effect from paying people to go to the gym eight times over a period of one month, as the rate of gym visits after the intervention increased significantly in both studies. Upon closer examination, we have the encouraging result that our incentive scheme was successful in creating this positive habit of exercising more: Participants who did not attend the gym before our study began to do so during our intervention and continued to go after it was concluded. This result is robust to a number of factors, including gender, the expressed desire to exercise more, and satisfaction regarding one's social and academic life. We also note that simply informing people about the benefits of exercise had very little effect.

Hence, the main result of this paper is that paying people to go to the gym regularly positively re-enforced this behavior. The concerns discussed above regarding a strong decline in exercising after removing the incentives were not completely rejected, as there is some slight evidence (primarily in Study 2) that imposing requirements can actually backfire with respect to people who have already been attending the gym regularly.

Finally, the evidence shows that people derive health benefits from our intervention, as the relative change in several biometric indices is significantly better for the eight-times group than the other groups in Study 2. Given the enormous sums of money spent on health care, even a modest improvement would yield large social benefits. Furthermore, if it is possible to

favorably influence the habits of young people, there is at least the possibility that this improvement will last for a long time, providing social benefits for the entire period. Of course, we cannot substantiate such a strong claim; however, we do find that the gym attendance rate does not decrease significantly during the post-intervention period in either study.

The implications of our findings for public policy are straightforward. Incentives to exercise work, but they should be targeted at people who currently do not exercise and must mandate enough practice hours for the habit to develop. We find that merely providing information about the benefits of exercise or even requiring one gym visit does not have much of an effect. Furthermore, paying people who currently exercise is at best a waste of money; at worst, as our findings hint, it can actually weaken post-intervention exercise habits for people who had already been exercising.

There are still many open questions in the literature on incentives and habit formation. Findings in the literature on bad habits, such as smoking, are not as encouraging as our findings. For example, researchers on cigarette smoking have used punishment or rewards (Donatelle *et al.*, 2004) to break the habit, but with very little success. The basic result is that people refrain from smoking when incentives are present, but go back after the incentives are removed. An interesting question that future research might address is why habits that we are trying to eliminate seem different from habits that we are trying to acquire.

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APPENDIX (For publication in a web Appendix)
Initial exercise handout

Please read the following essay

The importance of exercising

Exercise is good for your body, but did you know that exercise is also good for your mind?

Research has shown that regular exercise delivers a mental and emotional boost. It improves your mood, bolsters your self-esteem and gives you the confidence to handle whatever comes your way. Some studies hint that it also enhances the functioning of your brain.

Your Body's Medicine Cabinet

When you are physically active your body releases chemicals known as endorphins. These are your body's natural painkillers and stress reducers. They diminish anxiety and depression and produce a sense of well being known as the exercise "high."

Just one workout can release another cache of natural antidepressant chemicals from your body's medicine cabinet, such as dopamine, serotonin and norepinephrine.

A study at Duke University found that intense bouts of exercise are every effective in reducing feelings of depression, tension, anger and confusion.

Meanwhile, a host of other studies have shown that even short spurts of moderate exercise can improve your outlook on life and make you less anxious. Whether you take a brisk ten-minute walk, do a few jumping jacks, or bicycle around the block, you will feel the benefit both physically and emotionally.

Stress Buster

Chronic stress releases a number of different chemicals and hormones into your body that raise blood pressure, weaken your immunity to colds and illness, impair your memory, increase fat cell storage, and lead to depression.

Regular physical activity has been shown to be an effective stress buster and successful weapon against its debilitating effects. The set of beneficial chemicals and hormones released during exercise are an important arsenal that can defeat the negative chemicals created by stress.

Canadian researchers discovered that depressed people experienced significantly less depression after exercising for anywhere from 20 minutes to an hour, three times a week for five weeks. In some cases the benefits lasted up to one year. It is important to note however, that severe cases of depression require medical review and a combination of treatments.

In another study, a team of Australian researchers compared people who practiced progressive-relaxation techniques with a group who did 30 minutes of aerobic exercise three times a week. It was the exercise group that had lower blood pressure and responded best to acute stress.

A Boost to Self-esteem

How we feel directly affects how we use our bodies and how we look. Feelings of distress or doubt can cause us to hunch our bodies in an effort at self-protection. As a result our spines are compressed and our breathing is shallow. We limit ourselves to small movements leading our muscles and joints to stiffen and weaken. It is no wonder that our spirits might sag and our sense of self-esteem drop through the floor.

Often just starting out on a new exercise program can boost your sense of self-worth. As you find yourself progressing, you'll also find your confidence growing. Choose physical activities that stretch and strengthen. They will help you to physically stand taller, feel better, and face the world with a positive outlook.

Time Out

Like many leisure activities such as meditation or your favorite hobby, exercise gives your mind needed time out from everyday thoughts, worries and responsibilities. You return to your life refreshed, invigorated, and perhaps even mentally sharper.

By improving the flow of blood and consequently of oxygen and nutrients to your brain, it may be that aerobic exercise helps you to think better.

Regular weight training and aerobic exercise have been shown in several studies to impart an additional benefit. They can improve the quality and duration of sleep. A good night's rest can make you less fatigued and better able to function in your daily life.

A Little Bit Can Go a Long Way

A great deal of research continues to be done on the mental and emotional effects of physical activity. A recent study found that after several subjects spent 30 minutes on a treadmill, they scored 25 percent lower on tests that measure anxiety as well as demonstrated positive changes in their brain activity.

A brisk walk, a short jog, or even just several stretches during your day can help relieve stress and improve your outlook on life. Regular physical exercise releases a host of beneficial chemicals that can help you feel physically fit, mentally sharp, and emotionally positive. Find a physical activity you enjoy and give yourself a dose of good health every day. Stay fit and stay happy.

Staying motivated

One way to stay motivated is to constantly remind yourself that a worth-while pay-off lies ahead; a new, healthy, strong you is emerging. Effective, consistent exercise will not only improve your overall health and fitness, but will also improve your appearance, energy level, and social interactions. Also, look forward to the many psychological benefits as well: confidence, self-esteem, and relief from depression, anxiety and stress.

If you are serious about your health and well-being, you will take action and begin an exercise program, and you will benefit in all these ways. Once you see the results, you will become even more motivated. Action creates motivation!

Set Goals

Goal-setting is another great way of staying motivated. Goals focus your workout program and clarify what you are trying to achieve. As you attain each goal, you gain encouragement and further motivation. Here is how to achieve the goals you set and obtain the results you deserve.

1. Make sure your goals are measurable: A vague goal, such as "I want to be fit," gives you nothing to shoot for. Decide when and what you are going to achieve, such as "I want to lose 2 percent of my body fat by August 1st."

2. Be realistic: Make sure your goals are attainable. If you set your expectations too high, you will get frustrated and will be more likely to quit. Make sure, however, that your goals are not too easy; they should be challenging. When you achieve a challenging goal, your pride and satisfaction will create more motivation.

3. Set short-term goals as stepping stones to your "ultimate" (long-term) goals: If your long-term goal is to bench press 200 pounds in one year, then set short-term weekly or monthly goals of the weight you will need to bench press to achieve your long term goal--develop a plan. It is a lot easier to accomplish a goal one day or week at a time, such as increasing 2.5 or 5 pounds a week, than it is to think that you need to increase your bench press by 50 pounds.

Make It Fun

Another way of assuring that you stay motivated is to make exercise fun. If you perceive your workout as a chore, you more than likely will not stick with it. Here are some techniques for making your workout something to look forward to.

1. Add Variety: If your weightlifting is getting tedious and boring, change one of these factors:

- Vary how often you do an exercise and the number of sets and reps you do.
- Find an alternate exercise; for example, if you always do the bench press using a barbell, try doing it with dumbbells or on a machine.
- Change the order of the exercises you do for each muscle group and the muscle groups themselves.

2. Include Friends and Family: Training with a workout partner not only makes your training session more fun, safe, and intense, but will also increase the likelihood of your showing up at the gym. Make sure you pick a partner whose goals and interests are similar to yours and who is willing to spot you correctly and motivate you to do your best.

3. Fight Discouragement: If once in a long while you blow off a workout because you choose to go out with friends, just accept and enjoy your choice--do not feel guilty. Otherwise, the sense of failure can make it harder to get yourself back on track. Focus on how much progress you have made so far, not on how far you have to go.

4. Expect and Prepare for Plateaus: If you feel you have reached a plateau and/or are bored, do not give up--this is a natural part of working out. Make sure to vary the exercises, sets, repetitions and order of your workout--continually search for new ways of making your routine fun and exciting.

5. Schedule your Workout: If you always exercise on the same days at the same time, your routine will become a fixture in your life, not a whim. Not going to the gym will feel unnatural. Including exercise into your busy schedule will be an adjustment, and staying motivated will be equally challenging. Change is difficult for many people. However, if you have the willingness to work through the initial emotional discomfort as you move step by step through a safe and effective program, you will find the confidence, commitment and determination that will ease the way.

When you begin achieving great results, the excitement and fun you experience will make the change well worth the effort. Action creates motivation! Good luck: we hope you enjoy all the wonderful benefits of a healthy, active lifestyle.

Please answer the following questions

1. How often do you exercise? _____ times a week

2. What type of regular physical exercise do you engage in?

_____

_____

3. What type of physical exercises have you engaged in during the last 5 years?

_____

_____

4. Have there been periods in your life when you exercised more often? If so, please describe when: _____

_____

5. Do you wish to exercise more than you do today? If yes, please describe why you do not exercise more: _____

_____

6. Taken all together, how happy would you say you are?

-3	-2	-1	0	1	2	3
Not at all happy						Very happy