

Using Loss Aversion to Motivate Exercise: A Longitudinal Research

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Abstract

The modern lifestyles have resulted in physical inactivity and sedentary behavior which cause a lot of chronic illnesses. The benefits of exercising are becoming widespread knowledge but it is still challenging to change our behavior to a healthier one. The prior works in the literature in the field of behavior change are divided into two major groups: positive and negative reinforcement. Positive reinforcements' work are more popular in encouraging exercise but negative reinforcements are more focused on other behavior change fields such as quit smoking therapy and children's behavior modification. Our study aims to apply negative reinforcements for promoting exercise habit. In our experiments, we observed the behavior of 10 participants to perform physical activities such as running, jogging, and cycling, under the negative reinforcements' influence. We collected an initial deposit from the treatment groups and a portion of the deposit was returned per exercise only when they meet our goal for the week. The experiment lasted for 3 weeks with increasing goals every week. We found that the treatment groups performed better in attaining the weekly goals relative to the control group with the negative intervention having a significant effect on motivating users to exercise.

Keywords

Loss aversion; Transtheoretical model; Reinforcement theory of motivation; Behavior change; Monetary-incentives; Punishment.

INTRODUCTION

The huge amount of workload modern people has nowadays contributed enormously to sedentary behavior that eventually leads to an increase in physical inactivity levels. According to the World Health Organization report in 2009, physical inactivity and sedentary behavior causes a lot of chronic illnesses, such as diabetes, hypertension, colon or breast cancer, and so on. Therefore, it is a crucial matter to reduce sedentary behavior and physical inactivity levels by motivating people to start working out every week. A question that arises is how we get people to start working out.

According to the Reinforcement Theory of Motivation, one of the strategies that stimulate people to change behavior is punishment. People tend to stop doing unwanted behavior if doing so will lead to an undesirable consequence. Moreover, the fear of losing something is a negative emotion that can trigger someone to become extremely attached to his/her belongings. According to Rick (2011), negative emotions has a stronger impact on people compared to positive emotions.

In this paper, we present the findings from using punishment as the main motivator for people to start exercising by punishing them for unwanted behaviors. The study took cash from the participants when they failed to reach the minimum exercise frequency set for the week in the course of 3 weeks.

RELATED LITERATURE

In the exercise-related behavior change field, many studies have shown various interventions for motivating behavior change to become healthier - most of which are positive reinforcements such as encouragement or rewards mechanisms. This has been widely adopted by current applications and health programs that we see in the market. However, positive reinforcements such as rewards were proven to be less effective and less significant in triggering behavior change than negative methods. A few researches support that punishment might not be always a bad choice and rewards do not always lead to positive results (Axelrod, 2013). Alfie Kohn (1999) claimed that rewards are not always effective and might even bring the opposite behavior

intended. He discussed two behavior change experiments: (a) encouraging people to quit smoking and (b) to fasten the seat belts. The results of the experiment showed that encouraging people failed in the long run compared to non-rewards techniques which performed better in both experiments (Kohn, 1999). In addition, a study in 2002 indicated that punishment has benefits in modifying behavior disorders as it will create an immediate and substantial suppression on those particular behaviors (Lerman & Vorndran, 2002). It is also reported that punishment is often connoted with negative side effects, yet it is applied to suppress inappropriate behaviors, as well as contribute to some positive neglected side effects such as improvement in social behavior, emotional responsiveness, imitation and discrimination learning, and etc (Johnston, 1972). Although punishment could be effective in removing unwanted behavior, it is not readily accepted by researchers and the public. Also, preference for using positive reinforcement compared to punishment techniques is to avoid public outrage (Axelrod, 2013).

Even with the preference for positive reinforcements, multiple studies are found regarding negative reinforcements, such as punishments, on numerous behaviors change fields, especially on children's behavior modification or quit smoking therapy. In the health behavior change field, there are a growing number of researches focusing on the triggers by stimulating people to change their behavior to start exercising; but how to cultivate consistent and regular behavior change still remains a challenge. A research from Pennsylvania University found that potentially losing money is the best encouragement for people to stay healthy by doing exercise (Carlotti, 2016). This finding can be related to a behavioral theory, loss aversion, that is a type of cognitive bias claiming that people feel losses much more than gains and that the suffering of losing something is psychologically twice as dominant as the satisfaction of gaining. Because of this natural tendency, some people are willing to have third parties, such as mobile applications, trainers, etc. to motivate them to start a new exercise program.

Three main theories are applied to our design: (1) Transtheoretical Model of Behavior Change to identify the users' behavior change stage, (2) Punishment from Reinforcement Theory and (3) Loss Aversion.

The Transtheoretical Model of Behavior Change

Using the Transtheoretical Model for Designing Technologies Supporting an Active Lifestyle [14], which uses the Transtheoretical Model of Behavior Change and Deci and Ryan's Self-Determination Theory to induce corresponding strategies for each stage of the Transtheoretical Model, we targeted users who are on the preparation or action stage since these two stages are the critical period for behavior change.

On the preparation stage, education, gamification, and extrinsic rewards should be applied while social influence is crucial on the action stage. Both the preparation and action stages show the strategy of persistent visual feedback. No negative reinforcement such as punishment was introduced in the interventions' strategy model. But according to Shutters (2012), the ability to inflict punishment in one member of a group increases cooperation. This also agrees with the findings from the National Science Foundation that group punishments are effective at maintaining cooperation in informal institutions (Foundation, 2010). We observed that some negative interventions have been launched in the market for instance, Pavlok - a wearable device that gives an electronic shock to break bad habits. In our study, we would have the ability to inflict punishment to the participants which will supposedly increase their cooperation towards positive exercise behavior. With this study, we would like to know if negative intervention could work as a trigger in the early stages of cultivating regular and consistent exercise habits.

Reinforcement Theory of Motivation

The Reinforcement Theory is a behavior change manner designed by BF Skinner according to operant conditioning method which uses a Stimulus-Response mode to change people's behavior. There are four sections of the reinforcement theory which are positive reinforcement, negative reinforcement, punishment and extinction. We apply the negative intervention which is punishment into our experiment. The punishment is a restraining method to give a negative consequence as a stimulation when the target behavior we aim to modify is not conducted. In our experiment, we break the main goal, to exercise regularly, into weekly sub-goals. Failing to reach the weekly sub-

goal is seen as not conducting the desired target behavior; therefore, the punishment will be operated as the target behavior is not conducted.

There are a few interesting online articles talking about how financial incentives or behavioral economics improve health. The article "Do financial incentives improve health?" Komaroff (2016) uses financial incentive to design an experiment where users were divided into two groups. One of them was given money rewards every time they reached the daily goal the experiment set, while the users in the other group were given a "bank account" with total money they might win if they finish all the goals of the experiment and then had \$2 taken away every time they don't reach the goal. Both designs were given financial rewards but in different ways, the latter one using a positive reward with negative reinforcement. The experiment shows that losing money you would have won-proved more powerful than pure financial incentives.

Loss Aversion

Loss Aversion is one of the behavioral economics that can be applied to behavior change related to making decisions. According to Loss Aversion Theory, the health-related behavior change study conducted by Asch (2016) and his colleagues aimed to test the question "How to get employees to walk at least 7,000 steps a day?". They divided the subjects into three groups. The first group had no incentives; the second utilized monetary incentives: \$1.40 a day for every day they walk 7,000 steps; the third put loss aversion to frame the incentive, they provided a visual total amount that might be given to the subjects and deprive \$1.40 from the total amount once they didn't walk 7,000 steps (Wharton, 2016). In mathematical way, both the second and the third mechanisms had actually the same amount of external rewards however, the results of the third group that got the same \$1.40 framed as a loss incentive performed much better than the second group.

Strohacker et. al. (2015) details a study that looks at negative reinforcements as incentives to exercise. The sample group was divided it into a contract and lottery team where each had to deposit \$5 and \$3, respectively. The contract team earns back \$1 if they complete 80% of the activity while the lottery group were given one lottery entry wherein they can win the total lottery prize

deposited in the lottery group. Results show that both teams had similar number of attendances.

Both studies concluded that monetary incentives are good at pushing people to exercise. Using monetary incentives or framing monetary incentives with loss aversion are both common testing design for exercise behavior change, however, we discovered that pure negative intervention using loss aversion as a stimulus is a rare study in exercise-related behavior change.

METHODS

To assess whether punishment can actually motivate people to exercise, we conducted a field research using snowball sampling with 12 participants. The participants were divided into 3 groups: (1) control group, (2) people who stopped exercising but want to start exercising regularly, and (3) people who exercise but not consistently. These groups were selected since we are targeting behavior in the preparation and action stages of the Transtheoretical Model of Behavior Change. We focused on exercises such as running, jogging and cycling as they are easily measurable by using existing fitness mobile applications.

When the participants in the treatment group were onboarded, we explained that the test would last three weeks and that we will collect NTD 800 at the beginning of the study. In the first week (a week is counted from Monday to Sunday), they should do a minimum total of 2 exercises with each exercise lasting at least 20 minutes; in the second week, a minimum total of 3 exercises with each exercise lasting at least 20 minutes; and in the third week, a minimum total of 3 exercises with each exercise lasting at least 30 minutes. Every time the participants reach a goal, NTD100 will be refunded to them the next Monday. If they fail to reach the total goal, the participants will be told that they can't get the refund for the missed exercise.

We created a Facebook page called Fitbot and used its messenger to monitor the participants' activities and communicate with them, especially when they have inquiries regarding the weekly goals or money reimbursement. Facebook messenger was chosen as the main means of communication as most people are active on Facebook and have the application installed on their mobile phones. The participants need to report their exercise by sending a screenshot of their exercise activity using their preferred fitness

tracker to the Facebook messenger. Only those that met the minimum duration requirements were eligible for reimbursement.

All participants received the same interactive messages: a reminder of the goal for the week and the available amount that they have left with the researchers every Sunday, a follow-up message every Friday asking the participants to upload their exercise screenshot if there has been no activity from the participant from the beginning of the week up to Friday, and feedback regarding their uploaded screenshot, if they succeeded in reaching the goal or not. The languages used to communicate with participants were in Mandarin and English, depending on their preference. But overall, the messages had the same meaning regardless of the language used with the exception of the control group who did not receive any feedback about their available funds from the experiment.

At the end of the experiment, the treatment group was interviewed to know their thought process throughout the experiment and what could be improved in the experiment. After the interview, we fully reimbursed the participants of the amount they failed to collect during the duration of the study, if there were any.

RESULTS AND DISCUSSION

At the beginning of the experiment, we had a total of 12 participants from each group with each group having 4 people each. But during the course of the experiment, 1 participant from the control group and 1 participant from the 3rd group (people who exercise but does not do it consistently) withdrew from the experiment leaving only 10 participants active in the experiment.

Generally, the participants in the treatment group displayed better performance in meeting the weekly goals than the control group. In the first week, all the participants in the treatment group had successfully completed the weekly target while there were 1 participant in the control group who failed to meet the weekly goal - doing the exercise only once for the week. By the second week, we found that some of the participants had a hard time keeping up with the increased goal in both the treatment group and the control group. But the treatment group still outperformed the control group who only had one exercise frequency for all the participants in the group. Comparing the 2nd and 3rd treatment group, we found that the 3rd group performed better with all 3 participants

completing the second week and third week goal while only 1 out of 4 were able to meet the second week goal from the 2nd group. One participant from both the control group and the 2nd group did not exercise at all for the third week. When the participant from the treatment group were asked why, they said that the tight deadlines for that week was more important than the money at stake. The goals for the week and results from the participants are summarized in Figure 1.

1 st group	1 st	Week	
		2 nd	3 rd
A	2/2	1/3	0/3
B	2/2	1/3	2/3
C	2/2	2/3	1/3
2 nd group	1 st	Week	
		2 nd	3 rd
D	2/2	2/3	1/3
E	2/2	1/3	0/3
F	2/2	2/3	2/3
G	2/2	3/3	2/3
3 rd group	1 st	Week	
		2 nd	3 rd
H	2/2	3/3	3/3
I	2/2	3/3	3/3
J	2/2	3/3	3/3

Figure 1: The ratio between 10 participants' weekly goals and results for each respective group: (1) control group, (2) people who stopped exercising but want to start exercising regularly, (3) people who exercise but not consistently.

The participants in the treatment group reported that the money they could lose if they did not do the exercise contributed greatly in motivating them to exercise. Their changed mindset to exercise is also reflected in some decisions in their daily life with a participant noting that they would sometimes choose to walk instead of using public transportation when their destination could be reached by walking.

All the participants in our experiment are all students and the experiment took place on a very busy period for students. Some participants in the 2nd group said that weighing for other opportunities is important so some consciously did not meet the goal since they deemed that meeting their deadlines instead of working out to get the

reimbursement is more beneficial for them. While some participants in the 3rd group found the exercise goals as appropriate and easy and was more motivated to continuously exercise even after the experiment.

Based on the results, we can conclude that the control group and the 2nd group had a hard time with meeting the increasing goals but nevertheless, the 2nd group still performed better than the control group. The 3rd group's performance was exceptional with all participants meeting the 3-week increasing weekly goals. We can conclude that using monetary loss aversion to motivate exercise is more effective in pushing people to the action stage than in the preparation stage.

Limitation & Future Works

The experiment lasted for 3 weeks and was conducted with only 10 active participants who are all students. While the 3-week long trial period offered initial evidence that loss aversion can prompt behavior change on the participants, it is unclear whether the effect of this intervention will last after the experiment ends. The 3-week duration also might not be the ideal duration for negative interventions and future studies should explore this matter. The results of our study should be validated through a longer-term study with a larger sample and more participants with varied backgrounds.

In our experiment, the cash taken from all users were equal which does not take into account the participants' perception to the total money hold out. Some participants might think that this amount is not significant enough and thus, is not enough to boost their motivation considerably to exercise. Noting that our participants are all students, it might have created an accidental bias in the way they value their money because they do not yet have a stable income. We suggest for future work to recruit participants from a diverse profession to eliminate any accidental bias. Our work also heavily explored financial loss in encouraging participants to exercise. Future work can explore other types of pure negative interventions such as removing an object a user values when they fail to meet the desired behavior.

CONCLUSION

The modern lifestyle comes with a few negative consequences and we should be able to correct them to live a healthier lifestyle. The aim of this study is to see whether negative interventions are effective in

motivating people to exercise consistently during a period of time - which in our case is 3 weeks. The results of this experiment showed that it could be a motivator but different types of people react differently to increasing goals which could be studied in future research. Also, additional studies regarding the right amount of negative intervention, the most effective form of negative intervention and the most effective duration in applying this type of intervention should be explored in future research in exercise-related behavior change field and other behavior change fields that deals with encouraging positive behavior.

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