The Intrigue of Intermittent Reward and Cost: Unveiling Their Influence in Real Life

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Abstract:

This paper examines the role of Intermittent Cost (Punishment) in influencing the behavior of children who exhibit aggressive behavior through a laboratory Experiment. In the experiment, children in the treatment group were randomly placed in solitary confinement for attacking others. It is expected that Intermittent costs will reduce children's aggressive behavior. The paper will also explore how Intermittent Cost and Reward work in the brain, finding that when people experience pleasurable stimuli, the brain starts secreting dopamine, so much so that it affects our behavior and expectations. In addition, experiments have found that when rewards are intermittent, the brain experiences higher arousal levels. This explains why people always crave cookies or continue to use social media and gamble. Finally, this paper will also discuss the possible application of Intermittent Cost and Reward in different aspects, which can help us formulate some policies and increase the flexibility of users.

Keywords: Intermittent reward, behaviors, effect, life

1. Introduction

This paper discusses the application, transcendence, and influence of Intermittent Reward in different aspects and reveals its core.

Intermittent reward, or Variable reward, is a very important form of incentive, and it's used in a variety of ways. This incentive is offered intermittently, and people generally do not know when to receive the reward and the interval between the reward. This reward significantly changes people's behavior, making them more addicted to the task at hand.

The inspiration for this Intermittent study was B.F. Skinner's experiment on pigeons is called Skinner's Box [1].

The pigeon can get food by tapping on a pole. At first, the pigeon gets the same amount of food through tapping. The pigeon soon loses interest in the tapping action because the amount of food is the same each time it knocks. Then, the experimenter tested the pigeons' response by changing the number of treats. This time, the amount of food the pigeons were given was completely random, and the experimenters found that the pigeons were excited and did not stop tapping. Finally, the experimenter made getting food from the tapping impossible, but even so, the pigeons continued to tap the poles. Intermittent Reward is highly stimulating, causing the pigeon's thought patterns to go out of control.

This paper finds that not only pigeons but also people are affected by Intermittent rewards. Intermittent rewards for videos, such as "likes," keep you watching. Short videos are the most popular way to distribute Internet content. According to the China Mobile Internet Database, the daily activity of TikTok on the Chinese platform peaked at 700 million in 2022, and the average daily activity also reached 600 million. Short videos have now become the most popular form of video. Intermittent rewards are also widely used in areas such as gaming, gambling, and education.

Intermittent Reward does change people's behavior to a great extent, and this paper will start with different variables, such as gender and hormone level, to further study the impact of Intermittent Reward and Cost on people's behavior and its application in different fields.

In addition, this paper will also analyze Intermittent Punishment.

In Lerman and Iwata's papers [2,3]: Effects of intermittent punishment on self-injurious behavior: an evaluation of schedule thinning. This paper reviewed the relevant literature, experiments, and data reports and designed the Intermittent Reward experiment. They found that refining random punishments can enhance the effect of punishments and reduce the SIB. But for the most part, intermittent punishment was not particularly effective. In addition, we believe that the sample size of this experiment is still insufficient (only five subjects), and the experimental results are limited to the medical field. This is because the experiment's sample size is small and difficult to collect. However, the experimental subjects in this paper are relatively wide, so the influence of intermittent cost/benefit on behavior can be studied more accurately.

In this study, children with aggressive behavior will be randomly selected. They will be randomly divided into two groups. Children in the treatment group were confined for aggressive behavior but not in the control group. After many trials, the results of the experiment will be presented.

Next, this paper will introduce the experimental objectives, experimental design, and the importance of the experiment. Then, it will summarize the positive and negative Intermittent Rewards and Punishment in real life and summarize.

2. Research questions

1. How does intermittent punishment/negative reinforcement affect children's aggressive behaviors?
2. How does intermittent punishment/negative reinforcement reduce children's aggressive behaviors
3. What is the relationship between intermittent reward and addictive behaviors?

3. Method

3.1 Hypothesis

Null hypothesis: Implementing intermittent punishment (locking children who display aggressive behavior into small, separate, dark rooms for 3 hours) will not affect reducing children's aggressive behaviors. Alternative hypothesis: Implementing intermittent punishment (locking children who display aggressive behavior into small, separate, dark rooms for 3 hours) will affect reducing children's aggressive behaviors.

3.2 Sample

Select 150 adolescents who display aggressive behavior (mainly verbal violence) in a local juvenile system (ideally from different backgrounds, ages, and genders). Obtain informed consent from their parents and guardians. Kindly note that the children will only be grounded in the rooms; food will still be provided to them routinely.

3.3 Procedures

1. Randomly divide participants into three groups: a control group that will not receive any punishment for aggressive behaviors, a treatment group that will receive intermittent punishment for aggressive behaviors and another treatment group that will receive continuous punishment for aggressive behaviors.
2. Before implementing any punishment, establish a baseline measurement of aggressive behaviors by observing and recording the frequency of verbal attacks in all groups for a certain period.
3. A punishment protocol will be designed in which children who behave aggressively will be locked in small, separate, dark rooms where they cannot socialize for 3 hours. Researchers could freely decide when and how often to implement intermittent confinement punishment. (ideally to make it random and unpredictable) For continuous confinement punishment, researchers must implement the punishment every time there's a case of verbal violence. (If one occasion of verbal hostility is detected, the child goes immediately to the small dark rooms.)
4. Continuously collect data during the experiment by observing and recording instances of verbal attacks in all groups.
5. Implement intermittent confinement punishment only for treatment group 1 based on the predefined criteria. (refer to step 3)
6. Implement the continuous confinement punishment only for treatment group 2 based on the predefined criteria. (refer to step 3)
7. After one month, analyze the collected data to compare the frequency of verbal attacks between treatment 1, treatment 2, and the control group.
8. Evaluate the data to determine if there's a statistically significant reduction in aggressive behaviors in the treatment groups compared to the control groups.
9. Then compare and evaluate the data to determine whether the treatment one or treatment 2 group significantly reduces aggressive behaviors.
10. Throughout the experiment, prioritize the well-being and safety of the children. If any signs of distress or adverse effects emerge, be prepared to intervene and adjust the experiment accordingly.

4. Effect of Intermittent Reward

This section will elaborate on how intermittent reward works in the brain and how short videos reinforce people's behaviors intermittently.

When people experience a reward or a pleasurable stimulus, such as food, social interaction, or an entertaining video, their brain's dopamine neurons become activated. Dopamine is related to motivation, reinforcement, and pleasure. From an evolutionary perspective, it rewards people for beneficial behaviors and motivates them to repeat them. This explains why we eat one delicious cookie and want another [4].

Intermittent rewards work by capitalizing on the brain's neurobiology and response to unpredictability and variability in receiving rewards. When rewards are given on an intermittent schedule, the brain experiences heightened excitement and anticipation. This leads to increased dopamine release, making the associated

behavior even more reinforcing and compelling.

The human brain has four dopamine pathways, allowing dopamine to travel within the brain and body. Three of these four dopamine pathways are known as reward pathways. Those reward pathways will become active when we anticipate or experience rewarding events. The functional MRI paradigm shows that people's reward pathways are more active when they view a liked photo or receive a like from others [5]. Receiving a "like" increases the activity of dopamine in the brain, encouraging future use of social media and continued posting of content to recreate the enjoyable experience.

The second concept involved in intermittent reinforcement is reward prediction error. Reward prediction error refers to the difference between the expected or predicted reward and the actual reward received. When people face an unexpected reward or outcome, the brain measures a prediction. If the reward is better than expected, it results in a positive prediction error. Conversely, a negative prediction error occurs if the reward is worse than expected [6]. This combination of positive and negative prediction errors can be found in gambling. Slot machines provide intermittent payouts, and the uncertainty of winning creates a strong emotional response that keeps people engaged and motivated to continue playing [5]. If people hit the jackpot, which means that they get a reward that exceeds their expectations, the dopamine in their brain will respond strongly. In social media, for example, when people receive a like from others, especially strangers, their brain recognizes it as a reward and produces dopamine. In their daily life, they try to predict this reward and habitually check social media to see if it is equal to expectations.

Similarly, in the context of scrolling through short videos, intermittent reinforcement, and reward prediction errors can be seen in the scattered release of engaging or entertaining content. Not every video provides the same reward level; users never know what they will encounter next. This unpredictability keeps users engaged and motivated to continue scrolling as they anticipate finding something rewarding. When a user scrolls through a series of short videos, their brain predicts the potential content they might encounter. As the user interacts with each video, his brain compares the predicted reward with the actual reward, which refers to the content of the video. Suppose the actual content is better than predicted. In that case, a positive prediction error occurs, releasing excessive dopamine and an increased sense of reward and pleasure, which is much higher than the usual level [7]. However, a strong release of dopamine can lead to the development of addictive behaviors. Certain behaviors, such as scrolling short videos, can trigger an exaggerated dopamine release in the brain. Increasingly, the brain becomes accustomed to these heightened dopamine levels, leading to a desensitization of the reward systems [8]. Consequently, the individual may require a higher frequency of activity to achieve the same level of pleasure, leading to a cycle of increasing consumption and addictive behavior. Indeed, the reason why short videos are so popular and even addictive is closely related to the excessive release of dopamine due to intermittent rewards.

5. Positive and Negative Intermittent Rewards in Real Life

5.1 Positive

1. Education: Apply intermittent reward ideas to improve student learning outcomes. Students may receive periodic prizes from adaptive learning platforms for finishing modules or reaching milestones. As a result, there may be a greater chance of sustained engagement, a sense of accomplishment, and knowledge retention.

2. Environmental conservation: Investigate how sporadic rewards can encourage ecologically beneficial behavior. People might receive incentives for taking the bus or train, conserving electricity, recycling, or taking part in environmental protection initiatives. These incentives could take the form of modest payments or symbolic acknowledgment, encouraging good deeds toward a sustainable future.

3. Employee Motivation and Productivity: Workplace initiatives should include occasional rewards to increase employee motivation and productivity. Employees may receive bonuses for achieving goals, showcasing their ingenuity, or fostering a supportive workplace environment. These incentives could include praise, chances to develop skills, or adaptable working conditions.

Investigate how sensible financial practices can be influenced by intermittent rewards when making financial decisions. Financial firms could create initiatives that offer rewards.

4. Slot machines: Playing the slots can be quite the thrill; although players may not always win, they occasionally receive payouts that encourage them and keep them returning for more.

5. Discounts for online shopping: Online shopping discounts function similarly. Even if customers don't always benefit from lower pricing, when they do, it's an incredibly rewarding experience that encourages people to keep buying at a particular store or online in pursuit of additional deals.

6. Compliments: Receiving a compliment without expecting it makes us feel terrific and motivates us to

act appropriately. As a result, there may be a greater likelihood that we will soon receive more favorable feedback.

7. Variable work schedules: These schedules offer staff sporadic incentive programs. While they may not always have their ideal schedule, they are always driven to try again, hoping to have greater luck the next time.

8. Public transportation: Taking the bus or train immediately typically results in happiness; thus, using public transportation has similar effects. Even though one is aware that there will undoubtedly be times when expectations are met, delays cause disappointment.

9. Video games are experts at using intermittent reinforcement to entice players to play again and again. It can be incredibly satisfying to complete a challenging level since it offers an alluring reward that motivates the player to chase more difficult challenges and achievements.

10. Romantic relationships: These connections also require a certain level of intermediate reinforcement. For instance, when a partner does something kind or considerate, both parties are satisfied, encouraging continued positive behavior.

11. Incentive programs: Employees are periodically rewarded with incentives such as cash bonuses, praise, and additional vacation days to encourage them to put in even more effort. Such sporadic awards serve as a potent source of employee motivation.

12. Collectibles: It can be a bit of a hunt to find what you're looking for when collecting stamps, coins, and baseball cards, but that's part of the charm! Collectors are inspired to keep looking since it's exciting to occasionally find a rare item [9].

5.2 Negative

1. When the ignition is turned on, Some cars have a loud buzz; the driver must fasten their seatbelt to stop the grating buzz. This buzz serves as a deterrent to wearing seatbelts.

2. Making up a stomach ailment to avoid going to school. The school serves as a deterrent for making up illnesses.

3. Leaving early in the winter to avoid the chilly weather. The act of fanning oneself to cool off. Cold weather is a deterrent to walking home (the colder it is, the faster you walk.), and heat deters fans.

4. Cleaning the house to remove the offensive mess or to remove your mother's nagging. Messing and nagging are a deterrent to cleaning.

5. Exam preparation to prevent receiving a low grade. Low grade as a demotivator for studying (while high grade is simultaneously a motivator for studying)

6. Using aspirin to treat headaches. A good illustration is how a headache can discourage people from taking medicine.

7. Walking while removing a stone from the shoe. Pain acts as a deterrent for stopping to remove your shoes.

8. Inmates attempt to escape from custody to avoid the unpleasantness of being imprisoned.

9. Leaving a theater when a film is subpar.

10. Leaving the building immediately after the fire alarm goes off. Use the fire alarm as a disincentive to leave the building.

11. Smoking to lessen a bad mood. Mental turmoil is a harmful reinforcement of smoking.

12. Decreasing the radio's volume when it is too loud.

13. Modifications to sexual conduct, such as using condoms to prevent AIDS.

6. Conclusion

Identifying the factors that can boost individual motivation in various fields, such as business or the market. Several theories and methods have been proposed to enhance motivation, like Herzberg's Two-Factor Theory and Taylor's Motivation Theory. However, intermittent rewards are undoubtedly the most powerful and effective. Intermittent reward refers to the practice of providing rewards or reinforcements in an unpredictable manner rather than consistently after every desired behavior. In everyday situations, such as offering discounts to encourage more consumption and giving the thumb to users to increase their visiting of certain websites and apps. Intermittent rewards significantly impact decision-making and can boost individuals' motivation. The reason why intermittent reward works is mainly due to the activity of dopamine. Reward uncertainty sensitizes reward access, enhances motivation for rewards, and increases the ability of the cues to initiate proximity behaviors [10]. Nevertheless, there are still some limitations to this research proposal. Firstly, the whole proposal is based on theoretical knowledge and daily life applications. It could be better to use some historical experiments to support arguments, which might help us propose new perspectives. Secondly, Intermittent reinforcement bears the potential for over-reliance on the reinforcement and the over-justification effect, along with various other issues. Relying too much on reinforcement-intervention patterns can lead to over-justification, resulting in apathy towards desired behavior, reducing continuity toward these ends and rendering desired outcomes difficult. The limitation of the experiment is that the study on intermittent punishment was limited by a small sample size, which may not accurately reflect the overall population. Additionally, it is hard to determine the extent

of aggressive behavior, especially verbal violence. So, the outcome might be biased.

If some researchers or scholars are interested in this field, here are several starting points for them to consider. Firstly, researchers could conduct an experiment to test how people can avoid social media addiction. In the case mentioned before, intermittent rewards would cause social media addiction. If some researchers are interested in this part, they can experiment to see whether intermittent rewards or intermittent punishments can help people become less addicted to social media. Secondly, individuals' decision-making and behavior are compared before and after giving intermittent rewards. For example, if people receive intermittent rewards, their dopamine levels become more active. Therefore, considering individual behavior and decision-making differences before and after receiving such a reward is worthwhile.

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