



Behavioral Economics Perspective of Minors' Electronic Games Top-up Addiction Research

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Abstract. This paper studies the problem of minors' addiction to electronic game top-up, which has great social repercussion. On the basis of combing out the current situation, the behavioral economics theory is employed with a case analysis. Reasons for addiction include the misunderstanding of payment isolation, the obsession with small probability events, and the cognitive solidification of reference dependence. In order to construct a reasonable consumption system of electronic games for minors, specific policy suggestions are put forward from the perspective of family, school, society, and community governance. It is expected to provide theoretical support for the standardized development and policy formulation of the game industry, reduce prospective negative impacts, and promote the development of a more healthy and sustainable game culture.

Keywords: game top-up, addiction, payment isolation, gambling effect, reference dependence

1 Introduction

With the rapid development of industries of online entertainment, video games, especially games with a “lucky draw” and “open box” system, have become part of enjoyment for people in their daily lives. To be specific, adolescents are the major part of those groups. In fact, the addiction of minors to top-ups that was led by “lucky draws” and “open boxes” has been focused on by societal scholars, suppliers of video games, and policymakers. How to lead a rational consumption system and instruct scientific purchasing behavior for adolescents has critical meaning to the sustainability of consumption since they are major consumers in the future. In addition, how to understand and analyze players' decisions in those games, especially when prize draw behavior often becomes impulsive and detached from control of the rational mind, has triggered heated discussion for researchers. The deep motivation and potential influence on people of this kind of consumption deserve to be discussed from a variety of lenses. Although recent research involves the reward system and psychological research of video games, most of it focuses on the draw mechanism design and the impacts on players'

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behavior, with little from the view of case studies to deeply grasp the process of the minors' addiction to top-ups in video games.

This paper is thus going to use a case study, incorporating theories of behavioral economics, to analyze the decision-making process and psychological motivation of adolescents in the lucky draw of a top-up. On one hand, analyzing the psychological feedback and decision-making factors when an adolescent is purchasing can help figure out what factors motivate them to think and act in an impulsive manner, namely consistently conducting prize draws. On the other, the paper will also principally consider how different types of reward design and frequency of prize draws, as well as the players' communication, will affect minors' decisions of prize draws.

Based on the previous discussion, the article can not only better find out the behavioral economics theories in game design but also provide application scenarios for minors' rational consumption within game industries. Moreover, with the public appliance of the lucky draw mechanism, especially among the adolescents, theoretical support of standardized development and policy-making to game industries is expected to reduce the likely negative impacts, advancing healthier and more sustainable development of game cultures.

2 Literature Review

The specialized topic of top-up addition on video games of adolescents is little, mainly focusing on psychological analysis of lucky draws and addiction on top-ups.

2.1 Research on Lucky Draw and Player Decision Behavior

Venugopal et al. (2021) state that by using a random reward mechanism and uncertainty effect, a lucky draw system stimulates players' expectation effect, making people have impulsive decisions.[18] Yilmaz and Tunca (2024) believed that when a player faces uncertain rewards, their decision is to intend to pursue risks[20]. This kind of action is highly similar to the Gumbel effect in behavioral economics. Habib and Dixon (2010) analyzed that "almost there" effect, especially obvious in the lucky draw[7]. While players do not get a giant reward, they have the impulsive mind of keeping going. This psychological mechanism is called the "approximate winning phenomenon," often happened in the video games, especially when the reward system included fake objects and characters.

Besides, other research stated that communication and virtual reward inhabitation in video games' design have a great impact on players' decisions. For example, Brox (2011) illustrated the display of virtual objects, ranking, and society communication, and so on, factors in the game that will both affect the decision of players when they are making choices in drawing[3]. Minors, especially young-age players, are more easily affected by the influence of group actions and social stress; by using rare objects in the video games to get better self-image and social awareness or agreement, they actually approve of their impulsive drawing behavior.

2.2 The Research about the Psychological Mechanism of Addiction on Top-up

The correlation between lucky draw and addictive top-up already became a focus in the scholarly field. Myrseth et al. (2017) pointed out that addictive top-ups usually had a strong relation with immediate rewarding, emotional satisfaction, and social agreement or other factors[12]. Since minor players' rewarding systems in their brains are not mature, they usually have a high demand for immediate rewards and do not have enough patience to long delay rewards. In this case, by stimulating their desire for immediate rewards, the random rewarding system makes minors caught in the negative cycle of top-up and drawing. Besides, emotional actuation has a crucial role in the addictive top-up behavior of minors. Purwaningsih and Nurmala (2021) emphasized, in video games, getting virtual objects not only for raising the stats of players but also to satisfy the sense of accomplishment and belonging for players, which intensifies their participation in games[14]. This emotional satisfaction is always the main factor that leads players to keep topping up and drawing.

2.3 The Limitation of Current Research

Although much has already been discussed in the lucky drawing mechanisms and top-up behavior, there still exist a few limitations.

According to research subjects, most research focuses on adults or normal players' behavior mode. There is a lack of research that talks about the special psychological mechanism and behavior of minors. Especially adolescents, who are totally different than adult players in emotional mitigation, impulsive behavior control, social action, and so on. Recent research does not have enough focus on those differences and does not have deep analysis on the psychological causes and behavior mode of minor players in lucky draws and top-ups.

In terms of different dimension of psychological mechanisms, although there is already some research investigating the decision-making mechanism and addictive top-up in lucky research, most is still restricted to the rewarding mechanism, game design, and external factors. Analysis of players' psychological mechanisms, such as internal motivation, cognitive differences, emotional mitigation, are still insufficient. For instance, more expansion under behavioral economic research is needed to explore how to make drawing decisions in social stress and how to instruct self-cognition based on virtual rewarding.

From the level of solutions, while there are already some focuses on top-up addiction, the recent research is more focused on revealing the phenomenon itself, lacking the solving strategies and policy advice to minor players addiction. How to reduce the addiction to top-ups for minor players through game design, educational intervention, and parental monitoring still remains an unsolved problem.

Based on previous research, this paper makes these innovations. First, focus on the psychological motivation and behavior differences. This passage will try to analyze the psychological motivation of minor players, such as how they find emotional satisfac-

tion, self-efficacy, and social agreement. From various lenses, such as behavioral economics, neuroscience, and so on, subjects deeply discuss minor players decision-making strategies in drawing, revealing the mode of sense of rewarding and reaction to it. Second, based on multiple analyses on psychological mechanisms, investigate how emotional mitigation, cognitive dissonance, and risk estimation have an effect on the decision-making of lucky draws on minor players. Using a case study to deeply understand the variation in emotion and decision for minor players when facing a virtual reward. Last, this paper will provide policy recommendations to the problem of top-up. With the deeper influence that video games brought to minor players, discussing parent monitoring, game consumption warnings, age restrictions, and so on, factors to discuss the way to reduce the addictive behavior on top-ups on video games, respectively. Otherwise, the paper will also focus on the way to improve the ability of self-control for minor players, enhancing the education method of the recognition of impulsive consumption.

3 The Phenomenon of Minor Player Addictive Behavior on Top-up

According to statistics, 73.8% of parents know that their children have used adult accounts to bypass supervision to play mobile games. In terms of game recharge, more than 60% of minors' game recharge behavior is completed by their parents, and 70% of the children who complete their own recharge know the payment password, and some parents have loopholes in the management of the payment password.

For example, Zhang, a primary school student, used his father Mr. Zhang's identity information to register and log in to a mobile game of a network limited by share LTD. Within a few months, he used the payment password recorded by observing his mother's shopping at ordinary times to recharge 126 orders with WeChat change totaling 14,169 yuan. Mr. Zhang found out, and the game company negotiated on the refund, but the refund was fruitless.

From case 2, it can be seen that Rui, a minor under the age of 10, because of his enthusiasm for online games, only had 1 month of events, with his mother Li's WeChat changing to an online game company cumulative recharge of 25424 yuan. Her mother applied to the company for a refund and was denied.

The "Notice on Further Strict Management to Effectively Prevent Minors from Being Addicted to Online Games," released in 2021, pointed out that minors are addicted to online games, and the problem of irrational top-up is more serious, which requires families, schools, society, and communities to jointly build a firewall. Through the comprehensive improvement of minors' media literacy, the consumption behavior of minors' online game recharge addiction can be reduced.

Similar incidents have occurred in China in recent years. Why is there so much addiction among minors such as Zhang? This paper uses behavioral economics theory to analyze it.

4 Analysis of Behavioral Economic Causes of Addiction of Minors to Video Game Top-up

According to the theory of behavioral economics, the phenomenon of juvenile video game top-up addiction can be analyzed from multiple angles. This paper will explore the behavioral economic causes of juvenile top-up addiction from three perspectives: payment isolation, infatuation with small probability events, and reference dependence.

4.1 Analysis of Payment Isolation Perspective

The theory of payment isolation indicates that when making consumption decisions, the distance or psychological isolation between the expenditure and the actual payment will reduce the pain of payment, thus promoting impulse consumption (Prelec & Loewenstein, 1998)[13]. For minors, they have not yet fully formed a rational concept of consumption, and the sense of separation of payment is particularly obvious. Minors often top up through their parents' payment accounts, and the separation between payment and actual consumption enhances their demand for virtual rewards and reduces the psychological burden of consumption. As a result, minors may make repeated top-ups without being fully aware of the consequences.

Studies have shown that minors are often more prone to top-up addictive behaviors when they do not directly bear the consequences of payment (Ata & Sezer, 2021)[2]. This kind of payment isolation phenomenon makes minors have a high dependence on the random reward mechanism in the game, and it is not easy to psychologically carry out effective "payment cooling-off period" control, thus aggravating their top-up addiction behavior.

At the same time, in the video game top-up scenario, minors decouple the top-up behavior from the psychological perception of actual money loss by binding their parents' accounts, using virtual currency (such as coupons and diamonds) or small non-secret payments. For example, Zhang in the case uses WeChat to make 126 consecutive repayments, but because the payment password is easy to remember and does not require each input, his brain does not activate loss aversion mechanisms (Kahneman & Tversky, 1979), thus making continuous impulse purchases.[10]

4.2 Infatuated with Analysis from the Perspective of Small Probability Events

The gambling effect is an important concept in behavioral economics. According to research, when faced with a low probability but high-value reward, individuals tend to develop excessive expectations, which in turn lead to frequent impulsive decision-making. This phenomenon is clearly reflected in the "lucky draw" or "unboxing" mechanism (Adam et al., 2022)[1]. In the game, minors will continue to try to recharge because of the "almost win" phenomenon in the game, although the probability of winning is extremely low, but their expectations are still excited.

In the lucky draw, when the player fails to win the big prize but is close to the big prize, he will have the impulse to continue the draw, and this psychological mechanism leads to the formation of minors to “win” as incentive repeated recharge behavior. This fascination with small probability events makes it difficult for minors to stop the lottery and then fall into a vicious circle of top-up.

Minors, however, have an immature prefrontal cortex and a weak ability to rationally evaluate probabilities (Steinberg, 2008) and are more likely to be attracted by propaganda such as “0.1% probability of obtaining rare items.”[15] For example, in the case of Rui’s accumulated recharge of 25,424 yuan, its decision-making process is in line with Gambler’s Fallacy; it is believed that after repeated failure to win the lottery, “the next time must win,” resulting in continuous investment.

4.3 Analysis from the Perspective of Reference Dependence

Reference Dependence theory shows that an individual’s consumption decision is not only affected by the current utility but also by the reference point at which it is located. In video games, minors often use rare virtual items or game rankings obtained by others as reference points, and this social comparison leads to stronger consumer demand (Hsu & Lu, 2007)[8]. Within the game, elements such as social leaderboards and rare item displays form a reference point for underage decision-making, and players feel obvious social pressure by comparing their progress and virtual items with others, thus increasing the urge to recharge.

For example, when a minor sees a companion or player acquire a rare virtual item, they often feel their status in their social circle decreases, which can motivate them to boost their avatar and social identity by topping up. As a result, minors’ expectations of rewards are no longer limited to in-game rewards themselves but are influenced by peer and group behavior, which increases the impulse to top up.

5 Policy Suggestions

To establish a system promoting responsible video game consumption among minors, this study proposes a systematic intervention framework drawing upon behavioral economics and public policy theory. Operating across four key dimensions: family, school, society, and community; this framework aims to mitigate the risks of irrational spending by optimizing “choice architecture” and implementing institutional innovations.

5.1 Family-Level Interventions

Family governance serves as the primary safeguard for minors’ consumption habits. Interventions at this level should leverage behavioral economic principles such as commitment devices and default options. Commitment devices involve pre-set rules to constrain future behavior (Bryan et al., 2010)[4]. Parents could utilize this by setting “recharge cooling-off periods” (e.g., allowing only one top-up within 24 hours), employing delayed gratification to reduce impulsive spending. Concurrently, setting payment

accounts to “no auto-debit” by default (Johnson & Goldstein, 2003) necessitates active parental authorization for each transaction[9]. This approach significantly counteracts the distorting influence of the “payment insulation effect” on spending decisions.

Specifically, policy should mandate that game platforms offer “Family Sharing Account” features, enabling parents to monitor spending and approve top-up requests in real-time, akin to the Apple Family Sharing model. Additionally, the development of “Virtual Wallet Transparency Tools” is crucial. These tools should display cumulative spending and its real-world equivalent value (e.g., “This month’s ¥500 spending \approx 10 textbooks”) during the top-up process, enhancing both minors’ and families’ awareness of the financial consequences.

5.2 School-Based Risk Education Systems

Schools play an indispensable role in fostering accurate probability perception and risk awareness among students. By applying the framing effect (Tversky & Kahneman, 1981), educational content can be structured to influence decision-making positively[17]. For instance, reframing a “1% win rate” for in-game items as “99 failures out of 100 attempts” can mitigate the over-optimism often associated with chance-based mechanics.

Furthermore, curricula should incorporate the concept of “time discounting” (Laibson, 1997)[11]. By contrasting the immediate pleasure of in-game purchases with the long-term benefits of saving, schools can help correct students’ intertemporal decision biases. Integrating these behavioral insights into risk education and media literacy programs, linked to real-world spending scenarios, will cultivate more rational and long-term consumption perspectives among minors.

5.3 Societal Governance and Game Design Regulation

Societal-level interventions should be guided by “Nudge” theory, subtly adjusting the decision-making environment to encourage rational choices while preserving freedom (Thaler & Sunstein, 2008)[16]. Within this framework, platforms should be required to make high-risk spending mechanics, such as loot boxes, “non-default options,” requiring active opt-in.

Policy could also explore a “virtual consumption tax” on minors’ spending, such as a 20% surcharge on single top-ups exceeding a certain threshold (e.g., ¥50). Revenue generated could be earmarked for media literacy initiatives (Chetty et al., 2009)[5]. A forward-looking measure involves establishing a “Gaming Credit Score System.” This system could flag accounts exhibiting patterns like frequent excessive refunds, potentially limiting their access to high-risk features like raffles, thereby adding a layer of technological and credit-based control over problematic spending.

5.4 Community Advocacy and Non-Monetized Recognition Systems

Community interventions should harness the power of social norms (Cialdini et al., 1990) in shaping individual behavior[6]. Efforts should focus on decoupling in-game

status and achievement from monetary expenditure, reshaping how minors perceive value within gaming contexts.

Promoting “co-creative gaming” models is key. In these models, players earn desirable rewards through contributions such as designing levels, writing guides, or engaging positively in the community, offering alternatives to direct purchasing (von Hippel, 2005)[19]. This approach encourages achievement through skill and effort, reducing reliance on spending for status and facilitating a shift towards non-monetized forms of recognition.

6 Conclusion

Based on the theoretical framework of behavioral economics, this paper systematically analyzes the psychological causes of juvenile video game top-up addiction and puts forward practical and operable policy suggestions. Because their brain reward system is not fully mature, minors are easily affected by random reward mechanisms, resulting in impulsive consumption behavior in the “lucky draw” or “open box” mechanism. In particular, minors are significantly affected by psychological mechanisms such as payment isolation, infatuation with small probability events, and reference dependence during the top-up process and are prone to repeat top-ups without clear control and eventually form top-up addiction.

From the perspective of behavioral economics, this paper analyzes the decision-making process of minors in video games and reveals that their top-up decisions are often driven by factors such as immediate reward, emotional satisfaction, social identification, and external reward design. Through the above analysis, this study not only enriches the existing theoretical research on the consumption behavior of electronic games but also provides a scientific basis for the formulation of reasonable consumption policies of electronic games for minors. Especially for the characteristics of minors’ consumption behavior, this paper explores in depth how these factors affect minors’ impulsive consumption behavior by combining the behavioral economics concepts of “payment segregation,” “obsession with small probability events,” and “reference dependence.”

In the part of policy suggestions, this paper puts forward the comprehensive management strategy from family, school, society, community, and other aspects. To be specific, parents should strengthen the supervision of minor children’s game consumption, especially in terms of payment password management and the setting of game consumption ceilings. Schools should help minors establish a correct consumption concept through media literacy education. Society should strengthen the supervision of the game industry, and game developers should standardize game design and reduce the setting of high-value rewards with low probability. And provide clear consumption tips. In addition, the community should provide parents with education training and psychological counseling to enhance the self-control of minors and reduce the negative impact of game consumption behavior.

Future studies can further explore the individual differences in minors' electronic game consumption behaviors, especially under different ages, genders, and social backgrounds. Minors' consumption behaviors may be affected by different psychological motivations and environmental factors. At the same time, interdisciplinary research methods of neuroscience and behavioral economics can be combined to deeply analyze the neural responses and decision-making mechanisms of minors in the face of virtual rewards so as to provide more accurate theoretical support for the formulation of more effective policies.

To sum up, the root cause of juvenile video game top-up addiction lies not only in the game design itself but also in the psychological development of minors, decision-making ability, and the combined effect of family and social environment. Only through comprehensive intervention can we effectively curb the phenomenon of minors' top-up addiction, promote the healthy and sustainable development of the game industry, and ensure that minors can grow up in a safer and more rational environment.

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