

# Self-Control in Casual Games

The relationship between Candy Crush Saga™ players’ in-app purchases and self-control

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**Abstract**—Casual Games and free-to-play games have recently rapidly increased in popularity, perhaps in part because of the success of in-app purchases and micro-transactions as an economic model. While these games are often touted for their success in the gaming market, the effect on players when faced with such frequent purchasing decisions in-game is not well-studied. Theories of self-control suggest that people have limited resource pools of self-control, and facing frequent frustration and purchasing decisions may deplete this resource. In this paper, we present the results of a Mechanical Turk study on a popular casual game, Candy Crush Saga™, to investigate various factors impacting player behaviour, with a specific focus on self-control. Our study reveals that the amount players spend on in-app purchases is correlated with lower levels of self-control. On the other hand, purchases and self-control levels were not significantly correlated with the amount of time people play, game addiction, or problem video game playing. We present design recommendations which can be applied to existing or new game designs in terms of both the economics of games and the psychology of games, including mechanics to account for low self-control and to avoid negative effects on self-control.

**Keywords**—*self-control; casual games; design patterns; Freemium; micro-transactions; in-app purchases*

## I. INTRODUCTION

New forms of business models such as Freemium and micro-transactions are commonly used, especially in casual video games. Freemium business models provide users with a free of charge product, but they charge for various additional purchases. The word is a combination of *free* and *premium* to represent both meanings in the business model. Freemium models usually combine with micro-transactions or in-app purchases (IAPs). The amount of IAPs in casual games is an interesting phenomenon to carefully investigate. Freemium companies design additional features and services that players can purchase, enjoy, and explore in the game. The increasing use of this business model, especially in videogames, increases the importance of investigating its influence on players in terms of understanding the process of decision-making, their interaction with the applications, and their feelings when playing (e.g., [1,2]).

Among Freemium games, Candy Crush Saga™ has enjoyed rapid success and the amount of money paid through in-app purchases is extraordinary. The amount of money spent on the game, in addition to players’ stories regarding how they spend time and money, lead to interesting research questions about player behaviour [3–5].

A person’s self-control plays a major role in interrupting and overriding existing desires and changing current behav-

ours in all experiences, including games. In this paper, we examine whether there is a self-regulation element to players’ behaviour and decision-making in Freemium games, specifically Candy Crush Saga™. We present the results of an online survey that examined a variety of psychological factors that may impact player behaviour in casual games that make use of in-app purchases, including self-control, game addiction, problem video game playing, as well as general experiences of purchasing game power-ups. Our findings show that self-control is inversely correlated with the amount of money people spent in Candy Crush Saga™. We also describe the experience of frustration and ego-depletion that can lead to such purchases, and provide recommendations to game designers about designing games for players with low self-control.

## II. RELATED WORK

The work most related to this study includes the psychology literature on *self-control and ego depletion*, as well as *game design patterns and Freemium games*.

### A. Self-Control and Ego Depletion

Self-control describes one’s ability to control emotions, thoughts, and behaviour, in order to change one’s current state. It is “the exertion of control over the self by the self” [6,7]. In the absence of self-control, people think, feel, and act upon their immediate desires without following intrinsic or extrinsic rules that inhibit these desires. Exerting self-control involves interrupting, inhibiting, and overriding differing urges and desires by delaying gratification [7]. This ability is associated with a wide range of behavioural patterns described in psychology literature (e.g., [8–10]). A fairly large body of literature finds that self-control is an ability that relies on a limited resource “energy” (e.g., [7, 11,12]) that is vulnerable to depletion by self-regulatory effort (ego-depletion). The strength model suggests the resemblance of self-control to a muscle. It also shows we can exercise self-control through regular practice to improve the finite capacity or *self-control strength* [8]. Self-control spheres can be classified into specific classifications or general classifications such as their requirement of cognitive or affective processing. Regardless of the classifications, the model confirms that self-control is a uniform strength that the energy is being drawn from [11].

In this paper, we consider how self-control strength and ego-depletion can affect the process of decision making in purchasing decisions in the experience of playing casual games, specifically Candy Crush Saga™. The strength model of self-control can explain how self-control capacity depletion highly influences users’ decisions.

## B. Game Design Patterns and Freemium games

Some work describes the different design patterns that have been used in Freemium or Free-to-Play (F2P) games, which encourage people to engage more and spend more money in the games. Zagal et al. [13] describe several patterns that have been frequently used and could be considered questionable, or even unethical. Lewis [14] also identifies three “dark” design patterns and how to avoid them: *currency confusion*, *pay to skip*, and *monetized rivalries*. Other studies focus on the social aspect of business models for social games, and indicate various reasons that people engage and purchase virtual goods in social network games.

While these papers discuss design patterns for games, as well as both the “dark” side for players and the business opportunities for designers, this previous work has not shown a direct empirical connection between self-control and purchasing decisions. In our work, we specifically investigate this connection.

## III. STUDY

We conducted a study to investigate if there is a relationship between self-control and spending money in Candy Crush Saga™. We conducted an online crowd-sourced survey that tested participants’ general self-control and the amount of money they spend in Candy Crush Saga™. Previous research shows a relationship between self-control and addiction in videogame players [15]. Therefore, we also included the Game Addiction scale to investigate if the effect exists in this situation as well. We also asked participants about the average time and duration of actively playing Candy Crush Saga™ to test how the time they spent in the game influenced other factors.

### A. Participants

We recruited 88 American participants (54 female, 34 male) through Amazon Mechanical Turk (MTurk). We specifically requested participants who had actively played Candy Crush Saga at least once over the past week.

### B. Procedure

Our survey included several validated scales and questions regarding players’ experience while playing the game. They were first asked to complete the Self-Control Scale [9], and then asked about their overall experience playing Candy Crush Saga™ with respect to spending money, time, and their actions and feelings when playing. Next, they were instructed to imag-

ine their experience specifically over the past week when playing Candy Crush Saga™ and respond to validated scales for Game Addiction [16], and Problem Videogame Playing [17]. Finally, they were asked to describe in free-form text the experience they had when they were deciding whether or not to spend money in the game.

### C. Validated Scales

In addition to the questions regarding player experience in the game, the money and the time they spent in the game, the survey consisted of the following validated scales:

1) *Self-Control Scale (SCS)* [9]: We used the Self-Control scale, a 36-item scale that measures self-control in individuals. The scale includes five major factors, which respectively assess general self-discipline capacity, tendency toward non-impulsive actions, keeping healthy habits, self-regulation for work ethic, and reliability. It uses 5-point Likert scales.

2) *Game Addiction Scale (GAS)* [16]: we used the long 21-item scale to measure people’s video game addiction. The scale has subscales based on seven dimensions of addiction in a game player. Game addiction has seven subscales: salience, tolerance, mood modification, withdrawal, relapse, conflict, and problems. It uses 5-point Likert scales.

3) *Problem Video Game Playing (PVP)* [17]: we used a 9-item short scale in addition to the GAS to measure problem video game playing. It uses ‘yes’/‘no’ answers to measure problems of excessive use of video games.

In addition to the validated scales, we also asked questions regarding the amount of money participants spent while actively playing Candy Crush Saga™, about the different ways that they spent money (e.g., buying more moves vs. boosters), and whether they considered the amount they had spent to be a lot. We also asked participants to report the average amount of time they spent daily in the game, the number of months playing, and to rate their level of experience on scale of 1 to 10.

To conclude the study, we asked participants to think of a moment in the game when they decided whether or not to spend money. We asked them to report on this experience, including a description of their thoughts, feelings, and different reasons that may have influenced their decision.

TABLE I. RELATIONSHIP BETWEEN VARIABLES: PEARSON CORRELATION COEFFICIENTS

Scales	Variables					
	Amount of money spent in the game (N=30 <sup>†</sup> )	Self-control (N=88)	Average playing time (N=88)	Duration of playing (N=88)	GAS (N=88)	PVP (N=88)
Self-control	<b>-.400*</b> (.029)	—	-.083 (.441)	-.056 (.605)	-.195 (.069)	-.071 (.514)
Average playing time	.124 (.515)	—	—	.161 (.134)	<b>.318**</b> (.003)	<b>.279**</b> (.009)
Duration of playing	-.071 (.708)	—	—	—	-.116 (.283)	-.094 (.383)
Game addiction scale (GAS)	.123 (.518)	—	—	—	—	<b>.700**</b> ( <b>&lt;.001</b> )
Problem videogame playing (PVP)	.202 (.284)	—	—	—	—	—

† Only 30 of 88 participants reported spending any money, so the other 58 were excluded from these analyses.

Parenttheses show standard errors in the analysis. \* $p < .05$ , \*\* $p < .01$ .

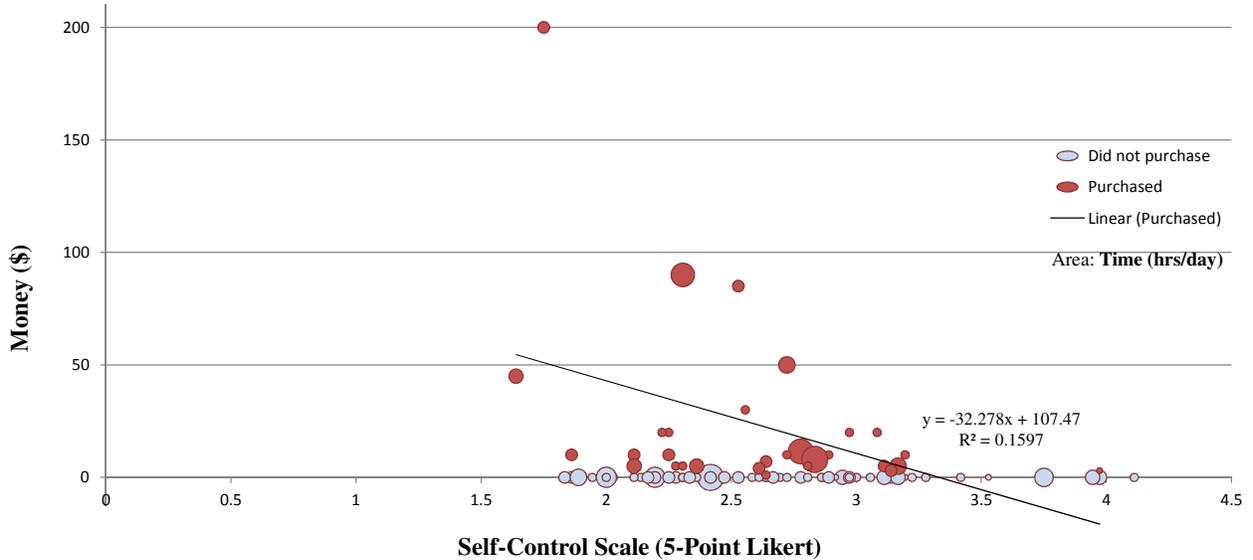


Fig. 1. The amount of money spent vs. self-control levels and the average amount of time spent in the game for participants that spent money in the game ( $N=30$ , area= time in hours per day).

#### D. Hypothesis

We identified the following hypotheses:

*H1: Participants with a higher level of self-control spend less money on in-app purchases.*

*H2: Participants who spend more money on in-app purchases spend more time in the game.*

*H3: Participants with a lower level of self-control have a higher level of addiction to the game.*

#### IV. RESULTS

Of the 88 participants, only 30 reported spending money in the game. Results of Pearson correlation analysis for some of the main variables in our study are presented in Table 1. No data were excluded from the analyses. There was a significant negative correlation ( $N=30$ ,  $r=-.400$ ,  $p=.029$ ) between the amount of money they spent and self-control, providing evidence for H1. Figure 1 shows the relationship between money spent in dollars and self-control, with the area of each circle representing time spent in the game. However, the correlation between the amount of time spent and self-control was not significant ( $N=88$ ,  $r=-.083$ ,  $p=.441$ ), nor was the correlation between self-control and game addiction ( $N=88$ ,  $r=-.195$ ,  $p=.069$ ) or problem gaming ( $N=88$ ,  $r=-.071$ ,  $p=.514$ ). We thus cannot confirm H2 or H3.

Overall, the average GAS score was 46 of 105 and the average PVP score was .26 out of 1.0, which are not considered high. However, for all participants there was a significant relationship between the average time spent and both GAS ( $N=88$ ,  $r=.318$ ,  $p=.003$ ) and PVP ( $N=88$ ,  $r=-.249$ ,  $p=.019$ ).

We also compared participants' responses about a moment in which they could spend money. Table 2 presents three categories of response, as coded by one experimenter.

TABLE II. PARTICIPANT RESPONSES ABOUT MONEY-SPENDING DECISIONS

Label	# Participants	%
Skipping the frustration of being stuck in the game	11	13%
Enjoy playing more of the game	3	3%
Skipping the experience of one or repeated failures at the verge of winning	3	3%
Did not report	71	81%

#### V. DISCUSSION

The study results indicate a connection between the level of self-control and the amount that participants purchased in the game. In this section, we discuss how the strength model of self-control explains this relationship. We also briefly discuss the possibility of eliciting negative feelings and consequences when players face purchasing decisions.

##### A. Enjoy more or suffer less

The results indicate a strong correlation between self-control and the amount of money players spent in the game to make purchases. This result suggests that people with lower self-control will experience more self-control capacity depletion, and therefore will spend more money in the game. Players face the desire of going to the next level. The feelings and thoughts associated with the desire may be because of the temptation of enjoying more in the game by going forward to the next levels or the frustration of passing the current level. In

order to clarify the results we also looked at *free-form* responses from the participants.

As discussed in the previous section, the results do not show a relationship between the amount of time or duration of time spent on average in the game with players' self-control and the amount of money they spent in the game. The results of the qualitative analysis also indicate that many of the participants had the experience of being stuck in the game. Table 2 shows that 13% of those participants experienced strong feelings of frustration. There were also several responses regarding the experience of being stuck in the game "for too long" and negative feelings regarding the experience. Therefore, it is more likely that participants want to avoid undesirable feelings of being stuck and pay a small amount of money to be able to skip to the next level. A small payment helps to skip the considerable amount of frustration associated with their experience in the game:

*"I'm trying really hard not to spend money on games. I did it a few times after being stuck for weeks because I was frustrated but I'm trying not to do it again." (P80)*

As discussed earlier, self-control is the willpower that self can exert to overcome thoughts, feelings and behaviours. By using a considerable amount of our self-control capacity, we might face ego-depletion and not be able to properly exert willpower in needed situations. In the same way, the frustration of being stuck in a game can cause ego-depletion more easily for those with lower self-control. One participant described switching to another easier game as a method to subvert this ego-depletion to avoid spending money:

*"I am feeling really frustrated because I am having trouble getting past this level. I know that if I buy the fish boosters, then I would have an easier time of getting past this level. I am seriously contemplating hitting the buy now option on my ipad to purchase the boosters. I get frustrated with myself and disgusted at the game turn it off, and then go to play farm hero saga instead, which is similar to candy crush but it is a lot less difficult to spend money on it because it is easier to play." (P7)*

We also found many other comments from participants that demonstrate the struggle of not really wanting to spend any money in the game.

The results show the kinds of experiences participants face when making a purchasing decision, and demonstrate that self-control capacity depletion can occur as a result of repeated failures and the frustration of not completing a level.

#### *B. Possible negative effects:*

Self-regulation is known to be an important ability in individuals [9]. Increasing self-regulatory energy and self-regulatory success has a significant influence on people's feelings, thoughts, and especially behaviour in opposition to self-regulatory failure (e.g., see [8,9]). In our study, many of the participants reported experiencing negative feelings in those moments. As discussed, many of the participants reported being frustrated in the game. Few others reported getting "too mad" (P4), impatient, and anxious. Some of the participants

consider spending money to be cheating and *purchasable* extra moves as "extra cheats" (P67). P36 and P57, who made purchases in the game, described their feelings as "not feeling like I will actually win, it feels like cheating," and "buying moves/pieces is cheating". People's positive feelings toward a game can be created by effective game design. On the other hand, some games may induce negative responses from players if, instead of reinforcing their positive feelings toward the game, in the moments which they face a repeated failures, they feel stuck and have to make a purchasing decision.

## VI. DESIGNING GAMES FOR PEOPLE WITH LOW SELF-CONTROL

Our study provides evidence that self-control levels affect purchasing decisions of players. In this section, we discuss how designers of games can consider self-control, how they can measure the level of self-control in the application, and how it can be applied to new game designs.

### *A. Self-Control Success and Failure*

Self-control successes and failures can significantly influence people. Literature emphasizes the effect of self-control success in interpersonal relationships and personal achievements [9,18], while self-control failure can lead to underachievement, bad habits, addictions, interpersonal relationships conflicts, and more. Self-regulation failure is also known to be associated with dejection-related (disappointment and sadness) or agitation-related (worry and anxiety) emotions [9,18,19]. The amount of negative emotions associated with self-control failure is considerable, especially for people with lower self-control who experience more repeated self-control failures and the frustration of this process. Thus, it is important to consider how our design patterns influence players.

### *B. Measuring Player Level of Self-Control*

The results of our study suggest two possible measures of self-control that could be detected as a player progresses through a game:

*Purchasing history*—Results show there is a strong correlation between the level of self-control and the amount of money people spend on the game. Therefore, *amount spent in a game can be used as an indicator of self-control*.

*Performance history*—The length of time a player persists in solving puzzles is an indicator of their self-control level [7]. Therefore, designers have the opportunity to analyze performance of players over a short period of time to evaluate persistence in the task and measure their self-control level.

### *C. Design Recommendations*

Our results also lead to several suggestions for game design, which we describe from two perspectives *game economics* (i.e., maximizing profit) as well as *game psychology* (i.e., maximizing player experience and benefiting self-control).

#### *1) Game Economics*

Many games are designed with one of its primary purposes being to make money. Thus, we describe several design suggestions based on our results which can both help address self-control, while still considering profit.

*A trade-off in the design pattern; quitting faster vs. purchasing more*—the decision making process involves users in a situation in which people can wait, spend money to skip, or quit playing the game. Designers face a trade-off when designing the game levels, the price of purchases, etc. For instance, increasing the price of each purchase may increase revenue by increasing marginal revenue for each purchase, but may have the effect of decreasing total purchases and the revenue by making the player quit. Therefore, the design should consider reaching an equilibrium in which players want to continue playing, but can be confronted with purchasing decisions.

*Changing pricing strategy*—people with lower levels of self-control can experience a higher level of frustration in the game, which can lead to quitting the game sooner. Thus, a designer could seek different strategies to cause less negative effects, and also have the players spend more time and money in the game. Pricing strategies can involve customizing pricing strategies, in which they lower the price for people with lower self-control, which could increase profit by having these players not exhaust their self-control reserve.

*Freemium fee limit and balancing the difficulty level for people with lower self-control*—one important feature of Freemium models that use micro-transactions is not having a payment limit. Payments may exceed far more than a fixed Premium fee. This makes it possible for designers to consider setting a limit for Freemium payments. This would lower the chance of experiencing repeated self-control failures and frustration for people with lower self-control, and also encourage the players to later quit and better enjoy playing the game. Hence, they have the benefit of using additional features of the game in case they face a very difficult level.

## 2) Game Psychology

Different game mechanics can also be used to address the psychological issues of self-control in the game. These recommendations could be applied to Candy Crush Saga™ or to other casual games with the same mechanics and issues.

*Strength of having a path*—there is a long tradition of using paths in games, but the potential usefulness of a path is not fully explored. Having a path in casual games such as Candy Crush Saga™ provides the opportunity to change game mechanics to reduce issues for people with lower self-control. We recommend two different ways of applying this idea:

First, the game could reveal different difficulty levels in the path for each map to offer a different experience for people with lower self-control. For instance, players can take the longer, less-risky road in the next map if they feel they cannot enjoy the challenge anymore due to frustration. This prevents them from quitting the game as well.

Second, the game could reveal temporary roads for people with lower self-control in some of the levels, as a secondary option. This idea is similar to having a quest to unlock the next map. Combining this idea with designed power-ups (see *Rewarding self-control success* below), more possibilities would be designed into the path. Note that we are not suggesting having an alternative way of playing the game (e.g. Dream World that Candy Crush Saga™), but instead allowing the pursuit of the *same* challenge in a different way. This idea could be ap-

plied to other casual games, such as Angry Birds. Instead of purchasing a Mighty (Mighty Eagle), the game could provide similar solutions for people with lower self-control.

*Balancing challenges*—unbalanced challenges can cause and accelerate the frustration of not having good flow in the game [20]. An important factor in balancing the challenges is to create levels in which the difficulty levels are gradually increasing. While many games already consider the idea of flow in the design, this could be considered differently depending on a player's level of self-control. For instance, when a player's self-control reserve is low, the game could decrease challenge.

*Rewarding self-control success*—games could also be designed to increase self-control successes and decrease failures. Casual games could use different reward systems to link rewards to more exertion of self-control in the game. Self-control exertion could be associated with positive feedback, instead of negative feedback such as “give up” in the face of decision-making in the game. Games could also create special Power-ups to act as a gateway to a new levels or paths in order to assist players, similar to the Warp Whistles in Super Mario Bros. 3. This reward system could act in opposition to depleting self-control capacity in players.

## VII. CONCLUSION AND FUTURE WORK

In this paper, we conducted a study that showed the relationship between self-control of game players and the amount of money they spend in Candy Crush Saga™. Our results highlight the importance of analyzing self-regulation in game-playing and Freemium business model patterns. In the future, we will further examine the relationship between time and money spent in casual games to be able to better explain purchasing decisions in video game playing.

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