Bachelor Thesis

The association between Gambling and Loot Box Purchasing:

Explained through Impulsivity and Arousal Needs

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Abstract

Aim: Loot boxes have become a popular form of micro-transaction in online video games, meaning more games are introducing these items in their in-game shops to be purchased, to create revenue for the companies. A link between gambling and loot box purchasing has been found, especially the increased potential to develop problem gambling through them. Therefore, loot boxes have gained more attention from gaming developers, users, and researchers. This study focuses on filling the gap of understanding between causal connections of this link by answering the research question, if impulsivity and arousal needs are factors that increase the development of problem gambling through gambling and loot box purchasing.

Methods: To answer the research question, an online survey was conducted and distributed on Reddit. The data collected was analyzed using RStudio, to test the reliability of the variables and the effect on gambling behavior, as well as loot box purchasing. The sample consisted of (N=) 603 participants (Age: M=27.03, SD=3.66; Gender: Male=44.3%, Female=36.2%, Non-binary=2,3%).

Results: The results of the analysis showed that impulsivity has a significant effect on both gambling and loot box purchasing. However, the significant effect of impulsivity on loot box purchasing was negative, while the significant effect on gambling behavior was positive. Arousal needs did not prove to have a significant effect on neither gambling nor loot box purchasing.

Conclusion: The findings contribute to the gap of understanding the causal connections of the existing link between gambling and loot box purchasing, specifically how they both include the risk of developing problem gambling. The study proved that impulsivity and arousal needs are not the risk factors of developing problem gambling when gambling and purchasing loot boxes.

Contents

1. Introduction

Gaming has been increasingly more popular in the last few decades. Particularly free online games have been attractive for younger, as well as older individuals to spend their leisure time. These types of games are easy to download and do not require being purchased. However, online games often incorporate the option to purchase items within the game. These items can range from skins for characters, weapons to items that make the gameplay itself more enjoyable and easier. One of the trends to provide such items to the users, that has been getting more attention are micro-transactions in the form of loot boxes. A loot box is an item that is purchased via an in-game shop. The buyer will then receive a box that can be opened. After opening the box, the player will receive a random item from the game. These items contain elements of surprise since the purchaser does not know which item they are collecting through the purchase, which is often defined as a chance-based outcome. Due to this similarity, loot boxes are viewed as being related to gambling and potentially leading to problem gambling (Gonzáles-Cabrera et al., 2023).

Previous literature has been increasingly exploring the link between the purchase of loot boxes and gambling behavior. In these studies, a proven association between loot boxes, gambling, and problem gambling has been found. They state that there is a high convergence of loot box purchasing and gambling due to this chance-based outcome of the purchased item. Therefore, they found that buying a loot box can lead an individual to develop problem gambling (Zendle & Bowden-Jones, 2019). Since this has been identified, more studies focused on the association between the two variables, specifically on the risk of individuals developing problem gambling as a behavior (Brooks & Clark, 2023). They argue that because loot box purchasing and gambling have similarities, and loot boxes can be seen as a form of gambling that there is a risk of gambling prone individuals to develop problem gambling with loot box purchasing.

Problem gambling, which will be further defined and explained in the theoretical framework, is a negatively associated term. It mostly includes negative consequences for the individual in financial terms. One of the links between gambling and loot boxes mentioned is that they work like a trap, which creates the need to purchase more items after the first purchase. This is described by a person having the desire to collect even more higher value items. While there is an increasing number of studies that focus on this area of research, there has been little studies that explore which variables cause this association or convergence, meaning little is known about the causal connections (Brooks & Clark, 2023). This study aims to fill the gap of understanding these causal connections.

Previously, it has been established that gambling and loot box purchasing have similarities and can both lead to problem gambling. Therefore, problem gambling is an association that both gambling and loot box purchasing share. This association is described as including the risk for individuals in for example financial terms in literature (Takeuchi et al., 2020). It is important to understand what leads individuals that gamble and purchase loot boxes to develop problem gambling, which is here defined as excessive behavior of gambling. Impulsivity and arousal needs are known to be preceding factors of problem gambling, also called antecedents. The aim of this study is to establish if impulsivity and arousal needs have a positive effect on gambling behavior and loot box purchasing. With this conclusion of the hypotheses, it can be assumed if impulsivity and arousal needs are the factors that cause individuals that gamble and purchase loot boxes to develop problem gambling in a similar way.

The research question for this research is: are impulsivity and arousal needs factors that create the risk of developing problem gambling for individuals that gamble and purchase loot boxes?

Understanding how the risk of developing problem gambling through loot box purchasing and gambling is created brings many benefits. First, researchers in the field can further explore and explain the causal connections of gambling and loot box purchasing, as well

as how the development of problematic behavior can be decreased. This could help to develop preventions of causing such behavior with in-game items such as loot boxes, by understanding the underlying relations to create less risks with gaming companies, to create better items that lead to no problematic behavior. Furthermore, arousal needs in regards to loot boxes have not been heavily discussed in research yet. However, the design of items has been proven to be important for general purchasing intention in previous literature (Wirtz et al., 2007). It is important to understand what kind of arousal needs effect purchasing intention of gamers when considering purchasing items such as a loot box. Therefore, this literature attempts to measure arousal in context with loot boxes as the attributes in form of design and animation.

2. Theoretical Framework

To proceed with the research, it is necessary to define the terms that will be used for analysis and explain the link between them. As previously described, problem gambling can be developed through gambling and loot box purchasing. Previous literature has found this existing association between the two. This study aims to understand if impulsivity and arousal needs, which are antecedents of problem gambling, are risk factors that lead to the development of this problematic behavior.

In the following analysis, loot box purchasing and gambling behavior will be correlated separately with impulsivity and arousal needs. It is hypothesized that if the effects will be similar, it can be assumed that these factors create a higher likelihood for an individual to develop problem gambling if exposed to high impulsivity and arousal needs when gambling or purchasing a loot box.

2.1. Problem Gambling

Problem Gambling commonly has a negative connotation. Ferries & Wynne give a good example of a definition to problem gambling. They describe it as behavior that is caused through gambling, that concludes negative consequences for the gambler and/or the environment (2001). Other more current studies share this definition and describe it as referring to a degree of time and money commitment that can harm the individual (Tseng et al., 2023). When gambling, also for loot box purchasing which is identified as a form of gambling, the gambler invests a lot of time during gambling and spends a lot of money while purchasing the items and playing with real-life money. Even if looking at in-gam currency, or coupons that individuals use on the machines, these need to be purchased with real-life currency in advance.

For the association of gambling and loot box purchasing in literature, loot box purchasing is seen as a having a "Gateway effect", meaning that it leads to problem gambling

(Spicer et al., 2022). This emphasizes that both loot box purchasing and gambling are known to create the risk for an individual to develop problem gambling, since they work in similar ways by creating the risk of problematic behavior.

These consequences for the individual are mostly seen in the financial aspect. Items such as loot boxes or gambling items such as scratch cards are purchased with real life currencies. Therefore, if there is an addictive behavior developed through them for the individual, such as problem gambling, they will continue to repetitively purchase items and suffer financial consequences in most cases. This behavior can be caused through feeling the need to purchase more loot boxes, which concludes potential financial strains for the individual. Studies show that people that have previously developed a gambling disorder show rather risky decision-making, especially in the financial domain (Takeuchi et al., 2020).

Additionally, other negative consequences can be in the areas of health and even relationship problems (Tulloch et al., 2023). With the amount of time and money investment, individuals can tend to hurt especially family when in constant struggles, and even go as far as borrowing money constantly without the reassurance of getting it back. It has also been found in previous literature that gambling is a significant factor that can cause suicidal behavior and in general strain an individual's health (Metcalf et al., 2023). However, these consequences are harder to measure in relation to gambling and loot box purchasing and would need an extra study. The focus in this study is on the financial aspect in relation to loot box purchasing and spendings on gambling activities. Overall, there is an assumption that problems with gambling are a phenomenon that exist within a community and can be measure with scales (Abbott et al., 2004). The specific scale being used for this study is adopted from previous literature studying the link between loot box purchasing and gambling in the UK (Wardle & Zendle, 2020). This scale was developed to measure the output of multiple studies that explored problem gambling in connection with loot box purchasing. Furthermore, the scale for loot box purchasing was

created by using similar items from the scale to measure gambling to create the association between the dependent variables.

2.2. Antecedents of Problem Gambling

The following section will discuss possible antecedents of problem gambling, which will be measured in the methods section. The study wants to investigate if impulsivity and arousal needs relate similarly to gambling and loot box purchasing, in order to answer if these are the risk characteristics of gambling and loot box purchasing that lead to problem gambling.

2.2.1. Impulsivity

There is no generally accepted definition of impulsivity, therefore the term is rather inconsistently used throughout literature. Some health studies define it as a construct that is seen as a risk factor for many disorders that damage health (Herpertz et al., 1997). A further defined definition, which is within the context of health concerns, is that impulsivity is a predisposition towards rapid and unforeseen reactions, caused by internal or external stimuli, without the awareness of negative consequences of these reactions (Dougherty et at., 2009). This means that these reactions often occur instantly and without much logical contemplation. This can be related to engagement in loot box purchasing and gambling, since these stimuli could be from the excitement caused through the chance-based outcome. Furthermore, arousal needs in form of animations of a loot box etc. can be external stimuli enhancing impulsivity.

Studies have established that there is a consistent association between impulsivity and gambling behaviors (MacKillop et al., 2016). The research argues that this has been proven in previous studies and adds that impulsivity could be divided into three categories being impulsive choice, impulsive action, and impulsive personality traits. In more detail, impulsive choice shows there is a discounting of delayed rewards. Furthermore, impulsive action shows the ability to restrain from motor responses. Lastly, impulsive personality traits which

represents the ability of self-reflection to self-regulate. This introduces and explains that impulsivity can be seen in different aspects to determine the level of degrees of severity for an individual. However, a study focusing on the relationship of impulsivity and loot box purchasing, where impulsivity was measured and defined as positive urgency and sensation seeking, found a positive correlation, but concluded that the factors implication seems to differ from the ways of problem gambling. Meaning, that while there is an association between loot box purchasing and gambling, there are still some underlying differences, which is why we view loot box purchasing and gambling as separate constructs.

Items that are created for the study to measure impulsivity ask if an individual tends to spend a lot of money instantly and on items that are not necessarily needed. It is expected that if impulsivity is high, it will positively influence purchasing behavior. Therefore, the individual will tend to score higher on gambling and loot box purchasing if impulsivity is high. In the context of this study, the term impulsivity is defined as reactions that occur, such as purchasing behavior, that is caused by external stimuli.

H1: Impulsivity is a risk factor that makes an individual develop problem gambling when exposed to loot box purchasing and gambling.

H1a: Impulsivity has a positive effect on loot box purchasing.

H1b: Impulsivity has a positive effect on gambling behavior.

2.2.2 Arousal needs

Arousal is always important to consider in areas such as tourism, advertisement etc., since it is something that can be used to make a product or service appear more appealing to purchase. Multiple studies explore the link of different forms of arousal and their effect on purchasing behavior. Most focus on in-store environments, where the environments are manipulated for visuals representing different levels of arousal from high to low (Wirtz et al.,

2007). In these studies, they prove that arousal needs increase the purchasing behavior of individuals. Meaning, that if they are exposed to positive stimuli, their willingness to purchase items increases. Therefore, it is important to consider it in the context of purchasing items such as loot boxes or other gambling items.

Other studies commonly defined arousal needs as a perception of stimuli, energy, and excitement of an individual (Menon & Kahn, 2002). If this is linked to the definition of the previously mentioned study from Wirtz et al., it can be identified that they measured arousal needs with pleasant and unpleasant store environments, that either elicited a positive or negative response. This response is based on the emotions of the participants. Thus, arousal is an emotion, that can be influenced by different factors and affect a certain behavior. Considering gambling, as well as loot box purchasing, there is an element of surprise for the outcome of the purchase, which is represented by excitement that an individual can feel. Another stimulus of a loot box representing arousal needs could be the appearance of the design or the animations of using them. The definition of the study previously mentioned is that elements or factors such as design of a loot box, the animation, theme etc., elicits more arousal, and causes the behavior to purchase an item. Therefore, arousal will be defined by the attractiveness of different attributes of a loot box that makes the individual more prone to purchase the item. It is expected that if arousal needs are high for an item, then gambling and loot box purchasing will positively increase.

Additionally, a study explored that in terms of gambling, arousing features could influence an individual to develop a need for the excitement it can provide (Zendle & Cairns, 2008). This is another example of arousal creating a positive emotion, triggering the behavior to purchase a loot box or other gambling item.

H2: Arousal needs are a risk factor that make an individual develop problem gambling when exposed to loot box purchasing and gambling.

H2a: Arousal needs have a positive effect on loot box purchasing.

H2b: Arousal needs have a positive effect on gambling behavior.

2.3 Conclusion

In conclusion, the link of gambling and loot box purchasing is hypothesized to be the risk of developing problem gambling. Impulsivity and arousal needs have been characterized as being antecedents of problem gambling, meaning that the influence of them can cause behavior that is caused through gambling and bring negative consequences for an individual and their environment. Since loot box purchasing was identified as potentially leading to this problematic behavior as well, this study tries to identify if the effect of impulsivity and arousal needs are similar on loot box purchasing, as it is on gambling.

Figure 1. Conceptual visualization of the relationship between the variables
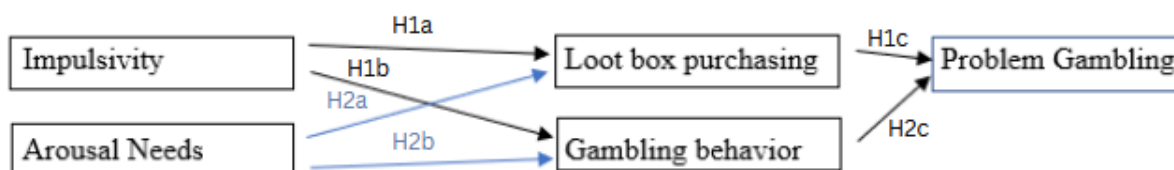
Note. This figure illustrates the expected relationships between the variables tested in the analysis.

3. Methods and Instruments

3.1 Design

The aim of the study is to answer if impulsivity and arousal needs are risk factors that lead to the development of this problematic behavior when gambling and purchasing loot boxes. The method of data collection was decided to be quantitative, in the form of an online survey. Data collection in form of an online survey was chosen to generate a large amount of data that can be scaled and related to each other. The study aims to test the effect of impulsivity and arousal needs on gambling and loot box purchasing using data that is number-based and measurable; therefore, a quantitative data collection was chosen to be most suitable. An online survey has the benefits of being easily distributed on channels, such as subreddits, and can gain a lot of responses that can be used for analysis through a coding software.

The survey was designed and divided into different sections. Each of the sections contain multiple items that measure one specific variable. The first variable consists of general demographics to derive conclusions about the sample of the study. Other sections were used to measure the constructs impulsivity, arousal needs, loot box purchasing and gambling behavior of the participants.

3.2 Participants

The survey was designed using Qualtrics, then published and distributed on academic subreddits. Reddit was the only platform used to share the survey, and the participants were restricted to be over the age of 18 and have previous experience in gaming. Therefore, the study collected data with a stratified random sampling method. The population of the study was divided into different groups, based on the restrictions that had to be fulfilled. After a brief analysis of the results in Qualtrics, it can be concluded that there was a total of 1006 participants that filled in the survey. After cleaning the data for completeness and consent, there was a total of (N=) 603 valid responses useful for analysis. The results show the main sample population

was balanced and consisted of individuals that identified as female (40.99%), male (50.23%), transgender (3.49%), and non-binary (2.59%), while some participants preferred to not state their identified gender (2.71%). Most participants reported that previous Loot Boxes in an online video game were purchased, simultaneously many of the participants have gambled before. According to the results, only 12.2% of the participants never gambled before, while 35.93% have never purchased a loot box, which means that people that gamble, do not necessarily purchase loot boxes even when gaming. The average age of the participants was estimated to be 27 years, with the average participant spending around 50-200 Euro on Loot boxes in the last three months (53.36%). Additionally, the average money spent in the last 12 months added up to 100-500 Euro (21.79%).

3.3 Procedure

Users of the platform Reddit could access the survey through a link. After being forwarded to the site of the survey, the first step the participants had to take was give informed consent to participate in the study. There they were informed that the data will be handled carefully and confidentially. They could exit and withdraw from the study at any given moment through the survey. Additionally, they were informed of the giveaway of a 20.- Euro Amazon gift-card of one random participant, if giving their e-mail address in the next question.

First, multiple demographics such as gender, age and ethnicity were asked in the first section. Additionally, they were asked for the duration of being experienced in video games and if they previously purchased a loot box. Next, they were asked to give some indication of their occupation, income and living situation. The following sections intended to measure the variables later used for the liner regressions. Questions to measure impulsivity were about their attitude towards spending money. Therefore, they indicated if the spend money instantly, on important items and in what frequency. Thirdly, the next section asked them if different attributes of loot boxes were important to them when considering a purchase. Furthermore, the

next section measured the frequency of purchasing loot boxes and previous experiences, such as regret of a purchase, or even rage emotions. The last section contained questions about gambling behavior. The participants answered questions such as previous gambling in the past 12 months, spent money, faced consequences, the need to purchase more and self-assessment of their gambling behavior. The last two section measuring loot box purchasing and gambling were similar and only differed in the context of gambling and purchasing loot boxes.

3.4 Measures

The measures of the study are demographics, impulsivity, arousal needs, loot box purchasing, and gambling behavior. Each measure is represented as a section in the survey, that measures a specific variable. Each section contains multiple questions associated with the variable. This creates a scale that uses a 5-point Likert scale for the section that measure impulsivity, loot box purchasing and gambling behavior. The section measuring arousal needs uses a 2-point Likert scale.

3.4.1 Impulsivity

Impulsivity is measured by a set of four questions, asking about impulsive spending behavior of money, since the focus of the study for impulsivity is on the financial aspect. The scale was not adopted from previous studies since it was intended to be tailored to the specific topic. In hindsight, for further studies a different scale measuring general impulsivity could prove to be more beneficial. The reliability of the scale proved to be very low. The factor analysis showed that in fact two items, created for the gambling behavior scale, were more suitable for this factor than the initially created items. Therefore, for future research a scale measuring general impulsivity such as the Barratt impulsivity scale should be used to create the measurement (Ireland & Archer, 2008). This scale consists of 30 items that focus on questions

of self-report and uses a 4-point Likert Scale ranging from rarely/never to almost always/always.

3.4.2 Arousal Needs

Furthermore, the scale measuring arousal needs was developed by the researcher. It specifically asked for attributes a loot box can contain that could be important for a potential purchaser. These attributes were established through asking gamers what they typically find attractive and pay attention to when considering buying a loot box. The items range from appearance, animation, theme of events to in-game currency, that still must be purchased with real-life currency. Important to mention here is that most participants played PUBG, meaning that arousal needs are heavily reliant on this specific design of loot boxes. The design of the loot boxes of this game are rather simplistic and realistic in appearance instead of flashy etc. This scale proved to be rather reliant with an alpha of .63. Moreover, the factor analysis showed that the factor created for the variable had high factor loadings on all the intended items.

3.4.3 Gambling Behavior

Next, the gambling scale was adopted from a previous study that compared and analyzed the results of multiple studies that study the link between gambling and loot box purchasing in the UK (Wardle & Zendle, 2020). This scale asks about the participations previous time and financial investment with gambling, to predict the severity of gambling behavior. For the 5-point Likert scale, a 5 would indicate very high gambling activity of an induvial, while a 1 would indicate very low to no gambling activity. Lastly, the loot box purchasing scale was derived from the gambling scale, adopted from Wardle and Zendle.

3.4.4 Loot box purchasing

The same items from the gambling scale were used, but with the focus on purchasing loot boxes, instead of other general gambling activities. While the reliability analysis showed that the factor loadings were high for all the loot box purchasing items, the loading for gambling

in the specific factor were lower. Furthermore, the alpha for internal consistency was rather high and reliable for the variable loot box purchasing; however, the alpha for gambling behavior was very low. Since, the scale was initially adopted from a previous study that showed reliable results, it can be assumed that because the loot box scale had almost identical items there was an overlap for the factors in the analysis resulting in the low values for gambling behavior.

3.4.4 Reliability and Validity

A factor analysis was performed to derive the most suitable items to create the variables representing impulsivity, arousal needs, gambling and loot box purchasing. The results showed that the factor loadings for the items initially created to measure loot box purchasing were almost perfectly fitting with high factor loadings of > .90 on almost every item in the section and a Cronbach's alpha of .96. The items of the section intended to measure arousal needs scored very high factor loadings on a specific factor as well with loading > .40. The internal consistency represented by the Cronbach's alpha was also acceptable with a value of .67. This concludes that the measurements for loot box purchasing, and arousal needs were high for reliability and validity. However, the factor analysis showed that items for the factor representing gambling behavior had rather low factor loadings of partially .36 and .37. Gambling behavior scored lowest for internal consistency of .43. Which can be assumed was caused by the similarity of items for the loot box scale, since the scale was adopted from previous literature where it was sufficient for internal reliability. Lastly, items belonging to the factor representing impulsivity were chosen from the gambling section in the survey, since they scored highest on the specific factor with loadings > .40.

Table 1. Factor analysis

Item	Factors			
	Loot box purchasing	Arousal needs	Gambling behavior	Impulsivity
How often do you purchase a loot box in video games?	.91			
How much money have you spent on loot boxes in the last three months?	.89			
Is it important for you to obtain a rare or good item?	.93			
Have you had the urge to spend more money on another loot box?	.92			
Have you ever stopped playing a game for a while because of the loot boxes?	.90			
The animation looks attractive when it opens.		.63		
The effects are appealing and flashy when it opens.		.52		
Loot boxes have an attractive and colorful design.		.49		
The loot box has a design themed to an even, holiday etc.		.47		
There is a showcase of the possible items I could win.		.54		
How often do you feel the urge to gamble more money to achieve excitement?			.43	
How long do you typically spend on gambling per day?			.36	
How do you assess your gambling behavior?			.37	
How much money have you spent on gambling in the past 12 months?				.49
Have you experienced any negative consequences?				.56
SS Loadings:	4.38	1.67	1.19	0.96
Proportion Var:	0.20	0.08	0.05	0.04
Cumulative Var:	0.20	0.28	0.33	0.37
Cronbach's alpha:	0.96	0.67	0.43	0.46

3.5 Data analysis

The data analysis was performed by using Qualtrics to design the survey and RStudio was used in order to analyze the collected data from the survey. The hypotheses state that if impulsivity is high, it will have a positive effect on gambling and loot box purchasing. Furthermore, if arousal needs are high, it will have a positive effect on gambling and loot box purchasing. Therefore, the measures were checked for reliability and validity to ensure that they measure the intended constructs. The factor analysis was used to determine which items were best chosen to represent impulsivity, arousal needs, gambling and loot box purchasing. Additionally, the internal reliability was checked with the Cronbach's alpha.

To test the hypotheses, correlations were tested for the relationship of impulsivity, arousal needs, gambling and loot box purchasing. With the results, it was concluded if the correlation between all the items were significant and important to be considered. Furthermore, the significance and effect of impulsivity and arousal needs were tested with simple linear regression. With the results it was possible to conclude if the stated hypotheses must be rejected or accepted. Meaning a conclusion could be drawn if the effect of impulsivity and arousal needs on gambling and loot box purchasing is positive. This will help to answer the research question if impulsivity and arousal needs are the risk factor to develop problem gambling, when gambling and purchasing loot boxes.

4. Results

4.1 Hypothesis testing

To test the before stated Hypotheses H1a, H1b, H2a and H2b, regarding the positive effect of impulsivity and arousal needs on gambling and loot box purchasing, simple linear regressions were performed. Gambling and loot box purchasing were treated as the dependent variables, while impulsivity and arousal needs were treated as the independent variables. Simple linear regressions are used because we view the variables as being continuous predictors.

Additionally, the correlations were tested to understand the relation between all variables introduced and gain a quick understanding of direction of the relationships. With the correlation matrix, it is evident that impulsivity has a strong correlation with both loot box purchasing and gambling. The correlation with gambling was the highest with a Pearson's r of .71, which shows a strong positive correlation. Loot box purchasing and impulsivity showed a significant correlation as well with a value of -.22, which indicates a strong negative correlation. Other correlations in our model proved to be not significant with values > .1.

Table 3. Correlation matrix

| Variables	M	SD	1	2	3	4
1. Impulsivity	2.82	.81	-			
2. Arousal Needs	1.63	.43	.085	-		
3. Gambling	2.85	1.64	.71**	.056	-	
4. Loot Box	1.41	0.86	-.22*	.072	-.08	-

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

4.1.1 Loot box purchasing

The simple linear regression of impulsivity on loot box purchasing proved to be significant, $F(1,602) = 30.64$, $p < .001$. It explained 4.7% of variance of loot box purchasing. The effect that impulsivity has on loot box purchasing can be described with the estimate $\beta = -.33$, $SD = .06$, $t(602) = -5.53$, $p < .001$. Concluding, H1a must be rejected. With the results it can be said that the null hypothesis is to be rejected; however, the significant effect impulsivity has on loot box purchasing is negative.

Figure 2. Significant effect of impulsivity on loot box purchasing
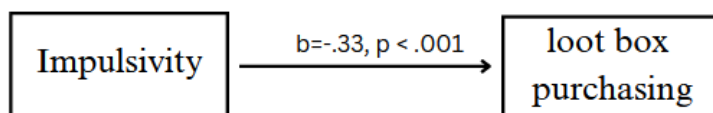
Furthermore, the linear regression of arousal needs on loot box purchasing did not prove to be significant, $F(1,602) = 3.14$, $p = .08$. The model explained less that 1% of the variance of loot box purchasing. The effect of arousal needs on loot box purchasing has been found to be $\beta = .28$, $SD = .16$, $t(602) = 1.77$, $p = .08$. Overall, the null hypothesis cannot be rejected. This means that H2a needs to be rejected as well, meaning that arousal needs do not have a positive effect on loot box purchasing.

Figure 3. Insignificant effect of arousal needs on loot box purchasing
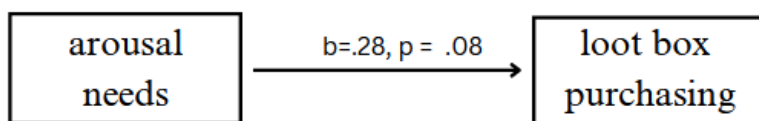
4.1.2 Gambling

The simple linear regression of impulsivity on gambling was significant with $F_{(1,602)}$ = 603.8, $p < .001$. The model explained 50% of the variance on gambling. The effect that impulsivity had can be described with $\beta = .56$, $SD = .02$, $t_{(602)} = 24.57$, $p < .001$. This means that null hypothesis must be rejected and conclude that H1b can be accepted. Impulsivity does have a positive effect on gambling behavior.

Figure 4. Significant effect of impulsivity on gambling behavior
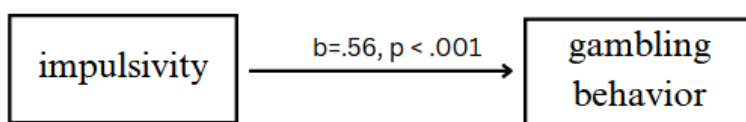
Next, the regression of arousal needs on gambling behavior proved to be insignificant, $F_{(1,602)} = 1.92$, $p = .17$. The model explained less than 1% of the variance of gambling behavior. The significance of the relationship between arousal needs and gambling can be described with $\beta = .11$, $SD = .08$, $t_{(602)} = 1.39$, $p = .17$. This means that H2b must be rejected, because arousal needs do not have a positive effect on gambling behavior.

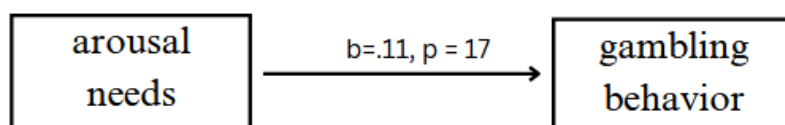Figure 5. Insignificant effect of arousal needs on gambling behavior

Table 2. Hypothesis testing

	Hypothesis	Result
H1	Impulsivity is a risk factor that makes an individual develop problem gambling, when exposed to loot box purchasing and gambling.	Rejected
H1a	Impulsivity has a positive effect on loot box purchasing.	Rejected
H1b	Impulsivity has a positive effect on gambling behavior.	Accepted
H2	Arousal needs are a risk factor that make an individual develop problem gambling, when exposed to loot box purchasing and gambling.	Rejected
H2a	Arousal needs have a positive effect on loot box purchasing.	Rejected
H2b	Arousal needs have a positive effect on gambling behavior.	Rejected

5. Discussion

5.1 Main findings

This study aims to fill the gap of understanding the causal connections between gambling and loot box purchasing and their association of both leading to problem gambling. More specifically it tried to answer the research question "Are impulsivity and arousal needs risk factors that cause an individual to develop problem gambling when gambling and/or purchasing loot boxes?". Previous research has established that loot box purchasing and gambling have similarities and are related (Gonzáles-Cabrera et al., 2023). Especially with the ability to cause problem gambling, which is defined as behavior caused through gambling that concludes negative consequences for the individual and their surroundings (Ferries & Wynne, 2001). To understand why this is the case, this study explored the effect of impulsivity and arousal needs on gambling and loot box purchasing. Since impulsivity and arousal needs are antecedents of problem gambling, it was expected that they could be the reason why gamblers and gamers that purchase loot boxes develop problematic behavior.

The study collected data using the social media platform Reddit, which is commonly known as a popular communication platform for gamers. The sample consisted of gamers that were averaging the age of 27 and played PUBG as their favorite game containing loot boxes. Through the analysis, the study found a significant effect of impulsivity on loot box purchasing and gambling. However, the effect of impulsivity on loot box purchasing was negative, meaning that H1a needs to be rejected. The factor analysis was used to determine which items should be used to represent impulsivity, which were chosen to be items initially created for the gambling scale. This could explain why the effect on loot boxes was negative and high for gambling. Furthermore, the effect of impulsivity on gambling proved to be significant as well. Since the effect was indeed positive, H1b must be accepted. Meaning, that impulsivity has a positive effect on gambling. However, we must consider that the items used for impulsivity were initially

designed for the gambling scale. Meaning, these results could contain error. Based on the results of the linear regressions considering the effect of impulsivity, it can be concluded that it influences gambling and loot box purchasing, but H1 cannot be accepted. There is no evidence found of impulsivity having the same positive effect on both gambling and loot box purchasing. Meaning, that it cannot explain that it contributes to individuals developing problem gambling when gambling and purchasing a loot box.

Additionally, no significant effect could be found of arousal needs on gambling or loot box purchasing. The regressions showed a p-value > .05. The reliability analysis showed that arousal needs, loot box purchasing and gambling measured the intended constructs. Therefore, it can confidently be concluded that arousal needs are not a risk that causes an individual to develop problem gambling when gambling and purchasing a loot box, meaning H2 must be rejected as well. For both gambling and loot box purchasing, the effect was insignificant with additional low, insignificant correlations to arousal needs defined as the attributes of a loot box. Hence both H2a and H2b need to be rejected. For the research question it means that impulsivity and arousal needs are not factors that cause both constructs to potentially develop problem gambling. According to our results this is the case for gambling behavior, as previous literature found as well (MacKillop et al., 2016). However, this study found no evidence that impulsivity has the same effect on loot box purchasing, even showing that with impulsivity, as defined in this study, there is less loot box purchasing. If we look at the study from Garret et al. who also studied the effect of impulsivity and loot box purchasing, where impulsivity was measured and defined as urgency and sensation seeking, they also found that while it may play a role in loot box purchasing, it behaves differently to those implicated in gambling behavior. Therefore, this study strengthens the point that impulsivity does not contribute to the association of gambling and loot box purchasing in the same way (2023). The findings of this study, viewing impulsivity with spending behavior of money strengthens this argument. Meaning that there is a need to

understand impulsivity differently in the context of loot box purchasing and how this effect purchasing intention.

5.2 Academical and practical implications

This study primarily contributes to the field of research. While previous literature has found a link between gambling and loot box purchasing, specifically their potential to cause problematic addictive behavior defined as the term problem gambling. Researchers have found that there is a lack of understanding of causal connections of this link between the two (Brooks & Clark, 2023). Therefore, this study tried to answer if one of this causal connection could be the effect that antecedents of problem gambling, in this study impulsivity and arousal needs, have on gambling and loot box purchasing. The answer is that neither impulsivity nor arousal needs showed a similar positive effect on gambling and loot box purchasing, meaning that the contribution shows that both impulsivity and arousal needs are not a causal connection between gambling and loot box purchasing potentially leading to problem gambling. Understand that through this study arousal needs, as defined in this study being more realistic and plain designs of loot boxes, does not influence purchasing behavior positively and lead to problematic behavior is important. The research field could now investigate different designs with flashy and colorful attributes to test differences in effect. Furthermore, we found that impulsivity has not explored in detail in the context of loot box purchasing, since it is known that it works differently than in the context of general gambling.

5.3 Limitations and Further Research

This study tried to reach a wide audience of gamers, which is why the survey was distributed on the social media Platform Reddit. Furthermore, this gave the advantage of not being limited to one specific country. However, since the survey was distributed on Reddit, it was limited only to users of this social media platform. This could be further improved by spreading the survey on additional social media platforms.

Additionally, it was found that most participants thought of the game PUBG when thinking about loot boxes and ultimately their attributes used to measure arousal needs. Therefore, the loot boxes discussed in this study are very specific for a design. A loot box of this game is rather simplistic and realistic in terms of design, color etc. In further research loot boxes from other games e.g., Overwatch with flashy and colorful designs and effects should be used for comparison. It could be assumed that more flashy and colorful designs create different arousal needs that potentially could have a positive effect on gambling and loot box purchasing.

Lastly, a different scale could be used to measure impulsivity. This study tried to focus on the spending behavior specifically, since it is one of the consequences connected to problem gambling. Furthermore, the results of the effect impulsivity, defined as different measure than spending behavior, has on gambling and loot box purchasing for the specific context could derive important knowledge. Therefore, in further research different scales for impulsivity should be used in order to gather more understanding of impulsivity in the context of loot box purchasing.

6. Conclusion

This study tried to answer the research question: are impulsivity and arousal needs factors that create the risk of developing problem gambling, when gambling and purchasing loot boxes? To collect data to test the constructed hypotheses to answer this research question an online survey was conducted. The data showed that impulsivity and arousal needs are not risk factors that create the risk of developing problem gambling when gambling and purchasing loot boxes in video games, according to the model used. The hypothesis H1 and H2 had to be rejected since there was no evidence found of both impulsivity and arousal needs having a positive effect on gambling and loot box purchasing. Arousal needs showed to have no significant effect on neither gambling nor loot box purchasing. Meanwhile, impulsivity had a significant effect on gambling and loot box purchasing. However, the effect it had on gambling was positive, while the effect on loot box purchasing was negative. Further research should focus on filling the gap of understanding causal connections between gambling and loot box purchasing. This study contributed that neither impulsivity nor arousal needs in this model explain this causal connection. However, other examples of loot boxes with more flashy designs should be subject for future research.

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Appendix A

Conceptual visualization of the effects and association between the variables. Showing the expected relationship between the independent variables, being impulsivity and arousal needs, on the dependent variables, being gambling behavior and loot box purchasing.

Figure 1. Conceptual visualization of the relationship between the variables
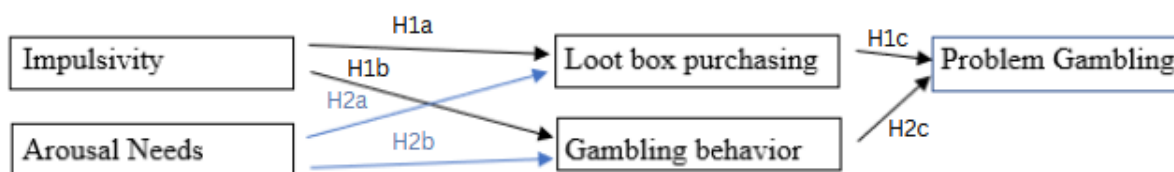
Appendix B

Reporting the output of the factor analysis for the items of each desired variables. The items are listed with their number, content, factor, and factor loading. The highest factor loadings are signaled in bold numbers.

Table 1. Factor analysis

Item	Factors			
	Loot box purchasing	Arousal needs	Gambling behavior	Impul-sivity
How often do you purchase a loot box in video games?	.91			
How much money have you spent on loot boxes in the last three months?	.89			
Is it important for you to obtain a rare or good item?	.93			
Have you had the urge to spend more money on another loot box?	.92			
Have you ever stopped playing a game for a while because of the loot boxes?	.90			
The animation looks attractive when it opens.		.63		
The effects are appealing and flashy when it opens.		.52		
Loot boxes have an attractive and colorful design.		.49		
The loot box has a design themed to an even, holiday etc.		.47		
There is a showcase of the possible items I could win.		.54		
How often do you feel the urge to gamble more money to achieve excitement?			.43	
How long do you typically spend on gambling per day?			.36	
How do you assess your gambling behavior?			.37	
How much money have you spent on gambling in the past 12 months?				.49
Have you experienced any negative consequences?				.56

SS Loadings:	4.38	1.67	1.19	0.96
Proportion Var:	0.20	0.08	0.05	0.04
Cumulative Var:	0.20	0.28	0.33	0.37
Cronbach's alpha:	0.96	0.67	0.43	0.46

Appendix C

This table shows the output of the correlation test that was conducted by using the Pearson's r correlation. Significant correlations are indicated with '**' and '*'. This output shows the significant positive relationship of gambling and impulsivity in our sample.

Table 2. Correlation matrix

Variables	M	SD	1	2	3	4
1. Impulsivity	2.82	.81	-			
2. Arousal Needs	1.63	.43	.085	-		
3. Gambling	2.85	1.64	.71**	.056	-	
4. Loot Box	1.41	0.86	-.22*	.072	-.08	-

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Appendix D

       The figures showcase the results of the linear regressions tested between impulsivity and arousal needs and gambling and loot box purchasing. The effects tested are from impulsivity and arousal needs on gambling and loot box purchasing.

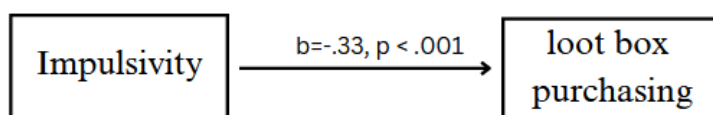Figure 2. Significant effect of impulsivity on loot box purchasing

Impulsivity	b=-.33, p < .001 →	loot box purchasing

Figure 3. Insignificant effect of arousal needs on loot box purchasing

arousal needs	b=.28, p = .08 →	loot box purchasing

Figure 4. Significant effect of impulsivity on gambling behavior
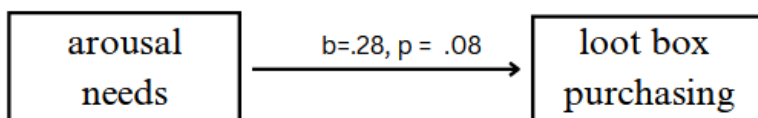
impulsivity	b=.56, p < .001 →	gambling behavior

Figure 5. Insignificant effect of arousal needs on gambling behavior
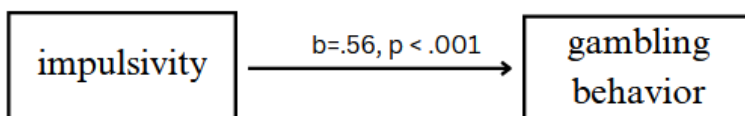
```
┌─────────────┐   b=.11, p = 17   ┌─────────────┐
│   arousal   │ ────────────────→ │   gambling  │
│   needs     │                   │   behavior  │
└─────────────┘                   └─────────────┘
```
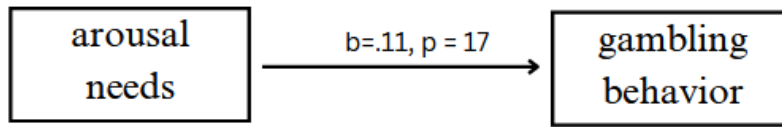
Appendix E

This appendix showcases the literacy study log. It gives more insights on the date of retrieval, source, searched keywords, search hits, as well as reference of the source.

Table 4. Systematic Literacy Study Log

Date	Database	Search terms	Search hits	
03.04.2023	Elsevier	Gambling, Loot boxes	990	J. Gonz´alez-Cabrera, A. Basterra-Gonz´alez, J. Ortega-Bar´on, V. Caba-Machado, A. Díaz-L´opez, H.M. Pontes, & J.M. Machimbarrena. (2023). Loot box purchases and their relationship with internet gaming disorder and online gambling disorder in adolescents: A prospective study. *Computers in Human Behavior, 143,* 107685. doi: 10.1016/j.chb.2023.107685
03.04.2023	Springer Link	Monetization, Video games	2185	M.J. Lehtonen, J.T. Harvianien, & A. Kultima. (2022). How monetization mechanisms in mobile games influence consumers' identity extensions. *Service Business,* 17, 113-136. doi: 10.1007/s11628-022-00518-4
17.04.2023	Research Gate	Loot boxes, Gambling	1004	H. Wardle, & D. Zendle. (2020). Loot Boxes, Gambling, and Problem Gambling Among Young People: Results from a Cross-Sectional Online Survey. *Cyberpsychology, Behavior, and Social Networking,* 24(4). doi: 10.1089/cyber.2020.0299
10.05.2023	Google Scholar	Problem gambling, Definition	434000	Abott, M., Volberg, R., Bellringer, M. & Reith, G. (2004, October). A Review of Research On Aspects Of Problem Gambling. *Gambling Research Centre.* Retrieved June 11, 2023, from https://niphmhr.aut.ac.nz/__data/assets/pdf_file/0003/7536/auckland_report.pdf
10.05.2023	Science Direct	Impulsivity, Definition	38211	Dougherty, D. M., Mathias, C. W., Marsh-Richard, D. M., Prevette, K. N., Dawes, M. A., Hatzis, E. S., Palmes, G., & Nouvion, S. O. (2009). Impulsivity and clinical symptoms among adolescents with non-suicidal self-injury with or without attempted suicide. *Psychiatry Research*, *169*(1), 22–27. doi: 10.1016/j.psychres.2008.06.011
11.05.2023	Google Scholar	Problem Gambling, Definition	434000	Ferris, J. & Wynne, H. (2001). The Canadian Problem Gambling Index. *Canadian Centre on*

Date	Database	Keywords	Hits	Reference
				Substance Abuse. Retrieved June 11, 2023, from http://jogoremoto.pt/docs/extra/TECb6h.pdf
11.05.2023	Elsevier	Impulsivity, Definition	38211	Herpertz, S., Sass, H. & Favazza, A. (1997). Impulsivity in self-mutilative behavior: Psychometric and biological findings. *Journal of Psychiatric Research ,31*(4), 451‑465. doi: 10.1016/S0022-3956(97)00004-6
11.05.2023	Google Scholar	Arousal Needs, Definition	392000	Martin, C. R. (1970, January 1). *What does the hospital anxiety and depression scale (HADS) really measure in liaison psychiatry settings?*. Latest TOC RSS. Retrieved June 11, 2023, from https://www.ingentaconnect.com/content/ben/cpsr/2005/00000001/00000001/art00006
11.05.2023	Science Direct	Arousal needs, definition	28750	Menon, S., & Kahn, B. (2002). Cross-category effects of induced arousal and pleasure on the internet shopping experience. *Journal of Retailing*, *78*(1), 31–40. doi: 10.1016/s0022-4359(01)00064-1
11.05.2023	Science Direct	Gambling behavior, definition	16991	Tulloch, C., Hing, N., Browne, M., & Rockloff, M. (2023, February). How gambling problems relate to health and wellbeing in Australian households: Evidence from the Household Income and Labour Dynamics of Australia Survey. *Addictive Behaviors, 137,* 107538. doi: 10.1016/j.addbeh.2022.107538
11.05.2023	Google Scholar	Loot boxes, problem gambling	17400	Zendle, D., & Cairns, P. (2018). *Video game loot boxes are linked to problem gambling: Results of a large-scale survey*. PLOS ONE. Retrieved June 11, 2023, from https://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0206767
18.07.2023	Scopus	Loot box, Gambling	140	Brooks, G.A., & Clark, L. (2023). The gamblers ofthe future? Migration from loot boxes to gambling in a longitudinal study of young adults. *Computers in Human Behavior,* 141, 107605. doi: 10.1016/j.chb.2022.107605
18.07.2023	Scopus	Loot box, Problem gambling	75	Gonzáles-Cabrera, J., Basterra-Gonzáles, A., Ortega-Baron, J., Caba-Machado, V., Díaz‑ López, A., & Pontes, H.M. (June 2023). Loot box purchases and their relationship with internet gaming disorder and online gambling disorder in adolescents: A prospective study. *Computers in Human Behavior,* 143, 107685. doi: 10.1016/j.chb.2023.107685

20.07.2023	Scopus	Impulsivity, Loot box	12	Ireland, J., & Archer, J. (2008). Impulsivity among adult prisoners: A confirmatory factor analysis study of the Barratt Impulsivity Scale. *Personality and Individual Differences,* 45(4), 286-292. doi: 10.1016/j.paid.2008.04.012
20.07.2023	Scopus	Impulsivity, Loot box	12	MacKillop, J., Weafer, J., Gray, J.C., Oshri, A., Palmer, A., & Wit, H. (2016). The latent structure of impulsivity: impulsive choice, impulsive action, and impulsive personality traits. *Psychopharmacology (Berl),* 233(18), 3361-70. doi: 10.1007/s00213-016-4372-0
21.07.2023	Scopus	Loot box, gambling	140	Spicer, G. S., Fullwood, C., Close, J., Nicklin, L. L., Lloyd, J., & Lloyd, H. (2022). Loot boxes and problem gambling: Investigating the "gateway hypothesis". *Addictive Behaviors,* 131, 107327. doi: 10.1016/j.addbeh.2022.107327
21.07.2023	Scopus	Problem gambling	6422	Takeuchi, H., Kosuke, T., Murao, T., Mizuta, H., Kawada, R., Murai, T., & Takahashi, H. (2020). Framing effects on financial and health problems in gambling disorder. *Addictive Behaviors,* 110, 106502. doi: 10.1016/j.addbeh.2020.106502
23.07.2023	Scopus	Gambling, negative	2158	Tseng, C.H., Flack, M., Caudwell, K.M., & Steens, M. (2023). Separating problem gambling behaviors and negative consequences: Examining the factor structure of the PGSI. *Addictive Behaviors,* 136, 107496. doi: 10.1016/j.addbeh.2022.107496
24.07.2023	Scopus	Loot box, gambling	140	Zendle, D., & Bowden-Jones, H. (2019). Loot Boxes and the convergence of video games and gambling. *Correspondence,* 6(9), 724-725. doi: 10.1016/S2215-0366(19)30285-8
26.07.2023	Research Gate	Arousal needs		Wirtz, J., Mattila, A., & Tan, R. (2007). The role of arousal congruency in influencing consumers' satisfaction evaluations and in-store behaviors. *International Journal of Service Industry Management,* 18(1). doi: 10.1108/09564230710732876
27.07.2023	Scopus	Gambling, depressive	491	Metcalf, O., Roebuck, G., Lawrence-Wood, E., Sadler, N., Baur, J., Van hoof, M., Forbes, D., O'Donnell, M., Hodson, S., Benassi, H., Varker, T., & Battersby, M. (2023). Gambling problems predict suicidality in recently transitioned military veterans, *Australian and New Zealand Journal of Public*

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