Exploring microtransaction use and gambling risk: a cross-sectional study

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Aim: To determine whether playing video games with microtransactions is a predictor of higher scores on the South Oaks Gambling Screen: Revised for Adolescents (SOGS-RA) questionnaire, and whether playing specific video games increases the tendency to gamble or if another factor is involved.

Methods: In this cross-sectional study, participants completed an online SOGS-RA questionnaire and answered questions about their gaming habits, such as how much money they had spent, how many games they had played, and how much time they had spent playing. We analysed the data using Spearman's correlation coefficient and linear regression.

Results: Two hundred and eight people completed the questionnaire, with three responses deemed invalid and excluded. Of the remaining participants, 180 reported playing video games with microtransactions. There was no significant association between playing specific video games and higher SOGS-RA scores ($\rho = -0.01$, $P > 0.05$). The most frequently mentioned video games with microtransactions were not correlated with higher gambling tendencies. Although some participants who reported spending more money on microtransactions also had higher SOGS-RA scores, there was no indication of a strong predictive relationship between video games and gambling behavior ($\rho = 0.17$, $P < 0.01$).

Conclusion: Gambling using video games was not linked to any specific video game, but rather to another factor that has yet to be identified.

Keywords: *gacha* games, gambling, loot boxes, microtransactions, video games

Introduction

Video games have steadily increased in popularity over the past decades, drawing attention from industries such as film, music, and gambling. Despite common misconceptions about their impact on mental health, video games can improve social interaction and problem-solving abilities through providing mental stimulation, social engagement, a sense of accomplishment, emotional resilience, and support for recovery (*1*). A meta-analysis (*2*) found that improvements in spatial skills from playing commercially available shooter games can be comparable to those achieved through formal educational courses designed to develop similar skills. However, excessive or pathological gaming – defined as gaming behavior that causes functional impairments detrimental to social, educational, occupational, or psychological domains – can, in contrast, have adverse effects on an individual's health (*3*). While many gamers play for extended hours without negative outcomes (*4*, *5*), pathological gamers typically engage for substantially longer periods (*6*).

While there are several categorizations of games and gaming, we focus broadly here on the two following, general genres: games offering purely cosmetic variations and those involving gameplay-altering mechanics. League of Legends and Counter-Strike 2 exemplify the former, where weapon skins affect only appearance. Conversely, games such as Genshin Impact, Honkai: Star Rail, and Tower of Fantasy feature characters and weapons that directly modify gameplay and player performance. Tower of Fantasy, additionally classified as a massively multiplayer online game, enables players to purchase characters that improve rankings and reduce difficulty – an approach often labeled as "pay-to-win" (P2W).

These market-prominent titles are examples of growingly popular *gacha* games, named after their reliance on *gacha*-based monetization systems. This term comes from the Japanese word *gachapon*, which refers to vending machines that dispense capsule toys. While *gacha* games are generally free-to-play (F2P), they include various in-game, *gacha*-type monetization mechanisms that encourage real-world spending on virtual currency, which players then use to obtain randomized digital items. The difference between F2P and P2W is that the former allows players to progress without payment, though at a slower pace, while the latter involves purchasing immediate advantages. Although these systems can create imbalances in multiplayer environments, their impact is often less pronounced in primarily single-player formats, which make up most *gacha* titles. Developers earn revenue through microtransactions, especially *via* "loot crates" or "boxes", where players pay sums typically ranging from €0.99 to €20 to acquire cosmetic enhancements, gameplay advantages, or other virtual goods that improve the user experience.

Our analysis focuses on *gacha* games due to their rising popularity and particular appeal among younger audiences, but also due to growing concern about the lack of robust regulatory frameworks to protect minors from the psychological and financial risks associated with these *gacha*-based mechanics. Unlike fixed-purchase microtransactions such as battle passes, *gacha* systems offer probabilistic rewards, providing only a chance to obtain desirable items, characters, or skins. Like loot boxes, these *gacha* systems distribute randomized rewards that can range from aesthetic items to gameplay-altering advantages, but are distinguished by a "pity" mechanic, which guarantees a high-value reward after a specified number of attempts – a feature common in F2P games. Loot boxes, meanwhile,

widely integrated across the gaming industry, are often marketed as suitable for children (*7*), raising ethical and developmental concerns. Some implementations of loot boxes have been described as "predatory", obscuring long-term financial commitments until players are already invested (*8*). In this sense, Brooks and Clark identified significant correlations between loot box engagement, problematic gambling behaviors, and disordered gaming patterns (*9*).

Previous research has shown that in-game monetization systems such as "loot boxes" and "*gacha*" can increase player spending. Montiel *et al.*, for example, observed widespread uptake of loot boxes among adults and adolescents, identifying frequent purchases among minors and significant associations with gambling-related problems (*10*). Griffiths and Kuss reported higher rates of pathological gambling among online gamblers (*11*). This trend prompted regulatory action in countries such as Belgium and the Netherlands, while the EU Internal Market and Consumer Protection Committee recommended addressing loot boxes through existing consumer protection frameworks targeting exploitative game design; as a result, Belgium, the Netherlands, and Slovakia have classified loot boxes as gambling activities requiring official licensing (*12*). To further explore this phenomenon, we aimed to identify predictors linking gambling tendencies with in-game spending behavior.

Methods

This cross-sectional, online survey-based study used the South Oaks Gambling Screen: Revised for Adolescents (SOGS-RA) questionnaire and additionaly gathered data about participants' video game routines, including playtime, money spent, and which video games they played. The protocol was preregistered on the Open Science Framework (*https://osf. io/trsd6*).

Sample characteristics

Using convenience and snowball sampling, we recruited individuals aged 18 years or older who played video games in the past, and excluded those below this age threshold, those who had not played video games in the past three months, or those who had not completed the entire survey.

Survey description

The survey consisted of three sections: participants' demographic characteristics (13 questions), participants' spending behavior (5 questions), and the SOGS-RA questionnaire (12 questions), for a total of 30 questions. The survey is available at the Open Science Framework (*https://osf.io/trsd6*).

The SOGS-RA is a twelve-item questionnaire developed by Winters *et al.* (*13*). Each item is scored as either 1 (affirmative) or 0 (non-affirmative). Only the first question has a multiple-choice answer: every time, most of the time, some of the time, or never. The remaining 11 questions have binary answers: yes or no. Example questions include: "Have you ever felt bad about the amount of money you bet, or about what happens when you bet mon-

ey?" and "Has your betting money ever caused any problems for you, such as arguments with family and friends, or problems at school or work?"

The calculation of narrow rates produces levels 0 to 3, determined by the total score. A total score of 0 corresponds to level 0, indicating no gambling in the past year. A total score of 1 corresponds to level 1. If any question is answered "Yes," the total score will be at least level 1. A total score of 2 or 3 corresponds to level 2, and a total score of 4 or higher corresponds to level 3.

Survey development and refinement

The questionnaire was pretested by 10 participants, all of whom were students at the Faculty of Humanities and Social Sciences in Split. Each participant completed the questionnaire twice: once before any changes were made and once using the version intended for actual sampling. All pretest participants were over 18 years old and had played video games in the past three months, closely matching the target population. Participants were selected through convenience sampling.

Survey administration

The questionnaire was administered in four Discord servers (Tower of Fantasy, Salty Sweet Squad, Overwatch 2, Honkai: Starrail Official) and in nine subreddits (DokkanBattleCommunity, psychologystudents, gachagaming, leagueoflegends, psychology, samplesize, TowerofFantasy, Genshin_Impact, and NarakaBladePoint). All participants completed the questionnaire between February 13 and March 13, 2025.

Discord is a voice, video, and text chat app used by tens of millions of people ages 13 and up to communicate and connect with their communities and friends. Most servers are private, invite-only spaces where groups of friends and communities stay in touch and spend time together. There are also larger, more open communities, generally focused on specific topics such as popular games. We requested approval from the Discord server moderators to advertise the survey and prepared the invitation letter to both moderators and members of the server.

Subreddits, meanwhile, are forums dedicated to specific topics on the website Reddit. They allow users to focus on specific interests or topics by posting content that is voted up or down based on relevance and user preference. As these subreddits operate based on pre-established rules and regulations of posts, we did not need to contact moderators or members for permission to share our survey.

Statistical analysis

We performed all statistical analyses in JASP, version 0.18.3 (JASP Team, Amsterdam, The Netherlands). We used the Shapiro-Wilk test to assess the normality of the distribution, and reported the data using frequencies and percentages or medians and interquartile ranges. For inferential analyses, we used Spearman's correlation and linear regression to assess the association between variables and SOGS-RA scores. We evaluated the reliability

of the questionnaire using Cronbach's alpha. Statistical significance level for all tests was set at $\alpha = 0.05$ ($P < 0.05$).

Ethical considerations

Ethical approval was granted by the Ethics Committee of the Faculty of Humanities and Social Sciences in Split (January 8, 2024; Reg. No. 2181-190-24-00005). Survey participation was completely anonymous, and no IP addresses were collected. The participants received an informed consent form outlining the purpose of the study, the requirements for completing the survey, and the risks and possible benefits. The form also included information about confidentiality, data security, the ethical committee approval number, and the researchers' contact details, after which participants could choose to agree to or decline participation in the research.

Table 1. Frequencies of demographic characteristics of participants (n = 205)

Variable		No. (%)
Age (in years)		26 (21–29)
Male		145 (70.7)
Female		51 (24.9)
Prefer not to say		9 (4.4)
Employment status	*Employed*	131 (63.9)
	Unemployed	74 (36.1)
Where are you from?	*USA*	57 (27.8)
	Germany	12 (5.9)
	Croatia	11 (5.4)
	Italy	7 (3.4)
	United Kingdom	6 (2.9)
	Other	112 (54.6)
Currently studying (Yes)		117 (57.1)
Have you ever used sick days or vacation days or skipped work/class just for gaming? (Yes)		84 (40.1)
Have you ever gone over your budget limit while spending money on microtransactions? (Yes)		59 (28.8)
Do you play video games competitively? (Yes)		102 (49.8)
Do you set rules or limits with gaming and then break them, playing longer or more frequently than intended? (Yes)		100 (48.8)
Do you neglect responsibilities, work, school or your family when gaming? (Yes)		76 (37.1)
Do you lie about or hide how much you play video games to others? (Yes)		59 (28.8)
Has being given a free lootbox (crate, wish… *etc*.) while playing video games made you more likely to spend money on more of them? (Yes)		68 (33.2)
Have they played video games with microtransactions (last three months) (Yes)		180 (87.8)
Most frequently played video games with microtransactions*	*Genshin Impact*	72 (35.1)
	Honkai Starrail	44 (21.5)
	League of Legends	28 (13.7)
	Counter-Strike 2	25 (12.2)
	Tower of Fantasy	19 (9.3)
	Other	48 (26.6)

*Players could state they play multiple games with microtransactions.

Results

Cronbach's alpha for the questionnaire was 0.497 (95% confidence interval = 0.438–0.554).

Participants were predominantly employed males with a median age of 26. Most (87.8%) had recently played video games with microtransactions, with Genshin Impact being mentioned the most often (**Table 1**). Fewer than one-third reported exceeding their budget or being influenced by free loot boxes.

The average daily playtime was nearly three hours. Median spending on microtransactions in the last three months was €136, with a median single-day maximum of €117 (**Table 2**). Most participants did not report gambling-related problems. The median SOGS-RA score was 0 (interquartile range = 0–2). Only 28.8% felt bad about betting, and 25.4% gambled more than they intended (**Table 3**).

Table 2. Time spent on video games and microtransaction purchases*

Variable	Median (interquartile range)
People in the household	3 (2–4)
Avg. daily time spent on video games in minutes	173 (60–200)
Amount of time purchasing a microtransaction in the last three months	8 (0–9)
Amount (€) spent on video games with microtransactions in the last three months	136 (0–120)
The largest amount (€) spent in one day on microtransactions	117 (14–113)

Table 3. Responses to the SOGS-RA questionnaire

Item		Yes, n (%)
How often have you returned on another day to try to win back money you lost gambling?	*Every time*	1 (0.5)
	Most of the time	5 (2.4)
	Some of the time	24 (11.7)
	Never	175 (85.4)
When you were betting, have you ever told others you were winning money when you weren't?		21 (10.2)
Has your betting money ever caused any problems for you such as arguments with family and friends, or problems at school or work?		7 (3.4)
Have you ever gambled more than you had planned to?		52 (25.4)
Has anyone criticized your betting, or told you that you had a gambling problem whether you thought it true or not?		17 (8.3)
Have you ever felt bad about the amount of money you bet, or about what happens when you bet money?		59 (28.8)
Have you ever felt like you would like to stop betting, but didn't think you could?		24 (11.7)
Have you ever hidden from your family or friends any betting slips, IOUs, lottery tickets, money that you won, or any signs of gambling?		17 (8.2)
Have you had money arguments with family or friends that centered on gambling?		12 (5.9)
Have you borrowed money to bet and have not paid it back?		1 (0.5)
Have you ever skipped or been absent from school or work due to betting activities?		9 (4.4)
Have you borrowed money or stolen something in order to bet or to cover gambling activities?		3 (1.5)
Total score, median (interquartile range)		0 (0–2)

*Abbreviations: IOU – I owe you (a written document that acknowledges debt between parties).

Table 4. Spearman's correlation coefficient between video game habits and SOGS-RA scores*

Item	Average daily time spent on video games (minutes)	Length of time purchasing a micro-transaction in the last three months	Amount (€) spent on video games with microtrans-actions in the last three months	The largest sum (€) spent in one day on microtransactions	SOGS-RA score
Average daily time spent on video games (minutes)					
Length of time purchasing a microtransaction in the last three months	0.280†				
Amount (€) spent on video games with microtransactions in the last three months	0.304†	0.881†			
The largest sum (€) spent in one day on microtransactions	0.224†	0.519†	0.633†		
SOGS-RA score	−0.005	0.252†	0.264†	0.174†	

*SOGS-RA − South Oaks Gambling Screen: Revised for Adolescents
†$P < 0.05$.

Table 5. Spearman's correlation coefficient between the most frequently mentioned video games and scores on the SOGS-RA questionnaire*

Item	Genshin Impact	Honkai Starrail	League of Legends	Counter-Strike 2	Tower of Fantasy	SOGS-RA score
Genshin Impact						
Honkai Starrail	0.362†					
League of Legends	−0.055	−0.139†				
CS2	−0.243†	−0.159†	0.199†			
Tower of Fantasy	−0.129	−0.044	−0.029	−0.068		
SOGS-RA score	−0.010	−0.067	0.108	0.126	−0.028	

*Abbreviations: SOGS-RA − South Oaks Gambling Screen: Revised for Adolescents.
†$P < 0.05$.

The number of times participants purchased microtransactions and the amount of Euros spent on video games with microtransactions in the past three months both showed a very low positive association with the SOGS-RA score (Table 4). Additionally, the highest amount of Euros spent in one day on microtransactions also showed a very low positive association with the SOGS-RA score.

We found no significant association between playing any of the five most frequently mentioned video games with microtransactions and higher scores on the SOGS-RA questionnaire (Table 5). However, we did observe that the participants who played Genshin Impact were more likely to also play Honkai Starrail, but less likely to play Counter-Strike 2 (CS2). Those who played Honkai Starrail were less likely to play CS2 and League of Legends, while participants who played League of Legends were more likely to play CS2. While noteworthy, we note that all the observed associations were weak, with the highest being 0.362.

Discussion

Our findings do not support the hypothesis that participants who spend money on video game microtransactions have higher gambling questionnaire scores. Specifically, spending habits in microtransaction-based games showed only weak associations with SOGS-RA scores, which, in turn, were not linked to the frequency or the monetary value of microtransactions over the previous three months. In contrast, average daily gaming time showed a weak negative association with these scores. We did find that playing Genshin Impact correlated weakly positively with playing Honkai Starrail and playing negatively with CS2; playing Honkai Starrail, meanwhile, correlated negatively with playing League of Legends and CS2; while playing League of Legends correlated weakly positively with playing CS2. Linear regression analyses showed that none of the examined variables significantly predicted SOGS-RA scores.

Receiving a loot box in video games did not make most participants feel a greater urge to spend more money on the game, nor did they want to return to their games to win back gambling losses. These findings contrast previous research indicating a significant relationship between engagement with loot boxes and gambling or gaming problems (*10*). Participants reported a median daily gaming time of nearly three hours and a median of eight microtransaction purchases in the past three months (intequartile range = 0–9). Repeated purchases were found to potentially extend playtime and increase the risk of developing gaming disorder (*14*). For example, CS2 encourages repeated spending by allowing players to believe they can "earn back" money through item sales, even when returns are lower than initial costs, thus reducing perceived loss. The median expenditure on microtransactions during the past three months was €136, with €117 as the highest single-day amount. Gambling expenditure remains a key factor in moderate-risk and problem gambling (*15*). These findings highlight the need for greater awareness and regulation of microtransactions.

Several limitations should be acknowledged, with the first being potential sampling bias resulting from our recruitment of participants primarily through Discord servers and Reddit forums for video games with microtransactions. For example, Tower of Fantasy had 288,464 members, Salty Sweet Squad had 18, Overwatch 2 had 595,189, and Honkai Starrail had 1,426,571 members. Because participation was anonymous, it was impossible to determine the exact number of respondents from each source. Additionally, the low number of responses relative to the total membership of these platforms limits the generalizability of our findings. Three incomplete responses were excluded, as all questions were mandatory, indicating that these three participants likely closed the browser in which they opened the survey before submitting their responses. Low reliability may also result from the sample's heterogeneity in cultural and demographic characteristics. Including more participants who had not spent money on microtransactions or who had spent money in different video games that were not mentioned might have altered the outcomes. Lastly, we examined only five video games, leaving many others unassessed. Future research should replicate the study with a substantially larger and more diverse sample to enhance reliability and validity. Incorporating multiple potential gambling risk

factors and their gaming equivalents could also provide deeper insight into the mechanisms underlying gambling-related behaviors.

The primary aim of this study was to examine whether engagement with video games featuring microtransactions could predict higher scores on a gambling questionnaire and, if so, to identify which games were most indicative of these associations. Previous empirical research has demonstrated relationships between loot box engagement – such as risky use and expenditure – and both problem gambling and problematic internet gaming (*9*), indicating the existence of a link between loot box use and gambling or gaming problems (*10*). However, we found no such association between spending on video game microtransactions and higher scores on the SOGS-RA gambling questionnaire, suggesting that the relationship between gaming microtransactions and gambling behaviors is neither direct nor attributable to specific games. Instead, it may depend on broader social, psychological, or behavioral factors not addressed in this study. Consequently, future research should include a wider range of video games and incorporate additional psychological and environmental variables to more comprehensively understand the links between gaming engagement and gambling tendencies.

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