

Gambling-like games: Loot boxes and their link to problematic video game and gambling behaviour among adolescents

Gambling-like games: Cajas botín y su relación con el uso problemático de videojuegos y juegos de apuestas en adolescentes

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Abstract

Loot boxes are monetization mechanisms incorporated into many video games that have attracted increasing research and regulatory attention due to their similarities with gambling. The aim of this study was to examine the association between the frequency of loot box use and problematic gaming, problem gambling, and depressive symptoms among adolescents. The sample comprised 3,700 adolescents aged 14–17 years from the Valencian Community, Spain (50.3% girls). Problematic gaming was assessed using the Game Addiction Scale for Adolescents (GASA), problem gambling with the Consumption Screen for Problem Gambling (CSPG), and depressive symptoms with the Center for Epidemiologic Studies Depression Scale (CES-D). Differences according to the frequency of loot box use were analyzed separately for boys and girls using one-way analyses of variance (ANOVA). The results showed a significant association between loot box use and problematic gaming in both genders, with a substantially stronger association among girls. Frequent loot box use was also associated with higher levels of problem gambling among boys and with greater depressive symptoms among girls. These findings add to the growing evidence linking loot box use to indicators of psychological vulnerability during adolescence and support the development of preventive and regulatory measures aimed at reducing the potential harms associated with these monetization mechanisms in video games.

Key Words

Loot boxes; gambling-like games; videogame; gambling.

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Resumen

Las cajas botín (*loot boxes*) son mecanismos de monetización presentes en numerosos videojuegos que, debido a sus similitudes con los juegos de apuestas, han despertado un creciente interés investigador y regulatorio. El objetivo de este estudio fue analizar la relación entre la frecuencia de uso de cajas botín y el uso problemático de videojuegos, el juego de apuestas problemático y la sintomatología depresiva en adolescentes. La muestra estuvo compuesta por 3.700 estudiantes de 14 a 17 años de la Comunidad Valenciana (50,3% chicas). El uso problemático de videojuegos se evaluó mediante la *Game Addiction Scale for Adolescents* (GASA), el juego de apuestas problemático mediante el *Consumption Screen for Problem Gambling* (CSPG) y la sintomatología depresiva mediante la escala CES-D. Las diferencias según la frecuencia de uso de cajas botín se analizaron mediante ANOVA, diferenciando entre chicos y chicas. Los resultados mostraron una asociación significativa entre el uso de cajas botín y el uso problemático de videojuegos en ambos sexos, especialmente en las chicas. Asimismo, el uso frecuente de cajas botín se asoció con un mayor nivel de juego de apuestas problemático únicamente en los chicos y con una mayor sintomatología depresiva únicamente en las chicas. Estos hallazgos refuerzan la evidencia sobre la relación entre las cajas botín y diferentes indicadores de vulnerabilidad en la adolescencia, apoyando el desarrollo de medidas preventivas y regulatorias dirigidas a reducir los riesgos asociados a estos mecanismos de monetización en los videojuegos.

Palabras clave

Cajas botín; gambling-like games; videojuegos; juegos de apuestas.

INTRODUCTION

Over the past ten years, the commercialisation of video games has undergone significant changes. User spending is no longer limited to purchasing the video game itself, but may be supplemented by the acquisition of in-game content that is continuously updated. Paid content is not limited to video games or mobile applications that must be purchased; it is also present in games that can be downloaded free of charge. These are known as freemium games (Syahrivar et al., 2021), in which the basic game can be downloaded for free, while additional content or expansions are offered for payment.

Some items available for purchase within applications can be used to personalise a character's appearance - the so-called skins - whereas others can improve performance during play and provide an advan-

tage over other players. These purchases generally involve small amounts of money and are therefore referred to as 'micropayments' or 'microtransactions' (Kim et al., 2017). Their expansion has raised concerns among researchers because of the potentially predatory mechanisms embedded in these practices (King & Delfabbro, 2018).

Among microtransactions, loot boxes (LBs) have attracted particular academic and regulatory attention. These are common items in video games and mobile applications that provide players with random virtual rewards (Rockloff et al., 2020; Xiao et al., 2022). They can usually be purchased with real money, and rewards are obtained through a variable reinforcement mechanism similar to that used in gambling, in which higher-value rewards are obtained only occasionally and unpredictably, thereby encouraging repeated play (Gong & Rodda, 2022).



In some cases, loot boxes can be obtained free of charge during the course of a video game, for example by completing levels or overcoming challenges. In this article, unless otherwise stated, we focus exclusively on loot boxes purchased with real money or with in-game virtual currency previously obtained through real-money transactions. The combination of monetary expenditure and, above all, the random component has led some researchers to draw parallels with gambling mechanisms (Garea et al., 2023).

Several authors have examined the similarities between gambling and video games containing loot boxes, referred to as gambling-like games (GLGs) (King & Delfabbro, 2020). Drummond and Sauer (2018) analysed 22 video games considered suitable for 17-year-old adolescents and found substantial similarities in their mechanisms, concluding that loot boxes are 'psychologically akin' to gambling. The way rewards are delivered to players resembles variable-ratio reinforcement schedules (Larche et al., 2021), which are common in gambling and tend to generate repetitive, reinforced behaviour (Haw, 2008).

Beyond these psychological parallels, whether loot boxes can legally be considered a form of gambling has been debated across different legal systems. Although definitions vary between countries, three common elements are usually identified. The first is 'consideration', meaning that the player must stake something of value - generally money - in order to participate. The second is 'chance', referring to the fact that the outcome depends on randomness rather than the player's skill. The third is the 'prize', which requires the player to receive something of value as a result of participation (Drummond et al., 2020b).

Because of these similarities, some countries have introduced regulations aimed at limiting the indiscriminate use of loot boxes. In 2018, Belgium adopted a particularly strict position. In its Research Report on Loot Boxes (Belgische Kansspelcommissie [Belgian Gaming Commission], 2018), the Commission concluded that loot boxes purchased with real money could meet the legal criteria for gambling and were therefore prohibited unless covered by a specific licence. The Netherlands followed suit (Kansspelautoriteit, 2018). China, adopting a less restrictive approach, required video game companies to disclose the probabilities of obtaining the rewards included in loot boxes (Xiao et al., 2023). The position adopted by the UK Gambling Commission in a policy paper on the issue is also noteworthy (UK Gambling Commission, 2017). The Commission stated that, if rewards cannot be converted into money, the combination of spending and chance is not sufficient to equate loot boxes with gambling.

Debate on this issue has intensified in recent years from both psychological and legal perspectives. While some countries have adopted regulatory measures, researchers have also begun to examine the broader cultural and economic implications of these monetisation practices. In particular, several authors have described the convergence between gambling mechanisms and video game design as a process of the 'gamblification of gaming' (Brock & Johnson, 2021; Brooks & Clark, 2019), highlighting how elements traditionally associated with gambling are increasingly incorporated into everyday video game experiences.

Recent studies consistently indicate that spending on loot boxes is positively correlated with problematic or risky gambling behaviours, both in adult and young-adult popu-



lations (Spicer et al., 2021; Villalba-García et al., 2025; Zendle & Cairns, 2019) and among adolescents (Hing et al., 2022; Kristiansen & Severin, 2020). The strength of this association may vary according to both individual sociodemographic characteristics and the characteristics of the loot boxes used.

In this context, sex is particularly relevant among adolescents. Although loot box use is more common among young males (Gambling Commission, 2024), adolescent girls who open loot boxes or sell the contents obtained from them also show a greater likelihood of developing gambling-related problems (Rockloff et al., 2021). In addition, girls who buy or sell loot boxes show more favourable attitudes towards gambling (Wardle & Zendle, 2020). Similarly, Kristiansen and Severin (2020) reported that loot box use among Danish adolescents aged 12 to 16 was associated with problem gambling, particularly among girls, and that those who sold items obtained through loot boxes were at greater risk. This may be because, given that females participate less than males in these activities, their involvement may require a greater degree of commitment.

With regard to loot box characteristics, two distinctions appear particularly relevant in relation to problem gambling. The first is the difference between purchasing loot boxes and purchasing other in-game items. The second is the distinction between loot boxes that can be purchased and those obtained free of charge.

Some studies have found that the association between loot box purchasing and problem gambling is stronger than the association between problem gambling and the purchase of other in-game items (Etchells et al., 2022; Zendle & Cairns, 2018). Spicer et al. (2021) also

supported this hypothesis, reporting a weak correlation between the use of free loot boxes and problem gambling, compared with a moderate correlation for paid loot boxes. Finally, another factor that appears to strengthen this association is the possibility of selling loot box rewards on a secondary market. Kristiansen and Severin (2020) observed this pattern, finding that a substantial proportion of participants who sold items on secondary markets were at risk of developing gambling problems.

The association between loot box spending and mental health indicators has, however, produced more heterogeneous findings. Although Etchells et al. (2022) found no significant correlations between loot box spending and mental wellbeing or psychological distress, other studies have identified relevant associations. Irie et al. (2023) found that adolescents who purchased loot boxes showed more depressive symptoms and higher levels of preoccupation and excessive online gaming than those who purchased other items. Notably, unplanned or impulsive loot box purchases were associated with more intense symptoms of immersion, withdrawal, preoccupation, and social isolation, suggesting a specific vulnerability among impulsive purchasers.

Consistent with these findings, Villalba-García et al. (2025) reported that risky loot box purchasing was correlated with anxiety, stress, depression, and impulsivity. They also identified a significant correlation between loot box purchasing and internet gaming disorder, particularly when depressive symptoms were high. Similarly, Drummond et al. (2020a) found that greater loot box spending was associated with increased negative mood and psychological distress, although they also identified a small and unexpected association with higher positive mood.



Another factor frequently examined in relation to loot box use is internet gaming disorder. Although one study found a negative relationship between loot box purchasing and participation in electronic sports or eSports (Macey & Hamari, 2018), the literature generally agrees that there is a positive relationship between loot box purchasing and symptoms of excessive gaming (Irie et al., 2023; Yokomitsu et al., 2021; Zendle, 2020). The study by Ide et al. (2021) confirmed these findings in an adolescent population. It also found that the likelihood of experiencing online gaming-related problems was higher among those who purchased loot boxes, particularly girls. Likewise, according to Li et al. (2019), loot box purchasing is also associated with more frequent and longer gaming sessions.

As noted above, mental health-related factors are also important to consider in this context. For example, Villalba-García et al. (2025) observed that the correlation between loot box purchasing and internet gaming disorder appeared to be stronger when depressive symptoms were elevated. This finding suggests that mental health vulnerabilities may be associated with a greater likelihood of excessive gaming among those who purchase loot boxes.

The present study, conducted with a sample composed entirely of adolescents, aims to investigate the relationship between the use of loot boxes and microtransactions in video games and: (i) problematic or risky gambling behaviours; (ii) problematic gaming; and (iii) adolescents' mental health.

METHOD

Sample

A total of 4,448 students in the first and second years of compulsory secondary education from 43 schools in the Valencian Community (Spain) participated in the study. A total of 748 cases were excluded for the following reasons: response time outside the acceptable range; age outside the 14-17-year range; schools with fewer than five participants; missing data or inconsistent responses; and adolescents who identified with the gender category 'Other', because their proportion was too small to allow reliable statistical analyses. The final sample comprised 3,700 adolescents, 50.3% of whom were girls. The mean age was 14.87 years ($SD = 0.795$; range: 14-17).

Procedure

The questionnaires were administered collectively, anonymously, and voluntarily through an online survey platform (SurveyMonkey, 2024), with the assistance of expert collaborators. They were completed using tablets configured specifically for administration. The study received approval from the ethics committee (DES.DLI.MBC.25).

MEASURES

Video game use, gambling, and microtransactions were assessed using ad hoc questions shown in Table I.

Gambling severity was assessed using the Consumption Screen for Problem Gambling (CSPG; Rockloff, 2012). This three-item questionnaire measures the frequency, du-



ration, and intensity of gambling behaviour and makes it possible to estimate the proportion of gamblers experiencing problem gambling. A total score of 4 or above is considered indicative of problem gambling. Internal consistency in the analysed sample was Cronbach's $\alpha = .75$.

The severity of video game addiction was assessed using the Game Addiction Scale for Adolescents (GASA; Lemmens et al., 2009; Lloret et al., 2017). The scale comprises seven items assessing the intensity of seven addiction symptoms: salience, tolerance, escape or mood modification, loss of control, withdrawal, and conflict. It has four response options: never, almost never, often, and very often. Scale reliability in this sample, estimated using Cronbach's alpha, was .74.

Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), adapted for the Spanish population by Herrero and Meneses (2006). The scale comprises seven items rated on a four-point scale ranging from 1 = never to 4 = always. Reliability in the present study was .84.

STATISTICAL ANALYSIS

First, a descriptive analysis of the sample was conducted. Continuous variables were summarised using means and standard deviations, whereas categorical variables were described using absolute frequencies and percentages.

Given the marked sex differences observed in video game and loot box use, all inferential analyses were conducted separately for boys and girls. To examine the associa-

tion between frequency of loot box use (never, sometimes, and many times) and scores on the problematic gaming (GASA), problem gambling (CSPG), and depressive symptomatology (CES-D) scales, one-way analyses of variance (ANOVA) were performed. When the overall effect was statistically significant, between-group comparisons were conducted using the Bonferroni procedure to control the Type I error arising from multiple comparisons.

The effect size of the ANOVAs was estimated using eta squared (η^2), with approximate values of .01, .06, and .14 interpreted as small, moderate, and large effects, respectively. For pairwise comparisons, mean differences and their corresponding significance levels were reported.

All tests were two-tailed and statistical significance was set at $p < .05$. Analyses were performed using IBM SPSS Statistics, version 25.0.

RESULTS

Video game use showed a clear sex difference, with a ratio of approximately two to one. Gaming was almost universal among boys, with 93.8% reporting that they played video games, compared with 43.1% of girls. This difference was also observed in weekly frequency: 80.1% of boys played on weekdays and 88.0% at weekends, whereas among girls these percentages fell to 31.6% and 25.3%, respectively. Regarding micropayments, almost all boys (90.4%) and a large majority of girls (70.6%) were familiar with them. As for loot box use, boys and girls reported similar levels of occasional use, but boys reported using them more frequently than girls.



Problematic gaming

A one-way ANOVA was used to analyse differences in problematic gaming. The results showed statistically significant differences according to frequency of loot box use in both boys, $F(2, 985) = 59.31$, $p < .001$, $\eta^2 = .107$, and girls, $F(2, 1226) = 414.61$, $p < .001$, $\eta^2 = .403$. Thus, frequency of loot box use explained approximately 10.7% of the variability in GASA scores among boys and 40.3% among girls (Table 1).

Bonferroni comparisons indicated that participants who had never used loot boxes had significantly lower GASA scores than those who had used them sometimes or many times. Among boys, the difference between 'Never' and 'Sometimes' was 0.45 points, $p < .001$, and between 'Never' and 'Many times' it was 0.56 points, $p < .001$. Among girls, these differences were considerably larger: 1.64 and 1.90 points, respectively, both $p < .001$. In neither sex were there significant differences between using loot boxes 'Sometimes' and 'Many times'.

Table 1. Video game use, micropayments, and loot boxes

	Boys (%)	Girls (%)
Do you play video games?	93.8	43.1
Do you play on weekdays?	80.1	31.6
Do you play at weekends?	88	25.3
Are you familiar with video games with micropayments?	90.4	70.6
Have you used micropayments in video games?	74.7	56.7
Do you play any game with loot boxes?	72.5	57.1
Have you used them sometimes?	42	39.5
Have you used them many times?	22.2	12.9
Do you intend to use them?	38.7	38.8

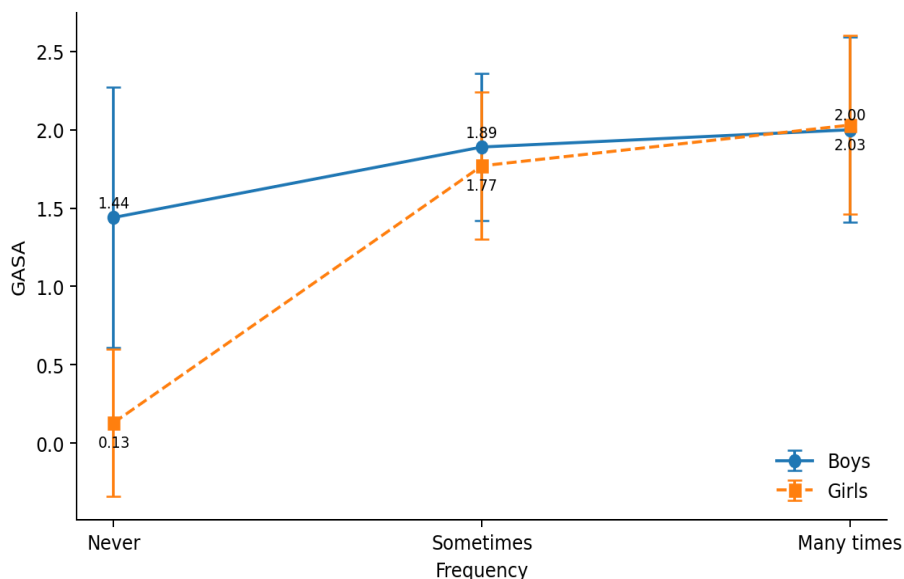
Table 2. Problematic gaming according to frequency of loot box use, by sex

Sex	Never, M (SD)	Sometimes, M (SD)	Many times, M (SD)	F(df1, df2)	p	η^2 [95% CI]	Bonferroni post hoc comparisons
Boys	1.44 (0.83)	1.89 (0.47)	2.00 (0.59)	59.31 (2.985)	< .001	.107 [.073, .143]	Never < Sometimes***, Never < Many times***, Sometimes = Many times
Girls	0.13 (0.47)	1.77 (0.47)	2.03 (0.57)	414.61 (2.1226)	< .001	.403 [.364, .439]	Never < Sometimes***, Never < Many times***, Sometimes = Many times

M = mean; SD = standard deviation; η^2 = eta squared. *** $p < .001$



Figure 1. GASA score (problematic gaming) according to loot box use and sex



Problem gambling

Among boys, the CSPG problem gambling score varied according to frequency of loot box use, $F(2.872) = 7.58$, $p < .001$, $\eta^2 = .017$. Although the effect was small, the Bonferroni post hoc test showed that those who used loot boxes many times had significantly higher CSPG scores than those who had never used them (mean difference = 0.44; 95% CI [0.16, 0.72]; $p < .001$). No differences were found between the 'Never' and 'Sometimes' groups ($p = .086$), or between 'Sometimes' and 'Many times' ($p = .175$).

Among girls, no significant differences were found in CSPG scores according to frequency of loot box use, $F(2, 152) = 0.98$, $p = .377$, $\eta^2 = .013$. Consistent with this result, none of the pairwise comparisons reached statistical significance.

Depressive symptoms

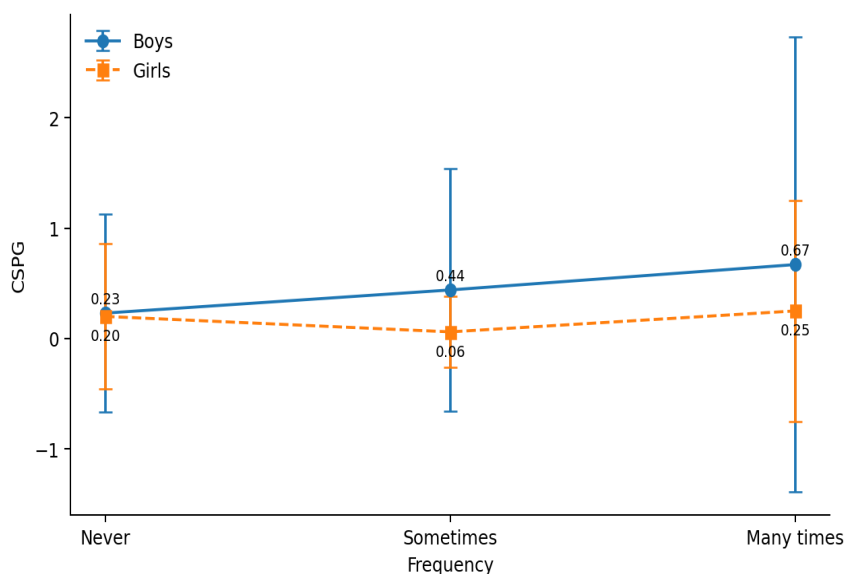
Among boys, the ANOVA showed no statistically significant differences in depressive symptoms according to frequency of loot box use, $F(2.985) = 2.03$, $p = .132$, $\eta^2 = .004$. Mean scores increased slightly from those who had never used loot boxes to those who used them many times, but Bonferroni comparisons detected no significant differences between any of the groups.

Among girls, statistically significant differences were observed, $F(2.1226) = 6.95$, $p = .001$, $\eta^2 = .011$. Participants who had never used loot boxes had a significantly lower CES-D score than those who used them sometimes or many times. There were no differences between the 'Sometimes' and 'Many times' categories.

**Table 3.** Problem gambling (CSPG) according to frequency of loot box use, by sex

Sex	Never, M (SD)	Sometimes, M (SD)	Many times, M (SD)	F(df1, df2)	p	η^2 [95% CI]	Bonferroni post hoc comparisons
Boys	0.23 (0.90)	0.44 (1.10)	0.67 (2.06)	7.58 (2.872)	< .001	.017 [.003, .036]	Never < Many times***; Never = Sometimes; Sometimes = Many times
Girls	0.20 (0.66)	0.06 (0.32)	0.25 (1.00)	0.98 (2.152)	.377	.013 [.000, .059]	No significant between-group differences

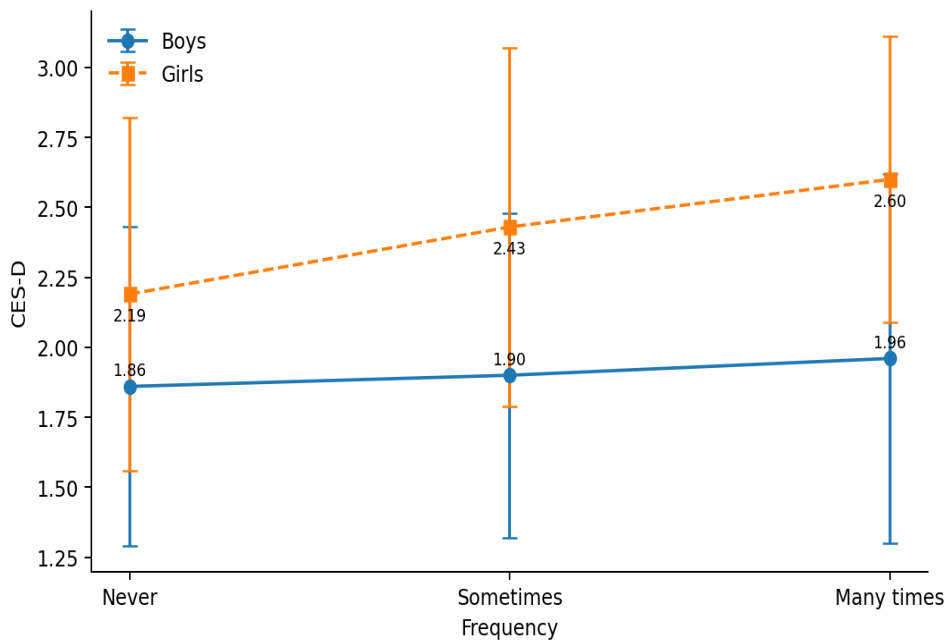
M = mean; SD = standard deviation; η^2 = eta squared. *** $p < .001$

Figure 2. CSPG score (problem gambling) according to loot box use and sex**Table 4.** Depressive symptoms (CES-D) according to frequency of loot box use, by sex

Sex	Never, M (SD)	Sometimes, M (SD)	Many times, M (SD)	F(df1, df2)	p	η^2 [95% CI]	Bonferroni post hoc comparisons
Boys	1.86 (0.57)	1.90 (0.58)	1.96 (0.66)	2.03 (2.985)	.132	.004 [.000, .014]	No significant differences
Girls	2.19 (0.63)	2.43 (0.64)	2.60 (0.51)	6.95 (2.1226)	.001	.011 [.002, .025]	Never < Sometimes*; Never < Many times*; Sometimes = Many times

M = mean; SD = standard deviation; η^2 = eta squared. *** $p < .001$

Figure 3. CES-D score (depressive symptoms) according to loot box use and sex



DISCUSSION

The aim of the present study was to analyse the relationship between frequency of loot box use and three indicators of vulnerability among adolescents: problematic gaming, problem gambling, and depressive symptoms. To this end, responses to a survey of a sample of 3,700 adolescents were analysed.

Video game and loot box use showed marked sex differences. Consistent with the literature, the proportion of boys who played video games was twice that of girls, and boys also used loot boxes more frequently. Boys likewise showed higher scores for problem gambling and problematic gaming (OEDA, 2025). However, the association between loot box use and problematic gaming was particularly strong among girls, for whom fre-

quency of use explained 40.3% of the variability in video game addiction scale scores, compared with 10.7% among boys. Although boys used video games and loot boxes much more frequently, the association appeared to be stronger among adolescent girls who engaged in this type of microtransaction. These findings are consistent with previous research describing a positive relationship between loot box purchasing and symptoms of gaming disorder among both adolescents and young adults (Ide et al., 2021; Irie et al., 2023; Li et al., 2019; Yokomitsu et al., 2021; Zendle, 2020). They also support the hypothesis that loot boxes are among the monetisation mechanisms with the greatest capacity to foster intensive patterns of video game engagement (King & Delfabbro, 2020). The larger effect size observed among girls is also consistent with Ide et al. (2021), who found that



the association between loot box purchasing and problematic gaming was particularly strong among adolescent girls. One possible explanation is that, because this behaviour is less common among girls, its occurrence may identify a subgroup with much more intensive involvement in gaming.

With regard to the second objective, concerning problem gambling, only boys who used loot boxes more frequently obtained significantly higher CSPG scores. Although the effect size was small, this finding is consistent with the extensive literature describing an association between loot box spending and problem gambling (Hing et al., 2022; Kristiansen & Severin, 2020; Spicer et al., 2021; Villalba-García et al., 2025; Zendle & Cairns, 2018, 2019). However, unlike some studies conducted with adolescents (Kristiansen & Severin, 2020; Rockloff et al., 2021; Wardle & Zendle, 2020), the present study found no significant differences among girls. This discrepancy is probably due to the small number of girls who frequently used loot boxes and, consequently, the lower statistical power to detect differences. Cultural differences or differences in video game participation between the samples studied may also play a role.

The third set of results concerned depressive symptoms and showed a different pattern. Whereas no significant differences were observed among boys, girls who used loot boxes showed higher levels of depressive symptoms. Nevertheless, the effect size was small, and frequency of use explained only 1.1% of the variability in depressive symptom scores. These findings are partly consistent with previous studies reporting associations between loot box purchasing and depressive symptoms (Drummond et al., 2020a; Irie et al., 2023; Villalba-García et al., 2025), although they con-

trast with other studies that found no relationship with psychological wellbeing (Etchells et al., 2022). These differences may reflect the influence of moderating variables not considered in the present study, such as impulsivity, anxiety, or stress, factors recently shown to intensify the association between loot boxes and mental health problems (Villalba-García et al., 2025).

Taken together, the results support the view that loot boxes are a phenomenon at the convergence of video gaming and gambling (King & Delfabbro, 2020). Their random reinforcement mechanisms, widely described in the literature (Drummond & Sauer, 2018; Larche et al., 2021), appear to be associated not only with greater engagement in video games but also with indicators of vulnerability related to gambling and, to a lesser extent, mental health.

A first limitation of the study is its cross-sectional design, which prevents causal relationships from being established between loot box use and the variables analysed. Consequently, it cannot be determined whether frequent loot box use contributes to the development of problematic behaviours or whether more vulnerable adolescents are more likely to use them. Second, all measures were self-reported, which may introduce recall or social desirability bias. In addition, frequency of loot box use was assessed using a simple ordinal measure, without collecting information on financial expenditure, amount spent, type of video game played, the existence of secondary markets, or the specific characteristics of the loot boxes, variables that recent research has identified as relevant (Kristiansen & Severin, 2020; Spicer et al., 2021). Finally, the small number of girls who were frequent loot box users may have limited the ability to detect associations for some variables.



From an applied perspective, these findings provide relevant evidence for the regulatory debate on loot boxes. The observed association with problematic gaming and, to a lesser extent, problem gambling reinforces concerns expressed by various regulatory bodies about the potential risks these mechanisms pose to minors. In the European context, a regulatory trend regarding loot boxes can be observed. While countries such as Belgium and the Netherlands have chosen to restrict or prohibit certain forms of loot boxes, others, such as Germany, require transparent information through disclosure of the probabilities of obtaining rewards.

Although the results of the present study do not allow causal conclusions to be drawn, they add to the accumulated evidence supporting the inclusion of loot boxes within public policies aimed at protecting minors from the risks arising from gambling-like game strategies. The study's conclusions support the adoption of a preventive approach combining prohibition or, in any case, regulatory measures - such as probability transparency, restrictions on minors' access, oversight of monetisation systems, and the inclusion of specific warnings - with educational interventions aimed at increasing adolescents' awareness of manipulative strategies, their understanding of chance mechanisms embedded in video games, and other dark patterns that have already become part of the digital entertainment environment.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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