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Article

Risk Factors Associated with Gambling on Loot Boxes

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ABSTRACT

Background: Loot boxes (LBs) are virtual objects that players open without knowing the value of the item they will obtain. Because of their features, studies have explored their association with gambling, finding commonalities. However, risk factors have been overlooked. This study examined risk factors associated with gambling as applied to LBs (gambling in the past year, having family/friends who use LBs/gamble, trait impulsivity, and sensation-seeking). **Method:** 253 participants (82.2% men) with a mean age of 28 years (*SD* = 12.11)—in three groups: gamblers (*n* = 89), LB purchasers (*n* = 63), and free-LB openers (*n* = 101)—completed a self-report. **Results:** Having family/friends who used LBs was related to increased engagement in opening LBs at no cost. However, having gambled in the past year or having family/friends who used LBs or who gambled was not associated with increased purchasing. Gamblers, LB purchasers, and LB openers scored equally highly on impulsivity and sensation-seeking. Because some gamblers used LBs, and LB purchasers also opened free-LBs, further analyses were performed to control for the effects of overlapping groups. Loot boxers had higher scores in sensation-seeking than gamblers. **Conclusions:** The results can contribute to the development of prevention and intervention strategies for LB users.

Factores de Riesgo Asociados al Juego de Azar en Cajas Botín

Palabras clave:
Cajas botín
Juegos de azar
Videojuegos
Impulsividad
Búsqueda de sensaciones

RESUMEN

Antecedentes: Las loot boxes (LBs) son objetos virtuales que se abren desconociendo el valor del artículo que contienen. Aunque se han relacionado con el juego de azar, sus factores de riesgo apenas han sido explorados. Este estudio examina los factores de riesgo del juego de azar en LBs (jugar a juegos de azar, tener familiares/amigos que usan LBs/juegan a juegos de azar, impulsividad-rasgo y búsqueda de sensaciones). **Método:** 253 participantes (*M* = 28, *DT* = 12.11, 82.2% hombres), distribuidos en tres grupos: jugadores de azar (*n* = 89), compradores de LBs (n = 63) y abridores de LBs gratuitas (*n* = 101), completaron un autoinforme. **Resultados:** Tener familiares/amigos que usaban LBs se relacionaba con la apertura gratuita, pero jugar a juegos de azar o tener familiares/amigos que usaban LBs/jugaron a juegos de azar no se relacionaba con la compra. Los tres grupos puntuaron igual en impulsividad y búsqueda de sensaciones. Tras controlar el solapamiento (algunos jugadores de azar usaban LBs, y los compradores de LBs abrían LBs gratuitas), los *loot boxers* puntuaron más alto en búsqueda de sensaciones que los jugadores de azar. **Conclusiones:** Conocer las comunalidades entre LBs y juegos de azar puede contribuir a su prevención e intervención.

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Gambling is a global problem that has attracted the attention of researchers, healthcare providers, and politicians, among others, due to its high prevalence rates and serious consequences. As regards regulated forms of gambling (i.e., sports betting, slot machines, lotteries), it is estimated that between 0.1% and 5.8% of players across the world meet the criteria to be classified as problem gamblers (Calado & Griffiths, 2016). However, new dynamics are emerging that covertly introduce characteristic features of gambling into easily accessible forms of recreation (e.g., video games), including to children and adolescents. These recreational activities are not considered gambling per se and are therefore not formally regulated or documented. One novel phenomenon that exemplifies this problem are loot boxes (LBs). These systems are used by players to randomly obtain virtual items in video games, either by opening LBs for free or by purchasing them with real money (Rockloff et al., 2021).

The first LBs were incorporated in the ZT Online video game in 2006–2007 (Azin, 2020). However, they would not begin to attract media attention until 2017 (Nielsen & Grabarczyk, 2019). Since then, numerous aspects of LBs have been explored in the literature (i.e., prevalence rates, purchase motivation, influence on the gaming experience), which have led LBs to be considered a problematic phenomenon. Currently, one of the main debates surrounding LBs is whether their use should be categorized as problematic video game use (King & Delfabbro, 2019a) or as gambling (Griffiths, 2018), although the evidence appears to support both positions (Garea et al., 2021). Previous studies in this line have suggested the existence of a positive relationship between problematic video game use and the purchase of LBs (Evren et al., 2021; González-Cabrera et al., 2022). As regards LBs as a form of gambling, there seems to be an association between both types of consumption. Specifically, a positive relationship has been observed between users' investment in LBs and increased engagement (Li et al., 2019; Wardle & Zendle, 2021) and spending (Wardle & Zendle, 2021) in other forms of gambling. These players have also been found to exhibit longer gambling sessions (Li et al., 2019) and higher scores on problem gambling scales (e.g., Problem Gambling Severity Index, PGSI). This relationship is not only observed in LB purchasing, but also occurs in users who watch LBs being opened (Zendle, 2020). Finally, some studies have found similarities between both types of consumption at the physiological level, such as an increase in the galvanic skin response during the opening of LBs (Brady & Prentice, 2019); similar to what occurs with electronic gambling machines (Wilkes et al., 2010).

The similarities between LBs and gambling could be due to the existence of common underlying mechanisms such as intermittent variable schedules of reinforcement, the immediacy of rewards, near-misses, catchy visual and sound cues (Derevensky & Griffiths, 2019), the low probability of winning the item, and no skill requirement (King & Delfabbro, 2019b). Indeed, the most valuable LBs have been found to trigger greater psychophysiological arousal and the urge to open them (Larche et al., 2021).

In light of the above, some studies have pointed to the possible existence of LB risk factors compatible with gambling. However, due to the scarcity of studies on risk factors of LB use, this relationship has been insufficiently explored.

Risk Factors in Gambling and Loot Boxes

Risk factors for gambling have been defined as "antecedent conditions that are associated with an increase in the likelihood of onset, greater severity, and longer duration of problem gambling" (Dowling et al., 2021). The most important risk factors associated with pathological or problem gambling include male gender (Jun et al., 2021); low socio-economic status (Barnes et al., 2015); starting to gamble at an early age (Hing et al., 2014); big wins early on (Turner et al., 2006); having family and friends who gamble (Hollén et al., 2020; Mazar et al., 2018); higher levels of impulsivity (Ciobotaru & Clinciu, 2022), sensation seeking (Hollén et al., 2020), and frustration (Gupta et al., 2006); anxiety and depression (Cosenza et al., 2019); antisocial behaviors (Jun et al., 2021); substance use (Richard et al., 2019); lower self-esteem (Abdi et al., 2015); the use of less effective coping strategies (Dickson et al., 2008); lower emotional regulation (Williams et al., 2012); and poorer school/work performance (Vitaro et al., 2018). Some of these risk factors have been explored in the framework of LB use, such as gender, ethnicity, or the presence of emotional disorders (DeCamp, 2021). However, recurrent factors in the gambling literature, such as impulsivity, sensation seeking, and close family/social ties (Allami et al., 2021; Dowling et al., 2017), have been little studied in relation to LBs.

Several authors have reported a positive relationship between impulsivity and gambling behavior (Benson et al., 2012; Estevez et al., 2015; Leeman et al., 2014), with higher levels of impulsivity identified in at-risk or problem gamblers (Secades-Villa et al., 2016). Furthermore, when impulsivity is measured in the framework of delay discounting (as an index of impulsive choices), problem or pathological gamblers have been found to focus more on immediate, albeit smaller, rewards as opposed to higher but delayed ones (Callan et al., 2011; Cosenza & Nigro, 2015). However, the results in the LB literature are contradictory. While Wardle and Zendle (2021) found that players who purchased LBs scored higher on impulsivity than those who did not and Xiao et al. (2022) reported a positive, albeit weak, relationship between spending on LBs and impulsivity, Zendle et al. (2019) found no relationship between LB spending and impulsivity.

Sensation seeking is both related to and a component of impulsivity (Whiteside & Lynam, 2001) or considered a trait that combines both variables; what is known as "impulsive sensation seeking" (Zuckerman, 1994). Despite the ambivalent results regarding gambling, several studies have found a positive relationship between sensation seeking and gambling severity (Harris et al., 2015; Reardon et al., 2019), with at-risk or problem gamblers being greater sensation seekers (Donati et al., 2013). To the best of our knowledge, however, no empirical studies have measured the relationship between LBs and sensation seeking.

Finally, the family and social environment can promote gambling behaviors, especially if significant others are involved (Sarti & Triventi, 2017). This includes first-level family members (parents, siblings, partners) and the peer group, which can serve as pressure agents or role models in the face of this problem. The gambling literature has shown that having family members and friends who engage in gambling is related to a higher risk of problem gambling (Canale et al., 2017; Langhinrichsen-Rohling et al., 2004; Mazar et al., 2018). As regards LBs, the literature

has shown that having friends who purchase these virtual items is related to a higher frequency of spending (King et al., 2020), whereas no relationship has been found between parents' purchasing of LBs and higher LB purchasing in their children (Ide et al., 2021).

In line with the above, the objectives of this research are: (a) to analyze risk factors (having gambled in the past 12 months and family/social environment) that may influence the free-opening and purchasing of LBs and (b) to compare risk factors (impulsivity and sensation seeking) between a sample of gamblers, a sample of LB purchasers, and a sample of free-LB openers. Based on these objectives, we propose the following hypotheses:

H1) Video game players who gambled in the past 12 months open and purchase more LBs than those who have not gambled.
H2) Video game players who have family/friends that use LBs open and purchase more LBs than those who do not have family/friends that use them.
H3) Video game players who have family/friends that gamble open and purchase more LBs than those who do not have family/friends that gamble.
H4) Purchasers and openers of LBs obtain similar scores to gamblers on impulsivity and sensation seeking.

Method

Participants

The sample consisted of 253 participants with a mean age of 28 years (SD = 12.11). The sample was not gender-matched [χ^2 (1, N = 253) = 105.02; p < .001] and included 208 males (82.2%) and 45 females (17.8%). These data are consistent with the literature, which has shown that the prevalence of both gambling and video game use is higher among men (Leonhardt & Overå, 2021; Wong et al., 2013). Of the total participants, 82.9% reported being single (n = 203), 12.2% were married (n = 30), 4.1% were separated (n = 10), and 0.8% were widowed (n = 2). As regards level of education, 4.9% had completed primary school (n = 12), 13.5% had completed secondary school (n = 33), 44.9% had a high school diploma (n = 110), 20.8% had undergone vocational training (n = 51), 13.5% had an undergraduate degree (n = 33), and 2.4% had a postgraduate degree (n = 6). Of the total sample, 57.1% (n = 140) were unemployed. Regarding family socioeconomic status, 6.9% reported being of low (n = 17), 19.2% lower-middle (n = 47), 56.3% middle (n = 138), 16.3% upper-middle (n = 40), and 1.2% high status (n = 3). The sociodemographic data are presented in Table 1.

Table 1
Sociodemographic Data

Variable		Gamblers	LB purchasers	LB openers	Comparisons	
		M (SD)	*M (SD)*	*M (SD)*	*H*-value	*p*-value
Age		38.17 (13.80)	22.97 (6.14)	22.28 (6.24)	94.79	< .001
		n (%)	*n (%)*	*n (%)*	χ^2- values	*p-values*
Sex	Male	78 (87.6)	59 (93.7)	71 (70.3)	17.24	< .001
	Female	11 (12.4)	4 (6.3)	30 (29.7)		
Marital status	Single	56 (62.9)	55 (91.7)	92 (95.8)	50.35	< .001
	Married	24 (27)	3 (5)	3 (3.1)		
	Separated	9 (10.1)	-	1 (1)		
	Widowed	-	2 (3.3)	-		
Highest academic level completed	Primary Education	11 (12.4)	1 (1.7)	-	46.40	< .001
	Secondary Education	20 (22.5)	7 (11.7)	6 (6.3)		
	High school	21 (23.6)	32 (53.3)	57 (59.4)		
	VET	16 (18)	13 (21.7)	22 (22.9)		
	Undergraduate	18 (20.2)	5 (8.3)	10 (10.4)		
	Postgraduate	3 (3.4)	2 (3.3)	1 (1)		
Currently employed	Yes	62 (69.7)	24 (40)	19 (19.8)	47.17	< .001
	No	27 (30.3)	36 (60)	77 (80.2)		
Family socio-economic status	Low	15 (16.9)	-	2 (2.1)	23.75	.003
	Lower-middle	16 (18)	13 (21.7)	18 (18.8)		
	Middle	42 (47.2)	37 (61.7)	59 (61.5)		
	Upper-middle	15 (16.9)	10 (16.7)	15 (15.6)		
	High	1 (1.1)	-	2 (2.1)		

Note. VET (Vocational Education and Training)

The sample was divided into three groups: (a) gamblers (n = 89), which included players from associations specialized in the treatment of problematic/pathological gambling; (b) free-LB openers (n = 101), which included video game players who opened LBs for free; and (c) LB purchasers (n = 63), which included video game players who purchased LBs with real money. LB users who obtained scores equal to or greater than eight on the Problem Gambling Severity Index (PGSI) were excluded from the study, as they were considered problematic gamblers but had not received psychological treatment.

Instruments

Ad hoc Questionnaire. We designed a questionnaire that included items aimed at collecting sociodemographic variables and aspects related to gambling and video game use:

Sociodemographic Data. Data were collected on the participants' age, sex (male/female), marital status (single, separated, married, or widowed), level of education (primary, secondary, high school, vocational training, undergraduate, postgraduate or doctoral studies), current employment status (yes if employed/no if unemployed), and family socio-economic status (low, lower-middle, middle, upper-middle, or high).

Questions About Video Games and the Opening/Purchasing of Loot Boxes. The participants were asked if they played video games (yes/no), had opened free LBs in the past three months (yes/no), the number of LBs opened in the past three months (less than 20, 20 to 50, 51 to 100, or more than 100), had purchased LBs in the past three months (yes/no), and the number of LBs purchased in the past three months (1 to 5, 6 to 10, 11 to 15, 16 to 20, 21 to 25, or more than 25). The participants were also asked if they had family members and/or friends who used LBs (yes/no).

Questions About Gambling. Participants were asked if they had gambled in the past 12 months (yes/no) and how often (daily, weekly, monthly, semi-annually/semestral, yearly). They were also asked if they had family members and/or friends who gambled (yes/no).

Problem Gambling Severity Index. (PGSI; Ferris & Wynne, 2001). We used the Spanish version of the PGSI validated by López-González et al. (2018). The PGSI consists of nine items that assess the severity of gambling (e.g., "Have you felt guilty about the way you gamble or what happens when you gamble?"). Responses are rated on a 4 point Likert scale from 0 (*never*) to 3 (*almost always*) with a total score ranging from 0 to 27 points. Depending on their total score, participants are categorized into four excluding groups (0 = *non-problem gambling*, 1 to 2 = *low risk gambling*, 3 to 7 = *moderate risk gambling*, and 8 or more = *problem gambling*). The internal consistency of the original instrument is .84 and .97 in the Spanish version.

Barratt Impulsiveness Scale-11. (BIS-11; Patton et al., 1995). We used the Spanish version validated by Salinas et al. (2018). The BIS-11 contains 30 items designed to assess impulsivity as a trait. It comprises three subscales: attentional impulsiveness (e.g., "I don't pay attention"), motor impulsiveness (e.g., "I do things without thinking"), and non-planning impulsiveness (e.g., "I plan trips well ahead of time"). The instrument is distributed on a 4-point Likert scale from 1 (*rarely/never*) to 4 (*almost always*). The total score is calculated as the sum of the subscales and ranges from 30 to 120 points. The scale does not have cut-off points, so a higher score indicates greater impulsive behavior. The internal consistency of the original instrument is .79 to .83 and .81 in the Spanish version.

Brief Sensation Seeking Scale. (BSSS; Hoyle et al., 2002). We used the Spanish version validated by Martín-Fernández et al. (2021). The BSSS consists of eight items that assess sensation seeking through four subscales: experience seeking (e.g., "I would like to explore strange places"), boredom susceptibility (e.g., "I get restless when I spend too much time at home"), thrill and adventure seeking (e.g., "I like to do frightening things"), and disinhibition (e.g., "I like wild parties"). This instrument uses a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The total score is calculated as the sum of the subscales, and ranges from 8 to 40 points. The BSSS has no cut-off points, so a higher score indicates greater sensation seeking. The internal consistency of the original instrument is .76 and .89 in the Spanish version.

Procedure

To collect the data, 64 Spanish associations specialized in the treatment of problem/pathological gambling were contacted via email. The response rate was 15.6% (n = 10). A total of 424 competitive teams that play different video games (*FIFA, Brawl Stars, Clash Royale, League of Legends, and Rocket League*) were also contacted through two channels to request their participation: by email and, if they did not have an email account, via Twitter, where all the teams had an account. The response rate was 1.2% (n = 5) via email and 7.5% (n = 32) via Twitter. Since the participation rate of LB openers and purchasers was low, the sample was expanded by requesting individual gamers belonging to WeClutch (an esports community) to participate in the study. The response rate of these players was 20.6% (n = 36).

Participants willing to take part in the study were sent a Google form explaining the aim of the research, the requirements to participate (being of legal age), the confidentiality of the information gathered, and the duration of the questionnaire (10-15 minutes). They were also told that there would be a drawing after the study was completed (five gift cards of €10 each). Once the participants accepted the conditions, they were asked to give their consent. The study procedures were carried out in accordance with the Declaration of Helsinki. The Institutional Review Board of the University of Cordoba (Ref. CEIH-22-25) approved the study.

Data Analysis

Since the assumptions of normality were not met for the dependent variables (impulsivity and sensation seeking) evaluated with the Kolmogorov–Smirnov test (p = .021 and p = .010, respectively), nonparametric tests were performed. For

the comparison of two nominal variables (*H1, H2, H3*), cross-tabulations with Pearson's chi-square statistic were performed. For the comparison of means between independent samples (*H4*), Kruskal–Wallis H tests were performed. Effect sizes were calculated for each of the tests using the phi coefficient (Φ) for Pearson's chi-squared and the epsilon squared statistic (ε^2_R) for the Kruskal–Wallis H test (Tomczak & Tomczak, 2014).

The data were analyzed using the IBM SPSS Statistics statistical package version 25 at a level of statistical significance of $p = .05$.

Results

Characterization of the Gamblers Sample

Of the sample of gamblers, 31.5% played video games. Of these, 46.4% stated that they had opened at least one free LB in the past three months. More specifically, 30.8% had opened less than 20 LBs, 61.5% had opened 20 to 50 LBs, and 7.7% had opened more than 100. In relation to the purchase of LBs, 17.9% reported having paid for them. Forty percent of the participants had purchased 1 to 5 LBs, while 40% had purchased 6 to 10 LBs and 20% had purchased 11 to 15.

As regards gambling behavior, 41.6% had gambled in the past year. Of these, 15.8% played daily, 10.1% played weekly, 7.9% played monthly, 2.2% played semi-annually, 5.6% played annually, and the remaining 58.4% not having gambled during last year.

Characterization of the Loot Box Openers

Of the total number of players who used LBs ($N = 164$), 61.6% had opened free LBs in the past three months. Of these, 66.3% indicated that they had opened less than 20 LBs, 16.8% had opened from 20 to 50 LBs, 7.9% had opened 51 to 100, and 8.9% more than 100. A total of 67.3% of the participants in this group reported having family members and/or friends who used LBs.

As regards the association between LB openers and gambling behavior, 40.6% had gambled in the past 12 months. In terms of frequency, 9.9% reported playing weekly, 9.9% monthly, 8.9% semi-annually, 11.9% annually, and the remaining 59.4% not having gambled in the past year. A total of 57.4% reported having family members and/or friends who gambled.

Characterization of the Loot Box Purchasers

Of the 164 LB users, 38.4% had purchased LBs in the past three months. Of these, 63.5% indicated they had purchased 1 to 5 LBs, 19% had purchased 6 to 10, 4.8% had purchased 11 to 15, 3.2% had purchased 16 to 20, and 9.5% had purchased more than 25. A total of 76.2% of the participants in this group reported having family members and/or friends who used LBs.

As regards the association between LB purchasers and gambling behavior, 49.2% reported that they had gambled in the past 12 months. Of these, 4.8% reported gambling daily, 4.8% weekly, 15.9% monthly, 11.1% semi-annually, 12.7% annually, and the remaining 50.8% not having gambled during last year. A total of 63.5% of the participants in this group stated that they had family members and/or friends who gambled.

Risk Factors That Could Influence the Opening/Purchase of Loot Boxes

Regarding the first hypothesis, which states that video game players who gambled in the past 12 months opened and purchased more LBs than those who had not gambled, no significant differences were found for either opening [χ^2 (1, $N = 192$) = 0.11; $p = .743$; $\Phi = .04$] or purchasing LBs [χ^2 (1, $N = 192$) = 0.98; $p = .323$; $\Phi = .08$].

As concerns the second hypothesis, which posited that video game players who had family/friends that used LBs opened and purchased more LBs than those who did not have family/friends that used them, significant differences were found with respect to free-opening LBs [χ^2 (1, $N = 191$) = 20.55; $p < .001$; $\Phi = .35$] but not purchasing them [χ^2 (1, $N = 191$) = 2.19; $p = .139$; $\Phi = .12$]. Most players reported that it was friends who used LBs (69.8%).

Finally, the third hypothesis, which stated that video game players who had family/friends that gambled opened and purchased more LBs than those who did not have family/friends that gambled, no significant differences were found for opening [χ^2 (1, $N = 191$) = 0.28; $p = .598$; $\Phi = .06$] or purchasing LBs [χ^2 (1, $N = 191$) = 0.62; $p = .430$; $\Phi = .07$].

Comparison of Risk Factors in Openers/Purchasers of Loot Boxes and Gamblers

Regarding the fourth hypothesis (purchasers and openers of LBs obtain similar scores to gamblers on impulsivity and sensation seeking), no statistically significant differences were found between the groups for impulsivity [χ^2 (2) = 4.40; $p = .111$; $\varepsilon^2_R = .02$] and sensation seeking [χ^2 (2) = 5.65; $p = .059$; $\varepsilon^2_R = .02$]. The means and standard deviations of the groups are shown in Table 2.

Table 2
Means and Standard Deviations on Impulsivity and Sensation Seeking

Measure	Gamblers ($n = 89$)	LB purchasers ($n = 63$)	LB openers ($n = 101$)
	M (SD)	*M (SD)*	*M (SD)*
Impulsivity	84.80 (12.93)	87.87 (8.51)	88.84 (9.93)
Sensation Seeking	22.49 (6.78)	24.56 (6.42)	25.01 (7.05)

Analysis of the Potential Overlap Between the Groups

A conceptual overlap between the groups was found (some gamblers used loot boxes, and LB purchasers also opened free-LBs). The sample was adjusted to examine the impact of this overlap on the results. Individuals in the group of gamblers who declared having used LBs were excluded ($n = 13$), leaving a total of 76 participants. LB openers and LB purchasers were merged into a group named "loot boxers" which was composed of 164 participants.

No statistically significant differences were found between gamblers and loot boxers on impulsivity [$U = 5640.5$, $p = .237$; $r = .08$]. However, statistically significant differences were found between the groups for sensation seeking [$U = 4819.5$, $p = .005$; $r = .18$], being loot boxers who obtained higher scores. The results of the descriptive analysis are reported in Table 3.

Table 3
Means and Standard Deviations on Impulsivity and Sensation Seeking after Controlling the Overlap Between the Groups

Measure	Gamblers (*n* = 76)	Loot Boxers (*n* = 164)
	M (SD)	*M (SD)*
Impulsivity	85.72 (13.10)	88.47 (9.40)
Sensation Seeking	22.01 (6.71)	24.84 (6.80)

Note. Loot boxers result from merging the sub-samples of LB purchasers and LB openers.

Discussion

The main purpose of this study was to analyze predictors and risk factors that might influence the opening and purchasing of LBs and to compare impulsivity and sensation seeking in gamblers, LB purchasers, and free-LB openers.

With respect to the first objective, our results showed that gambling in the past 12 months is not related to either opening or purchasing LBs. These data are not consistent with the literature, as numerous studies have found a positive significant relationship between gambling and LB use (Close et al., 2021; Drummond et al., 2020; Li et al., 2019; Wardle & Zendle, 2021; Zendle et al., 2020; Zendle & Cairns, 2019). This discrepancy could stem from the assessment instrument used in each study as it could measure different facets of gambling. Previous studies have used the PGSI to assess gambling severity and explore its association with LB use. However, in the present study, gambling behavior was explored by directly asking participants if they had gambled in the past 12 months (yes/no). Although we found no statistically significant results in this study, it is important to note that, qualitatively, approximately 41% of the video game players that opened free LBs and 49% who purchased them had also gambled in the past 12 months. With the contribution of these qualitative data, we want to emphasize that a moderate proportion of video game players may be interested in the random mechanics underlying LBs and in gambling (simultaneously), and that this is an important aspect to consider when proposing preventive measures and interventions aimed at this population.

As for the second hypothesis, we found a relationship between having family/friends who used LBs and the opening of LBs but no relationship with purchasing LBs. In terms of family members, the results are consistent with the study by Ide et al. (2021), who did not find a relationship between parents' purchasing of LBs and their children's purchasing behavior. A potential explanation for this finding could be associated with the fact that some parents are unfamiliar with LBs or, in the case they know about them, perceive LBs as negative (Dong et al., 2020). Consequently, families would not invest in LBs. When examining the influence of peers, our results differ from those obtained by King et al. (2020), who found a relationship between having friends who purchased LBs and a higher frequency of LB purchases. The differences between our findings could be attributed to the video games explored. While King et al. (2020) only asked participants about one concrete game (Fortnite), we included games that differ from Fortnite (e.g., Fortnite only provides cosmetic items, but FIFA is a pay-to-fast/win game). In addition, in our study, Fortnite was excluded because at the time the study was conducted, LBs were removed. Another plausible explanation for these results could be that since opening LBs comes at no cost, players and family/friends are encouraged to jointly achieve goals and accomplishments to obtain them. However, when payment with real money is required, family/friends might not encourage the purchase of LBs since it could imply a higher risk of obtaining an unwanted item of less value than the money paid, thus avoiding responsibility for the economic loss.

In reference to the third hypothesis, no relationship was found between having family/friends who gamble and either opening or purchasing LBs. To our knowledge, there are no studies exploring this topic on LBs, thus there is no research to compare our findings. However, these results contrast with the previous literature on gambling, which suggests that having family and friends who gamble is related to a higher risk of problem gambling (Canale et al., 2017; Langhinrichsen-Rohling et al., 2004; Mazar et al., 2018). It could be hypothesized that the lack of association between the variables may be due to the fact that family members/friends who gamble do not play video games or, in case they do, they do not use LBs. Therefore, they would not act as models for the use of LBs and would not influence players who use LBs. However, further research on the relationship between the convergence of gambling and gaming behavior among family and friends is needed. Given these results, it could be stated that having family members and/or friends who use LBs or gamble may not be an influential variable in the consumption of LBs. Nonetheless, although such aspects may not be risk factors, they should not be disregarded when planning prevention and intervention strategies.

Regarding the second objective (to compare the impulsivity and sensation seeking constructs between samples), it is important to note that there is no available literature to compare our results, since previous comparisons have not been made between these populations. We found no differences between gamblers, LB purchasers, and LB openers with respect to the impulsivity variable, that is, the three groups obtained similar scores for this construct. Likewise, no differences were found between gamblers, LB purchasers, and LB openers on sensation seeking. These results support the hypothesis of this study and are consistent with the literature if we consider LBs as a form of gambling (Gibson et al., 2022). Regarding the impulsivity scores, Stanford et al. (2009) suggested that scores of 72 or above should be classified as high impulsivity. In our study, the mean scores of the gamblers, purchasers, and openers of LBs are above that cut-off score (>84). Although no cut-off points are available for sensation seeking, the mean scores of the three groups are in the middle range of the questionnaire scores (22-25 points for a range of 8–40). It is important to take these scores into account when developing prevention and intervention strategies and designing programs to work on impulsivity and sensation seeking, especially in LB openers and purchasers who exhibit higher engagement with LBs.

Because some gamblers used loot boxes and LB purchasers also opened free-LBs, further analyses were done to control the effects of overlapping groups. When the overlap between the groups was controlled, no significant differences were found between gamblers and loot boxers on impulsivity. However, significant differences were found on sensation seeking, with loot boxers obtaining higher scores than gamblers. A possible explanation for this difference may be age related. Previous studies have consistently found that sensation seeking decreases with age (Evans-Polce et al., 2018). In our study, gamblers who played video games and used LBs tended to

be younger than traditional gamblers (who did not use video games). Consequently, excluding these participants increased the age of the group of gamblers, thus decreasing the mean scores for sensation seeking. Despite this statistical difference between the groups, the scores obtained on impulsivity and sensation seeking remained within the same ranges described in the previous paragraph.

The results should be taken with caution, as this study is not without its limitations. One of the most important limitations is the small sample size, which could affect the generalizability of the results. Similarly, due to the peculiarities of the participants composing the sub-samples (i.e., individuals receiving treatment for gambling problems, LB users who compete in esports teams), generalizability could be compromised. Additionally, as this is a cross-sectional study, it has not been possible to establish causality between the variables. Finally, another limitation has to do with the data collection process, which was carried out using an online form, thus leading to inherent difficulties such as the loss of contextual control or convenience sampling. For future lines of research, in addition to overcoming the study limitations, it would be necessary to continue investigating predictors and risk factors to construct a theoretical explanatory model of LB consumption that considers other possibly influential variables, such as cognitive bias. Likewise, it would be of interest to make further comparisons between LB consumers and gamblers to determine their common characteristics. This would provide us with additional evidence to classify LBs as a form of gambling and extrapolate gambling treatment programs to the LB consuming population.

In sum, this study provides evidence that contributes to the knowledge about variables that could influence the free-opening and purchasing of LBs. The results suggest that having family/friends who used LBs was related to a higher propensity to open free LBs. As regards LB purchasing, neither gambling in the past year nor having family/friends who use LBs or gambled was related to a higher purchase of LBs. Finally, gamblers, LB purchasers, and LB openers were not found to differ on impulsivity and sensation seeking, except when the overlap between the groups was controlled, where loot boxers obtained higher scores than gamblers on sensation seeking. The scores of the groups were high, thus suggesting that these behavioral traits may be risk factors.

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