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The association between loot boxes and gambling in children and adolescents: A systematic review

Short Title: Loot Boxes and Gambling in Youth

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Abstract

Background: With increased screen time among children and adolescents, concerns about the impact of loot boxes (LB) on gambling behaviors have grown. LBs, often included in video games as purchasable items with randomized rewards, resemble gambling mechanics, raising concerns about potential risks for youth.

Methods: This systematic review collected and analyzed all available studies on LB use and gambling in individuals under 18 years old. A literature search was conducted using Cochrane, SciELO, and PubMed databases up to March 30, 2024. The inclusion criteria focused on peer-reviewed empirical studies examining the association between LBs and gambling behaviors in minors, while studies on unrelated gambling behaviors or those involving adults were excluded.

Results: From 74 initial articles, 4 studies met the inclusion criteria. Findings consistently showed a positive association between LB engagement and gambling tendencies in adolescents. Results indicate that adolescents involved with LBs are at a higher risk of problematic gambling behaviors, with gender differences also observed, as male adolescents showed higher engagement with LBs and gambling risks.

Conclusions: The review suggests a clear association between LB use and gambling behaviors in youth, with potential for LBs to act as a "gateway" to gambling. The findings highlight the need for regulatory actions, including age restrictions and educational efforts

to protect youth from these risks. Further research with representative samples is necessary to deepen understanding of the LB-gambling link in young populations.
Keywords: loot boxes, children, adolescents, gambling.

1 INTRODUCTION

The amount of time children and adolescents spend on screen devices has increased, while the age of exposure has decreased.[1-2] Prolonged screen exposure in children and adolescents has been associated with several negative effects on both physical and mental health, such as attention and learning difficulties, self-harm behaviors, suicide, cyberbullying, obesity, a sedentary lifestyle, and sleep disturbances.[3]

Gambling involves staking something of value in the expectation of obtaining something greater. Only a minority of people who gamble develop a disorder.[4] Problem gambling denotes loss of control over gambling that produces social, personal, or interpersonal harm.[5] Gambling disorder is characterized by a persistent pattern of gambling with impaired control, increasing priority given to gambling over other activities, and continued behavior despite negative consequences. When the behavior occurs predominantly via the internet or other electronic networks, it may be specified as online.[6] Gambling disorder can also be qualified by severity, course (episodic vs. persistent), and remission status.[7]

Cash gambling has become a profitable business model in the world of electronic games,[8] with the market valued in the billions.[9-10] The similarities between loot boxes and gambling have fueled intense debate on their legal classification and regulation.[11] Loot boxes (also referred to as reward boxes, gachas, or chests)[12] are an increasingly common type of microtransaction in video games[13] and their use has risen in recent years.[14]

Loot boxes are items that players pay for with real money to open and randomly obtain an object of unknown initial value they can use in the game, such as special characters, weapons, or clothing; it might affect gameplay, be aesthetic, or serve as collectible items.[14-17] A common feature of loot boxes is that when purchasing one, the player does not know the characteristics of the item they will receive in return for the money spent.[18,11] The chance-based nature of loot boxes is the primary similarity to gambling.[19]

The prevalence of loot box use among those under 18 varies depending on the definition, the recall window, and the sampling frame. In North American 8th-grade school samples, the proportion of adolescents who consumed loot boxes ranged from 24.9% to 31.6%.[14] In a Spanish cohort (11–17 years old), loot box purchases ranged from 25.3% to 27.3% in the past 12 months. [20] Among British adolescents aged 16–18, 40.5% reported paying to open

loot boxes in the past month..[21] Reviews of adolescent gamers indicate typical annual prevalence rates between 20% and 33.9%.[13] Taken together, these data suggest that loot box involvement is common in those under 18, with higher estimates when considering purchase (not just use) and shorter windows.

Children and adolescents are particularly vulnerable to gambling behaviors due to factors such as a limited understanding of probability and statistics, sensitivity to peer pressure, family influence, marketing that promotes gambling, impulsivity, sensation-seeking, and antisocial behavior.[22] Researchers suggest that loot boxes can serve as a gateway to gambling and that players may engage in gambling due to the influence of purchasing loot boxes, and the reverse may also occur.[23] The more severe a player's gambling disorder symptoms, the more they spend on loot boxes. People with gambling disorder also tend to spend more on loot boxes, and loot box buyers generally have a higher frequency of online gaming and more hours of play.[24]

This review aims to gather all available scientific data on loot boxes and their association with gambling among individuals under 18 years of age. To achieve this, the study will analyze and synthesize existing literature, reporting on key aspects such as the relationship between loot boxes and gambling disorder in children and adolescents, sample characteristics, demographic data, study designs, and sampling methods. This approach seeks to provide insights into the potential harm that engagement with loot boxes may pose to individuals and to inform policymakers on how to better protect vulnerable populations from the risks associated with gambling involvement.

2 METHODS

2.1 Search strategy

The methodology for the current review was developed a priori and described in the preregistration protocol (PROSPERO CRD42024525228, https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42024525228). This review was conducted in accordance with the latest revised guidelines for the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist.[25]

The literature search was conducted up until August 09, 2025, using the Cochrane, SciELO, EMBASE, Scopus, PsycINFO, Web of Science, LILACS, and PubMed databases. The search strategy used a combination of keywords, including: gambling, loot boxes, loot box, adolescents, teenagers, young people, teens, children, kids, scholars, and infants. No restrictions were applied regarding the publication date. Prior to the final data synthesis on

August 30, 2025, the search was updated, but no additional studies were identified for inclusion.

2.2 Screening process

First, titles, abstracts, and keywords were screened to identify and remove duplicates. This stage of the screening was conducted by one screening author. No secondary screening or independent validation by a second reviewer was performed. The search results were imported into the systematic review management website Rayyan (https://www.rayyan.ai/) to facilitate duplicate removal. Subsequently, the eligibility of the remaining studies was assessed. If the abstract did not provide sufficient information to determine eligibility, the full text of the article was reviewed. Studies that appeared potentially relevant were further evaluated based on predefined inclusion and exclusion criteria.

2.3 Inclusion criteria

A set of inclusion criteria was established to determine whether a study should be included in the review. Each study needed to be a peer-reviewed empirical investigation focused on loot boxes and examining their relationship with gambling in individuals under 18 years old. No language restrictions were applied.

2.4 Exclusion criteria

Studies were excluded from the review if they were published in non-peer-reviewed journals, were theoretical or qualitative in nature, were single case studies (i.e., studies with N = 1), or were review studies. However, review studies were used to identify cited articles that were not captured by electronic searches. Additionally, studies analyzing gambling unrelated to loot boxes or those that included participants over 18 years old were excluded.

2.5 Quality appraisal

The articles were evaluated by one reviewer using the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) checklist for cohort, case-control, and cross-sectional studies (combined version). The STROBE checklist establishes a set of items that should be included in articles to ensure adequate reporting of observational research.[26]

The checklist consists of 22 items divided into six sections: title, abstract, introduction, methods, results, and discussion. Of these, 18 items are common to all three study designs,

while four items (6, 12, 14, and 15) are design-specific, with variations for each design or part of the item.

To assess the quality of the articles, the adapted version of the Newcastle-Ottawa Scale (NOS) for cross-sectional studies was used.[27] The tool evaluates study quality according to the following criteria: clearly stated aim, subject selection, comparability, and outcome. Studies with scores between 13-16 were considered “high quality,” those with scores between 9-12 were classified as “moderate quality” and studies with scores of 8 or lower were classified as “low quality.”

Table 1 presents the results of the quality appraisal using the adapted Newcastle–Ottawa Scale (NOS): three studies scored 12 and two scored 11, indicating moderate quality across all 5 included studies. The articles included in this review met all applicable items in STROBE checklist based on their specific study design.

Table 1. Quality assessment of included studies

Criteria	Zendle et al., 2019.[21]	Kristiansen & Severin, 2020.[28]	Hing et al., 2022.[29]	González-Cabrera et al., 2023.[20]	Müller et al., 2025.[30]
1. Clearly Stated Aim	2	2	2	2	2
2a. Representativeness of the Sample	1	2	1	2	1
2b. Sample Size	2	1	2	1	1
2c. Non-respondents	0	1	1	0	1
2d. Ascertainment of Exposure (Risk Factor)	1	1	1	1	2
3a. Confounding Factors Control	1	1	1	1	1

3b. Comparability of Outcome Groups	1	1	1	1	1
4a. Assessment of Outcome	1	1	1	1	1
4b. Statistical Test	2	2	2	2	2
Total score	11	12	12	11	12

2.6 Data extraction

Data extraction was performed by the researcher, who collected general information about the studies and used a spreadsheet to record the following content from eligible studies: study design and setting, participant demographics, loot box engagement assessment, gambling assessment instrument, objectives, and results. Detailed findings for all articles investigating the association between loot boxes and gambling in children and adolescents are presented in Table 2.

Table 2. Data extraction

Authors	Country	Research Design and Setting	Participants	Loot box engagement assessment	Gambling assessment instrument	Objectives	Results
Søren Kristiansen & Majbritt Christine Severin (2020.[28]	Denmark	Cross-sectional survey.	N=1,137 Danish adolescents aged 12-16. The sample was composed of 575 females participants and 562 males participants.	Measured engagement over the past 12 months: (1) obtaining loot boxes (earned in-game), (2) purchasing loot boxes or keys, (3) selling loot box items. Categorized into four levels of engagement.	SOGS-RA	To explore loot box engagement patterns and their relationship to problem gambling severity.	Loot box engagement was significantly correlated with problem gambling severity, especially among those who bought or sold loot boxes.

David Zendle et al. (2019).[21]	UK	Cross-sectional survey, conducted online.	N= 1,155 adolescents aged 16-18. A total of 1020 participants described themselves as 'Male', 107, 'Female', and the remaining of the sample, as other categories	Asked how much money adolescents had spent on loot boxes in the past month, reported in dollars (converted via exchange rate). Also explored loot box features (e.g., near misses, resale possibilities, competitive advantages).	CAGI	To examine the link between loot box spending and problem gambling in adolescents.	Found a significant relationship between loot box spending and problem gambling, with a moderate to large effect size.
Nerilee Hing et al. (2022).[29]	Australia	Cross-sectional surveys using two samples collected through online panels.	N= 1,669 adolescents aged 12 to 17 , with 953 males and 716 females.	Showed images of popular loot boxes and asked: "When was the last time you…" (1) opened a free loot box, (2) paid real money, (3) used virtual currency purchased with real money. Response options: past 7 days, past 4 weeks, past 12 months, more than 12 months, never. Created a composite variable for past month use.	DSM-IV-MR-J	To assess the relationship between loot box purchasing and problem gambling in adolescents, controlling for monetary gambling.	Loot box purchasing significantly increased the risk of problem gambling, even when controlling for monetary gambling, with odds ratios ranging from 3.7 to 6.0.

González-Cabrera et al., (2023).[20]	Spain	Prospective cohort design	N= 2,23 adolescents aged 11 to 17 ,with a distribution of 1.067 boys (48.9%) and 1,146 girls (51.1%).	At T1, asked if adolescents had purchased loot boxes in the past 12 months; at T2, in the past 6 months. Also assessed: loot boxes opened in the past week, purchases in the past week, and money spent in the past month (categories: none, €1–10, €11–25, etc.).	IGDS9-SF;OGD-Q	The study aimed to 1) ascertain the stability of LB purchasing in minors and 2) investigate the associations between LB purchasing with gambling online and online gambling disorder within six months.	At baseline, 10.6% of adolescents reported online gambling and 0,6% presented a diagnosis of OGD, rising to 11.1% and 1.1%, respectively, after six months. Loot box purchasers were 2.5–3 times more likely to gamble online, with stronger effects among girls (3.5-fold risk vs. 2-fold in boys). They also had a fourfold higher risk of developing OGD, which increased to tenfold among girls.

Müller et al., (2025).[30]	Switzerland	Cross-sectional survey	N=1,005 adolescents (aged 12–17, mean = 13.7 years). 47.5% female, 50.5% male, 2.1% non-binary.	School survey; after defining loot boxes, adolescents were asked about loot box use, frequency of purchase, and amounts spent. Analyses linked LB use to gaming problems and online gambling.	RLBI;GASA; OGD-Q	To examine the prevalence of loot box use among Swiss adolescents and analyze its association with problematic video game use and participation in online gambling.	Loot box use was associated with problematic gaming and online gambling, increasing the risk of problematic gaming more than threefold (RR = 3.3, 95% CI 2.0–5.4) and nearly doubling the risk of online gambling participation (RR = 1.8, 95% CI 1.0–2.9). Only one participant met criteria for online gambling disorder.

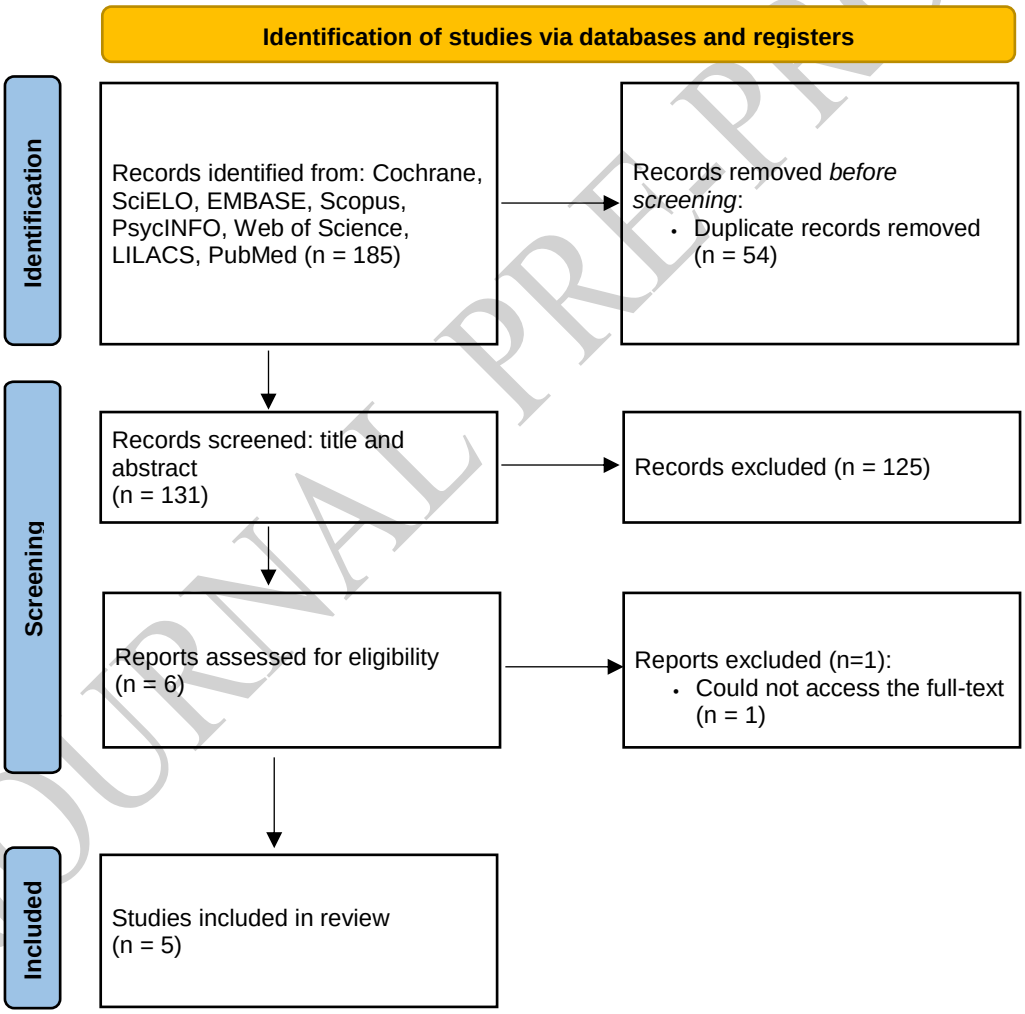
Table 2. Characteristics of studies examining loot-box (LB) engagement and gambling outcomes in adolescents. Columns report authors, country, research design/setting, participants, LB engagement assessment, gambling assessment instrument, objectives, and main results for each study included in the review (Denmark, UK, Australia, Spain, Switzerland). Abbreviations: LBs = loot boxes; RLBI = Risky Loot Box Index; GASA = Game Addiction Scale for Adolescents; OGD-Q = Online Gambling Disorder Questionnaire; CAGI = Canadian Adolescent Gambling Inventory; DSM-IV-MR-J = Diagnostic and Statistical Manual-IV Multiple Response-Juvenile; IGDS9-SF = Internet Gaming Disorder Scale–Short Form; OR = odds ratio; RR = relative risk; CI = confidence interval; T1 = past 12 months; T2 = past 6 months.

3 RESULTS

3.1 Selection process

The initial searches for the literature review identified 185 articles. After removing duplicates (n = 54), 131 unique entries remained for screening. Title and abstract screening led to the exclusion of 125 articles, leaving 6 articles for full-text review. Only empirical, peer-reviewed studies were eligible for inclusion. One study[31] was excluded because its full text was unavailable. In total, five studies were included. No additional studies were identified post-search during the data extraction phase as potential inclusions. For further details, see the PRISMA flowchart (Figure 1).

Figure 1. PRISMA Flow Diagram



3.2 Main Findings

Several studies highlight the potencial role of loot boxes engagement as a "gateway" to gambling.[21,27,30] The random-reward embedded in loot boxes resemble betting structures, potentially familiarizing adolescents with risky behaviors. Across studies, males gamers

consistently reported higher loot box use than females, suggesting that cultural and social factors may partly explain boys' greater exposure to gambling behaviors. Importantly, engagement with loot box— particularly through buying or selling items rather than acquiring them for free— was strongly associated with elevated risk of gambling-related problems.

One study,[29] noted for its rigorous control confounding variables such as monetary gambling participation, demonstrated that loot box engagement independently increased the odds of gambling problems among adolescents by 3.7 to 6 times. This investigation combined mixes recruitment methods (advertisements and Qualtrics) and applied Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Multiple Response, Juvenile version (DSM-IV-MR-J) as a screening tool, strengthening the validity of the findings. In contrast, a Swiss study[30] reported a statistically significant but modest association between loot box use and online gambling. Despite the legal prohibition of online gambling for minors in Switzerland, adolescents still accessed these activities, underscoring shortcomings in youth protection policies.

The studies reviewed employed diverse assessment instruments according tailored to their aims and contexts. The Risky Loot Box Index (RLBI) quantified the intensity and risk of loot box engagement, whereas the Online Gambling Disorder Questionnaire (OGD-Q) assessed the severity of online gambling among adolescents.[30,29] Other investigations relied on widely validated instruments for assessment of problematic gambling including the Canadian Adolescent Gambling Inventory (CAGI), [21] the DSM-IV-MR-J[29] and the South Oaks Gambling Screen – Revised for Adolescents (SOGS-RA).[28] The Use of multiple validated instruments enhances reliability but also introduces variability in the operationalization of gambling-related harm.

Across countries, boys generally exhibit higher prevalence of loot box purchasing and gambling involvement. In Denmark, male engagement was significantly greater and correlated with higher problem gambling severity.[27] In Spain, boys more frequently purchased loot boxes and participated in online gambling overall; however, longitudinal analyses indicated that prior loot box purchases predicted subsequent online gambling disorder (OGD) and internet gaming disorder (IGD) more strongly for girls.[20] In Switzerland, engagement widespread among both sexes, with socioeconomic factors (e.g., school level) emerging as more salient moderators.[30] In Australia, boys were more likely to purchase loot boxes, though the association with gambling problems persisted after adjusting for sex.[29] Finally, UK data also documented greater male spending on loot boxes, while consistently reinforcing the link between loot box engagement and gambling problem severity.[21]

4 DISCUSSION

Although the current evidence base remains limited, the studies included in this review converge in a consistent direction: engagement with loot boxes is reliably associated with gambling behaviors among children and adolescents. The random reward mechanics present in loot boxes, which resemble those found in traditional gambling practices, position this feature as a potential risk factor for early exposure to risk-taking behaviors. Across studies, adolescentes engaging with loot boxes demonstrated behavioral patterns similar to those observed in individuals with gambling-related problems.

The association appears particularly pronounced when financial transactions are involved, underscoring loot box engagement as a potentially harmful factor for youth mental health. This finding illustrate how environmental and social context shape adolescents 'digital behavior, highlighting the need for preventive strategies and policies that address both direct and indirect risk pathways.

Sex differences appear primarily in exposure: boys generally report higher rates of loot box purchasing and gambling participation. However, the magnitude of the association between loot box engagement and gambling-related outcomes varies by sex across studies**.** Taken together, these findings are complementary rather than contradictory: boys tend to be more exposed, whereas girls who do engage may show equal or greater vulnerability.

Children and adolescents remain underrepresented in the literatura, as most studies focus on adult samples. This review, therefore, advances knowledge on the early impact of gambling-like digital practices in a particularly vulnerable developmental stage, marked by heightened neuropsychological susceptibility.

The implications of these findings are substantial for clinical practice, education, and public policy. The consistent association between loot boxes use and gambling among youth underscores the need for early intervention strategies, targeted regulation of digital game content, digital literacy initiative for parents and caregivers, and the systematic screening in school and child and adolescent mental health services.

In this context, jurisdictions and gaming platforms should implement a comprehensive package of youth-safeguard and consumer-protection measures. These may include mandatory disclosure of loot-box probabilities, spending caps, prohibition on sales to minors, robust age verification systems, transparent real-money pricing, default parental controls with expenditure tracking, restrictions on near-miss and pay-to-win mechanisms, and simplified refund mechanisms for unauthorized minor purchases.

Finally, future research should adopt longitudinal methodologies, standardized assessment instruments, and representative samples to better understand the causal relationship between loot boxes use and the development of gambling behaviors. It is also essential to explore protective and vulnerability factors, as well as aspects such as the sources of money used for these purchases and how adolescents gain access to such resources, in order to support the development of more effective and personalized preventive strategies.

5 LIMITATIONS

The principal limitation is that the included studies are observational; they are suited to estimating prevalence and exploring associations, but they do not establish temporal ordering and therefore cannot support causal inference.

Another relevant constraint is the variability in measurement instruments across studies, such as the CAGI,[21] DSM-IV-MR-J,[29] SOGS-RA[28,] IGDS9-SF, OGD-Q,[20] RLBI and GASA.[30] This heterogeneity complicates direct comparisons, as the choice of instrument may influence the assessment of gambling problem severity across populations. Furthermore, no studies were identified that examined the relationship between loot boxes and gambling among children younger than 12 years old, leaving a significant gap in understanding early exposure effects.

Gender differences and cultural factors were not explored in depth, although all studies indicate a predominance of males in loot box use. Without a detailed analysis of social and cultural influences, it is challenging to fully understand the reasons behind these differences between boys and girls. Additionally, some samples were self-selected, where adolescents more engaged in gaming and loot boxes may have been more likely to participate, limiting the generalizability of findings.[28]

6 CONCLUSION

Thus the review indicates a clear association between loot box use and gambling in adolescents. The random reward mechanics of loot boxes, which resemble betting practices, may function as a "gateway" to gambling, familiarizing adolescents with risky behaviors. A higher prevalence of engagement was observed among boys, suggesting that gender may shape patterns of exposure to gambling-related risks.

These findings support the implementation of age-based access restrictions and clear risk disclosures to limit adolescent exposure to loot boxes, alongside targeted education for young people and caregivers and systematic monitoring of use. Future research should

move beyond cross-sectional designs by adopting longitudinal and experimental approaches—for exemple, testing randomized probability disclosures or spending-limit features— while employing harmonized measures and cross-cultural samples to strengthen generalizability and clarify causality. In summary, loot boxes function as gambling-like mechanisms associated with indicators of problematic gambling in adolescents. Regulators, educators, and clinicians should recognize them as a public-health concern and act proactively to mitigate their risks.

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