

LOOT BOXES – GAMBLING-LIKE MECHANISMS HIDDEN IN DIGITAL GAMES. A NARRATIVE REVIEW OF PSYCHOLOGICAL PROCESSES, ADDICTION RISK, AND REGULATION

LOOT BOXY – MECHANIZMY ZBLIŻONE DO HAZARDU UKRYTE W GRACH CYFROWYCH. NARRACYJNY PRZEGŁĄD PROCESÓW PSYCHOLOGICZNYCH, RYZYKA UZALEŻNIENIA I REGULACJI PRAWNYCH

Robert Jarosław Modrzyński ^{A-G}

Department of Clinical Psychology and Neuropsychology, Maria Curie-Skłodowska University, Poland
Katedra Psychologii Klinicznej i Neuropsychologii, Uniwersytet Marii Curie-Skłodowskiej, Polska

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Abstract: Loot boxes have become a common monetisation strategy in digital games. The aim of this paper is to review how they relate to gambling-like mechanisms, addiction risk, and regulation. **Material and methods:** The paper presents a narrative integrative review of empirical studies and institutional reports on loot boxes. The author conducted targeted searches in PsycINFO, PubMed, Scopus, and Web of Science and screened selected reports and legal analyses using predefined inclusion criteria.

Results: The review shows that loot boxes reproduce key mechanisms identified in gambling research, including variable-ratio reinforcement, near-miss effects, and cognitive distortions, and that spending on loot boxes is significantly associated with problem gambling and, to a lesser extent, problematic gaming, especially among adolescents.

Conclusions: Loot boxes operate in a legal “grey area” in Poland and may contribute to addiction-like behavioural patterns in vulnerable players, which supports the need to refine regulatory and preventive frameworks.

Keywords: loot boxes, gambling, problematic gaming, cognitive distortions, adolescents, regulation

Streszczenie: Loot boxy stały się powszechnym sposobem monetyzacji gier cyfrowych. Celem artykułu jest przegląd ich związków z mechanizmami zbliżonymi do hazardu, ryzykiem uzależnienia oraz regulacjami prawnymi.

Materiał i metody: Artykuł ma charakter narracyjnego, integrującego przegląd badań empirycznych i dokumentów instytucjonalnych. Autor przeprowadził ukierunkowane wyszukiwanie w bazach PsycINFO, PubMed, Scopus i Web of Science oraz analizę wybranych raportów i opracowań prawnych, stosując z góry określone kryteria włączenia.

Wyniki: Przegląd pokazuje, że loot boxy odtwarzają kluczowe mechanizmy znane z badań nad hazardem (wzmocnienia o zmiennym stosunku, efekt „prawie wygranej”, zniekształcenia poznawcze) i że wydatki na loot boxy są istotnie powiązane z problemowym hazardem oraz – w mniejszym stopniu – problemowym graniem, zwłaszcza u młodzieży.

Wnioski: W Polsce loot boxy funkcjonują w prawnej „szarej strefie” i mogą współtworzyć wzorce zachowania o charakterze nałogowym u osób wrażliwych, co uzasadnia potrzebę doprecyzowania regulacji i działań profilaktycznych.

Słowa kluczowe: loot boxy, hazard, problemowe granie, zniekształcenia poznawcze, młodzież, regulacje

Adres korespondencyjny: Robert Jarosław Modrzyński, Katedra Psychologii Klinicznej i Neuropsychologii, Uniwersytet Marii Curie-Skłodowskiej, ul. Głęboka 45, 20-612 Lublin, Polska; email: modrzynski.robert@gmail.com ORCID: 0000-0002-5571-9894

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Introduction

In today's computer and mobile games, loot boxes have become a common way of monetising player engagement. They are usually defined as virtual containers that can be opened for a fee (real money or in-game currency previously purchased with real money), providing a randomised reward of uncertain value. From the player's perspective, loot boxes are highly engaging. They combine the excitement of chance, audiovisual stimulation, and the hope of obtaining rare items that can increase one's status or in-game advantage (Kristiansen, Severin, 2020; Czerska, Majerska, 2023). The outcome is uncertain, the timing of "wins" is irregular, and the next purchase always offers a renewed hope of something exceptional, which can drive repeated spending.

Importantly, loot boxes are not just an additional cosmetic feature. They embed gambling-like mechanics directly into games that are often marketed as entertainment for children and adolescents. A growing body of research shows that spending on loot boxes is associated with problem gambling, problematic gaming, and other indicators of risky behaviour (Zendle et al., 2020; Garea et al., 2021; Hing et al., 2022). These risks are particularly salient among younger players, who are still developing self-control and financial decision-making skills.

The aim of this article is to provide a narrative, integrative review of empirical research and policy documents on loot boxes, with a particular focus on: (a) the psychological mechanisms underlying engagement with loot boxes, (b) the association between loot box use and indicators of addiction-like behaviour in different age groups, and (c) current regulatory debates, with special attention to the situation in Poland.

Method – narrative integrative review

Type of review

The present paper is a narrative integrative review, not a systematic review or meta-analysis. Its goal is to synthesise key strands of evidence and theory relevant to clinical and policy questions, rather than to exhaustively cover all available publications or provide a quantitative meta-analysis of effect sizes. The author focuses on studies that illuminate psychological processes, risk factors, and regulatory dilemmas related to loot boxes.

Search strategy and inclusion criteria

Between January and March 2025 the author conducted targeted searches in the following databases: PsycINFO, PubMed, Scopus, and Web of Science. The searches used combinations of keywords such as loot box, loot boxes, random reward, microtransactions, gambling, problem gambling, gaming disorder, addiction, cognitive biases, near miss, and regulation. The search was limited to publications in English and, for the Polish context, to Polish-language reports and legal analyses.

In addition, the author manually screened: (1) references in key empirical and review papers, (2) reports of public institutions and non-governmental organisations (e.g. national reports on loot box use, industry statistics), and (3) policy and legal analyses concerning the regulation of loot boxes.

Studies and documents were included when they met the following criteria: (1) empirical peer-reviewed articles, systematic reviews, meta-analyses or official reports, (2) a clear focus on loot boxes or closely related random-reward mechanisms in digital games, (3) quantitative or mixed-methods data on prevalence and patterns of loot box use, associations with gambling, gaming or

other psychological outcomes, structural and psychological mechanisms underlying engagement, or regulatory frameworks and legal classifications; and (4) participants being children, adolescents, and / or adults (community or clinical samples).

Opinion pieces without empirical data and papers focusing solely on other forms of monetisation (e.g. non-random cosmetic microtransactions) were excluded unless loot boxes were explicitly analysed as a separate mechanism.

Selection and synthesis

The literature on loot boxes is expanding rapidly. Rather than enumerating exact counts of all screened records, the author concentrated on: (1) longitudinal and experimental studies that help to clarify causal mechanisms (e.g. González-Cabrera et al., 2023; Spicer et al., 2022), (2) larger cross-sectional surveys and representative samples, (3) meta-analyses and systematic reviews in adjacent areas (e.g. near-miss effects in gambling, Barton et al., 2017; Pisklak et al., 2020), and (4) key reports and studies concerning Poland and neighbouring countries.

The findings are presented thematically: first the author describes the structural and psychological mechanisms that make loot boxes similar to gambling, then reviews evidence on their links with gambling and gaming disorders across age groups, and finally discusses risk factors and regulatory responses.

Guiding research questions

The review is organised around three guiding questions:

1. Which structural features and psychological processes make engagement with loot boxes similar to gambling?
2. How is loot box use associated with problem gambling, problematic gaming and related outcomes among children, adolescents, and adults?
3. Which groups appear most vulnerable, and how do current legal frameworks – particularly in Poland – address the risks associated with loot boxes?

Loot boxes worldwide – from novelty to everyday practice

Loot boxes have evolved from a niche mechanic to a central element of the contemporary games business model. Industry estimates suggest that random-reward microtransactions, including loot boxes, generate billions of dollars in annual revenue and are a major source of profit for many publishers (Entertainment Software Association, 2022). Large-scale surveys indicate that a substantial proportion of players regularly encounter or purchase loot boxes in popular franchises, including titles aimed at adolescents.

From a design perspective, loot boxes “gamify” spending: they combine the promise of rare rewards with visually attractive interfaces, countdowns, and animations that emphasise wins and downplay losses. Unlike traditional gambling, loot boxes are embedded in entertainment products, often without age restrictions parallel to those imposed on casinos or betting. This raises questions about whether they may function as an early form of exposure to gambling-like experiences.

Loot boxes in Poland – a developing concern

In Poland, loot boxes have also become increasingly common, although systematic national monitoring is still limited. Survey and report data suggest that a notable proportion of Polish gamers – including adolescents – have purchased loot boxes or similar mechanisms at least once, and a smaller group engages in such spending frequently (Lelonek-Kuleta et al., 2020). Expert analyses highlight that Polish children and adolescents may be particularly exposed due to high popularity of online and mobile games, limited financial literacy, and relatively weak parental awareness of loot boxes as a potential risk factor (Czerska, Majerska, 2023; Lelonek-Kuleta et al., 2020).

Recent psychometric work has also improved measurement tools in Poland. The Risky Loot Box Index has been adapted and validated in Polish samples, demonstrating good reliability and gender / age invariance (Cudo, Lelonek-Kuleta, Bartczuk, 2024). This facilitates future large-scale studies on patterns of engagement with loot boxes and their relationship to gambling-related cognitions and behaviours.

Overall, the available Polish data, though still fragmentary, converge with international findings: for a minority of players, loot box use is frequent, emotionally charged, and associated with elevated indicators of risky or problematic behaviour.

Controversies surrounding loot boxes

The implementation of loot boxes in games has sparked controversy in at least three areas: structural similarity to gambling, monetisation practices, and transparency.

From a structural perspective, loot boxes share key features with gambling: players stake money on an outcome determined by chance, receive intermittent rewards of variable value, and can sometimes cash out or trade items in secondary markets (Zendle et al., 2020; Kristiansen, Severin, 2020). When loot boxes provide in-game advantages in competitive modes, this further blurs the boundary between entertainment and high-stakes play.

Monetisation practices add another layer of concern. Games may encourage players to purchase “bundles” of loot boxes, provide limited-time offers, or integrate loot boxes into progression systems in ways that make play significantly more difficult without paid random rewards. For young players, these practices may be hard to recognise as commercial strategies rather than neutral features of gameplay.

Finally, transparency is often limited. Although some jurisdictions require disclosure of probabilities, information is usually buried in menus or websites and may be incomprehensible to younger users. Many games do not clearly present the odds of obtaining rare items at all, leaving players with subjective impressions based on salient wins seen in their own play or on streaming platforms.

Psychological mechanisms underlying engagement with loot boxes – when play stops being just a game

Loot boxes engage a cluster of psychological mechanisms that have long been studied in gambling research, including reinforcement schedules, near-miss effects, cognitive distortions, and the impact of audiovisual cues and social context.

Variable reinforcement and near-miss effects

A central mechanism is the variable ratio schedule of reinforcement: players do not receive valuable rewards every time they open a loot box, but intermittent high-value outcomes are powerful in maintaining behaviour. Behavioural and neuroimaging studies in gambling show that such schedules produce high response rates and persistent play, even when the expected value is negative (Kahneman, Tversky, 1979; Clark et al., 2009).

Closely related are near-miss events – outcomes that are technically losses but resemble wins (for example, two rare items visible in the animation but not awarded). In slot machines, near misses have been shown to increase physiological arousal, frustration, and the urge to continue gambling, and to recruit brain regions associated with reward processing (Reid, 1986; Dixon et al., 2012; Clark et al., 2009). Loot boxes replicate these dynamics through animations that slow down, highlight “almost obtained” rewards, or display rare items in the reel even when they are not granted.

Experimental and correlational studies suggest that these mechanisms are also active in loot boxes. Players report strong emotional reactions to “almost winning” rare items, and those who experience such events more intensely tend to engage in more frequent loot box purchasing and show higher scores on measures of problem gambling and gaming (Garea et al., 2023; Macey, Hamari, 2019).

Cognitive biases and distorted thinking

Engagement with loot boxes is also shaped by cognitive biases known from gambling research. Rather than saying that “loot boxes use cognitive errors”, it is more precise to state that the design of loot boxes evokes and amplifies cognitive distortions in players.

One of the most common distortions is the illusion of control – the belief that one’s skill, rituals, or “luck” can influence outcomes that are, in fact, random. This is visible when players are convinced that opening loot boxes at specific times, using particular combinations of actions, or following influencer “rituals” increases their chances of obtaining rare items. Similar patterns have been observed in gamblers who believe they can influence slot machines or lotteries.

Another key bias is the sunk cost effect. Once players have invested time and money into loot boxes, it becomes harder to stop, even when further purchases are unlikely to be rational. The feeling that “the next box might finally pay off” encourages continued spending, especially after sequences of losses. This pattern mirrors gambling behaviour, where chasing losses is a well-documented risk factor for disorder.

The availability heuristic also plays a role. Players overestimate the probability of rare wins because they are highly memorable and frequently showcased in social media, influencer content, or in-game notifications (“Your friend just unpacked a legendary item!”). At the same time, the many ordinary or disappointing outcomes are less salient and rarely shared. As a result, subjective estimates of success diverge from actual probabilities.

Studies on loot boxes show that greater endorsement of gambling-related cognitive distortions is associated with higher spending on loot boxes and stronger links between loot box use and problem gambling (Brooks, Clark, 2019; Lelonek-Kuleta et al., 2020).

Audiovisual stimulation, social pressure, and collecting

Loot boxes do not rely solely on randomness and cognitive biases. They also engage sensory, social, and collecting motives.

- 1. Audiovisual stimulation.** Opening loot boxes is typically accompanied by dynamic animations, sounds, and visual effects that resemble miniature casino experiences. Wins are celebrated with bright colours and triumphant sounds, while losses fade quickly, which strengthens the emotional impact of rare rewards and invites repeated play.
- 2. Social context.** In many games, loot boxes are intertwined with social comparison. Players who obtain rare skins or powerful items can display them in multiplayer modes, streams, or social media, which may create pressure to “keep up” and not fall behind peers. Studies suggest that social motives – the desire for status, belonging, or recognition – are important drivers of spending on loot boxes, especially among younger players (Macey, Hamari, 2019; Garea et al., 2021).
- 3. Collecting motives.** Games often turn loot boxes into part of larger collections, sets, or seasonal events. The drive to complete a set or obtain a specific rare item can become a strong motivator, even when the practical utility of these items is limited. This may lead players to spend more than they originally intended, particularly when items are time-limited or perceived as “exclusive”.

Taken together, these mechanisms create an environment in which emotional and motivational processes can overshadow rational evaluation of costs and probabilities.

Loot boxes and the risk of gambling and gaming disorders – what does the research say?

A large body of cross-sectional research consistently shows a positive association between spending on loot boxes and indicators of problem gambling, with effect sizes that are clinically meaningful (Zendle et al., 2020; Garea et al., 2021). Meta-analytic findings suggest that this link is robust across different countries, measurement tools, and age groups.

Evidence from adults and mixed-age samples

In representative samples of young adults and general populations, higher loot box spending is associated with higher scores on problem gambling scales, even after controlling for overall gambling involvement (Brooks, Clark, 2019; Kristiansen, Severin, 2020). Some studies also report associations with problematic gaming, although these links are often weaker and may be mediated by gambling-related variables (Garea et al., 2021).

Importantly, the association between loot box spending and problem gambling appears to hold regardless of specific design features such as cash-out options or pay-to-win advantages (Zendle et al., 2020). This suggests that the mere combination of money, chance, and randomised rewards may be sufficient to create risk for vulnerable individuals.

Evidence from children and adolescents

The picture is particularly concerning in adolescent samples. Longitudinal and cross-sectional studies indicate that adolescents who purchase loot boxes are more likely to engage in gambling and to display symptoms of gambling-related problems over time (Hing et al., 2022; González-Cabrera et al., 2023; Ide et al., 2021). In some analyses, the strength of the association between loot box spending and problem gambling is higher in minors than in adults, which may reflect developmental vulnerabilities in self-control, emotion regulation, and risk evaluation.

Prospective research with adolescents shows that loot box purchasing is relatively stable over several months, and that it predicts later involvement in online gambling, even when initial

gambling behaviour is taken into account (González-Cabrera et al., 2023). At the same time, not all adolescents who buy loot boxes develop clinically significant gambling or gaming disorders. Rather, loot boxes appear to contribute to a pattern of behaviour characterised by preoccupation with rewards, increasing time and money spent, difficulties in cutting down despite negative consequences, and conflicts with school or family – a pattern that overlaps with diagnostic criteria for gambling disorder and gaming disorder.

Risk factors – who is more vulnerable?

Not every player who opens loot boxes develops problems. Research points to several risk factors that increase vulnerability:

- 1. Age and developmental stage.** Younger players, especially adolescents, have less experience with financial decisions and are more sensitive to peer influence. They may also find it harder to recognise commercial strategies in games and to differentiate between skill and chance.
- 2. Impulsivity and compulsive traits.** Higher levels of impulsivity, sensation-seeking, and obsessive-compulsive tendencies are associated with more frequent loot box purchasing and stronger links with problem gambling (Garea et al., 2021). For some individuals, opening loot boxes becomes a repetitive behaviour that is difficult to control.
- 3. Motivations and coping style.** Players who use loot boxes to regulate emotions (e.g. to escape stress, boredom or negative mood) or to gain social status appear more vulnerable than those who spend primarily for curiosity or occasional fun. Emotion-driven motives resemble coping motives in gambling and are associated with more severe problems.
- 4. Contextual factors.** Easy access to payment methods, lack of parental monitoring, and exposure to streamer or influencer content that normalises heavy spending may create an environment that reinforces risky play patterns. For adolescents who already experiment with gambling, loot boxes may become part of a broader portfolio of risky behaviours.

When these factors co-occur, frequent loot box use can contribute to the development of addiction-like patterns of behaviour: preoccupation with openings and rewards, tolerance (needing more purchases to achieve the same excitement), loss of control, and continuation despite conflicts with family, school or finances.

The legal situation in Poland – a grey area and growing controversy

In Poland, the legal status of loot boxes remains ambiguous. Current gambling regulations were designed with traditional games of chance in mind (e.g. lotteries, betting, slot machines) and do not explicitly address randomised monetisation mechanisms in digital games. As a result, most loot boxes are not formally classified as gambling as long as their contents cannot be easily exchanged for real-world money.

This position has been criticised by experts and people who support children's rights. They say that rules should be based on how much it resembles gambling, not on how much people actually win. They say that many loot boxes involve real money, chance outcomes and gambling-like patterns of reinforcement. They also point out that these loot boxes are often accessible to under-18s without effective age verification.

Public debate has intensified in recent years. Media reports describe loot boxes as a "casino for children" and question the lack of protective measures, such as spending limits, clear probability disclosures, or age-based restrictions. Ombudsman and expert bodies have called on the Ministry of

Finance to consider legislative changes, but so far no comprehensive regulation has been introduced. At the same time, Polish players are exposed to games published in jurisdictions where loot boxes have already been restricted or banned, such as Belgium and the Netherlands.

Internationally, regulatory approaches vary. Some countries classify certain loot boxes as gambling when they allow cash-out or trading, others focus on transparency and consumer protection, and a growing number of public health experts argue for treating loot boxes as a continuum of gambling-like products, calling for harmonised regulation (Xiao et al., 2022). Against this backdrop, the Polish situation can be described as a grey area in which commercial practices develop faster than legal frameworks.

Conclusion

Loot boxes have become a widespread and highly profitable feature of digital games. By combining variable reinforcement, near-miss effects, cognitive distortions, intense audiovisual stimulation, and social and collecting motives, they create experiences that are psychologically similar to gambling, even when they are not formally labelled as such. For a substantial minority of players, particularly adolescents and young adults with additional risk factors, engagement with loot boxes is associated with elevated scores on measures of problem gambling, problematic gaming, and related psychosocial difficulties.

The evidence available to date does not justify alarmist claims that all loot box use leads to addiction. However, it supports a cautious conclusion: loot boxes may contribute to the development and maintenance of addiction-like patterns of behaviour in vulnerable individuals, and this risk is greater when loot boxes involve real money, are embedded in highly engaging social and competitive contexts, and are used as a way of coping with negative emotions.

In Poland, as in many countries, legal frameworks have not fully caught up with these findings. The lack of clear regulation leaves parents, educators, clinicians, and young players without adequate guidance or protection. Important next steps include strengthening monitoring, including questions about loot boxes in surveys on gambling and gaming, and supporting longitudinal research – including the use of proven tools such as the Polish adaptation of the Risky Loot Box Index.

From a public health perspective, the debate on loot boxes is not only about classifying a particular game mechanic as “gambling” or “not gambling”. It is about recognising how modern digital products can harness psychological mechanisms in ways that blur the boundary between entertainment and high-risk behaviour, and about designing regulations and educational interventions that protect the most vulnerable without stigmatising ordinary play.

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