



# Normalization of Chance-Based Mechanisms in Mobile Games for Children: A Descriptive Analysis

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## Abstract

Games for mobiles present strategies to monetize not only from selling a title but from financial exchanges that take place in the game. Those microtransactions motivate players to purchase random or surprise items (known as loot boxes) to customize game features or to overcome narrative obstacles necessary to progress to new levels. Researchers associate the practice with gambling if completing the transaction does not mean the acquisition of an item but the chance to receive it. This research quantified gambling-like features in games available for free, classified by Apple's marketplace as suitable for children from 4 to 8 years old, and from the top-downloaded list. The findings reveal normalization traces of chance-based mechanisms in most of the games. According to the research literature, early exposure to such features may result in problem gambling in adult life. This paper concluded that legal changes and more information provided by the marketplaces are needed to raise awareness of gambling-like practices in mobile games.

**Keywords** Chance-based games · Gambling normalization · Mobile games · Loot box · Games for children

## Introduction

Mobile games monetization techniques rely on selling surprise, random or not fully disclosed virtual items (loot boxes) that may provide the player with game advantages or customization possibilities. Such chance-based mechanisms have been associated with “disordered gaming” (Zendle, 2020, p. 4), generating debates about products that offer to or demand from the player financial exchange for the chance to receive a product. Recent research reveals concerns about the risk of addiction due to the player's exposure to chance mechanisms, especially among young audiences, sometimes labeling the in-game loot box commercialization as “predatory” (Close & Lloyd, 2021). The spread of gambling-like approaches in games in which chance mechanism is not the main advertised purpose may lead to its normalization, with the future impacts on gamers' behavior unknown.

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Despite the evidence connecting loot boxes with gambling (Hall et al., 2021; Zendle et al., 2019), there are only a few studies measuring or estimating children's access and exposure to digital games that promote some sort of chance-based feature (Zendle, 2020). Mobile application marketplaces (e.g., Apple's App Store, which is the one used for this research) offer lists of the most downloaded products at the time they are accessed. For games, they present free or paid options with a brief description and age-playing suitability, which is based on app content following the distributor's rating systems. In Australia, the country of this research, those systems also consider gambling according to their own criteria. Apple has its Apple Rating (Age Ratings, n.d.) and Google uses local classification (Information for families, n.d.), not necessarily associating them with any chance-based mechanism.

Observing the video game industry, Zendle et al. (2019) mentioned that there is no legal requirement for producers to inform new users of loot box content. Legislation has failed to make producers reveal the presence of gambling-like mechanisms within games. Countries deal with the matter without a consensus on whether they should label loot boxes as gambling, each dealing with the matter differently. In Australia, irrespective of the platform (consoles, desktops, or mobile phones), no classification describes their presence within video games (which will change in September 2024 with new guidelines for ratings; it is not clear if they include mobile games). Similarly to what Cartwright and Hyde (2022) conclude, legislation has dealt insufficiently with the matter and its potential harms.

The research of Rockloff et al. (2020), which demonstrated that most of the bestselling video games for adolescents and young adults included loot boxes, prompted this investigation of free mobile games listed as the top downloaded ones to detect chance-based mechanics or traces of it. The objective was to quantify the in-game gambling-like phenomenon featured in products ranked as suitable for children from 4 to 8 years old, considering the availability and how normalization practices manifest within the games.

Playing the games delineated categories of potential gambling-like mechanisms, aligned with the concepts described by the literature. The categories aid reflection on if and how mobile games invite the players to assume risks (even if the loss or gain is only of a digital and symbolic item that may have no value outside the game narrative) or perform actions in exchange for a chance of being rewarded with a desired item or a pack of (previously) unknown items.

This text hopes to contribute to the understanding and regulation of the potential normalization of gambling-like content targeted at children, especially among distributing marketplaces such as mobile app stores, which (as in Australia until recently) may remain untouched by legislation.

## Foundation

While playing the top-200 games listed on Apple's marketplace, it was possible to identify recurrent aspects that guided the search for literature directly or indirectly related to video game chance-based mechanisms and mobile application monetization.

The research looked for free mobile games for children containing traces of conditional undisclosed rewards by chance, listed as the most downloaded ones by the App Store, and labelled (rated) according to its self-regulation criteria.

By using these features as key concepts, related literature covering them was selected, which review assisted to break the aim into individual topics, elucidating their association

with normalization of gambling-like practices within video games and strategies to monetize.

Focusing on the products for mobiles and targeted at children, this research raised the following subjects discussed by the selected works:

- Smartphones as everyday devices
- Freemium and free games
- Microtransactions
- Chance-based items
- Games for children
- Normalization and regulation
- Monetization

Even though they are interdependent, it is possible to ponder each subject's role while drawing a picture that helps to understand the results and provide information relevant to the discussion.

### **Smartphones as Everyday Devices**

In recent years, mobile phones have become a common accessory for performing different tasks (Armstrong et al., 2018) according to the user's needs and the application's (app's) premises. Marketplaces (notably Apple's App Store and Google Play) mediate the acquisition of these accessories. With the numerous options available on mobiles, users operate their devices several times a day (James, O'Malley, Tunney, 2016). This intense connection may lead to problematic behaviors, as some habits that comply with regulations outside the digital world present facilitated access using the mobile conveniences. One of these behaviors is gambling (King & Delfabbro, 2016; James, O'Malley, Tunney, 2016).

In many countries, gambling is restricted, or not permitted. In either case, compliance relies on legislation that dictates what players can or cannot access and imposes limits to the practice. Online gambling, on the other hand, is "abundantly available" (King & Delfabbro, 2016, p. 199) as a feature of console, desktop, and mobile games, not only by betting, but also within narratives that offer the players gambling-like situations, with or without money to access the chance-based experience. To increase the reach of such features, specifically on mobile games, it is also possible to find them in products offered for free.

### **Freemium and Free Games**

As digital products shifted from physical copies to downloaded ones, the production and distribution costs changed, allowing novel monetization possibilities. One of them is replacing the sale of a tangible product with the offer of free software, for which additional content resources or services are available upon payment. This approach is the freemium model, which lets users have an app up to a certain point, at which the limitations halt the experience unless they pay to unlock the content (Hamari et al., 2020).

Payment may require not only the user's money, but also other forms of exchange, such as watching an ad, performing a task, publicly declaring the usage on social media, or using in-app currency. Even if indirectly, freemium products normally try to generate some sort of revenue. The freemium model is well known in games. Google's and Apple's marketplaces have dedicated lists of the games advertised as free. Some declare in-app

purchases, delivering information about the potential exchange of money within the app. Other approaches are not so clear until the user starts playing the downloaded title. The purpose is to generate higher profits with the in-app exchangeable features than makers would have if they sold the product fully unlocked (Seufert, 2014). It is a complex equation that usually demands users to engage with the content and somehow feel they are rewarded by it.

Video games have been trying different monetization approaches, including “untested” ones (Perks, 2019, pp. 1009–1010). Davidovici-Nora (2013, p. 1) explains that the strategy to offer a “Free-to-Play (F2P)” game is under the argument there is no charge for it. What players may perceive as beneficial for not requiring financial exchange can remove “the cap on how much a given game will cost a player” (Etchells et al., 2022, p. 2).

From the freemium perspective, mobile products can also explore inconveniences (e.g., ads and secondary tasks players cannot skip) or “artificial limitations” (Hamari et al., 2020, p. 2) that narratives may display as challenges.

Attempting to make players somehow pay for the free downloaded content, they may present difficult or impossible situations to overcome without some sort of payment. Those are the paywalls (King & Delfabbro, 2018; Perks, 2019), which can appear at various stages of the game, depending on how engaged with the product the players presumably already are. Those paywalls not only demand a certain condition to go further within the game, but also the possibility of satisfying it by acquiring specific items by chance (loot boxes) among unknown ones upon payment.

The player may be under the impression that only in-game currency exchange is required, even though the resources are potentially obtained by some monetized operation. Those actions characterize microtransactions (Rockloff et al., 2020), and they are also available in games for underage players (King & Delfabbro, 2016).

Exchanging and/or risking what one has for a previously undisclosed reward resemble gambling (James, O’Malley, Tunney, 2016), even if the reward may only have value within that specific game.

## Microtransactions

Microtransaction is defined as the exchange of financial value for a service or product within the digital world (Uddin, 2021). The desire to acquire an item may be mediated by in-game currency. In that case, the player must buy an amount of virtual money with real-world money and use the former to finalize the buying process.

There are other ways to obtain in-game currency, such as by logging in with a certain frequency, watching ads, overcoming certain challenges or repeating them several times, linking the game score to social media, or inviting other people to play that game. Each form gives the player a different amount, but usually the direct purchase of virtual money is the one that provides the larger sums, working to bypass tasks that serve more as inconveniences placed for monetization than to challenge skills.

Those ways of obtaining virtual currency from the game mechanics may motivate the player to acquire it using real currency, as the in-game benefits are clear. Such an understanding considers the acquisition of virtual money (or anything that has exchangeable power, e.g., tokens, tickets, and virtual diamonds, among others) also as a form of microtransaction. Operations via microtransaction do not have regulatory norms, and the only rules to follow are the ones within the game.

## Chance-Based Items

Microtransactions are not driven by a known specific item only. That kind of operation may also provide a surprise one, and/or offer the buyer the chance to get it. In that case, the game may reward the player with, or offer the chance to buy, a package containing items that will reveal its content when opened (Kristiansen & Severin, 2020), with or without the desired item.

Chance-based challenges converge gaming and gambling (Zendle, 2020; Sidloski et al., 2022). It happens in a variety of ways, from casino-like visuals to narrative tasks. The abundance of forms creates a gaming language also used by games with no microtransactions, which may help to normalize the practice. Habit is cultivated from the use of random ratio rewarding approaches (James et al., 2016) to reinforce the player's exposure to the product and its features.

Calculating how much to exchange while trying to achieve what is desired appears to be an impossible task, as the games are unlikely to display an estimation of the odds (Close & Lloyd, 2021), unless regulation demands to. The top downloaded games in Australia did not have any product disclosing the odds, irrespective of age or in-game purchase option. According to Perks (2019), producers admit that the inspiration for such surprise containers design comes from gambling machines. Conversely, the review of the literature did not find producers acknowledging that gambling machines usually operate in controlled environments and under legislated norms, at least in countries like Australia. They cannot match the availability and technology available to distributors of mobile-gambling-like titles, which only require download.

Gaming literature usually refers to the surprise containers as loot boxes. Although they can be freely given (as a reinforcement strategy or to instigate future purchases), there is a connection between them and microtransactions, which are either acquired directly or by means of in-game currency.

Among other visually compelling strategies to instigate curiosity, games display them as chests, packs of cards, and gift boxes, based on variable ratio reinforcement (and its potential to “manipulate behavior” as observed by Browne, 2020, p. 3) approaches.

There are differences between loot boxes and gambling. Firstly, the former normally provide rewards with in-game items that are linked to customization possibilities or narrative progression. There are exceptions, including cashing them out for real-world money (what the research mostly found, however, were rewards with no value outside the game boundaries, even though some may be available with real-world money). Kristiansen and Severin (2020, p. 2) consider loot boxes the “gambification of gaming”, claiming that they constitute a sort of entrapment grounded on long playing periods and continuous monetized exchange (Brooks & Clark, 2019). Secondly, such traps are unregulated and may target minors.

For those reasons, some authors consider the loot box monetization strategy to be exploitative, and the engagement with it a “cognitive distortion” (Kristiansen & Severin, 2020). The reinforced habits of opening the container can lead to problem gambling (King & Delfabbro, 2016), as the reasons for continued risking in the digital setting and out of it are similar. Brooks and Clark (2019), Perks (2019), Zendle (2020) and Cartwright and Hyde (2022) claim that risk-taking actions may be preparing players for future gambling behavior. If that is the case, even the games that do not require voluntary exchanges from players (e.g., by compulsory provision of loot boxes after completing a level) are normalizing the chance-taking habit.

## Games for Children

Zendle (2020) noted that loot boxes are not the only gambling-like mechanics within games. Even though they are the prevalent form, some samples include digital spinning wheels and slot machines displaying the potential of by-chance prizes.

Irrespective of the risk or exchange cost, these features are accessible to young players. However, game information meant to guide guardians and to protect minors from unsuitable content, such as age ratings, may (depending on the country) neither consider nor disclose the odds (Xiao et al., 2020). In Australia, users are not aware of the existence of in-game gambling-like activities within the downloaded product until they start playing, which constitutes an unregulated direct exposure of (and sometimes disguised) content. Unless guardians play the game beforehand, the message will convey to children its normalizing content without critical adult mediation.

It can be assumed that players make choices and decide not to play or self-impose limits, but is a child's agency sufficient to do that? Children are more vulnerable to the matter and less experienced than adults in dealing with social pressures and stimuli (Xiao et al., 2020), although they are perfectly able to create and maintain habits. Research has pointed out that young adults who open loot boxes are more likely to gamble (Rockloff et al., 2020). If that is true for young adults, it may also be said that games presenting loot boxes for children are defining the practice of gambling for minors. Drummond and Sauer (2018) have already claimed minors engage with loot boxes.

It is also a long-term strategy. As studies show that behaviors are stronger and repeated with random rewards (Close & Lloyd, 2021), creating the habit at an early age will reinforce it until adulthood. At that time, it is likely to be part of daily life and already normalized, interfering with the decision-making process about when to stop or when to establish time and money limits, potentially becoming problem gambling.

## Normalization and Regulation

The free offer of games with chance-based and/or unknown rewards and their facilitated access aims at social circulation (and exposure acceptance, as noted by McGee, 2020). The cues within the gameplay encourage engagement and seek to increase the gaming frequency.

The random or surprise factors are the ones normalizing the practice, based on monetization approaches that are aimed at attracting players and grooming their engagement. Some games disguise such strategies in the gameplay, revealing their presence only when the player is "psychologically committed" (King & Delfabbro, 2018, p. 1967).

Cartwright and Hyde (2022) state that the gambling-like features can be coercion, as the paywalls are placed in such a way players have little option but to face them if they wish to continue playing. For adults, it is about deciding to download another title and start again, but the decision-making process of a child requires more understanding. A player trying to overcome the paywall demanding or not real or virtual currency (or both), may not be successful at the first attempt, as some games, say the authors, require grinding, reinforcing the habit by continuously simulating gambling and exposing the player to it. King and Delfabbro (2016) describe those mechanics as creating a gateway effect.

Grooming (i.e., normalization) is based on the misperception of gambling (King & Delfabbro, 2016), which shifts any potential harm to the excitement of the surprise and

enjoyment, giving the players the sensation of earning instead of risking and losing. When creating the sensation of chance-based rewards as something additional and not exchanged for taking risks, the games associate the given rewards with gifts (cf. Perks, 2019), which help producers to argue that giveaway is not gambling, thus avoiding legislation and motivating engagement. That association defies the current legal definitions of gambling, leading to a lack of consensus on what constitutes the practice within the digital world (King & Delfabbro, 2016).

Problems with the definition and the understanding of potential practices make the balance between consumer freedom and protection hard to achieve (Xiao et al., 2020). Although there are legal definitions on what gambling is (and some of them, even if only partially, cover loot box features), decentralized interpretations (state, federal, and international levels) do not assist in the matter. Thus, definition is complex, and regulation diffuse.

In the Australian case, the current unregulated mobile games scenario favors what authors describe as the fusion between gaming and gambling, leaving open opportunities for entrapment strategies. For some countries, no consensus does not mean lack of action (Xiao et al., 2021). Some nations have been discussing video game gambling-like licenses. It has been reported that Belgium banned loot boxes (Drummond et al., 2020; Cartwright & Hyde, 2022). However, Xiao (2022) described such a measure as fruitless in practice. In addition, changing some game features will place them out of legal purview, mainly because (as Cartwright & Hyde, 2022, state) gambling laws were not made with loot boxes in mind (to which this research adds, nor the other traces of it that do not require real money exchange).

While legal systems try to establish a line of action, other regulatory approaches could manage the matter. Attempts at industry self-regulation are in place (Close & Lloyd, 2021). The marketplaces have norms for advertising, distributing, and making titles available to the public containing violence, language, and sexual depiction. However, in cases like Australia, there are no categories of chance-based mechanisms or traces of them for the displayed game information and rating. Close and Lloyd (2021) argue that parents tend to ignore self-regulated ratings, which highlights the need for education and awareness actions in addition to the information that games display.

## The Mobile Game Industry Monetization Approach

With no legal constraint or need to inform of gambling-like content, mobile games offer in-game games, paywalls, placed inconveniences, and customization possibilities alongside direct shopping for digital products or services within the narratives. This creates their metagame (characteristics and information that motivate players to improve their conditions within the game, according to Close & Lloyd, 2021) using marketing strategies to attract players while ignoring any potential harm to them.

Even though loot boxes have been connected to gambling, video game companies do not have the downside of gambling operators. Without real-money value (unless under cashing-out proceedings), game producers do not lose money with the rewards that are given, unless the player stops spending once the desired item is received (Xiao et al., 2021).

The notion of value is fragmented by the virtual currency, and the perception of the real-world costs may be inaccurate due to the mediation of the in-game currency or the diverse types of tokens that players can use for the final exchange, whether they acquire them with real money or not (Uddin, 2021). The misperception of value while under variable ratio reinforcement strategies may misguide self-imposed limits as players do not feel the risk of

their actions, and benefits seem greater than harms. As video game companies do not face restrictions to digital resources, they can increase the frequency of rewards according to how they plan to attract or retain players.

## Method and Findings

For a descriptive analysis, the research accessed the “Top Free Games” list (by selecting the “See All” option) from Apple’s mobile marketplace in Australia (under the “Games” tab) on two different dates with a one-month interval, in June and July 2022. The source for data collection was chosen after empirical observation of how parents or guardians download games for their children, and because the top games list is more accessible than the dedicated selection Apple provides with suggestions for children, which required using the search bar to find potential titles. Furthermore, the criteria the company used to suggest products were unclear.

The top list offered 200 games and changed from time to time according to the number of downloads. Different Apple devices and models were used to verify if the download source also changed the list, but when accessed at the same time there was no difference due to the equipment used. The list displayed only the game position for each of the 200-title ranked, its name, a succinct description (which was sometimes used to advertise it), a “Get” option (to download it), and an indication of the presence of any in-app purchase. Information such as users’ ratings, age classification, genre and position within the genre, developer, language, size (in megabytes), and device compatibility, were available only upon selecting the game.

The research verified each game’s age suitability. Apple’s classification had 4 labels: 4+, 9+, 12+, and 17+, with its own rating criteria. It was different from Google Play, associated with external rating systems (as Zendle et al., 2019, observed). In the case of Australia, the Australian Classification Board (ACB).

As the sample, only the games classified as 4+ were selected, of which there were 70 titles within the top 200 on the first round, and 76 on the second.

These games were played individually to identify any chance-based mechanism. Traces of gambling normalizing practices were defined as casino-like features (with potential prizes shown up front or not) and loot boxes with unknown rewards. Following Close and Lloyd (2021), if the latter’s content was known, it was not considered as linked to gambling.

Some presented such a feature only after playing them for several minutes, by achieving a minimum score, or reaching a certain level. Xiao et al. (2020) also faced long playing periods until loot boxes could be found, although using a different sample. It may indicate that some products intentionally hid such features until they had established some player engagement.

The research created categories of chance-based mechanisms as traces of them were detected while playing.

Not all the 4+ games were designed to target children; Apple’s classification indicated that this category had “no objectionable material” (Age Ratings, n.d.) for any age. Some presented challenges based on words or math. Some children in this age category are assumed to be illiterate or still learning to read and to calculate basic operations. For that reason, a filter was later created for the games understood as potentially targeting children within that age range.



## Labels

Authors have defined in-game gambling differently. For this research, the focus was not only gambling, but also the mechanics that could lead to the normalization of its practice. For that reason, any indication of unknown rewards obtained by exchanging or achieving certain points or levels were considered traces of gambling. If the game offered the player a loot box as a chance-based or not fully disclosed reward, it was labeled a normalizing gambling title.

Although the games presented different approaches, four patterns or categories were identified and assigned to the games according to the playing experience:

1. *Free chance or loot box giveaway*: Players were offered casino-like turns or digital gifts with no apparent exchange of an item from the player, but which were normally connected to a reward such as a daily login, a high score, a new level achieved, or a secret item found, or by performing an out-of-the-game action such as promoting the game by telling others on social media that the player had downloaded or been playing it.
2. *Chance reward by watching ads*: Players could win a loot box or play a casino-like machine in exchange for their time and attention watching ads, a form of monetizing the games.
3. *Direct chance purchase (virtual and real money)*: Players could pay for loot boxes or casino-like machine rounds. Such a purchase could use the in-game currency (gems, crystals, virtual coins, etc.) or real-world money. For the former, virtual currency could be acquired by watching ads, achieving scores or levels, or performing tasks. For the latter, usually a credit card was required, and prices changed according to the number of turns or the number of items within the box, or the relevance of the potential items to the gameplay.
4. *Indirect loot box purchase (real money)*: Players bought rounds or loot boxes using the in-game currency, but one of the alternatives for acquiring it was by exchanging real money for packs of virtual currency. Normally, the more in-game currency there was in the pack, the more expensive, increasing the number of opportunities to access the chance mechanisms within the game or the declared relevance of the loot box.

The categories were nonexclusive. Some titles displayed all four of them, depending on the choices made by the player.

This research did not consider the possibility of cashing out the rewards for these divisions. Additionally, categories 3 and 4 generated a single label. Future studies should separate them to better understand their individual implications.

## Results

From the 70 games classified as 4+ from the first round of playing, 69 were played. (One was removed from the App Store shortly after being listed.) Of those, 51 (73.9%) featured traces of chance-based mechanics or sub-games dedicated to them (i.e., they presented at least one of the four categories listed above).

From the 76 games classified as suitable for ages 4+ on the second round of playing, 71 were considered, as Apple removed five from the Australian store shortly after listing them. Of those, 55 (77.4%) fell under at least one of the chance-based categories. When

overlaps from both lists were eliminated, there were 111 games in total but only 105 available to play, with 82 (78.1%) having any chance-based component.

Some other features were also considered. For instance, the first round counted 55 (79.7%) with any in-game currency. In the second, there were 56 games (78.8%). Altogether (with no redundancies), there were 84 (80%) titles with in-game currency, highlighting that most of them were driven to offer the player some sense of acquisition related to money-owning and the possibility of exchanging it for some item, which could interfere with the gameplay.

The relationship of these games with money was a close one: when both lists were merged, despite being advertised as free, 86 games (81.9%) had some sort of real money exchange, reinforcing the freemium monetization techniques.

Some of the detected real-money microtransactions were aimed at purchasing full versions of the game, unlocking or skipping other levels, allowing new game attempts, removing inconveniences (ad-free), getting game hints, and/or acquiring (known or unknown) game resources. This last one was found in 51 (73.9%) games from the round 1 list and 46 (64.7%) from the round 2 list. The resources were commonly associated with the in-game currency and chance-based offers.

Despite being offered for free, 72 games (with both lists, or 68.5%) required or prompted players to spend real money to fill the gaps left by the F2P promotion, including purchase of game currency that could be exchanged for game resources. When observing in-game currency transactions obtained by playing the game (and not by real-world money), there was a similar pattern of spending purpose as the one using real money. Removing ads seemed to depend solely on real money.

The chance-based mechanisms also revealed some patterns. Although some titles included resemblance to real-world gambling practices such as flipping cards or spinning a virtual roulette wheel, most of the games used gift boxes, card packs, or chests to represent their loot boxes.

## Narrowing the List

Once the first descriptive round was completed, the research went on to classify which titles from the 4+ list were directly or indirectly targeted at that age range. Features based on specific knowledge or skills associated to older ages (such as some operations, texts as the main source of instruction, strategic thinking, visual recognition of distinct geographic locations and photorealistic interior design visualization) eliminated some games from the list (see Table 1).

This filter did not mean children would not play the excluded ones, but assumed the content was not primarily made for them. For example, some strategy games that were considered more for adults than for children, such as Chess, were not included in the second list (Table 2), although it is known that children can play them.

The procedure for labelling a product as a game for that audience proved challenging, as an 8-year-old child is expected to have had more school content than a 4-year-old, responding differently when facing written instructions and basic math. Yet, the gameplay and visual design revealed some standards, as distinct from the ones found in games for other age ratings. The ones exclusively on the second list mostly displayed more intuitive interfaces, normally with higher levels of brightness and contrast than the eliminated titles. For the gameplay, the child-driven products required little or no initial learning curve (different from Uno!, or Sudoku, where one must learn the rules

**Table 1** Selection of products directly or indirectly targeted at children from 4 to 8 years old

	Game name	(Assumed as) targeted at children
1	Fruit land & puzzle games	Yes
2	Fishdom	Yes
3	8 Ball pool—3D online Pool	No
4	Block puzzle jewel-puzzle game	Yes
5	Solo leveling: hit & run *(1)	Yes
6	Fruit shooting-ninja cut fruit	Yes
7	Pocket champs: run & race	Yes
8	Candy crush saga	Yes
9	Tetris	Yes
10	Sudoku	No
11	Super mario run	Yes
12	slither.io	Yes
13	Trivia star: trivia games quiz	No
14	Magic tiles 3: piano game	Yes
15	Two dots	Yes
16	Dream wedding	Yes
17	Bottle jump 3D	Yes
18	Logo quiz 2022: guess the logo	No
19	Shoes evolution 3D	Yes
20	Royal match	Yes
21	Angry birds 2	Yes
22	Chess—play & learn	No
23	Idle bank	Yes
24	Shopping mall 3D	Yes
25	Blob hero	Yes
26	Hay day	Yes
27	Word guess—word games	No
28	Coloring match	Yes
29	Block puzzle—brain games	Yes
30	Uno!	No
31	Snake.io—fun online slither	Yes
32	BrainGains	No
33	Sort water color puzzle	Yes
34	Dog translator—games for dog	Yes
35	BlockPuz—block puzzles games	Yes
36	Cooking madness-kitchen frenzy	Yes
37	Color switch	Yes
38	Words of wonders: crossword	No
39	Geometry dash lite	Yes
40	FIFA football	Yes
41	Mud racing	Yes
42	Word connect	No
43	Idle egg factory 3D	Yes
44	Homescapes	Yes

**Table 1** (continued)

	Game name	(Assumed as) targeted at children
45	My mini mart	Yes
46	Block puzzle—fun brain games	Yes
47	Perfect cuts	Yes
48	*Solitaire	No
49	Puzzle page—daily puzzles!	No
50	Redecor—home design makeover	No
51	Fun feud trivia: quiz games	No
52	Mad Fut 22 draft & pack opener	Yes
53	Happy clinic	Yes
54	Stack ball 3D	Yes
55	Aquarium land	Yes
56	Burnout masters	Yes
57	Galaxy attack: space shooter	Yes
58	GeoGuessr	No
59	Overcrowded: Tycoon	Yes
60	Fruit Ninja	Yes
61	Gold and goblins: idle merge	Yes
62	Rush royale—tower defense TD	Yes
63	NBA 2 K mobile basketball game	Yes
64	Truck simulator USA car games	Not available
65	Dragon city mobile	Yes
66	Little go	Yes
67	Claw games—real claw machine	Yes
68	Hotel frenzy: design makeover	Yes
69	Idle school tycoon	Yes
70	Patch master	Yes
71	Classic solitaire game 2020	Not available
72	Cube blast—match 3 Games	Not available
73	Sky force—shooting games	Yes
74	Survivor!.io	Yes
75	Hotel master: build the empire *(2)	Yes
76	Sudoku—number nonogram games	Not available
77	Township	Yes
78	Makeup kit—color mixing	Yes
79	Sudoku: sudoku puzzles	No
80	Airport master!	Yes
81	Fruit ninja 2	Yes
82	Makeup styling—makeover game	Yes
83	Tofu drifter	Yes
84	Steering wheel evolution	Yes
85	Mario kart tour	Yes
86	Boba tale	Yes
87	Mayan diamonds	No
88	Doodle jump 2	Yes

**Table 1** (continued)

	Game name	(Assumed as) targeted at children
89	Merge mansion	Yes
90	Volleyball arena	Yes
91	Gossip harbor: merge game	Yes
92	Candy crush soda saga	Yes
93	Word trip—word puzzles games	No
94	Junkyard keeper	Yes
95	PGA TOUR golf shootout	No
96	Classic solitaire—card games	No
97	Blobsbuster	Yes
98	SimCity BUIDIT	No
99	Rope and balls	Yes
100	Breaker fun 2—zombie games	Yes
101	Angry birds dream blast	Yes
102	Trivia crack	No
103	Skip-bo	No
104	Soccer super star—football	Yes
105	Dunk ball on fire—basketball	Not available
106	Car cops	No
107	Bubble pop! Game legend	Yes
108	Rocket league sideswipe	Yes
109	Crosswords jam—fun word games	No
110	Pokies: Grand Jackpot Heist!	Not available
111	Cut the Rope	Yes

\* (1) Shortly after the research, the game changed its name to Hit & Run: Solo leveling. It's rating became 9+

\* (2) Shortly after the research, the game changed its name to My Perfect Hotel. It's rating became 12+

beforehand to play accordingly), counting (with or without text) on animations instructing how to play and/or follow-through introductory tutorials, making it possible to start the game regardless of a person's previous knowledge about the themes or comprehension of any text.

They regularly presented challenges connected with a narrative and/or visually entertaining stimuli, whereas the products targeted at older audiences relied on the scores and repertoire.

Those aspects assisted the classification even when some of the mechanics of games presumably intended to different audiences were similar. For instance, both PGA Tour Golf Shootout and Angry Birds 2 had the principle to shoot an object (by calculating the impulse) at a target while displaying trajectory arcs to guide the player's decisions. However, while the latter let players find the goal and visually calculate the applied strength, PGA Tour Golf Shootout required the understanding of the distance in yards between the ball and the hole (the goal was not always visible), as more strength than needed would make the ball to continue rolling after hitting the area marked as its initial falling area. That distance was displayed in written form at the beginning of a match and before each shot,

**Table 2** Normalization, currency and purchase features found in mobile games for children from 4 to 8 years old

	Mobile game name	Traces of chance-based mechanism	In-game currency	Real money in-app purchase
1	Fruit land & puzzle games	Yes	Yes	Yes
2	Fishdom	Yes	Yes	Yes
3	Block puzzle jewel-puzzle game	No	No	No (ads only)
4	Solo leveling: hit & run	Yes	Yes	No (ads only)
5	Fruit shooting-ninja cut fruit	Yes	Yes	No (ads only)
6	Pocket champs: run & race	Yes	Yes	Yes
7	Candy crush saga	No	Yes	Yes
8	Tetris	Yes	Yes	Yes
9	Super mario run	Yes	Yes	Yes
10	slither.io	No	No	No
11	Magic tiles 3: piano Game	No	Yes	Yes
12	Two dots	Yes	Yes	Yes
13	Dream wedding	Yes	Yes	No
14	Bottle jump 3D	Yes	Yes	Yes
15	Shoes evolution 3D	Yes	Yes	Yes
16	Royal match	Yes	Yes	Yes
17	Angry birds 2	Yes	Yes	Yes
18	Idle bank	Yes	Yes	Yes
19	Shopping mall 3D	Yes	Yes	Yes
20	Blob hero	Yes	Yes	Yes
21	Hay day	No	Yes	Yes
22	Coloring match	Yes	Yes	Yes
23	Block puzzle—brain games	Yes	Yes	Yes
24	Snake.io—fun online slither	No	No	Yes
25	Sort water color puzzle	Yes	No	No (ads only)
26	Dog translator—games for dog	No	No	Yes
27	BlockPuz—block puzzles games	Yes	Yes	Yes
28	Cooking madness-kitchen frenzy	Yes	Yes	Yes
29	Color switch	Yes	Yes	Yes
30	Geometry dash lite	Yes	No	No (but links to full paid game option)
31	FIFA football	Yes	Yes	Yes
32	Mud racing	Yes	Yes	Yes
33	Idle egg factory 3D	Yes	Yes	Yes
34	Homescapes	Yes	Yes	Yes
35	My mini mart	No	Yes	Yes
36	Block puzzle—fun brain games	Yes	Yes	Yes
37	Perfect cuts	Yes	Yes	No
38	Mad fut 22 draft & pack opener	Yes	Yes	No
39	Happy clinic	Yes	Yes	Yes
40	Stack ball 3D	No	No	Yes
41	Aquarium land	Yes	Yes	Yes
42	Burnout masters	No	Yes	Yes

**Table 2** (continued)

	Mobile game name	Traces of chance-based mechanism	In-game currency	Real money in-app purchase
43	Galaxy attack: space shooter	Yes	Yes	Yes
44	Overcrowded: tycoon	Yes	Yes	Yes
45	Fruit ninja	Yes	Yes	Yes
46	Gold and goblins: idle merge	Yes	Yes	Yes
47	Rush royale—tower defense TD	Yes	Yes	Yes
48	NBA 2 K mobile basketball game	Yes	Yes	Yes
49	Dragon city mobile	Yes	Yes	Yes
50	Little go	No	No	No
51	Claw games—real claw machine	Yes	Yes	Yes
52	Hotel frenzy: design makeover	Yes	Yes	Yes
53	Idle school tycoon	Yes	Yes	Yes
54	Patch master	Yes	Yes	Yes
55	Sky force—shooting games	Yes	Yes	Yes
56	Survivor!.io	Yes	Yes	Yes
57	Hotel master: build the empire	Yes	Yes	Yes
58	Township	Yes	Yes	Yes
59	Makeup kit—color mixing	Yes	No	No
60	Airport master!	Yes	Yes	Yes
61	Fruit ninja 2	Yes	Yes	Yes
62	Makeup styling—makeover game	Yes	No	Yes
63	Tofu drifter	No	Yes	No
64	Steering wheel evolution	Yes	Yes	Yes
65	Mario kart tour	Yes	Yes	Yes
66	Boba tale	Yes	Yes	No
67	Doodle jump 2	No	No	Yes
68	Merge mansion	Yes	Yes	Yes
69	Volleyball arena	Yes	Yes	Yes
70	Gossip harbor: merge game	Yes	Yes	Yes
71	Candy crush soda saga	No	Yes	Yes
72	Junkyard keeper	Yes	Yes	Yes
73	Blobsbuster	Yes	Yes	No (ads only)
74	Rope and balls	Yes	Yes	Yes
75	Breaker fun 2—zombie games	Yes	Yes	Yes
76	Angry birds dream blast	Yes	Yes	Yes
77	Soccer super star—football	Yes	Yes	Yes
78	Bubble pop! Game legend	Yes	Yes	Yes
79	Rocket league sideswipe	Yes	Yes	No
80	Cut the Rope	No	No	Yes

guiding the player's strategies, and leading to the understanding that it was not considering a child's skills for its gameplay.

The resulting lists (Table 2) with the child-driven titles had the same number for both rounds: 54 games in each list featuring at least one of the mentioned categories. Without

redundancies, there were 80 games in all, in which 65 (81.25%) presented any incidence of chance-based traces within the gameplay. The research found the same number for games with real money in-app purchase, and 68 (85%) featuring in-game currency.

The numbers reveal the offers of rewards driven by money and gambling normalization. Future studies are needed to measure potential growth or decline in this picture.

## Discussion

The findings show that the incidence of chance-based mechanism traces was higher for the list with products directly or indirectly targeted at 4+ children than if titles supposedly for other ages were included, suggesting that grooming strategies are intense and attempt early ages.

The 81.25% of games with any chance-based feature do not mean they present gambling, but that they offer surprise rewards by chance or gambling-like situations that can normalize the practice. Incorporating such to the narratives and the gameplay may deviate the focus from the chance mechanisms, making players engage with them as part as the challenges, regardless of being free or demanding exchange.

Continuously opening digital containers to access mystery items seemed to be the strategy to attract young players while introducing them to exchanging their time, attention, or resources for odds. Far from being an isolated aspect of certain games, some studies detected that loot boxes are common in bestselling video games (Rockloff et al., 2020). It is possible to add such a claim to the free and most downloaded ones.

The narratives concealed the risks, diluting the notion that players could lose something, or that they had to repeatedly perform tasks, which could work to increase engagement.

The research also identified facilitated (and, in the case of Australia, also undisclosed) access to these mechanisms. The mobile titles were available with no cost (based on the freemium model), and their gameplays did not require previous learning nor knowledge (same approach for the tasks driven by odds). They had animated instructions to guide the players towards chance-based situations, using (although there were exceptions) visual design based on high levels of brightness and contrast aligned with the narrative, guiding the player's focus to specific content, including the moments when the surprise was revealed.

The narratives also featured inconveniences or paywalls as part of the challenges, demanding grinding, exchange, or random-reward exposure, paving the strategy for in-game currency acquisition (and potentially its spending as a process for indirect loot box purchase). As Cartwright and Hyde (2022) observed, motivator cues within the narratives serve to transform players into gamblers with strategies such as pay to win (when challenges can only be overcome by purchasing a certain item) and pay to skip (when players avoid grinding). This contradicts some of the arguments presented by loot box defenders, who expressed their views on the surprise container as like opening sports trading cards or obtaining a random toy from a candy (as reported by Close & Lloyd, 2021, Xiao et al., 2021 and Rockloff et al., 2020). Despite certain similarities, those non-digital habits are usually mediated by the guardians, who are likely to limit the purchase in costs and frequency. In addition, they serve no purpose apart from the surprise momentum and collection-building potential, whereas a loot box is, for some games, a mandatory necessity to move forward in the narrative.



Paying to continue playing or to access an undisclosed item by using money related to the narrative may influence the notion of value and create (in the case of chance-based products) associations with its spending for an odd instead of a known output, grooming future perceptions and habits. In the case of children, when the perception of value is not one that comes with experience, the no-cost playing and reinforced actions may generate financial misconception.

Those are likely to be the reasons why microtransactions were part of most of the detected games with gambling-like traces.

The early contact with these mechanisms makes the long-term effects unpredictable, although theories propose that they can span from recreation to problem gambling behavior (James et al., 2016). As Drummond and Sauer (2018) explain, players can acquire a behavior through repeated attempts to receive rewards, which function as reinforcement.

These strategies are not illegal nor go against any marketplace rules, even if potentially preparing habits in adult life. At the present stage, whether some of its materializations (such as loot boxes) legally configure gambling is open to debate.

Yet, Close and Lloyd (2021) mention a statement from the House of Lords Gambling Industry Committee (United Kingdom) claiming that, regardless of the current legislation definitions, “[I]f a product looks like gambling and feels like gambling, it should be regulated as gambling” (p. 33). If so, what is required is not only broadening of understanding of the characterization of it, but also the identification of analogous approaches that may lead to its normalization.

If gambling legislation does not apply, classification criteria should include the phenomenon and create new labels to inform those responsible for what children are playing. Apple’s age rating states that games with gambling are suitable only to the 17+ age group (Age Ratings, n.d.). Such labels could follow the four categories this research identified while playing the top-listed titles, describing not only gambling, but also its traces and normalization practices. With 78.1% of free 4+ titles displaying them, it is possible to consider that the exposure is more than mild. As Zendle et al. (2019) explain, ratings should prevent children to being exposed to content considered inappropriate to them.

However, improving classification criteria may not be enough. As Close and Lloyd (2021) conclude, legislation may be quickly outdated due to the fast dynamics of the video game industry. What is required is continuing research, protective measures, and education, as well as consideration of interconnected factors such as the 68.5% of games that require some sort of microtransaction with real money and the 80% presenting some sort of exchangeable in-game currency.

It is worth noting that, for some children, those games may be their first contact with the concept of currency, and it is built upon a stage when they may not be fully able to understand the potential harms of exchanging it for odds.

Potential social impacts demand more and continuous study on the topic, and research suggests the phenomenon is a growing multibillion-dollar issue, resonating to other age strata with different numbers from country to country (Xiao et al., 2020), indicating the need to compare the results of the Australian numbers with those from other nations.

Although intense exposure is a current concern, future studies will determine if chance-based traces are also present within different age classifications. At least in Australia, the federal age classification will include “gambling-like content” (Minister for Communications, 2023) in September 2024, after an open consultation with the population about the matter (Australian Classification, 2023). It is not known if mobile games will be under the umbrella of computer games (as the new classification labels them), once the ACB traditionally refers to them as console or desktop products (Australian Classification, n.d.),

which may leave the mobile market untouched by the changes. Additionally, they are for in-game purchases; if such an understanding does not consider virtual currency acquiring a digital item as a purchase, the mobile normalization strategies will remain away from legislated restrictions.

It is worth noting that the described strategies are not illegal (at least in countries like Australia) and operate within a competitive industry where producers “struggle to choose between economic viability and the use of controversial monetization strategies” (Perks, 2019, p. 1007). The mobile chance-based monetization model is a form of industrial survival that, while unregulated, calls for further discussions.

## Limitations

The research for this study used Apple’s App Store as the only source. As previous research has found that several games from the App Store are also on Google’s app marketplace for the Android operational system (Zendle et al., 2019), the next step would be to compare these findings by conducting a similar analysis with the latter. Expanding the age strata may also confirm the presence of chance-based mechanisms in games targeted at varied audiences.

The research also suggests the need for an ongoing study comparing different moments in time of the “top” lists presented by the mobile marketplaces. Such an approach will allow to verify whether the phenomenon increases or decreases over time.

Another limitation is the players’ loyalty and playing frequency. The lists of top downloads suggest popularity at a given moment but do not provide any data on how long or how often players engage with a particular game, nor their acceptance or rejection of in-game chance-based options that are not mandatory to the gameplay.

Unlike other marketplaces (as Zendle et al., 2019, noted from observing Steam and Google Play), the information about the games provided by the App Store does not quantify the number of downloads, working against future analysis of the reach of each product.

The lists used for this text do not include paid games, games acquired by subscription to the Apple Arcade selection, or the dedicated top-ten kids’ apps. Future studies should also consider these options.

For this research, even though the games were played individually and extensively, as mentioned, prolonged periods of playing may be required before discovering the presence of loot boxes. This issue was also described by Zendle et al. (2019), who claimed such a characteristic may result in “false negatives” (pp. 1770–1771).

Finally, as noted by previous research, the connection between early exposure to gambling or its mechanisms and long-term habits is yet to be established and measured. Whether normalization practices may lead to gambling and cause adulthood addiction is a topic for future and ongoing studies.

## Conclusion

The collected data show that the prevalence of gambling-like mechanisms is intense. Advertising the games as free may work as a hidden strategy to convince guardians to avoid immediate spending on a product which can result in harms later in the child’s life.

As Zendle et al. (2019) claim, exposure to chance-based mechanisms at an early age may lead to future problem gambling.

Those who are responsible for what children play are unable to keep pace with the mechanics targeted at young players (Uddin, 2021). It is evident that guardians are only able to uncover those mechanics by playing extensively, as sometimes the metagame reveals traces of them only after long gaming periods. On the other hand, it is not an occasional feature in these games, normally containing loot boxes.

Close and Lloyd (2021) express ethical concerns about the predatory strategies of loot boxes. According to them, game monetization research is still in its initial stages and not only is legislation on the matter needed, but also education.

Australia has gambling-awareness programs, but these have not included loot box spending or the exposure of children to it. If complete bans on loot boxes are found to be harmful to the game industry and not effective to protect players, other ways of advising guardians need to be formulated, including rating systems and campaigns encompassing the supporting chance-based practices of in-app currencies and microtransactions. The self-declared content of games also needs to include more detail, as paywalls are placed freely irrespective of the targeted player's age.

The four gambling-like categories described in this research use narratives to disguise the gamblification of the game. This is a pathway to gambling normalization that helps circulate the message among children. For both producers and legislators, the 81.25% of games with chance-based traces directly or indirectly targeted at children from four to eight years old show it is time to rethink the exposure, monetization strategies, and legislation.

## Declarations

**Conflict of interest** The author declares there is no financial interest and no conflict of interest.

**Ethical Approval** No ethical approval to conduct the research was needed.

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