

Video game loot boxes are psychologically akin to gambling

Video games are increasingly exposing young players to randomized in-game reward mechanisms, purchasable for real money — so-called loot boxes. Do loot boxes constitute a form of gambling?

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Playing video games is a common pastime in industrialized nations, with 65% of US homes including at least one gamer¹. To increase the longevity and profitability of their products, video game developers are, with increasing frequency, incorporating purchasable randomized rewards — commonly referred to as 'loot boxes' — in their games². Consumers and, more recently, policymakers are becoming increasingly concerned that these randomized reward mechanisms may constitute a form of unregulated gambling targeting minors^{3,4}. Here, we examine the structural and psychological features of loot boxes to evaluate similarities to gambling. Whether (and which) loot boxes may be deemed illegal is a matter determined by the laws of individual countries.

'Loot box' is a catch-all term for a digital container of randomized rewards. Essentially, a loot box contains one or more random rewards that alter the game in some way. Rewards may allow players to personalize aspects of the in-game aesthetic (for example, alter their avatar's appearance) or improve their in-game performance (for example, via powerful weapons). Possessing rare game rewards is therefore highly desirable⁴. Of particular interest is the increasing trend to allow players to purchase loot boxes using real-world currency.

One factor that might initially motivate players to purchase loot boxes is that loot box rewards can provide considerable competitive advantage in multiplayer games (that is, an increasingly common game type). Thus, players may purchase loot boxes to gain an advantage or simply remain competitive. In either case, some players are engaging in this practice and those who do not may be at a considerable disadvantage. Here, we focus on the concern that the mechanisms underlying players' engagement with loot boxes are similar, if not identical, to gambling^{3,4}, and many of these players are minors¹. Research investigating the exposure of adolescents to simulated gambling suggests that risks



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such as peer pressure and a dilution of monetary value through the exchange of real currency for virtual currency might facilitate migration to monetary forms of gambling⁵. Moreover, adolescents tend to have poorer impulse control than adults, potentially increasing their vulnerability to gambling mechanics and behaviours learned from these mechanisms^{6,7}.

On face value, loot boxes present a number of striking similarities to real-world gambling. Players often purchase loot boxes for money and receive rewards of varying value based on chance. Thus, over multiple purchases, players will receive a high-value item on average every X number of times they open a box (where X represents a number of openings determined by a pre-defined algorithm). For example, a game with a 10% chance of a high-value item in a loot box, may result in success, on average, once for every ten boxes purchased. Critically, however, due to the random nature of rewards, the exact number of boxes that require purchase to obtain a valuable item varies. This kind of reward structure is termed a variable ratio reinforcement

schedule, and underpins many forms of gambling^{7,8}. Variable ratio reinforcement results in people quickly acquiring behaviours and repeating these behaviours frequently in the hopes of receiving a reward^{7,8}. Research has long shown that behaviours acquired with variable ratio reinforcement are extremely persistent⁸. Given these features are similar to those underlying traditional forms of gambling^{7,8}, the Belgium Gaming Commission and Australian and US regulators are investigating whether loot boxes constitute a form of gambling³. However, at present, there is no consensus on whether such simulated forms of gambling constitute illegal gambling operations^{4,5}.

Whether loot boxes are a form of gambling has important ethical and regulatory implications. If loot boxes are akin to gambling (the legal age for which is 18 or older in most US states, and in many countries), this would raise serious concerns about their appropriateness for games available to younger audiences. Our analysis of the characteristics of loot boxes in 22 games rated by the Entertainment

Table 1 | Gambling features in the 22 video games containing loot boxes in 2016–2017

Game	ESRB rating	Exchange of money	Unknown future event	Chance involved	Avoid losses if opt out	Competitive advantage	Can cash out
<i>Assassins Creed Origins</i>	17+	✓	✓	✓	✓	✓ ^a	X
<i>Battlefield 1</i>	17+	✓	✓	✓	✓	X	X
<i>Call of Duty: Infinite Warfare</i>	17+	✓	✓	✓	✓	✓	X
<i>Call of Duty: WWII</i>	17+	✓	✓	✓	✓	X	X
<i>Destiny 2</i>	13+	✓	✓	✓	✓	X	X
<i>FIFA 17</i>	E	✓	✓	✓	✓	✓	✓
<i>FIFA 18</i>	E	✓	✓	✓	✓	✓	✓
<i>For Honor</i>	17+	✓	✓	✓	✓	✓	X
<i>Forza Motorsport 7</i>	E	X ^b	✓	✓	✓	✓	X
<i>Gears of War 4</i>	17+	✓	✓	✓	✓	X	X
<i>Halo Wars 2</i>	13+	✓	✓	✓	✓	✓	X
<i>Injustice 2</i>	13+	X	✓	✓	✓	✓	X
<i>Lawbreakers</i>	17+	✓	✓	✓	✓	X	X
<i>Madden NFL 17</i>	E	✓	✓	✓	✓	✓	✓
<i>Madden NFL 18</i>	E	✓	✓	✓	✓	✓	✓
<i>Mass Effect Andromeda</i>	17+	✓	✓	✓	✓	✓ ^a	X
<i>Middle Earth: Shadow of War</i>	17+	X ^c	✓	✓	✓	✓ ^a	X
<i>NBA 2K18</i>	10+	✓	X	X	✓	X	X
<i>Need for Speed Payback</i>	13+	✓	✓	✓	✓	✓	X
<i>Overwatch</i>	13+	✓	✓	✓	✓	X	X
<i>PlayerUnknown's Battlegrounds</i>	13+	✓	✓	✓	✓	X	✓
<i>Star Wars Battlefront II</i>	13+	X ^c	✓	✓	✓	✓	X

E, everyone. ^aThese games are single player or cooperative, but loot boxes can provide competitive advantage against the game and make players more powerful than friends or team mates. ^bTurn 10 Studios (the publisher of *Forza Motorsport 7*) have announced they will be adding the ability to purchase loot boxes with money soon. ^cOriginally included, but shut down at time of writing due to consumer backlash.

Software Ratings Board (ESRB) as appropriate for audiences 17 years old or younger reveals that loot boxes have important structural and psychological similarities with gambling.

Gambling

To determine whether loot boxes constitute gambling, we must first define gambling. Griffiths⁹ specifies five characteristics common to most gambling activities, and that distinguish gambling from other risk-taking behaviour:

- (1) The exchange of money or valuable goods.
- (2) An unknown future event determines the exchange.
- (3) Chance at least partly determines the outcome.
- (4) Non-participation can avoid incurring losses.
- (5) “Winners gain at the sole expense of losers” (p. 1 in ref. ⁶).

A sixth characteristic that is important to consider is whether the winnings can be converted in some way into real-world money — that is, ‘cashed out’. The ability

to cash out winnings is often considered a criterion for gambling by regulatory bodies^{4,5}. Although not all games with loot boxes contain this functionality, some games include the ability to cash out via third-party websites (that is, not run by a game company), others via the platform on which the game is distributed.

Loot boxes

To frame this Comment, we sourced a list of games containing loot boxes over the past 15 years from the video game review site Giant Bomb (<https://www.giantbomb.com/loot-boxes/3015-9059/games/>). We focused on games released in the past 2 years (2016–2017) due to the recent controversy over the issue, and because there were as many games released with loot boxes in 2016–2017 as there were before this time, which confirms the rapid growth of this practice over the past 2 years.

For each game, we determined the relevant characteristics of the loot-box system by watching online videos of players opening the loot boxes. Table 1 shows how the loot-box systems for each game aligned with Griffiths’s criteria for gambling^{4,9}.

The first criterion required the box to be purchasable for real-world currency. The second criterion required that the box was only received after payment. The third criterion required that the box’s contents were randomly determined. The fourth criterion was satisfied in cases where losses could be averted by choosing not to buy a box. The fifth criterion was more complex. The definitional difficulty arises because no player who purchases a loot box receives their money back directly. Instead, they receive items of various utility, desirability or rarity, which may have some value to the player, or, in cases where virtual items can be traded or sold, can be later converted to real-world money. We took a relatively conservative approach to this criterion and assumed that winners only profit at the expense of losers if the obtained reward provides winners with a direct competitive advantage over losers (that is, some rewards increase the chances of the recipient winning future games). This is displayed in the ‘Competitive advantage’ column. We also collected information about whether it was possible to sell the items received from loot boxes, thus ‘cashing out’ one’s winnings.

Ten (45.45%) of the twenty-two games meet all five of Griffiths' criteria for gambling⁹ (eleven would actually meet the criteria assuming *Forza Motorsport 7* introduces purchasable loot boxes as Turn 10 Studios have indicated). For four of these ten games, players could also cash out winnings, albeit via websites unaffiliated with the company that published the game (that is, independent websites exploiting features within these games that allow players to trade with each other, to buy and sell in-game rewards for real-world money). However, we note that, for these four games, the publisher's terms of use appear to explicitly prohibit the trading or re-sale of virtual currencies. A fifth game — *PlayerUnknown's Battlegrounds* — met only four of the five criteria for gambling, but allowed players to cash out (by selling items for varying prices) on the distributor's (Steam) marketplace. We found no text in the publisher's terms of use explicitly prohibiting trading or re-selling virtual items. At the time of writing, many items were purchasable in this game's marketplace for less than the cost of opening a loot box. Thus, through a chance outcome, players could lose money by obtaining items worth less than the cost of opening a loot box and cashing the item out via the game's distribution platform (see Steam marketplace <https://steamcommunity.com/market/search?appid=578080>). Thus, although players do not gain an in-game competitive advantage, winners gain at the expense of losers due to the real financial gains or losses incurred in these market transactions. Six of the ten games that met all of Griffiths' criteria, as well as all of the games that allow players to cash out for real money, were rated appropriate for audiences 13 years old or younger.

Some legal definitions of gambling require that the aforementioned ability to cash out their winnings for money is present⁴. However, we argue that this is a narrow definition of gambling because it fails to recognize the value created for players from the combination of scarcity of, and competitive advantage provided by, in-game items in the gaming environment. Nonetheless, even according to this strict interpretation of gambling, at least one in five (23%) of the games with loot boxes we sampled constituted a form of gambling.

In sum, in the way they encourage and sustain user engagement, loot-box systems share important structural and psychological similarities with gambling. Of those games containing loot boxes, 100% allow for (if not actively encourage) underage players to engage with these systems. The literature on those at risk of developing problematic gambling behaviours suggests that the video-gaming population might be a ripe breeding ground for such issues. Males are both more likely to develop pathological gambling behaviours (cf. females)¹⁰ and overrepresented in the video-gaming population¹. People exposed to gambling when young are also most at risk of developing problematic gambling behaviours¹⁰.

Recommendations

Given the identified structural similarities between loot boxes and gambling, and the known potential for these mechanisms to produce maladaptive behavioural consequences^{7–9}, we propose the following. Games that allow players to sell their virtual items (that is, cash-out their winnings) provide the clearest example of gambling in video games. Although game developers may not be legally responsible for third-party websites that facilitate players cashing out virtual items, allowing players to trade virtual items creates clear opportunities for players to convert those items to real currency via these independent sites. These games appear to meet both the psychological and legal definitions of gambling. Thus, for games with these mechanisms, we suggest that the ESRB, other ratings agencies and gambling regulatory bodies consider restricting access to people of legal gambling age. Games that allow players to cash-out items via the distribution platform of the game (that is, games that meet legal criteria for gambling, and where the publisher controls the cash-out mechanism), may warrant regulatory oversight as bona fide gambling operations.

We noted two other categories of games. (1) Games that meet the psychological definitions of gambling according to Griffiths' criteria^{4,9}, but do not include the ability to cash out winnings. We recommend that the ESRB and other ratings agencies review these games and increase their recommended minimum age. (2) Games

that do not meet all psychological criteria for gambling, but still involve the exchange of money for randomized rewards. Despite not meeting legal and/or psychological definitions of gambling, these games include mechanisms for initiating and maintaining player engagement that tap into basic psychological principles associated with gambling behaviour (for example, variable ratio reinforcement schedules). Further research must determine whether games in these two categories result in adverse short (for example, overspending) or long-term (for example, addiction) consequences, as the appropriate regulatory intervention should depend on the prevalence and severity of such consequences. Finally, we suggest the ESRB and other ratings agencies adopt additional parental advisory information detailing loot-box mechanics in video games to help consumers and parents make informed decisions. □

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Competing interests

The authors declare no competing interests.