

Loot Boxes: Are they grooming youth for gambling?

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Executive summary

This report outlines research aimed at understanding the risks posed by loot boxes to adolescents (12-17) and young adults (18-24) in NSW. Loot boxes are a growing concern due to the risk and reward properties that closely align them with traditional gambling, the potential for encouraging greater gambling involvement, and the potential for associated gambling harm. Broadly, this research revealed:

- Loot boxes are common in the best-selling video games. Our exploration included a selection of 82 best selling video games and revealed 62% (51) had loot boxes.
- In our survey sample, almost all of the respondents played at least one video game with loot boxes within the last 12 months (93.2%).
- About a third (32.9%) of the survey respondents who played games with loot boxes within the last 12 months had also purchased a loot box, and their median monthly expenditure was \$50 for adolescents and \$72 for young adults.
- Compared to other purchasers, young adults who more *recently* first purchased loot boxes were more likely to have gambling problems. Conversely, there was no evidence that earlier experiences with loot boxes predict later gambling problems.
- Both adolescents and young adults who had either opened, bought or sold loot boxes within the last 12 months were also more likely to have: 1) gambled in the last 12 months (young adults), 2) gambled more frequently (young adults), 3) spent more money gambling (young adults), 4) suffered more gambling problems (adolescents and young adults), 5) suffered more gambling-related harm (young adults), and 6) endorsed more positive attitudes towards gambling (adolescents and young adults).

What are loot boxes?

Loot boxes are an in-game feature of many best selling video games wherein a player receives a virtual box that can be opened to reveal specific, and often randomly determined, in-game items or abilities that enhance gameplay across multiple sessions. The most common items won via loot boxes are *skins*, which are visual enhancements to a video game avatar or equipable items. These skins are generally purely cosmetic and do not affect gameplay. More rarely loot box items might confer in-game play advantages, such as special abilities or advantageous equipment (e.g., weapons).

Loot boxes are therefore conceptually akin to a lucky dip prize or packaged trading cards, where the contents are obscured before “unpacking” the box to reveal its contents. As with trading card packs, most purchases yield only common, low-value

items, but sometimes the contents include rare, high-value contents. Some loot boxes are given to players as a reward for gameplay, whereas others can be purchased separately in microtransactions: small purchases that are distinct from the initial purchase of the game.

Should we worry?

Community concern around loot boxes is tied to a more general concern about excessive video game involvement by youth and the potential for video games to be addictive. A broad emerging literature has supported the contention that video games can have addictive properties that can lead to excess time and money spent on the games, which aligns video game addiction to the better recognised mental health condition of a gambling disorder.

Loot boxes in video games, however, are particularly close to gambling since players invest time and/or money obtaining them, and they receive a random reward of uncertain value. The virtual items, abilities or characters are valuable to the player, and in some circumstances may be traded for other items or sold for cash. In practice, players can sell an entire game-account to other players, which indirectly allows a conversion of highly valued loot box prizes into cash. Consequently, in-game prizes obtained from loot boxes comprise a virtual currency, a thing of value, that transforms the purchase of loot boxes into a largely unregulated gambling product.

Despite loot boxes meeting a technical definition of gambling, there should be less concern for the potential for harm if video game players simply accumulate the prizes contained in loot boxes for their personal enjoyment during play. In this case, loot boxes more closely resemble lucky dip prizes or packaged trading cards, although arguably even this use of loot boxes can have a coercive element whereby the consumer may need to buy several boxes to obtain desired items.

Loot boxes might be problematic for consumers if they 1) spend too much money on them, or 2) serve as a gateway to greater involvement in other forms of gambling. Consequently, it is important to understand how common loot boxes are in video games, how many people use them, and whether there is a relationship between loot box use and other forms of traditional gambling.

How many best selling games use loot boxes?

Loot boxes might only be a concern if they appear in many best-selling video games. Therefore, as a first task the research project included an environmental scan of best-selling video games, wherein the researchers documented the presence and features of loot boxes in top selling video games offered to Australian consumers.

This investigation used several private and public sources of video game sales and public descriptions of video games to compile a list of 82 best-selling games and their loot box inclusions. Due to the difficulties in obtaining unimpeachable sources, however, the list cannot be guaranteed as a definitive list of best selling games in NSW but rather a reasonable sample set of such games. Critical features of loot boxes included the ability to purchase them with in-game currency, and the ability to convert loot box items into cash, convert them into in-game currency, or trade them for other items of value. These features arguably make loot boxes more closely resemble a traditional gambling product as opposed to packaged trading cards or a lucky dip prize.

Research Question 1

“What best selling video-games use loot boxes, and which provide rewards that are convertible to cash or other items of value?”

The environmental scan revealed that many of the sampled best selling video games, by revenue, contain loot boxes (62% or 51). Of games that had loot boxes, 59% (30) allowed loot boxes to be purchased via a two-step process of 1) purchasing in-game currency with cash, and 2) purchasing the loot box with this acquired in-game currency. Lastly, 84% (43) of games with loot boxes allowed the skins or other items to be sold for cash or traded for other items with a monetary value (e.g., other skins, in-game currency, etc.).

In short, the environmental scan revealed that most of the sampled best selling games have loot boxes. Many of these games have loot boxes that are purchasable, and therefore have the potential for people to spend more than they initially anticipate in order to obtain rare or desired items. Many video game accounts can be sold privately for cash, and a large number explicitly allow items obtained in loot boxes to be sold for cash or traded for other virtual items or in-game currency. The marketplace as represented by this sample of games, therefore, contains a diversity of popular video game products that have at least the potential for being used as a gambling-product. An important additional consideration, however, is how video game players engage with loot boxes.

Prevalence of loot box use

Research Question 2

“What is the prevalence in the use of loot boxes by adolescents (12-17) and young adults (18-24); and who uses them as a gambling product?”

An online survey of 1,954 NSW persons aged 12 to 24 was conducted with the help of a panel aggregator, Qualtrics. Youthful respondents were targeted due to the known vulnerabilities to gambling problems and their near ubiquitous use of video

games. By design, approximately half of participants were adolescents aged 12-17 (47%) and the rest were young adults aged 18-24 (53%). The only restriction to inclusion was residence in NSW. The sample had a high number of respondents with gambling problems (22.3%), and therefore prevalence estimates should be treated as preliminary and with caution, since they may not be representative of the true population of NSW residents aged 18-24.

Respondents nominated the best selling video games that they had played in the last 12 months. From the environmental scan, this included a checklist of 51 games we discovered with loot boxes in them, but participants were given the opportunity to nominate other games with loot boxes. The results revealed that 93.2% of respondents had played a game with loot boxes in them within the last 12 months. Thus, loot boxes are contained within a majority of sampled games, and most people in our sample played at least one game with loot boxes in the last 12 months (and often several). The potential for harm evidenced, therefore, is not limited by lack of exposure.

Awareness of loot boxes

Although loot boxes are featured in many games, they are most often an optional feature of the game. Some players may not use them, and some players may not even notice them. After a brief description, the survey asked participants if they were aware of loot boxes prior to undertaking the survey, and 77.3% (1,511) said that they were aware of their presence in video games. Only a slightly smaller number (69.4%, 1,356) reported that they had opened a loot box in the last 12 months. Despite most people having opened a loot box, only about a third (32.9%, 599 of 1,822) of people who had played games with loot boxes said that they had also purchased a loot box. Of those who purchased loot boxes, the median monthly expenditure was \$50 for adolescents and \$72 for young adults.

Motivations for purchasing loot boxes

A list of motivations for purchase was compiled from internet searches, including internet chat forums. People who purchased loot boxes selected their motivations from this list and could nominate other reasons for purchase. The most common reason selected for purchasing loot boxes was “wanting to gain items to advance more quickly in the game.” However, it is important to note that a great diversity of reasons for purchase were selected, and no one reason dominated people’s considerations.

Skins from some video games can be used as a virtual currency for online casino-style gambling. “Gambling” was nominated as at least one motivation for obtaining

skins from loot boxes by 27.3% (89) of young adult purchasers (326) and 21.3% (58) of adolescent purchasers (273) .

Selling loot box items

Loot boxes most closely resemble traditional gambling products when the virtual items that are obtained from them are sold for cash. In this case, money is spent for the potential reward that is converted again to cash, and thus contributes to a potential new source of funds to make further purchases (or alternatively, to gamble). Of people who obtained loot box rewards in games, 6.8% of respondents had sold at least some of these rewards for cash. For the people who sold rewards, the estimated cash made from the sales of loot box items/rewards, or accounts containing these items/rewards, was \$20 per month for adolescents and \$60 per month for young adults.

Negative attitudes towards loot boxes

Respondents' relationships to loot boxes, however, are complex. There was a slim majority agreement that loot boxes constituted a type of "gambling" (53.8%), irrespective of their individual features (e.g., saleability of skins). Moreover, a large proportion of respondents agreed with a description of loot boxes as "addictive" (73.1%), although some may have interpreted "addictive" as a positive feature to suggest they are engrossing. Nevertheless, the results revealed that most participants were aware of the potential negative consequences of loot boxes, including its resemblance to traditional gambling products.

Lastly, the study was focused on the associations of early involvement in the use of loot boxes and its relationship to current gambling, gambling harm, and gambling problems. One of the purported risks of loot boxes is as a gateway to greater gambling involvement. Since loot boxes are available to adolescents in a way that commercial gambling is not, there is a natural concern that loot boxes may encourage youth to transition to other and potentially more harmful gambling activities in adulthood.

Early exposure

Research Question 3

"What are the associations between early exposure to gambling via loot boxes, attitudes and intentions regarding gambling, as well as subsequent gambling and harm?"

Participants were asked about early experiences with loot boxes, including when they first opened and purchased loot boxes. Young adults who first opened loot

boxes no more than 12-24 months ago, as opposed to earlier, were more likely to: 1) be current gamblers, 2) gamble more frequently, and 3) have more gambling problems. Young adults who more recently first purchased loot boxes were also more likely to have gambling problems. However, there was no evidence that earlier experiences with loot boxes predict later gambling problems. Instead, young adults who gamble and have gambling problems were more likely to have recent experiences with loot boxes, which may suggest that gamblers seek out this novel gambling-like experience.

There was also a strong relationship between current use of loot boxes and current gambling. Both adolescents and young adults who had either opened, bought or sold loot boxes within the last 12 months were also more likely to have: 1) gambled in the last 12 months (young adults), 2) gambled more frequently (young adults), 3) spent more money gambling (young adults), 4) suffered more gambling problems (adolescents and young adults), 5) suffered more gambling-related harm (young adults), and 6) endorsed more positive attitudes towards gambling (adolescents and young adults).

In summary, loot boxes are a common game-mechanic that appears in our sample of top grossing video game products sold in Australia and worldwide. Since video game addiction and youth involvement in gambling are two issues of contemporary concern, it is natural to examine this intersection. Most of our survey respondents played games with loot boxes, were aware of them, and had opened them. In the last 12 months, a little less than one-third purchased them, and less than 1 in 10 stated that they acquired skins for gambling purposes. For young adults (18-24 years), there was a reliable association between recent first involvement in opening and purchasing loot boxes and current gambling problems. For both young adults and adolescents, there was a strong association between current loot box use and gambling risk. Consequently, although median expenditure on loot boxes is modest, there is evidence that these products are associated with harmful gambling involvement. There may be cause for preventive measures to better protect adolescents from exposure to loot boxes, and particularly limits to loot box games where loot box rewards or accounts can be sold for gain.

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Background and Literature

Introduction

Online gaming has seen an enormous increase in popularity in recent times. Technological advances have catalysed improved game functionality, including features that appear to captivate the user. Among these is the *loot box*, a surprise package periodically encountered during game play that contains a number of (generally) unknown virtual items or rewards that can be saved and used across play sessions. Games can differ in terms of how these loot boxes are opened: many game developers rely on a microtransaction-based free-to-play (a.k.a. freemium) model, in which gamers pay an amount to do so. Importantly, because some loot boxes do not reveal their contents prior to purchase, and can also be re-sold for cash, they have attracted criticism that engagement with them is psychologically akin to gambling (Drummond & Sauer, 2018). Due to the apparent shared characteristics with gambling, the associated risk of psychological and financial harm posed, as well as their reported popularity with players, recent research has prioritised exploring the impact this design element has on gamers and the wider community.

The current chapter presents a targeted narrative literature review on the flurry of such recent research in order to gain a better understanding of whether loot boxes should be considered gambling. It first describes the defining features of different types of loot boxes and how they fit into the wider gaming scene, as well as how they relate to existing definitions of gambling. It then reviews the general findings of the loot box literature, focusing on how these findings relate to existing gambling literature. The chapter concludes by discussing how this information may be used to guide further research into loot boxes.

Gaming, Loot Box, and Gambling Overview

A look at modern gaming

When digital games were first developed in the 20th century, they were arcade games on dedicated hardware. With the advent of the Internet, games appeared online in many different forms (King, Gainsbury, Delfabbro, Hing, & Ararbanel, 2015). While video games have always been popular, the accessibility, affordability, and desirability of online games made possible by technological advances have led to tremendous uptake of these forms, with prevalence estimates showing that approximately two-thirds of adults play games on a regular basis (Carbonell, Guardiola, Beranuy, Bellés, 2009; China Internet Network Information Center, 2017; McDonald, 2017).

Many games are inherently social, with interaction with other players necessary (Griffiths, Hussain, Grüsser, et al., 2013; He, 2017; Pontes & Griffiths, 2014). In addition to numerous between-game variables associated with narratives and themes, games also vary in their monetary models of play, including those akin to the ‘traditional’ category (i.e., pay once/periodically), as well as those that are ‘free-to-play,’ but present offers to players which they can purchase if they choose (often referred to as *freeware*, *shareware*, and *lure-to-play* models; King, Gainsbury, et al., 2015; Mistry, 2018). This review will focus on the latter, due to their reliance on microtransaction functionality (Harviainen et al., 2019).

Games allow the player to be creative, in that players often must choose an avatar and may wish to customise its look with virtual items (Korkeilaa & Hamari, 2020). Players use their created character to function in the game and interact with other players. It is these avatars that most often find and use loot boxes, which are in turn the focus of this review.

What does harmful gaming look like?

As with almost any activity, gaming can also be associated with negative outcomes, including emotional, peer, and behavioural problems (Dreier, Wölfling, Duven, Giralt, Beutel, & Müller, 2017). However, as discussed by Ferguson, Bean, Nielsen, and Smyth (2019), problem gaming may be reflective of underlying mental health issues rather than this hobby being addictive/harmful in and of itself. Moreover, generational differences in values may inflate the perceived cause for concern (e.g., ‘the kids are playing video games too much’) as might sensationalist media reporting of the issue (Bean, 2018; Brus, 2013; Nielsen, 2017; Ferguson & Ceranoglu, 2014; Przybylski et al., 2017; Rothmund, Klimmt, & Gollwitzer, 2018; Scharrow, Festl, & Quandt, 2014).

One prolific component of modern online gaming is the loot box, which is posited to have high addictive potential and therefore has been described as being “akin to gambling” (Drummond & Sauer, 2018; p.1). Thus, research is needed not only to determine the harm that the activity of gaming causes to a person’s health, but also to determine the addictive potential of loot boxes themselves. Among concerns is whether use of this product leads to gambling, but this link is yet to be established. If harm from loot boxes is demonstrated, whether in the context of gambling behaviours or otherwise, a targeted approach to addressing these harms is required. The remainder of this review focuses on exploring whether the argument that engagement with video game loot boxes is akin to gambling participation is valid. It will not explore other nuanced ways in which gambling and gaming, more generally, are related – extensive coverage of this is provided elsewhere (Kim, Wohl, Salmon, Gupta, & Derevensky, 2015; King et al., 2015).

What are loot boxes?

An increasingly visible and integral feature of modern online games (Schwiddessen & Karius, 2018; Zendle, Meyer, Cairns, Waters, & Ballou, 2020), loot boxes were estimated to have generated in excess of \$30 billion dollars during 2018 in the USA alone (Wright, 2018), which does not include money spent on external sites (Hoggins, 2019). This section of the review describes the key mechanics and dynamics of loot boxes, in order to frame later discussion of how these relate to gambling products.

Loot boxes are extremely popular; however, research on the prevalence of loot box exposure and use, as well as the psychological and financial impact they have on the user, is needed. Many gamers have opened loot boxes. Fewer gamers report actively looking for, and working to obtain, loot boxes, and even fewer (approximately half) of regular gamers spend money actually opening them (Brooks & Clarke, 2019; Drummond et al., 2020; Kaneko, Yada, Ihara, & Odagiri, 2018). Loot boxes, also referred to as *loot crates* or *kompu gacha* in Japan (Shibuya, Teramoto, & Shoun, 2015, 2016¹), are a common game design feature of modern online video games. Presented sporadically during game play, loot boxes allow the opportunity to attain additional items or rewards (including abstract bonuses such as power-ups, etc.) for use within that game, usually through small purchases called *microtransactions*. Importantly, these rewards are “owned” and can be used in future play session. Some rewards are ultimately expendable, but most are persistently available for future enjoyment.

The contents of loot boxes may be broadly classified as cosmetic or functional. Cosmetic items do not change game play, but allow players to customise the look of a game character or their belongings (e.g., avatars, skins/outfit design, pets, etc.). Functional loot items include special skills or items that can directly help advancement through the game (e.g., characters/players, weapons, armour, stamina, certain types of skins, etc; Csikszentmihalyi & Csikszentmihalyi, 1992; Hull, Williams, & Griffiths, 2013; Witmer & Singer 1998). While loot box items can be won via the successful completion of missions, they can be purchased, either directly using cash or indirectly by the player first purchasing in-game currency. Preliminary estimates (among regular online adult gamers, who report spending money on loot boxes) indicate positive skew for monthly expenditure, with the amount typically spent on loot box transactions ranging from US \$1 to US \$50 each month (however, approximately 10% of adults surveyed in research using small, non-representative samples reported spending more than these amounts; Brooks & Clarke, 2019; see also Drummond et al., 2020).

¹ The term *loot box*, will be used, hereafter, to refer to all these terms, unless otherwise stated

Within each of these broad types, the number of different items possible and the probability of obtaining them vary. For example, some games, such as *Overwatch* and *Dota 2*, have over 3,500 cosmetic items available (Chen et al., 2019; Shibuya et al., 2016). Unsurprisingly, rare and popular items are more highly valued (Lehdonvirta, Wilska, & Johnson, 2009). These virtual items are believed to be popular as they: allow players to self-express (Huang, 2012; Hussain & Griffiths, 2008); earn respect and recognition from others (Cleghorn & Griffiths, 2015; Lee, 2005; Lehdonvirta et al., 2009; Manninen & Kujanp, 2007); and enhance status through the exclusivity of items obtained (Hamari & Lehdonvirta 2010). They can also extend the time spent playing the game (Castranova & Wagner 2011; Kaburuan, Chen, & Jeng, 2009; Pontes & Griffiths, 2014). Motivations for using loot boxes are discussed in more detail later.

Once the player chooses to pay to open it, the loot box typically reveals its contents with celebratory animations and sounds similar to those displayed with a winning spin on an electronic gaming machine (EGM). While there have been recent calls to allow players to preview the contents of loot boxes, in order to avoid duplicate and otherwise unwanted purchases (Dreier, Wölfling, Duven, Giralt, Beutel, & Müller, 2017; Hoggins, 2019; cf. Chen et al., 2019), most games conceal the loot box contents until post-purchase. In this respect, they are similar to packaged trading cards.

Types of loot boxes

There are two main categories of loot boxes: those that involve *cashing-in mechanics* and those involving *closed-loop mechanics* (Arvidsson, 2018). These types, essentially, refer to the different business models that game developers employ to profit from loot box transactions in terms of the ability of purchasers to sell these to others (*cashing-in mechanics*), or not (*closed-loop*). These are briefly explained further below.

Closed-loop mechanics

Closed-loop loot box mechanisms are thought to be less harmful, although there is a lack of current empirical evidence to support this notion. In this type of mechanic, microtransactions may occur, but items obtained may only be used in the game and cannot be sold to others. While transactions may take place in unauthorised markets (see next section), these games are not designed with the intent of consumers being able to buy and sell items. Accordingly, developers do not need a licence to provide loot boxes with closed-loop mechanisms. However, while closed-loop loot boxes may not be associated with monetary gain, they may be highly valuable to gamers in other ways, particularly via the influence of social motivators, such as prestige, competition, or other non-monetary utility (Karlsen, 2011; Tay, 2005). They may also

be used as a virtual currency for wagers in other online activities, such as skin gambling on eSports (Udesen et al., 2019).

Cashing-in mechanics

Cashing-in loot box mechanisms allow gamers to buy and sell loot box items, via the game itself, for cash or items of monetary worth. Cashing-in mechanisms are a licensable gambling activity under UK law. There are also several unlicensed, third-party websites (e.g., FutGamer.com) that allow items that are won in-game to be cashed in. In addition to the sale of individual virtual items, these websites also allow players to sell their full account as a larger package that includes their skins, in-game currency, progress, weapons/kit, and avatar/s. Arguably, these secondary transactions are not as prone to impulsive purchases, as consumers are generally able to preview and consider what they are buying, and avoid duplicate items. However, they do present opportunities for tangible monetary gain and additional motivations for gaming, as well as pushing loot boxes more clearly into the 'gambling' category (Nielsen & Grabarczyk, 2018). Of course, the distinction between closed-loop and cashing-in mechanics becomes increasingly blurred when the gaming black market is considered. If items from games that are designed as closed-loop are sold on third party websites, this black market effectively presents the opportunity to 'cash-in' virtual goods (Garrelts, 2010)

Why are loot boxes so problematic?

While the characteristics of loot box purchasers compared to non-purchasers is not well-understood, purchasers may be more vulnerable to harm, at least in the sense that they are targeted by sophisticated and, arguably, aggressive loot box marketing (Inoue, 2012; Liu, 2019). Many gamers report their game-playing to be highly enjoyable, and loot boxes may add to this enjoyment. Further, many games are free to play and only a minority of players make in-game purchases. Thus, the revenue needs of developers, player enjoyment, and player wellbeing, especially for vulnerable gamers, need to be balanced (McCafferty, 2020). This involves assessing what is considered fair play in this context, as well as to what extent loot box purchasing encourages gambling.

As noted below, a 'where do we draw the line' argument has seen loot boxes being compared to dealing in baseball cards, or similar, and other 'lucky dip' style games of chance (see Hong, 2019). On the surface, this seems quite reasonable as these activities do have much in common with loot boxes; however, the argument loses its sting when one takes into account predatory monetisation techniques, such as customising loot boxes contents for individual players and changing the odds of receiving valuable 'goods' to manipulate players into purchasing (Liu, 2019). Nojima (2011) described three elements of game marketing: 1) providing a *hook*, or a

chance to play, 2) *retention*, by keeping players interested and regularly returning to game play and, 3) motivating players to pay for game features, termed *monetisation*. King et al. (2019) examined registered loot box patents that specifically focussed on encouraging game microtransactions, through use of artificial intelligence that became more efficient over time. They found strategies that: vary the probabilities of rare rewards based on behavioural tracking; collect key demographic information (including time played, previous spending, gender, ethnicity, age, etc.) and use this to market loot boxes, and; 'match' the information of loot box purchasers to non-purchasing players and target them to induce new and continued purchases by providing customised offers (in terms of types of products shown, price, etc.).

King et al. (2019) note that many potential patents are not submitted, to avoid copy-cat products, protect intellectual property, and retain competitive advantage and market share. Consequently, these are only the practices that we are currently aware of – there may, or may not, be others. Gamers may or may not actually want these features to enable a more-customised game experience. Thus, it is important to ascertain customer perspectives, but perhaps more importantly, to make them aware of these practices in the first instance.

Online gaming is a multi-billion dollar industry. Compared with disordered gambling, high monetary amounts are not normally associated with problematic loot box use – apart from a small proportion of purchases. The spending distribution is highly-skewed, with many gamers not purchasing loot boxes at all. Thus, games that follow a microtransaction-based business model rely on the custom of only a subset of the millions of gamers (Brooks & Clarke, 2019; Kaneko, Yada, Ihara, & Odagiri, 2018). However, loot boxes can present other forms of harm for the individual, including those that are commonly seen in disordered gambling.

A closer look at the definition/s of gambling

Most definitions describe three requirements for an activity to be considered gambling: *stake*, *chance*, and *prize*. The gambler must decide to place a *stake* on a *chance* outcome, in the hope of winning a *prize* that is more valuable than the original amount staked. It is different to other activities as follows: if a stake is not present, the activity is gift giving; if chance is not present, the activity would be a regular purchase transaction, as the customer knows exactly what they are buying and can decide if the amount invested is worth the goods/service received; if a prize is not available, then this would be considered extortionate business dealings. While the prize in gambling, as well as the associated probabilities of achieving that prize, may be communicated, sometimes this is of an unknown value; however, it must be equivalent to money or something of monetary value to be considered gambling.

While the general definition of gambling is clear and consistent across most jurisdictions, the interpretation of whether certain activities fulfil these criteria is more varied. Of most relevance to our discussion of loot boxes is how an item of value is defined. According to Arvidsson (2018), *convertibility* is the main characteristic of loot boxes that determines whether they should be classified as a gambling product or not, that is, whether they can be converted into cash. Thus, *cashing-in* mechanics show the most commonalities with gambling and are believed to be the most harmful. Loot boxes are considered gambling in Belgium and several other countries because they are believed to have monetary value via cashing-out mechanisms within-game or on secondary/unauthorised markets; whereas they are not classified as such throughout North America, the U.K., and Australia, presumably because most games do not permit the re-sale of loot box items and because the link between use and harm is not yet well-established (Abarbanel, 2018). However, *closed-loop* mechanics, while not associated with cash gains, may still be exploitative, unjust or harmful.

Why all the gamer/gambler comparisons?

Disordered gambling is associated with several deficits in psychological, personal, interpersonal, and financial functioning (APA, 2013; Raylu & Oei, 2002). Risk factors for problem gambling span demographic, psychosocial, and biological factors. Correlates include being young (18-25 years), male, having lower education, earning a lower income, marital discord, having friends who gamble, and concurrent substance use (Delfabbro, Lahn, & Grabosky, 2006; Johansson, Grant, Kim, Odlaug, Götestam, 2009; King, Gainsbury, Delfabbro, Hing, & Ararabanel, 2015; Livazović & Bojčić, 2019; Mazar, Williams, Stanek, & Volberg, 2018). Multivariate analyses have identified trait impulsivity, erroneous gambling cognitions, excessive consumption, and less use of safe gambling practices as important risk factors for gambling-related harm (Browne et al., 2019).

Due to the recently emergent, albeit widespread, use of loot boxes, evidence is scant on how risk factors for problem gambling and gaming overlap and interact with those for risky loot box use. As discussed by Starcevic and Billieux (2018), having accurate estimates of engagement with, and harm caused by, loot boxes is important to better understand the nature of the phenomenon and to manage public health.

A 'where do we draw the line' argument has seen loot boxes being compared to trading on the stock market, dealing in baseball/football cards, and other 'lucky dip' style games of chance (e.g., Interactive Games and Entertainment Association; see Lum, 2018). We therefore briefly outline why loot box use may be more akin to gambling, to explain why we are comparing this element of online gaming to gambling, and not to other types of behavioural addiction.

The scope of *behavioural addiction* is still widely debated. Nonetheless, it can be characterised by the repeated uncontrolled seeking of short-term rewarding behaviours, as opposed to the consumption of psychoactive substances (as for other addictions, e.g., drugs and alcohol). While these behaviours may not be harmful in and of themselves, their persistent pursuit is detrimental to a person's psychological, physical, and interpersonal functioning; and behavioural addiction have been argued to include exercise, eating, shopping and sex, as well as theft (known as kleptomania; Holden, 2010). It should be noted that, while impulsivity may be present, it is not a defining feature of behavioural addictions (cf., Billieux, et al., 2017).

A checklist of risk factors for game features, based on risk factors of problem gambling, was developed by King et al. (2015). More recently, King (2018) found that the overwhelming majority of video games contained gambling-like features. These include the criteria of placing a monetary *stake* for a chance at an unknown future outcome, as well as being able to avoid losses if players do not engage with loot boxes. However, like gaming, gambling can be associated with positive outcomes for those who engage with it without problems (Blackman, Browne, Rockloff, Hing, & Russell, 2019); thus, any comparison between the two activities is perhaps best conceptualised in terms of harm caused and how the characteristics of these activities influence this harm, rather than superficial similarities between them.

How do loot box characteristics match up with gambling?

This section of the review aims to compare the characteristics of loot boxes to gambling activity, with a specific focus on game design and how this impacts users. For further coverage on the common features shared by gaming and gambling activities, see checklists proposed by Drummond and Sauer (2018), Griffiths (2018), and King, Gainsbury et al. (2015).

Structural characteristics

The physical characteristics and rules of play for different gambling activities vary. Electronic gaming machines (EGMs) appear to be the most similar to gaming and loot box use, due to their technology medium, display of attendant auditory and visual stimuli, placement of small stakes, low skill requirement, and presence of other non-gambling themes (e.g., Queen of the Nile, Star Wars, etc.). Many of these features are increasingly observed in other forms of gambling also, such as online casino games (Griffiths, 2013; King & Delfabbro, 2016; King, Delfabbro, & Griffiths, 2010). While also providing the opportunity for continuous play, the main difference is that purchasing of loot boxes is less frequent than bets placed on EGMs, due to the contextual narrative present in online games vs betting being the sole focus of the

activity for the latter. This means that the average amount and range of money spent on EGM gambling is much higher than on loot boxes. Otherwise, like many forms of gambling, loot box purchase during online gaming is only restricted by available funds and time.

Reward schedules

Although the schedules of reinforcement offered by gambling and loot boxes are often compared (e.g., Drummond & Sauer, 2018), there are quite distinct differences between the two. Unlike gambling, loot box outcomes are offered on a *continuous reinforcement schedule*, since a reward is obtained every time a loot box is purchased (Cooper, Heron, & Heward, 2007). Of course, there is the possibility of obtaining duplicate or unwanted items (these may be offset by salvage/resale/trade-in opportunities), but there are no true losses associated with loot box purchases, unlike gambling. *Intermittent variable-ratio schedules* of reinforcement (Skinner, 1953), where reward is delivered after only some, but not all purchases, are also present with loot boxes, but this only applies to *rare* items. For this reason, loot box purchasing may, of course, also predispose gamers to be attracted to gambling, upon exposure. Therefore, loot boxes present a complex interplay between continuous and intermittent variable-ratio schedules – the former often used to encourage learning of new behaviours and the latter to maintain existing behaviour. This combination, along with the other classical conditioning forces at play, potentially makes their use highly addictive, perhaps even more so than gambling. The differences and similarities between these structural characteristics are further detailed in Table 1.

TABLE 1. RELATIONSHIP BETWEEN GAMBLING AND LOOT BOX CHARACTERISTICS

	Gambling	Loot box Purchasing	Comment
Stake	Non-optional	Optional	If items can be won in ways (not only via purchase)
Chance	Unknown	Known	A form of <i>bundling</i> , if outcome known; gambling, if not
Cash-in	Yes	No	Within-game mechanisms are perhaps easier to regulate. May still seem like gambling if 'no,' as value

Links between loot box use and gambling harm

Several empirical studies have directly examined the relationship between loot box purchasing and problem gambling behaviours. The general consensus is that purchasing loot boxes is associated with disordered gambling (Drummond et al., 2020; Zendle, 2019; Zendle & Cairns, 2018; Zendle & Cairns, 2019; Zendle, Cairns, Barnett, & McCall, 2019, cf. Macey & Hamari, 2018; Shibuya et al., 2019), an effect also observed amongst adolescents (Kristiansen & Severin, 2020; Zendle, Meyer, & Over, 2019). Due to the cross-sectional nature of these studies, there is no clear evidence that loot boxes are a direct pathway to problem gambling, with only associative relationships established between the two.

Compared to gamers who do not buy loot boxes, gamers who do purchase them have been found to: play video games more often, for longer periods of time, and with greater intensity; and gamble online more frequently, and for longer periods of time (Li, Mills, & Liu, 2019; Zendle, Cairns, Barnett, & McCall, 2019; see also Zendle, 2019). Other research has shown that the amount spent on loot boxes predicts problem gambling severity (Brooks & Clark, 2019; Drummond et al., 2020; Zendle & Cairns, 2018; Zendle & Cairns, 2019; Zendle, Cairns, Barnett, & McCall, 2019; Zendle, Meyer, & Over, 2019; as well as IGD, Dreier et al., 2017). The ability to cash out loot box bounty, showing near-misses (i.e., when a desirable item was nearly obtained), and use of in-game currency to purchase loot boxes have also been found to weakly increase the relationship between loot box spending and problem gambling (Zendle, Cairns, & Barnett, 2019). These findings support previous research that accessibility affects gambling frequency and intensity (Kim, Wohl, Salmon, Gupta, & Derevensky, 2015), and these gamblers perhaps see loot boxes as another medium by which they can 'strike it lucky' (Macey & Hamari, 2018a). Stronger associations have been observed for disordered gambling and *video game-related* and *online* gambling, compared to *offline* and *loot box purchasing* modes (Hamari & Macey, 2018a; Hamari & Macey, 2018b), highlighting the role increased accessibility of gambling outlets has on gambling behaviours (Gainsbury, Russell, & Hing, 2014; Howe et al., 2019; King, Delfabbro, Kaptsis, & Zwaans, 2014).

Whilst providing valuable information, particularly in the context of comorbid and contextual considerations for loot box use, research has yet to show direct causal links between engagement with this game feature and problem gambling. It may be that people with pre-existing problem gambling issues and/or vulnerability are attracted to loot boxes. Research is needed to examine the direct influence loot box use has on actual gambling by employing longitudinal research designs, as well as exploring future intentions to gamble amongst gamers who have not yet taken up this activity. *Section 5* discusses this further. Prevalence research is also required to get a better sense of how many people are negatively affected by different loot box business models and how severely are they impacted.

Cognitive research

Research has also examined cognitions associated with loot box use. For instance, Brooks and Clark (2019) examined the extent to which loot box use is associated with gambling beliefs and disordered gambling behaviours, as well as problematic online gaming in general, among adult gamers (who all reported prior video games play and/or some familiarity with loot boxes; and most participants in their study reported regularly playing games). They found that the general attitude towards loot boxes was that it was a 'good feature;' most (at least two-thirds) also endorsed the statement that *loot boxes sometimes makes me feel like making a bet*, and agreed that *loot boxes are a form of gambling*; however, why they felt that way is unclear and qualitative methodologies could explore this further. Their study found that risky loot box use (indexed by self-reported problems), excitement in opening loot boxes, increased time spent playing in order to find loot boxes (including at the expense of other responsibilities), and the pursuit of valuable items, was correlated with increased gambling symptoms, and gambling-related cognitions (e.g., illusion of control, interpretive bias, predictive control, gambling-related expectancies, and perceived inability to stop gambling). In fact, gambling variables (i.e., severity and cognitions) predicted 37.1% of the variance in loot box use, considerably more than problematic gaming symptoms (8.6% of the variance), highlighting specific common elements that may be shared between these gambling and loot box use.

Loot box use appears to be more closely related to gambling than gaming (Brooks & Clark, 2019); however, research is needed to ascertain what factors predict problematic loot box use, problem gaming, problem gambling, and combinations of these behaviours. Research by King et al. (2012) indicates that, "among those persons who both gambled and played video games, video game playing was uniquely and significantly positively associated with the perception of direct control over chance-based gambling events" (p.421). Wu, Sescousse, Yu, Clark, and Li (2018) also found increased skill-oriented cognitive distortions (e.g., illusions of control), persistence during EGM play, and desire for reward amongst people who experience symptoms of *internet gaming disorder* (IGD). While not examining perceptions of control over loot boxes directly, previous research indicates the possibility that perception of control and/or skill also attracts video gamers to this particular design feature. This is perhaps what makes "predatory monetization" (King et al., 2018, 2019) strategies, that tailor loot box contents to individual players' previous gaming patterns, potentially harmful since they can capitalise on these perceptions of skill and control.

Gambling research on cognitive distortions has indicated that, while illusion of control is observed amongst problem gamblers, other gambler's fallacies show stronger relationships with disorder symptoms (Goodie & Fortune, 2013; Toneatto, Blitz-Miller,

Calderwood, Dragonetti, & Tsanos, 1997). For instance, gamblers report compulsive tendencies and feeling unable to stop gambling, despite their desire to do so (Tani, Gori, & Ponti, 2018). This has not been convincingly shown with loot box use and gamers. Further research is required into unique and shared cognitive distortions of loot box users, gamers and gamblers, and into attitudes to loot boxes beyond the preliminary investigations to date (i.e., the endorsement of 'good' vs 'bad'; Brooks & Clark, 2019).

Motivation research

Some researchers argue that addiction—whether it be to loot box purchasing, gambling, or gaming—reflects some underlying need, such as to escape, cope with mental illness (e.g., depression, anxiety), or to address some sort of deficit in reward functioning (Damasio, 1994, 1996; Dreier et al., 2017; Ferguson et al., 2019; Holden, 2010; Kardefelt-Winther, 2017). A considerable amount of research has examined motivations for in-game purchases, identifying interesting and complex reasons for buying loot boxes. However, studies have not always considered individual differences and underlying needs, and people are not always aware of what motivates their behaviour. Studies involving self-reported motivations may therefore be limited in this respect.

Social motivations, expressed in descriptions of pride, self-expression, and pursuit of perfection, have consistently been reported to drive loot box purchasing (Cleghorn & Griffiths, 2015; Dreier et al., 2019; Griffiths, Hussain, Grüsser, et al., 2013; Hamari, Alha, Jarvela, Kivikangas, Koivisto, & Paavilainen, 2017; Hamari & Keronen, 2017; He, 2017; Huang, 2012; Korkeilaa & Hamari, 2020; Zendle, Meyer, & Over, 2019). The focus on social relations within games may mean young people are more vulnerable to feeling pressure to purchase loot boxes, due to well-documented real and perceived pressures on them (Prinstein & Dodge, 2008).

Other factors have been positively associated with in-game purchasing. One factor is the desire for unobstructed play (Cleghorn & Griffiths, 2019; Hamari & Keronen, 2017; Huang, 2019), where purchasing a loot box enables continued progression. An economic rationale may also be salient, where players see the game as presenting value for money and want to support developers of good games (Hamari et al., 2017; Zendle, Meyer, & Over, 2019). Other factors include: perceived value in terms of exclusivity, collectability and profitability (Cleghorn & Griffiths, 2015; Zendle, Meyer, & Over, 2019); affective control (Huang, 2012); to express identity (Cleghorn & Griffiths, 2019; Huang, 2012); enjoyment of unlocking content and investment in an enjoyable pastime, as well as emotional attachment to, and vicarious living through, their in-game character (Hamari et al., 2017; Hamari & Keronen, 2017; Huang, 2012; Korkeilaa & Hamari, 2020; Udesen, Lenskjold, & Niclasen, 2019; Rab, 2007; Zendle et al., 2019). Interestingly, Hamari et al. (2017) found that in-game spending does

not appear to be related to competitiveness (unless game play requires their purchase, cf. Zendle et al., 2019), suggesting that pay-to-win is not a likely motive for most purchasers.

Focus groups with adolescents in Greenland revealed that many young people view loot boxes as gambling, due to the exchange of money that takes place, and that some had experience selling valuable skins to other gamers (Udesen et al., 2019). Interestingly, early experiences (attaining desired outcome vs not) were found to play an important role in shaping further engagement with loot boxes, mirroring findings from gambling studies (Blaszczynski & Nower, 2002; McCowan & Chamberlain, 2000; Sharpe, 2002).

Other disordered gambling research has shown the motivations for affected individuals primarily span those that alter mood; for example, they may do so to achieve increased excitement (i.e., enhancement or sensation-seeking gamblers) or in response to negative moods (i.e., coping or escape gamblers; Beaudoin & Cox, 1999; Griffiths, 1991; Moodie & Finnigan, 2005; Neighbors et al., 2002; Sharpe, 2004; Wulfert, Roland, Hartley, Wang, & Franco, 2005). While social factors (Lam, 2007) and perceived value (Lee, Chae, Lee, & Kim, 2007) have also been shown to drive gambling behaviours, loot box use appears to be associated with more complex links to identity and investment in a hobby.

Biopsychological research

There is a distinct lack of neuroscientific research into the biological determinants and effects of loot box use. Preliminary biopsychological research, using skin conductance as an indicator of autonomic nervous system activity, has shown increased arousal in anticipation of, and in response to, rewarding outcomes among 'healthy/normal' gamers (Larche et al., 2018). Research has also examined psychophysiological responses from people who report problematic loot box use/gaming. Brady and Prentice (2019) found attenuated responses to loot box outcomes, indicating possible hyposensitivity to reward, perhaps akin to tolerance effects developed over time. The American Psychiatric Association (APA, 2013) posits that, when gaming, certain pathways in the brain are triggered in the same direct and intense way that a drug addict's brain is affected by a particular substance. Neuroimaging research (e.g., EEG [electroencephalogram], fMRI [functional magnetic resonance imaging], BOLD [Blood oxygenation level dependent imaging], etc.) is needed to better understand if this is the case, why some people are more susceptible to harm than others, and whether these effects are similar to what has been observed among disordered gamblers (Clark, Boileau, & Zack, 2018; Murch & Clark, 2016).

Marketing, advertising, and responsible-gaming research

Loot boxes are unlikely to entice gamers in and of themselves - players have to enjoy the game first, then decide if they see value in investing in it further (Hamari & Keronen, 2017). This finding is similar, in some ways, to recent gambling research into offers presented in wagering advertising, in that inducements to gamble have the most impact on those who are already vulnerable (Binde, 2009; Hing, Cherney, Blaszczyński, Gainsbury, & Lubman, 2014; Hing et al., 2018; Lole et al., 2019).

Within the population of those already using loot boxes, research has begun to explore the impact that loot box advertising has on gambling expenditure. A Japanese study on advertised inducements to play kompu gacha, found that *limited-time* offers were associated with greater loot box expenditure, including at 6 months after the viewing these offers (Shibuya, Teramoto, Shoun, & Akiyama, 2019). Unlike gambling studies, responsible gaming research, in the context of loot boxes, is limited; however, if findings from the former are to guide the latter, one would expect limited effectiveness of information-provision efforts for regular gamers (e.g., Gainsbury, Aro, Ball, Tobar, & Russell, 2015; Lole, Li, Russell, Greer, Thorne, & Hing, 2019). Future research should examine the effects of advertising on loot box consumption in order to guide appropriate regulations. It could also explore the effectiveness of responsible loot box use-messaging to counter any associated harm.

Conclusion

A large number of people have an interest in knowing whether loot boxes lead to harm. For example, video gamers seek an enjoyable gaming experience but with adequate consumer protections; game developers are interested in sustained financial viability; and regulators should be interested in minimising harm to players. This review has shown convincing evidence that several aspects of loot boxes are cause for concern, due to unethical business practices and game design, highlighting the 'pull' of predatory monetization techniques, immersive conditioning principles, and powerful motivations involved. This highlights the need for further research into several aspects of loot boxes, and their links with disordered behaviour and associated harm.

One important area of research is into the links between loot box use and disordered gambling. A considered approach to researching this issue is crucial and needs to be mindful of not only how these two activities are alike, but also how their structural and contextual factors differ. Several methodologies can inform this endeavour. Longitudinal, experimental, quasi-experimental (using categorical groups of the presence of problems vs not), and qualitative methods may provide the most accurate picture of how loot boxes impact players' wellbeing. Specific research that

focuses on young gamers and players who have comorbid mental health conditions is also warranted. Research into healthy gamers and those who only developed problems as a result of using loot boxes is also likely to yield useful information to inform how these games should be regulated and designed. Collaborative research between product developers, gamers, their significant others (particularly parents), and the academic community is desirable in this bid to establish whether loot boxes are akin to gambling. A thoughtful and heterogenous approach is needed to address concerns about loot box harm, due to the complexities of this issue, the diversity of the gaming community, and consideration of what is at stake.

Study 1: Environmental Scan

Introduction

The aim of this research stage was to identify via an environmental scan which best selling video games played by Australians have loot boxes, and of these which provide prizes that are convertible to cash or other items of value and therefore most closely resemble traditional gambling products.

The need for the environmental scan was two-fold. First, loot boxes can only represent a substantive risk to the population if they are common in popular video games. Like most risky products, exposure is a key element to producing the potential for harmful outcomes. Next, an enumeration of the best selling video games was a key input into the next phase of the research project. In order to have an accurate picture of the prevalence with which young people play video games that have loot box features contained therein, it was practically important to be able to present a list of common loot box games to participants in the subsequent survey in the next stage. This need arises from the fact that people may not remember all the games that they play which contain loot boxes. Moreover, since loot boxes are only a small part of the overall gaming experience, and often an optional component of games, people may not know or recall if loot boxes are available in games that they play often.

As outlined below, there are several disparate sources for compiling video game offerings to Australian consumers, and no known sources that comprehensively document loot box features of available games. The environmental scan was therefore necessary to compile this information into a single reference source to satisfy the objective of the study.

Methodology

Data Sources

A total of 82 video game titles were selected for the environmental scan, which was conducted between August 2019 to October 2019. Video games were selected based on several data sources to identify which were the best selling amongst Australians in 2019. The final list of 82 games reviewed in the environmental scan are provided in Appendix B, along with the data sources.

The aim was to identify by Australian market share the top video games sold in 2019. Forty-four (44) games titles based on 2018 market share data were sourced from

market research company *Euromonitor International*, as shown in Appendix A². There were three main issues with the two market share lists which led to identifying game titles from additional sources: 1) the game titles listed were often generic to a series rather than the latest game releases, for example 'FIFA' as opposed to the latest releases FIFA18 and FIFA19; 2) 'other' brands accounted for 70.7% of the digital software and 20.2% of the physical software markets; and 3) Nintendo was listed as 'brand' without listing specific game titles, accounting for 8.2% of the physical software brand share. Additional sources served two purposes: 1) identifying additional video games, 2) narrowing a game series listed to a specific game release.

In lieu of hard-to-source Australian market share data, global 'top-lists' of video games based on revenue, playing, or watching in 2018-2019 were sourced online, as video gaming by Australians are likely to mirror global figures. Sources included: SuperData Research's 2018 top 10 free-to-play games and the top 10 premium PC and console games, both by revenue³; SuperData Research's May 2019 top 10 grossing game titles by PC, console, and mobile⁴; VGCharts's top 20 global game titles by units sold December 2018⁵; 20 most watched games on Twitch⁶; and Newzoo's top 10 most watched games on Twitch and YouTube Gaming in March 2018⁷. Sixteen (16) new games were sourced from these 'top game lists', including well known games: Clash Royale, Hearthstone, Madden NFL, NBA 2K, Overwatch, and PlayerUnknown's Battlegrounds (PUBG).

The second additional source was May-July 2019 data collected from Australian online survey respondents for an unpublished CQUniversity project⁸ on the video games played by Australian adults in the previous 12 months. Twenty-two (22) new games were sourced, including Rocket League, Team Fortress 2, Formula 1 series, Heroes of the Storm, and the Need for Speed series.

The video game market is large and fragmented, and these 82 games were not intended to be a comprehensive scan of all games offered to Australian consumers that contain loot boxes. Instead, the scan was devised to be a sample survey of the

² Australian dollars and as a percentage of total share for the games.

³ SuperData Research. (2019). *2018 Year in Review: Digital Games and Interactive Media*. <https://www.superdataresearch.com/market-data/market-brief-year-in-review/>

⁴ SuperData Research (June 2019, email communication). *Worldwide digital game spending declined in May, down 4% YoY*.

⁵ VGCharts (2019). *Top 100 Global Years Chart 2018 (taken 23 July 2019) – USA, EU, EK, Germany, France, Japan*. Retrieved 23 July, 2019 from: <http://www.vgchartz.com/yearly/2019/Global/>

⁶ Twitchtracker.com (2019). Top Games on Twitch, Last 7 Days by Average Viewers. Retrieved 23 July, 2019 from: <https://twitchtracker.com/statistics/games>

⁷ Newzoo (March 2018). Most Watched Games on Twitch and Youtube Gaming (as of March 2018). Retrieved 23 July, 2019 from: <https://www.wepc.com/news/video-game-statistics/#gaming-video-content-market>

⁸ Greer, N. (2018). Gambling and video games: Are Esports and Skin Betting pathways to greater youth gambling involvement and harm? ECR Gambling Grant, Victorian Responsible Gambling Foundation, \$50K.

best selling games on offer, such that descriptive statistics could be applied to the set in determining the frequency of loot box offerings in various guises. Implicit in this methodological consideration, however, is that the market of video games that was not surveyed bears some resemblance to this high sales volume subset.

Some popular games identified via the data sources were video game titles that span several releases. For example, the game title “Fortnite” is listed instead of all latest games in the series: *Battle Royale*, *Save the World*, etc. Popular games are often released repeatedly in a series and identified by a version number or publication year. For these serially-released games, all past 3-year releases in the series were reviewed. While 82 game titles are listed in our scan used for analysis purposes, 40 game titles had 2 or more individual releases within a series, which resulted in 296 individual products being individually reviewed. The results presented in this report are for 82 video game titles (and not serial releases). Serially-released games were collapsed to show one title wherever the loot box features were functionally the same across multiple releases.

Coding Structure

The following information was gathered from the environmental scan via online searches, forums, and other relevant websites (e.g., skin exchanges):

- 1) Video game name
- 2) Video game developer
- 3) Video game publisher
- 4) In-game currency purchasable (yes, no)
- 5) Loot box available (yes, no), if yes:
 - a) Loot box purchasable (microtransaction) (yes, no)
 - b) Loot box won in game (without purchase) (yes, no)
 - c) Loot box purchasable with in-game currency (yes, no)
 - d) Loot box contains skins or other items of value which can be traded for money/other items of value (yes, no)
 - e) Loot box contains in-game currency which can be used to purchase skins or other items of value (yes, no)

Defining a loot box

For the purposes of the scan, strict criteria were developed to clearly define a “loot box.” A consensus definition for loot boxes is not well established. Consequently, any choice to classify a games as having a loot box (or not) is strongly reliant on arguable criteria. Here we advance what we view to be a reasonable and well specified definition. To qualify as a loot box within a game title, the prospective “loot box” needed to conform with the following criteria:

1. A loot box is strictly a virtual container that assembles one or more virtual items or other rewards as its contents. Physical 'loot crates' are available for some games, which are delivered to consumers in the real world and contain unknown random products such as merchandise (e.g., tee-shirts, mugs, etc). Due to their rarity and lack of immediacy, these physical boxes were excluded in our definition of loot boxes.
2. When opened, the loot box must reward the player with content that can be used for that game. Content from loot boxes may include cosmetic items or skins (i.e., visual enhancements to game characters, weapons, etc.), functional items (e.g., new characters), special abilities, in-game currency, or more loot boxes. Hereafter, "items" will refer to all rewards from loot boxes irrespective of the type of the reward. Items from loot boxes may be consumable, such that they disappear after use. Nevertheless, to qualify as a loot box, items must have at least some "persistence" such that the player can hold the reward for use in subsequent play sessions (if desired).
3. The contents of the loot boxes must be random or at least appear to be random from the standpoint of the player. If the contents are known by the player beforehand or are the same for all players (e.g., opening a case at location X in the game always offers the same weapon), they were not defined as a loot box. Instead, these types of boxes would more properly be called *bundles*.
4. Loot boxes need not visually resemble a box or crate but rather can take many forms that are nevertheless essentially a container for in-game items. Our investigation of loot boxes showed that these can appear in many forms other than boxes, such as crates, chests, cases, packs, big wheels, etc.

Importantly, in the study we sought to diligently apply these criteria to each game in the sample. However, given the complexity and multitude of examined game titles it is possible that classification errors may still exist. Like other types of measurement, the results do not need to be perfect to contribute to valid follow-on analyses. In our view, minor specification errors that might be found by the reader should not be taken as necessarily invalidating all results from this study, but rather taken into consideration in the context of the quantity and scope of any errors.

Study 1: Findings and Discussion

Research Question 1

"What best selling video-games use loot boxes, and which provide rewards that are convertible to cash or other items of value?"

Table 2 shows the summary results of the environmental scan. The availability and features of loot boxes for each individual video game title is presented in Appendix B.

The scan was devised to feed the list of resulting game titles into the online survey for the purpose identifying the prevalence of video game play on titles that offer loot boxes. However, another purpose, as detailed below, was to analyse the overall availability of loot boxes in the best selling games, and discover how common it is for the rewards gained from loot boxes to be purchasable and tradable for cash or other items of value. Both of these latter features align loot boxes more closely with traditional gambling products.

Loot box availability and obtainment

As shown in Table 2, 62% (51) of explored video game titles contained loot boxes. Of games which had loot boxes, the most common method of offering a loot box to players was free in-game (86%, 44). Free loot boxes are offered either as a reward for game play (e.g., progression, completing challenges); offered daily (e.g, for logging in); gifted from another player; or randomly dropped (e.g., as a special event). It was also common for loot boxes to be purchasable with in-game currency (75%, 38) but less so directly via microtransactions or spending money (31%, 16). Some game titles offer multiple methods for obtaining loot boxes, therefore these alternative methods do not add to 100%.

Most games with loot boxes that can be bought with in-game currency also allow in-game currency to be purchased with money via microtransaction (30 of 38 games, 79%). Consequently, players can purchase loot boxes in a two-step process; that is by: 1) purchasing in-game currency, and 2) spending that virtual currency on a loot box. Consequently, fifty-nine (59%, 30) of surveyed games with loot boxes (51) can utilise this two step process. Notably, while 59% (48 of 82) of all games offered purchasing of in-game currency, a greater proportion of games with loot boxes (36 of 51 games, 71%) offered in-game currency purchases. It could be reasonably surmised that in-game currency, therefore, is an intentional mechanism for encouraging the sale of loot boxes as opposed to being exclusively related to other in-game sales.

The monetary value of loot box content

The content of loot boxes varied by game, and ranged from skins (cosmetic items) to items which benefit the players' gameplay (e.g., weapons, characters, energy, abilities), or in-game currency. Skins, in-game currency, and other items gained from loot boxes have monetary value by virtue of players being able to: 1) sell these virtual goods for cash (real money), 2) sell skins or other items of value for virtual in-game currency, 3) trade skins or other items of value for other virtual items (e.g., other skins, weapons, etc), or in some limited circumstances, 4) use skins to gamble on online casino games.

It is important to note that virtually all game accounts, regardless of the intentions of the publisher, can be sold by one player to another for cash in a private transaction.

Whether sale of virtual items is widespread, however, was a topic of exploration for the follow-on study in this project that involved surveying video game players.

As shown in Table 2, 84% (43 of 51) of games that offer loot boxes include virtual items, such as skins or weapons, that can either be sold for cash or traded for other skins, items of value, or in-game currency. Arguably, any loot box with this cash-out feature is more similar to traditional gambling products than those without. The randomised outcome that is realised by the unpacking the loot box can be transformed into a currency that can be used for future loot box purchases. Winning or losing streaks can be created by repeating this cycle of purchasing and redemption. Although loot boxes always contain some virtual items or in-game currency (they are never empty), in many cases the unpacked items may be of little value relative to the purchase price which creates a loss for the player.

Over half (55%, 28 of 51) of titles with loot boxes contained in-game currency which could be used to purchase skins or other items of value, which can be subsequently sold for cash or traded for other skins or other items of value.

A description for each game title with respect to how skins, in-game currency, and other items of value obtained from loot boxes can be sold or traded for money or other items is presented in Appendix C.

Skins, items, and in-game currency gained in loot boxes can also be transformed into cash by selling an entire game account. Third party websites offer the opportunity to sell accounts on 37 popular titles, which amounts to 73% of the 51 titles in our sample that offer loot boxes. Examples of third-party websites for the sale of accounts include: *Playerup*, *PlayerAuctions*, *g2g.com*, and *Gameflip*. As noted previously, assuming a seller can find a buyer, it may also be possible to sell accounts for other games through an unmediated private transaction.

Some video game publishers provide the facility to trade skins and other items gained in loot boxes for in-game currency (20 games, 39%), trade loot box skins/other items of value for different items (8 games, 16%), or sell items gained in loot boxes back to the developer for cash (4 games, 8%).

Lastly, some third-party websites allow the sale of individual skins, other items or in-game currency for cash or cryptocurrency (e.g., Bitcoin), rather than requiring the sale of an entire player account (18 games, 35%). The most prominent examples are skin-exchange websites including: *Bitskins*, *Skinwallet*, *Skins.Cash* and *CSMoney*.

TABLE 2. SUMMARY OF ENVIRONMENTAL SCAN RESULTS

Audit item	Count (<i>n</i> = 82)	% of all Video games (<i>n</i> = 82)	% of games with loot boxes (<i>n</i> = 54)
In-game currency purchasable w/ cash	48	59%	69%
Loot box available	54	66%	-
Loot box purchasable (microtransaction)	16	20%	30%
Loot box won in-game (without purchase)	46	56%	85%
Loot box purchasable with in-game currency	39	48%	72%
Loot box contains skins tradeable for cash/other items of value	39	48%	72%
Loot box contains in-game currency which can be used to purchase skins	30	37%	56%

In summary, the environmental scan revealed that loot boxes are common in the best selling video game titles represented by our sample. A majority of titles with loot boxes offer at least some of them “for free” as part of a reward system of gameplay. Nevertheless, it is common for loot boxes to be offered for purchase either directly with cash, or with in-game currency that is purchasable. It is often easy for players to be able to convert items obtained from loot boxes back into cash. Consequently, there is little preventing a motivated user from employing loot boxes in a manner consistent to use of traditional gambling products, whereby it would be possible to accumulate streaks of wins or losses of financial consequence. Study 2 used survey methods to explore how people engage with loot boxes in games, including the frequency with which survey respondents transform items gained from loot boxes back into cash.

Study 2: Online Survey

Introduction

The environmental scan, conducted as Study 1, is an important input into the survey for the presently described Study 2. For this present study, the purpose was to understand how many young people in our sample, including adolescents and young adults (18-24 years), were aware of loot boxes, played games with loot boxes, purchased loot boxes, and sold items gained from loot boxes. These types of engagement with loot boxes represent increasing levels of involvement that cause loot boxes to functionally resemble a traditional gambling product. First, people cannot be exposed to risk if they are unaware of the existence of loot boxes within the games that they play. Loot boxes are a random reward, but do not represent a risk from an investment unless that loot box was purchased (as opposed to given to the player freely as part of the game mechanics of a purchased game). Any items gained from loot boxes might be considered “a thing of value,” which would qualify purchased loot boxes as a gambling product. However, to the extent that players sell loot box items, transforming them into cash, the product becomes fully-realised as a gambling game where money is risked for a potential (but not certain) cash reward.

The environmental scan documented the potential of best selling video game titles to entice players with loot boxes that can functionally serve as a gambling product. Perhaps the more important question, however, is whether people use loot boxes in ways that make them resemble traditional gambling, or whether instead people simply accumulate loot box items for their own private enjoyment as cosmetic or functional items within a game. Study 2 was thus devised to answer the following research question:

Research Question 2

“What is the prevalence in the use of loot boxes by adolescents (12-17 years) and young adults (18-24 years); and who uses them as a gambling product?”

Importantly, we could *only* explore this question with the aid of our convenience sample, which is not entirely representative of adolescents and young adults in NSW. Nevertheless, this study aimed for a first approximation with available data since random sampling of adolescents and young adults is procedurally difficult and prohibitively expensive. We accept, of course, that some readers may take issue with estimating prevalence with a convenience sample regardless of these caveats. We can only emphasise prevalence results should be interpreted with extreme caution since a hypothetical representative sample may have produced different results. Since a representative sample for this problem is likely to remain “hypothetical” we offer these prevalence results in the belief that some estimate is better than no estimate, and in the context of the importance for, and urgency of, understanding this problem.

To the extent that people may spend excessive amounts of money on loot boxes, there is a potential for these activities to be harmful. However, it is also possible that early exposure to loot boxes, particularly in adolescence, can act as a gateway to greater gambling involvement with other products. Loot boxes are widely available to

young people, whereas regulation aims to limit the exposure of adolescents to traditional gambling products. Thus, it is important to be aware of two pathways to harm that are possible as a result of engagement with loot boxes: first, people may experience direct harm through spending too much, and second loot boxes may groom youth to accept a greater role for gambling in their lives. These considerations led to the formulation of the third and final research question for the project:

Research Question 3

“What are the associations between early exposure to gambling via loot boxes, attitudes and intentions regarding gambling, as well as subsequent gambling and harm?”

In summary, Study 2 was devised to use knowledge about the availability of loot boxes within best selling video game titles as input to survey who plays these games; who is aware of loot boxes; whether people use them as a gambling product; and whether use is associated with gambling intentions, gambling product use, problems, and harm.

Methodology

Study 2 comprised a cross-sectional online survey of young people, aged 12-24 years, for the purposes of understanding their knowledge and engagement with loot boxes and traditional gambling products, including the potential harms and gambling problems that they are experiencing from their gambling.

Participants

Respondents were recruited through Qualtrics, who acted as an intermediary to online panel providers. Respondents were aged between 12 and 24 years and resided in the state of New South Wales (NSW), Australia. Respondents consented to take part in the study in compliance with the requirements set forth by the Central Queensland University Human Research Ethics Board (HREC # 22128). All respondents successfully complete an attention check early in the survey ("This question is an attention check - Please select "seven" to continue with the survey). The survey was in-field from 5th December 2019 until 12th January 2020.

A total of 8,522 participants started the survey. Of those respondents, 5,605 were excluded because they were not within the age range and/or did not live in NSW. A further 100 persons were excluded because they did not consent to take part, leaving 2,817 potential recruits. Data quality checks covered exclusions for failing the attention check ($n = 118$) and exclusions for poor data quality (e.g., straight-lining or entering junk responses in open-ended text fields, $n = 50$). Of the remaining 2,650 qualifying respondents, 1,954 completed the full survey (completion rate = 73.7%). The median completion time was 9.5 minutes.

Of the final 1,954 respondents, 59.9% were female, 39.2% male and 0.9% indicated a gender other than male or female. By establishing quotas prior to recruitment, the sample was approximately evenly split between those aged 12-17 years (under the legal age of gambling in Australia, $n = 919$, 47.0%) and 18-24 years ($n = 1,035$, 53.0%).

Procedure

Respondents were invited to take part in the survey via an email from Qualtrics' panel partners. Respondents were screened based on their age and the state in which they reside. Information sheets outlined the nature of the study (on loot boxes) but did not reveal the study questions. Respondents were informed of the right to withdraw prior to survey submission, that their answers were anonymous, and their answers would not be identifiable in any publications. Respondents were compensated in line with the reward structures of the panel partner, which most often offered points to be redeemed for gift certificates, prizes, etc. Some questions within the survey were only asked of either the adolescent or adult samples (see measures section below).

Measures

As outlined in more detail below, some questions were only asked of the adolescent respondents (12-17 years), while others were only asked of the young adults (18-24 years). Because they can take part in these activities legally, only the young adults were asked about their current gambling participation. Intentions to gamble in the future (and as adults) was only asked of the adolescent sample. Unless otherwise noted, other questions were asked of both adolescents and young adults.

Demographics

The demographics section included questions about: age (in years), gender (*male, female, other*), whether respondents speak a language other than English at home (no, yes), and Aboriginal or Torres Strait Islander status (*Aboriginal, Torres Strait Islander, both, neither*). The young adults sample were also asked for their marital status (*single/never married, living with partner/de facto, married, divorced or separated, widowed*) and the highest level of education that they had completed (*no education, primary, secondary, technical school and/or some university [but not a bachelor's degree], Bachelor or equivalent, Masters or equivalent, Doctoral or equivalent, Other [please specify]*). Both the young adults and adolescents were asked for their current income. The question for the adolescent sample specifically mentioned that this should reflect their own income, not their parents' income, and that for most people their age, their income would be \$10,000 or less (the lowest bracket).

Engagement in games that include loot boxes

All respondents were asked whether they had played within the last 12 months each of 68 video game titles that are known to have loot boxes (see Appendix D for list). These included the 51 games identified in Study 1, but respondents also entered up to five additional games that they played if they believed the game included loot boxes.

Two of the authors (AR and NG) looked through the additional responses and found some respondents had entered the names of games that were already on the list of 51 best selling games with loot boxes (see Study 1). These were back-coded into the appropriate category. Nevertheless, there were over 900 “other” responses. Verifying whether all these additional games had loot boxes was a time-prohibitive task. However, the authors considered video games in the data set for the subsequent analyses if: a) a respondent had not identified any other games in the given list (i.e., if a game they entered made a difference to whether or not they were classified as having played a game with loot boxes or not), or b) if a particular game was entered by more than five respondents. These criteria allow for a smaller set of game titles for verification according to our criteria laid out in the methods section of Study 1. A total of 13 new games were found to have loot boxes, and these video game titles were grouped into a single “other” category for convenience in the analyses that follow.

Loot box awareness, engagement, purchasing, purchasing motivations and selling

All respondents were asked if, before today, they were aware of loot boxes (*no, yes*), if they had ever opened a loot box, and the age at which they had *first* opened a loot box. Additionally, respondents were asked if they had ever bought a loot box, at what age they first bought one, and if they had ever sold items they won in a loot box.

Those who had purchased loot boxes were asked for their motivations for purchasing loot boxes, through a list of 20 possible motivations compiled from a search of internet chat forums. Participants could specify “other” motivations using free-text entry.

Attitudes towards loot boxes

Respondents who indicated that they were aware of loot boxes, or who had opened a loot box, were asked 13 questions about their attitudes towards loot boxes. These questions were compiled from issues discussed on internet chat forums. Purposefully, these questions focused on the perceived negative features of loot boxes, since forums did not generally discuss positive aspects of loot boxes as much as the positive features of items contained in loot boxes.

Attitudes towards Gambling

The *Attitudes Towards Gambling Scale* (Orford et al, 2009⁹) consists of 14 items, seven of which are coded in a “positive” direction and seven in a “negative” direction. Items include “gambling should be discouraged,” and “gambling livens up life.” Cronbach’s alpha for this scale in this sample was .85.

Anti-social Loot box behaviour

Some people may engage in anti-social behaviours to obtain loot boxes; similar to such negative behaviours for obtaining other addictive products like alcohol, drugs, and cigarettes. A list of 5 such behaviours were compiled from internet forum searches. Using free-text entry, respondents could also enter up to five “other” behaviours that had made them feel guilty about their purchase or use of loot boxes.

Gambling behaviour

Young adults were asked about the frequency of their gambling on 15 different activities compiled from a recent NSW gambling prevalence survey¹⁰ (see *Appendix E* for list of activities). Young adults were asked how frequently they had bet on each activity in the last 12 months (*never in the last 12 months, less than once a month, once a month, 2-3 times a month, once a week, 2-3 times a week, 4 or more times a week*). Adolescent respondents were instead asked about their intention to gamble on these activities after turning 18 years old. For purposes of the analyses that follow, adolescents who indicated that they were likely or very likely to gamble on any form after turning age 18 were classified as intentioned future gamblers.

Gambling-related problems amongst adolescents (DSM-IV-MR-J¹¹)

Adolescent gambling-related problems were assessed using the DSM-IV-MR-J, completed by all adolescents in the sample. The DSM-IV-MR-J consists of ten items, although only the first nine are considered for classification purposes. A score of 4 or more items endorsed is considered a classification of “problem gambler” amongst adolescents.

⁹ Orford, J., Griffiths, M., Wardle, H., Sproston, K., & Erens, B. (2009). Negative public attitudes towards gambling: findings from the 2007 British Gambling Prevalence Survey using a new attitude scale. *International Gambling Studies*, 9(1), 39–54.

¹⁰ Browne, M. Rockloff, M., Hing, N., Russell, A.M.T., Boyle, C., Rawat, V., Tran, K., & Sproston, K. (2019). *NSW Gambling Survey, 2019*. Commissioned by New South Wales Responsible Gambling Fund, Sydney.

¹¹ Fisher, S. (2000). Developing the DSM-IV-DSM-IV criteria to identify adolescent problem gambling in non-clinical populations. *Journal of Gambling Studies / Co-Sponsored by the National Council on Problem Gambling and Institute for the Study of Gambling and Commercial Gaming*, 16(2-3), 253–273.

Gambling-related problems amongst young adults (PGSI)

The Problem Gambling Severity Index (Ferris and Wynne, 2001¹²) was completed by all young adults. The Problem Gambling Severity Index assess gambling risk severity over the last 12 months and consists of nine items, such as “have you bet more than you could really afford to lose?”. Response options are *never* (0), *sometimes* (1), *most of the time* (2) and *almost always* (3). Scores are summed for a total between 0 and 27. Respondents are then categorised into four categories: *non-problem gamblers* (0), *low risk gamblers* (1-2), *moderate risk gamblers* (3-7) and *problem gamblers* (8-27). Cronbach’s alpha for this sample was .95.

Gambling-related harm amongst young adults (SGHS)

The Short Gambling Harms Screen (Browne, Goodwin, and Rockloff, 2018¹³) was completed by all young adults in the sample. The screen consists of 10 items based on behaviour resulting from one’s gambling in the last 12 months, such as “felt ashamed of your gambling” and “spent less time with people you care about.” Response options are *no* and *yes* for each item. Cronbach’s alpha in the current sample was .91.

Study 2: Findings and Discussion

The results for Study 2 are organised into a) demographic statistics, b) problem gambling status, c) evidence on research questions 1, 2 and 3, and d) other ancillary finding. Demographic statistics and problem gambling status set the stage for understanding the context for the exploration. The survey is based on a convenience sample of panel participants, and therefore the research questions need to be interpreted within the context of the unique characteristics of the sample. After consideration of the research questions, however, there were some additional exploratory findings that reflect on people’s motivations for purchasing loot boxes, anti-social behaviours related to loot boxes, and their negative attitudes towards loot boxes.

Demographics

Demographic descriptive statistics are reported in Table 3. Sample demographic descriptive statistics for adolescent and adult

¹² Ferris, J. A., & Wynne, H. J. (2001). *The Canadian problem gambling index*. Canadian Centre on Substance Abuse Ottawa, ON.
[https://www.greo.ca/Modules/EvidenceCentre/files/Ferris%20et%20al\(2001\)The_Canadian_Problem_Gambling_Index.pdf](https://www.greo.ca/Modules/EvidenceCentre/files/Ferris%20et%20al(2001)The_Canadian_Problem_Gambling_Index.pdf)

¹³ Browne, M., Goodwin, B. C., & Rockloff, M. J. (2018). Validation of the Short Gambling Harm Screen (SGHS): A Tool for Assessment of Harms from Gambling. *Journal of Gambling Studies / Co-Sponsored by the National Council on Problem Gambling and Institute for the Study of Gambling and Commercial Gaming*, 34(2), 499–512.

samples are reported separately. Both groups included more females than males (52.3% female for the adolescent sample, 66.7% female for the adult sample). Compared to the NSW population, both groups included a relatively large proportion of respondents who spoke a language other than English at home (24.0% for adolescents, 32.4% for young adults), and people of Aboriginal and/or Torres Strait Islander background (10.2% adolescents, 7.2% young adults).

TABLE 3. SAMPLE DEMOGRAPHIC DESCRIPTIVE STATISTICS FOR ADOLESCENT AND ADULT SAMPLE

Measure	Level	Adolescent sample (<i>n</i> = 919)	Adult sample (<i>n</i> = 1,035)
Gender	Male	430 (46.8%)	335 (32.4%)
	Female	481 (52.3%)	690 (66.7%)
	Other	8 (.9%)	10 (1.0%)
Age	Mean (SD)	15.04 (1.66)	20.73 (2.00)
	Median	15	21
Language other than English at home	Yes	221 (24.0%)	335 (32.4%)
Aboriginal or Torres Strait Islander (ATSI)	No, not ATSI	825 (89.8%)	960 (92.8%)
	Aboriginal	77 (8.4%)	67 (6.5%)
	Torres Strait Islander	10 (1.1%)	2 (.2%)
	Both Aboriginal and Torres Strait Islander	7 (.8%)	6 (.6%)
Marital Status	Single/never married	-	793 (76.6%)
	Partner/de facto	-	196 (18.9%)
	Married	-	39 (3.8%)
	Separated or divorced	-	5 (.5%)
	Widowed	-	2 (.2%)
Highest level of education	No education	-	11 (1.1%)
	Primary education	-	24 (2.3%)

Measure	Level	Adolescent sample (n = 919)	Adult sample (n = 1,035)
	Secondary education	-	486 (47.0%)
	Technical school and/or some university (but not a Bachelor's degree)	-	260 (25.1%)
	Bachelor or equivalent	-	206 (19.9%)
	Master or equivalent	-	36 (3.5%)
	Doctoral or equivalent	-	10 (1.0%)
	Other (please specify)	-	0 (.2%)

Gambling-related problems

The adolescent sample completed the DSM-IV-MR-J, since most alternative scales are not validated with respect to younger people. Based on this screen, 53 of the 919 adolescents (5.8%) were classified as experiencing gambling-related problems.

The adult sample completed both the Problem Gambling Severity Index (PGSI) and the Short Gambling Harms Screen (SGHS). According to the PGSI, 55.8% of the young adults in the sample were classified as non-problem gamblers, 13.5% as low-risk gamblers, 8.3% as moderate risk gamblers, and 22.3% as problem gamblers. Moreover, based on the SGHS, 45.2% of the adult sample had experienced one or more of the 10 surveyed harms in the last 12 months.

Research Question 2a

“What is the prevalence of loot box use amongst adolescents and young adults?”

This research question was answered through documenting the prevalence for: 1) the awareness of loot boxes, 2) opening of loot boxes with video games, and 3) play on games that contain loot boxes. Later we address the related question of who uses loot boxes as a gambling product.

Awareness of loot boxes

When explicitly asked if they were aware of loot boxes, 77.3% of the sample reported that they were aware of their existence prior to taking part in the study

(75.6% adolescents, 78.8% young adults, no significant difference, $\chi^2(1, N = 1954) = 2.87, p = .090$).

Opening loot boxes within games

More than two-thirds (69.4%) reported having opened a loot box within a game. This figure also did not differ significantly between the adolescent (68.8%) and adult (70.0%) samples, $\chi^2(1, N = 1954) = .32, p = .572$.

Playing games that contain loot boxes

Of 1,954 respondents in the sample, 1,822 (93.2%) indicated that they had played at least one game that included loot boxes in the last 12 months, either via selecting a game from the list provided, or entering a game into an open-ended text box. It is notable that this figure is higher than the 77.3% who were aware of loot boxes, suggesting loot boxes escape the attention of some players. The proportion of respondents who indicated playing games that contained loot boxes did not differ significantly amongst adolescents and young adults (92.7% for adolescents, 93.7% for young adults, $\chi^2(1, N=1954) = .79, p = .374$). The median number of different games selected was 4 for both adolescents and young adults.

The ten best selling games that contain loot boxes are indicated in Figure 1. Two of the top 10 games were found to be significantly more popular amongst the adolescent sample compared to the adult sample: *Call of Duty: Black Ops 4* and *Clash Royale*. Two of the top 10 were more popular amongst young adults: *Overwatch* and *Apex Legends* (see Figure 1).

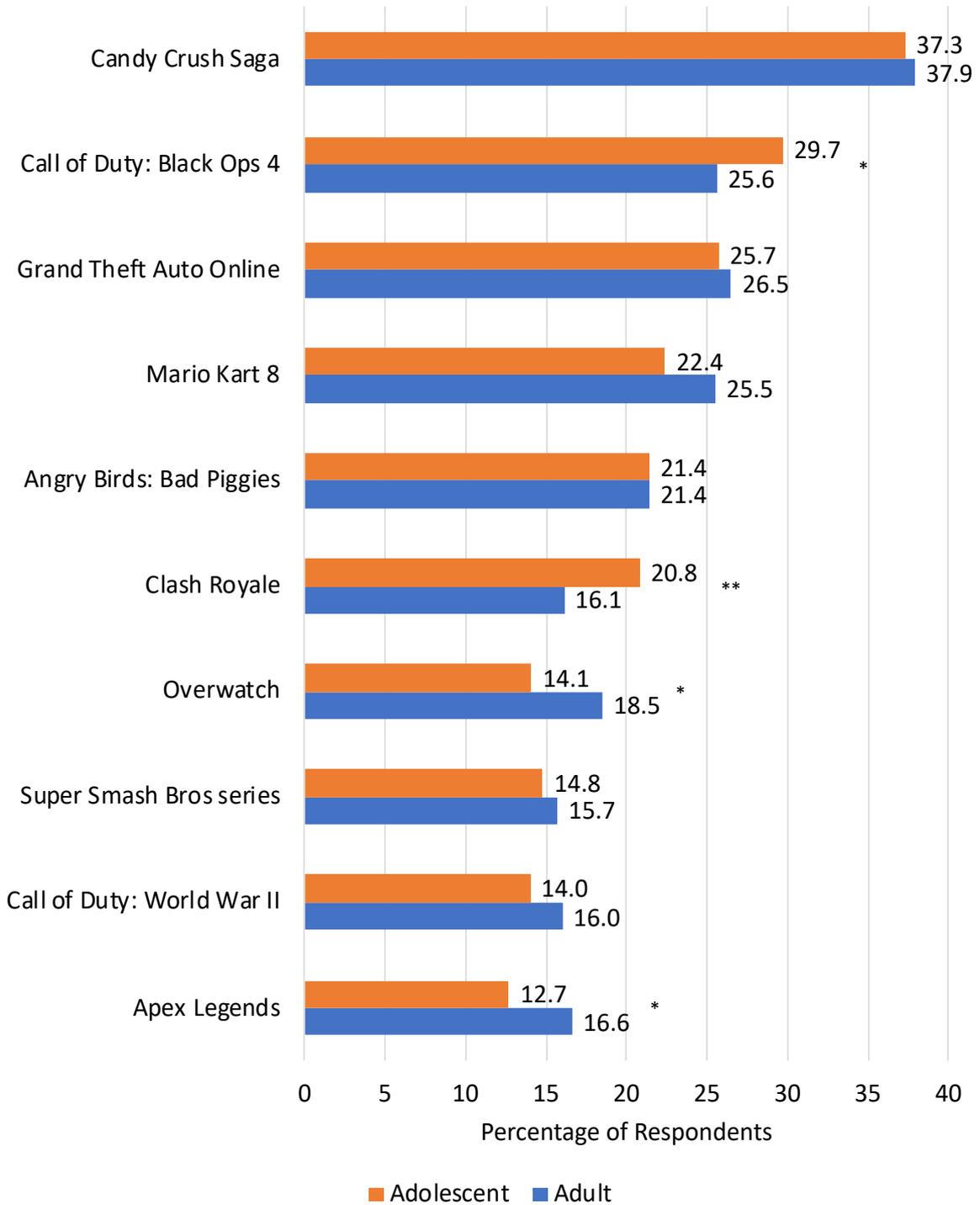


FIGURE 1. TOP 10 GAMES WITH LOOT BOXES PLAYED, BY ADOLESCENT (N=919) AND ADULT (N=1035) SAMPLE.

Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

Research Question 2b

“Who uses loot boxes as a gambling product?”

Loot boxes most closely resemble a traditional gambling product when people purchase them. Otherwise loot boxes might be better understood as a bundled feature of a purchased video game. Once purchased separately, however, the loot box represents money risked for an outcome with an uncertain value, which is at least one reasonable definition of a gambling product. Additionally, however, transformation of the contents of a loot box into cash even more closely aligns loot boxes to traditional gambling products, since proceeds can be reinvested into new purchases, creating the potential for an extended streak of monetary wins or losses. For this reason, and to address the research question, this section addresses the sample prevalence of young people’s purchasing and selling of loot boxes.

Purchasing loot boxes

Amongst the 1,822 respondents who had played games that contained loot boxes, 599 indicated that they had purchased loot boxes within these games (32.9%). This figure did not differ significantly for the adolescent or adult samples (32.0% and 33.6% respectively), $X^2(1, N=1822) = .50, p = .478$.

Median monthly expenditure on games with loot boxes was \$50 AUD for adolescents and a significantly higher \$72 AUD for young adults, *Mann-Whitney U*=453594.5, $Z=2.23, p = .026$.

Selling loot boxes (or accounts)

Because it was possible to sell loot boxes, items within loot boxes, or player accounts without necessarily having made a purchase within the game (recall that some loot boxes and items can be gained through gameplay alone), the percentage of persons selling loot boxes was considered in two ways: as the proportion of those who had played games containing loot boxes, and as the proportion of those who had made loot box purchases in games.

Of the 1,822 respondents who had played games containing loot boxes, 126 (6.8%) reported making sales from these games. This figure was significantly higher for the adult sample (9.4%) compared to the adolescent sample (4.0%), $X^2(1, N = 1822) = 20.66, p < .001$.

Of the 599 respondents who had made purchases in games that contain loot boxes, 112 (18.7%) reported selling items or accounts from these games. This figure was also significantly higher for young adults (26.1%) compared to adolescents (9.9%), $X^2(1, N=599) = 25.60, p < .001$.

The median amount made from selling loot box items was \$20 per month for adolescents and a significantly higher \$60 for young adults, *Mann-Whitney* $U=450525.5$, $Z=4.77$, $p < .001$.

Early exposure

Research Question 3

“What are the associations between early exposure to gambling via loot boxes, and attitudes and intentions regarding gambling, as well as subsequent gambling and harm?”

To answer this research question, we group together several indicators of early involvement in gambling as the independent or predictor variables. As dependent or outcome variables, we assembled measures of attitudes, intentions to gamble, gambling behaviour, gambling problems, and harm.

Independent (predictor) variables included the following:

- Whether respondents had played games with loot boxes in them¹⁴ (yes, no),
- Whether respondents had opened loot boxes (yes, no),
- Whether respondents had bought loot boxes; either directly with money or with in-game currency purchased with money (yes, no), and
- Whether respondents had sold loot boxes or items gained from loot boxes (yes, no); including selling skins, or selling an entire gaming account that contains loot box purchases.

Dependent (outcome) variables were:

- Attitudes towards loot boxes (whole sample),
- Attitudes towards gambling (whole sample),
- Intention to gamble on any form when 18 (adolescents only)¹⁵,
- Whether or not respondents had gambled on any form in the last 12 months (young adults only)¹⁶,
- Gambling frequency across all forms (adult gamblers only, log-transformed due to skew),
- Gambling expenditure across all forms (adult gamblers only, log-transformed due to skew),

¹⁴ We note that only 9.3% of the sample had not played games with loot boxes in them. However, due to the sample size, this was still over 100 participants. We have reported the results, but note that they should be interpreted with caution.

¹⁵ We also considered intention only on non-lottery forms. The results are in Appendix D.

¹⁶ We also considered gambling behaviour only on non-lottery forms. The results are in Appendix D.

- Gambling-related problems (assessed using score on the DSM-IV-MR-J, adolescents only)¹⁷,
- Gambling-related problems (assessed using score on the PGSI, log-transformed due to skew, young adults only), and
- Gambling-related harm (assessed using the Short Gambling Harms Screen, log-transformed due to skew, young adults only).

These analyses were conducted using a series of bivariate regressions predicting each outcome variable with each independent variable. The results are reported in Table 4.

The results, as reported in Table 4, reveal that all independent variables (playing games with loot boxes in them, and opening, buying and selling loot boxes) were associated with:

- more positive attitudes towards gambling,
- gambling on one or more forms (results restricted to the young adult sample),
- gambling more frequently (results restricted to the young adult sample),
- a higher risk of gambling-related problems (measured by the DSM-IV-MR-J; results restricted to the adolescent sample only),
- a higher risk of gambling-related problems (measured by the PGSI; results restricted to the young adult sample), and
- a higher risk of gambling-related harm (measured by the SGHS; results restricted to the young adult sample).

In addition, playing games with loot boxes, buying loot boxes, and selling loot boxes (but not opening loot boxes) was associated with higher gambling expenditure. These results are restricted to the young adults, however, as we did not ask about gambling expenditure of the adolescent sample due to ethical considerations.

Playing games with loot boxes in them was associated with more positive attitudes towards loot boxes, potentially indicating that exposure increases liking. Opening, buying and selling loot boxes was not significantly associated with attitudes towards loot boxes.

No variables (playing games with loot boxes, or opening, buying, or selling loot boxes) were associated with intention to gamble amongst adolescents.

¹⁷ We also considered DSM-IV-MR-J as a categorical variable, those with and without gambling-related problems. The results are in Appendix D.

TABLE 4. ASSOCIATIONS BETWEEN EXPOSURE TO LOOT BOXES (PLAYING GAMES WITH LOOT BOXES, OPENING LOOT BOXES, BUYING AND SELLING ITEMS FROM LOOT BOXES) AND GAMBLING ATTITUDES, INTENTIONS, GAMBLING BEHAVIOUR AND GAMBLING-RELATED HARM.

Independent variables	Dependent variables								
			Gambling Intent		Gambling	Gambling			
	Attitudes	Attitudes	when 18	Gambling status	frequency	expenditure	DSM_IV_MR_J	PGSI	SGHS
	Towards	towards	(adol., any form,	(adults, any	(adult, across	(adult, across	(adol., score)	(adult, score log +1)	(adult, score log +1)
Loot boxes	gambling	ref = no)	form, ref = no)	forms, log +1)	forms, log +1)				
Played games with loot boxes in last 12 mo. (ref = no)^	0.075** (0.032)	0.070** (0.023)	-0.013 (0.072)	0.264*** (0.065)	0.174*** (0.032)	0.167*** (0.045)	0.074* (0.032)	0.125*** (0.032)	0.135*** (0.032)
<i>N</i>	1,612	1,954	919	1,035	1,035	745	919	1,035	1,035
Opened loot boxes in last 12 mo. (ref = no)	0.092 (0.068)	0.139** (0.049)	0.126 (0.157)	0.610*** (0.146)	0.282*** (0.067)	0.153 (0.083)	0.274*** (0.071)	0.220** (0.067)	0.195** (0.068)
<i>N</i>	1,612	1,954	919	1,035	1,035	745	919	1,035	1,035
Buying loot boxes in last 12 mo. (amongst people who played games with loot boxes in them) (ref = no)	0.140 (0.052)	0.278*** (0.049)	0.282 (0.168)	1.153*** (0.182)	0.598*** (0.065)	0.476*** (0.074)	0.510*** (0.073)	0.599*** (0.066)	0.602*** (0.066)
<i>N</i>	1,546	1,822	852	970	970	713	852	970	970
Selling loot boxes in last 12 mo. (amongst people who play games with loot boxes in them) (ref = no)	0.035 (0.023)	0.135*** (0.023)	0.025 (0.099)	0.438*** (0.108)	0.217*** (0.027)	0.127*** (0.029)	0.252*** (0.044)	0.264*** (0.027)	0.227*** (0.027)
<i>N</i>	1,562	1,822	873	973	973	715	873	973	973

Note: * p < .05, ** p < .01, *** p < .001. All variables standardised apart from gambling intent when 18 (adolescents) and gambling status (young adults), as both were binary variables and logistic regression requires dependent variables coded 0 and 1. Values are thus standardised coefficients and their standard errors. Some outcome variables were only available for one sample, and this is indicated with adol. = adolescent sample and adults = young adult sample. ^ While relatively few people indicated that they had not played games with loot boxes in them (5.5% of the sample), we have included this row of results here because there is a progression from playing to opening to buying to selling. While the results for playing games with loot boxes in them should be interpreted with caution, they generally line up with the findings on opening, buying and selling loot boxes. Note also that alternative ways of treating three variables are considered in the appendices: considering gambling intention and gambling behaviour by only looking at non-lottery forms; and considering DSM-IV-MR-J as a categorical variable. In general, however, the overall pattern of results is similar.

To aid the reader in an interpretation of the above table, we have reported below the associations between buying loot boxes and the outcomes of current gambling as young adults, gambling-related problems, and gambling-related harm. We have used the “buying loot boxes” classification for these comparisons, rather than playing or selling, because the cells in the analyses are more balanced.

Table 5 indicates the association between buying loot boxes and gambling on one or more activities amongst young adults.

As indicated, 86.5% of young adults who buy loot boxes are gamblers, compared to only 66.9% of those who do not buy loot boxes. The difference is statistically significant, $\chi^2(1, N=970) = 42.60, p < .001$.

TABLE 5. RELATIVE FREQUENCIES OF GAMBLING (OR NON-GAMBLING) AMONGST YOUNG ADULTS WHO EITHER BOUGHT OR HAD NOT BOUGHT LOOT BOXES IN LAST 12 MONTHS.

	Non-gambler	Gambler	Total
No buy	33.1%	66.9%	100%
Buy	13.5%	85.6%	100%

Base: Young adults who play games with loot boxes in them, $n = 970$.

Table 6 indicates the association between buying loot boxes and gambling-related problems amongst adolescents who play games with loot boxes in them. As can be seen below, 3.6% of adolescents who play games with loot boxes - but who do not buy them - reported experiencing gambling-related problems, which was significantly lower than the proportion of those who do buy loot boxes (11.7%), $\chi^2(1, N = 852) = 20.84, p < .001$.

TABLE 6. RELATIVE FREQUENCIES OF GAMBLING PROBLEMS FOR ADOLESCENTS WHO HAD BOUGHT OR HAD NOT BOUGHT LOOT BOXES IN LAST 12 MONTHS.

	No DSM problems	4+ DSM problems	Total
No buy	96.4%	3.6%	100%
Buy	88.3%	11.7%	100%

Base: Adolescents who play games with loot boxes in them, $n = 852$. Adolescents classified as experiencing gambling-related problems if they scored 4 or more on the DSM-IV-MR-J.

A similar pattern was observed for young adults (see Table 7). Those who do not buy loot boxes were significantly more likely to be non-problem gamblers (64.3% vs 35.3% of those who do buy loot boxes), while those who buy loot boxes were significantly more likely to be moderate risk gamblers, and particularly problem

gamblers (38.0% vs 16.2% for those who do not buy loot boxes), $\chi^2(3, N=970) = 83.27, p < .001$.¹⁸

TABLE 7. RELATIVE FREQUENCIES OF GAMBLING PROBLEMS (PSGI) FOR YOUNG ADULTS WHO HAD BOUGHT OR HAD NOT BOUGHT LOOT BOXES IN LAST 12 MONTHS.

	Non-prob.	Low-risk	Mod-risk	Prob. Gam.	Total
No buy	64.3	12.6	7.0	16.1	100
Buy	35.3	15.6	11.0	38.0	100

Base: Young adults who play games with loot boxes in them, $n = 970$.

Lastly, young adults who bought loot boxes in the last 12 months were significantly more likely to have experienced one or more gambling-related harms (SGHS, 66.3%), compared to those who do not buy loot boxes (37.4%) as indicated in Table 8. The difference is statistically significant, $\chi^2(1, N=970) = 72.23, p < .001$.

TABLE 8. RELATIVE FREQUENCIES OF GAMBLING HARM (SGHS) FOR YOUNG WHO HAD BOUGHT OR HAD NOT BOUGHT LOOT BOXES IN LAST 12 MONTHS.

	No Harmed	Harmed	Total
No buy	62.6	37.4	100
Buy	33.7	66.3	100

Base: Young adults who play games with loot boxes in them, $n = 970$. Young adults classified as experiencing harm if they scored one or more on the Short Gambling Harms Screen.

For those respondents who had opened a loot box ($n = 1356, 69.4\%$), they were asked at what age they had first opened one. This “first opened” age was subtracted from their current age, creating a variable that captured how many years ago they had first opened a loot box. The aim of the calculation was to aid in comparing those who had first opened a loot box recently versus those who had first done so longer ago. We considered for comparison those who had first opened a loot box at their current age (i.e., the difference between their current age and the age at which they first opened a loot box = 0) as “recent,” but for qualifiers in the sample, this would be an age differential of under 12 months, and for many, only a few months. Therefore, instead we recoded the variable to “first opened a loot box recently” based on those who had first opened a loot box at their current age or one year younger, meaning they had first opened a loot box within the last 12-24 months and no longer ago. We used the same procedure for the 791 respondents who reported buying loot boxes, in order to compare those who had first bought a loot box within the last 12-24 months to those who had first bought a loot box 24 or more months ago.

¹⁸ Tests of proportions revealed significant differences for all categories except low-risk gamblers.

Recency of opening loot boxes

Those who first opened loot boxes within the last 12-24 months were significantly more likely to: 1) have more positive attitude towards loot boxes, 2) have a more positive attitude towards gambling, 3) be a gambler (young adults), 4) gamble more frequently (young adults), 5) have higher expenditure on gambling (young adults), and 6) have more gambling-related problems (i.e., a higher PGSI score for young adults). There was no significant relationship between the recency of opening loot boxes and gambling-related harm, as opposed to problems, for either adolescents or young adults. There was also no significant relationship for adolescents between the recency of opening loot boxes and their current gambling problems (i.e., DSM_IV_MR_J scores). Nevertheless, the earlier results in the Table 4 above indicate that opening a loot box is related to many gambling outcomes, but so is the recency of when one first opens a loot box as shown in Table 9.

TABLE 9. ASSOCIATIONS BETWEEN REGENCY OF FIRST OPENING OR BUYING LOOT BOXES AND GAMBLING ATTITUDES, INTENTIONS, GAMBLING BEHAVIOUR, AND GAMBLING-RELATED HARM.

Independent variables	Dependent variables								
	Attitudes Towards Loot boxes	Attitudes towards gambling	Gambling Intent when 18 (adol, any form, ref = no)	Gambling status (adults, any form, ref = no)	Gambling frequency (adult, across forms, log +1)	Gambling expenditure (adult, across forms, log +1)	DSM_IV_MR_J (adol, score)	PGSI (adult, score log +1)	SGHS (adult, score log +1)
First opened a loot box within the last 12-24 months (ref = no)	0.176* (0.069)	0.191** (0.070)	-0.081 (0.208)	0.642* (0.295)	0.370*** (0.106)	0.306* (0.119)	0.182 (0.102)	0.397*** (0.109)	0.189 (0.108)
<i>N</i>	1,356	1,356	632	724	724	549	632	724	724
First bought a loot box within the last 12-24 months (ref = no)	0.186* (0.077)	0.129 (0.076)	-0.310 (0.238)	0.297 (0.342)	0.209 (0.117)	0.117 (0.127)	0.149 (0.128)	0.281* (0.126)	0.166 (0.123)
<i>N</i>	791	791	370	421	421	349	370	421	421

Note: * p<.05, ** p<.01, *** p<.001. All variables standardised apart from gambling intent when 18 (adolescents) and gambling status (young adults), as both were binary variables and logistic regression requires dependent variables coded 0 and 1. Values are thus standardised coefficients and their standard errors. Some outcome variables were only available for one sample, and this is indicated with adol = adolescent sample and adults = young adult sample

Recency of buying loot boxes

Having first bought a loot box within the last 12-24 months (but no longer ago) was significantly associated with a more positive attitude towards loot boxes, and more gambling problems (for young adults but not adolescents). No significant relationship was observed for the recency of loot box purchases with attitude towards gambling, gambling intention, gambling status, gambling frequency, gambling expenditure, and gambling-related harm. While buying loot boxes is associated with many of the gambling behaviour and problem/harm related variables, the relationships based on when a person first bought a loot box were not statistically significant. However, these analyses are based on a lower number of respondents, and statistical power may be an issue.

Early loot box use and gambling problems

It is important to note that research question 3 implicitly proposed that there might be a relationship between early loot box use and subsequent gambling problems. These results do not support that contention, and in fact the direction of the results is opposite to this claim. Instead, there is a concurrent relationship in time whereby people with current gambling problems are also more likely to have first opened and bought loot boxes recently. This may reflect that when people are interested in gambling they seek out new gambling-like experiences, including loot boxes, when they otherwise might not have

Other findings

The survey also canvassed motivations for purchasing loot boxes to provide context for understanding the associated harmful outcomes documented above. One of the critical motivations for purchasing loot boxes that was explored was for players to use items found therein for “gambling” (as detailed below). Thus, the analysis of motivations also helps explicitly address Research Question 2b: Who uses loot boxes as a gambling product?

This section also surveys anti-social behaviours related to acquiring loot boxes, since these are other potential negative outcomes from loot box purchasing that have not yet been explored. Lastly, the survey explored negative attitudes towards loot boxes to provide a counter-point to gambling.¹⁹ For context towards understanding the results of these studies, it is important to understand the frequency with which people endorse complaints about loot box offerings.

¹⁹ Attitudes towards loot boxes have already been explored above in Table 4 and Table 9 for their relationship to loot box use, opening, purchasing and selling.

Motivations for purchasing loot boxes

Motivations for purchasing loot boxes are outlined in Figure 2. The motivations that were endorsed by the highest proportion of the sample related to: gaining items to advance more quickly within the game; the excitement of unboxing items; finding rare items; and finding new items, including items that completed a set, or items that were only available in loot boxes. Making money from loot boxes or obtaining skins for gambling were endorsed by less than 1/3 of loot box purchasers.

Wherever significant differences were observed, a higher proportion of the young adults endorsed those motivations. Specifically, young adults were more likely to endorse buying loot boxes: 1) because the item they wanted was only available in a loot box, 2) because of the frustration of grinding for free loot boxes or items, 3) to support the development of the game, 4) to improve their mood, 5) because they could not miss out on a well-priced loot box sale, 6) because they were unhappy with what they got in a previous loot box, 7) to give loot boxes as a gift, and 8) to make real money from selling the items obtained in loot boxes.

Fifty-nine respondents also indicated “other” fill-in-the-blank reasons for purchasing loot boxes. These responses included “for fun” or “for satisfaction”, or specifically related to features of the skins that could emerge from the loot boxes, such as “cosmetics look good.”

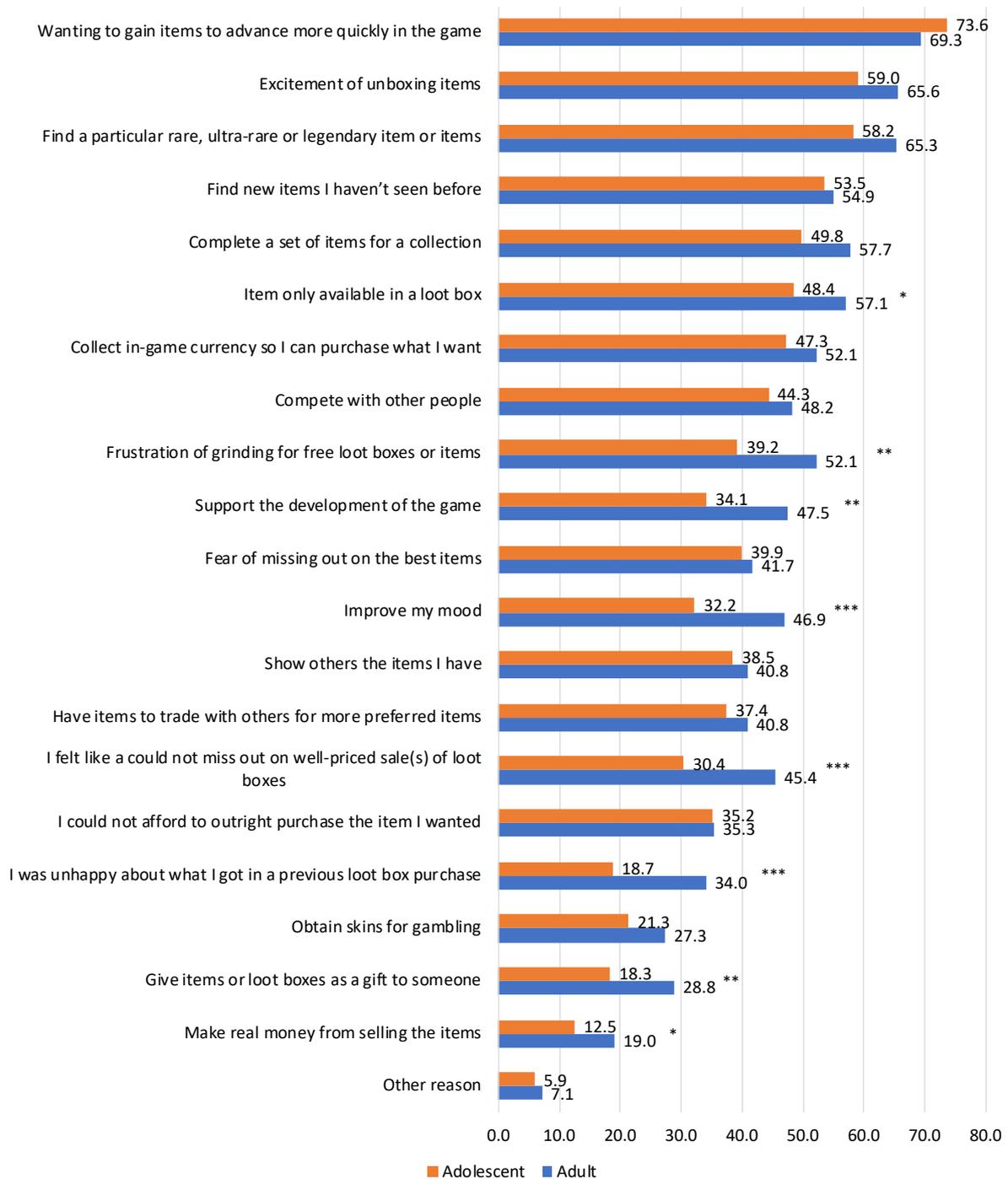


FIGURE 2. MOTIVATIONS FOR PURCHASING LOOT BOXES, BY ADOLESCENT (N=273) AND ADULT (N=326) SAMPLES.

Base: Respondents who had made purchases within games (n = 599).

Anti-social loot box behaviour

Respondents who had opened loot boxes were asked about whether they had engaged in five anti-social behaviours relating to purchase of loot boxes (see Table 10 below) that were compiled from a search of internet chat forums. Between 8.9% and 17.8% of respondents had engaged in each behaviour, with no significant

differences between young adults and adolescents, with the exception that young adults were slightly more likely to admit to getting into an argument with someone over their loot box purchase.

TABLE 10. ENGAGEMENT IN EACH OF FIVE PRACTICES RELATING TO LOOT BOXES DURING THE LAST 12 MONTHS

Item	Adolescents (n = 632)	Young adults (n = 724)	Test statistic
Borrowed money without asking to buy loot boxes	57 (9.0%)	77 (10.6%)	$\chi^2(1, N = 1356) = .99, p = .320$
Tricked someone into giving away a loot box item (skin or other item)	56 (8.9%)	68 (9.4%)	$\chi^2(1, N = 1356) = .12, p = .735$
Hid the purchase of loot box from someone, such as your parents	75 (11.9%)	110 (15.2%)	$\chi^2(1, N = 1356) = 3.17, p = .075$
Told someone you earned an item playing in a game, when instead you purchased it or got it in a loot box you bought	88 (13.9%)	129 (17.8%)	$\chi^2(1, N = 1356) = 3.81, p = .051$
Got into an argument with someone over your loot box purchase	61 (9.7%)	95 (13.1%)*	$\chi^2(1, N=1356) = 3.99, p = .046$

Base: Respondents who had opened a loot box (n = 1356).

Negative Attitudes towards loot boxes

The most endorsed negative attitude towards loot boxes was that they encourage “pay to win”, followed by “make non-purchasers grind for in-game items,” and “often don’t disclose the odds of getting valuable items” (see Figure 3). Almost three-quarters of participants (73.1%) reported that they *agreed* or *strongly agreed* that loot boxes are addictive, and 53.8% agreed or strongly agreed that loot boxes are a

form of gambling. No significant differences were observed between the adolescent and adult samples for any of the 13 attitudes individually, nor on scores on the overall attitudes towards loot boxes scale, $t(1610)=.67, p = .503$.

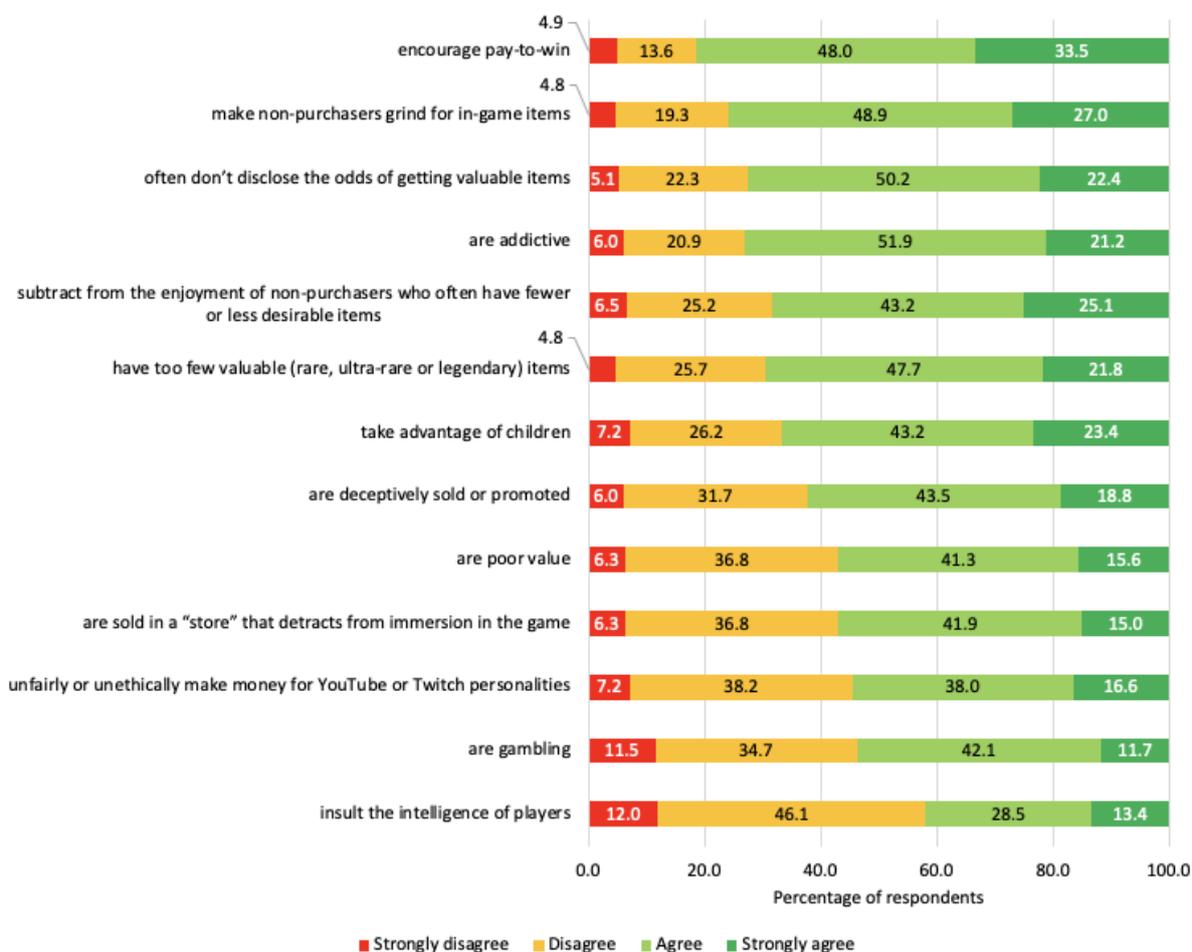


FIGURE 3. ATTITUDES TOWARDS LOOT BOXES

Base: all participants ($n = 1954$)

Summary

The results indicate that playing games that contain loot boxes is widespread, both amongst adolescents and young adults in our sample. However, only about one-third of respondents who played games with loot boxes in them had purchased them, and these purchases were made for a variety of reasons, mostly to do with advancing in the game, or excitement related to unboxing or finding a rare item. Selling items from loot boxes was even more rare. Only 6.4% of respondents who played games with loot boxes inside them sold these items.

Nevertheless, opening, buying, and selling loot boxes in adolescence was associated with a range of negative outcomes for both adolescents (aged 12-17) and young adults (aged 18-24). People who had opened, bought, or sold loot boxes were more likely to gamble (young adults), more apt to gamble frequently (young adults), more likely to suffer from gambling problems (adolescents and young adults), and more likely to suffer harm from their gambling (young adults). These findings are associations in a cross-sectional survey, and thus must be interpreted with caution. However, amongst young adults there was also a relationship between the recency with which people first opened and bought loot boxes and gambling problems. Thus, there is more than a simple association showing the types of people who gamble also enjoy loot boxes. Instead, people who have gambling problems are much more likely to have first tried opening and buying loot boxes somewhat recently. It may be that people involved with gambling are more attracted to other gambling-like experiences, including the purchase of loot boxes.

Conclusions

The results of Study 1, the environmental scan, revealed that many of the best selling video games in Australia have loot boxes. Many loot boxes are offered “for free” to players as rewards for progression in the game. Nevertheless, many video games also offer the ability to purchase loot boxes; either directly or with in-game currency that has been purchased with cash. Since the contents of loot boxes are randomly or quasi-randomly determined, the player is risking money on a game with an uncertain reward with real value. This activity satisfies a technical definition of gambling. For many video games we sampled there is a ready path for selling items gained in loot boxes or entire game accounts that contain items derived from loot boxes. The proceeds can be reinvested in purchasing new loot boxes, which allows for establishing streaks of cash wins or losses.

Due to their ubiquity in video games, Study 2 revealed that most people we surveyed play games that offer loot boxes. Moreover, over two-thirds of respondents were aware of the availability of loot boxes, many people have opened free loot boxes, a smaller number have purchased them, and a few convert items won on loot boxes back into cash. Arguably, this last activity of converting items back into cash most closely aligns loot boxes to traditional gambling: where money is risked on a game with a randomised outcome for a potential cash gain.

A wide range of potentially negative outcomes are associated with the use of loot boxes. People who used loot boxes are more likely to: 1) gamble (young adults), 2) gamble more frequently (young adults), 3) spend more on gambling (young adults), 4) have gambling problems (young adults and adolescents), and 5) suffer from gambling harm (young adults). Moreover, young adults who have opened or bought their first loot box recently are more likely to be suffering from gambling problems. It may be that people engaged with gambling are apt to seek out new gambling-like experiences. Conversely, there was no evidence found for the conjecture that early experiences with loot boxes are related to gambling involvement or problems.

People in our survey were aware of the risks that emerged in our findings. Young adults and adolescents generally agreed that loot boxes could be “addictive” and a majority agreed that loot boxes are a form of “gambling.”

Limitations

Like all projects, these studies are subject to methodological limitations. Study 1, the environmental scan, excluded less profitable video games from consideration due the overwhelming number of video games on offer in the contemporary marketplace. The method thus made the simplifying assumption that the best selling games

surveyed ($n = 82$) were representative of the whole market. This may be a reasonable assumption since these chosen video games are some of the best selling games available, and thus reflect many people's experiences with loot boxes. Nevertheless, there is a long tail of less popular video games that may have a different composition of loot box offerings.

For the interpretation of the Study 2 survey, it is important to recognise that the sample is not entirely representative of the underlying NSW population of young persons (12-24). In particular, gambling problems of young adults within the panel were much higher than might be typically expected of NSW adults aged 18-24. In addition, there was a modest gender imbalance, where 59.9% of respondents were female, 39.2% were male, and a further 0.9% indicated a gender other than male or female. This unrepresentativeness cannot be easily fixed with weighting, since there are likely many other unknown and unknowable ways in which people in the survey might differ from other NSW residents of similar ages. Nevertheless, it is reasonable to use the prevalence figures herein as a starting point for some knowledge about the ubiquity of loot box use amongst young people in NSW. Moreover, the analyses on relationships between variables is less affected by problems with representativeness, since the basic relationship (e.g., between loot box usage and gambling problems) are likely to be similar in the larger population at least in direction - if not by degree.

The finding that use of loot boxes predicts negative gambling outcomes is purely correlational. It is possible that the type of people who engage with traditional gambling are only incidentally the same type of people who are interested in loot boxes. However, loot boxes in various guises resemble traditional gambling products. Moreover, there was a discovered relationship between the recency of first opening and buying loot boxes and gambling problems (for young adults) that suggest gambling involvement may cause some to seek out loot boxes as a similar activity. This conjecture is reinforced by the finding that a majority of participants perceive loot boxes as a form of gambling.

Lastly, the present results need to be understood in the context of a rapidly developing environment around loot boxes. Video game loot boxes have been around in a basic form for over a decade, but the ubiquity of loot boxes that can be bought, sold and traded is a relatively new phenomenon. Technological and other changes to the video game marketplace in the near future should warrant reconsideration of the present findings at regular intervals.

Future Directions

In the future it may be possible to better understand the potential interactions between traditional gambling and use of loot boxes through use of alternative methods. First, to the extent that people are aware of the connection between loot box use and gambling, qualitative methods could expose how some people may transition from traditional gambling to using loot boxes and vice-versa. Longitudinal research could also be helpful in exploring transitions between gambling and loot box use between adolescence and adulthood.

It would also be helpful to explore if loot boxes create an excitement of “winning” that is the principal entertainment value that people get from their use. Gambling is an entertainment product, and the main value is the enjoyment people derive from the random schedule of rewards. It is at least possible that loot boxes are not particularly exciting, but rather are only a technique used by game-developers to conceal the true cost of in-game items, and extract more money from consumers than they might otherwise be willing to spend. Without entertainment value in the random act of winning items, loot boxes can be an annoyance or frustration for player who wish to receive only the items they want.

Last, this research raises questions about whether cash-out options for loot boxes should be restricted. As discovered in this research, relatively few people cash out items that they have gained from loot boxes, and relatively few people nominate that they acquire items from loot boxes for the purposes of gambling. Nevertheless, there is widespread concern about loot boxes being addictive, and a majority of respondents agree that loot boxes are a form of gambling. To the extent that loot boxes items can be cashed out and recycled into funds for new purchases, loot boxes bear a close resemblance to an (unregulated) traditional gambling product.

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Appendices

Appendix A: Video games selected for environmental scan, Australian market share \$AUD and percentage of total, and software type (Source: Euromonitor International)

Video game name	Company name	Market share 2018 – Digital Software		Market share 2018 – Physical Software*	
		\$AUD millions	% of total	\$AUD millions	% of total
Call of Duty	Activation Blizzard Inc	138.1	6.2	107.2	20.3
Clash of Clans	Supercell Oy	155.7	7.0	-	-
FIFA	Electronic Arts Inc	65.6	3.0	49.7	9.4
Grand Theft Auto	Take-Two Interactive Software Inc	0.8	< 0.1	71.3	13.5
Minecraft	Microsoft Corp	48.1	2.2	17.0	3.2
Candy Crush Saga	Activation Blizzard Inc	48.8	2.2	-	-
League of Legends	Tencent Holdings Ltd	41.4	1.9	-	-
Pokémon GO	Niantic Inc	26.5	1.2	-	-
Uncharted	Sony Corp	7.3	0.3	12.0	2.3
The Sims	Electronic Arts Inc	12.1	0.5	6.9	1.3
The Elder Scrolls	Bethesda Softworks LLC	6.3	0.3	12.6	2.4
Halo	Microsoft Corp	-	-	17.1	3.2
Pokémon (unspec)	Nintendo Co Ltd	-	-	16.0	3.0
Assassin's Creed	Ubisoft Entertainment SA	-	-	12.9	2.5
Tom Clancy's The Division	Ubisoft Entertainment SA	11.6	0.5	0.4	0.1
Diablo	Activision Blizzard Inc	9.4	0.4	1.4	0.3
Batman	Warner Bros Entertainment Inc	-	-	10.7	2.0
Dungeon Fighter Online	Nexon Co Ltd	10.3	0.5	-	-
Defense of the Ancients	Valve Corp	9.9	0.4	-	-
Counter Strike	Valve Corp	7.6	0.3	-	-

Video game name	Company name	Market share 2018 – Digital Software		Market share 2018 – Physical Software*	
		\$AUD millions	% of total	\$AUD millions	% of total
StarCraft	Activation Blizzard Inc	7.6	0.3	-	-
Angry Birds	Rovio Entertainment Ltd	7.3	0.3	-	-
Final Fantasy	Square Enix Holdings Co Ltd	6.8	0.3	-	-
World of Warcraft	Activation Blizzard Inc	6.3	0.3	-	-
Destiny	Activation Blizzard Inc	5.9	0.3	-	-
Spyro: Skylanders	Activision Blizzard Inc	-	-	5.7	1.1
Fruit Ninja	Halfbrick Studios Pty Ltd	5.0	0.2	-	-
Super Mario Bros.	Nintendo Co Ltd	-	-	4.7	0.9
World of Tanks	Wargaming Group Ltd	4.5	0.2	-	-
Cut the Rope	Electronic Arts Inc	4.2	0.2	-	-
Battlefield	Electronic Arts Inc	-	-	4.0	0.8
Fallout	Bethesda Softworks	3.5	0.2	-	-
Star Wars: Battlefront	Electronic Arts Inc	-	-	1.2	0.2
Sonic	Sega Sammy Holdings Inc	0.4	< 0.1	-	-
Age of Empires	Microsoft Corp	-	-	0.3	< 0.1
Where's my water?	Walt Disney Co	0.3	< 0.1	-	-
Little Big Planet	Sony Corp	-	-	0.2	< 0.1
Gran Turismo	Sony Corp	-	-	0.1	< 0.1
Moshi Monsters	Mind Candy Ltd	0.1	< 0.1	-	-
Mass Effect	Electronic Arts Inc	-	-	0.1	< 0.1
Other games		1568.5	70.7	106.4	20.2
Total		2219.7	100.0	527.5	100.0

* Excludes video game listed as Nintendo as this is a company with many games sold at bricks-and-mortar stores (\$43.1, 8.2%)

Appendix B: Video game environmental scan – game details, in-game currency and loot boxes

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box tradeable	Loot box for cash/other value	Loot box which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Age of Empires (series)	EI	Ensemble Studios, Big Huge Games, Robot Entertainment, Relic Entertainment, Hidden Path Entertainment, Forgotten Empires	Microsoft Corp	No	No	-	-	-	-	-	-	-	
Angry Birds (series)	EI, TGL	Rovio Entertainment	Rovio Entertainment	Yes	Yes	Yes	Yes	Yes	No	No	Angry Birds: Bad Piggies, Angry Birds: Transformers, Angry Birds 2	Angry Birds: Bad Piggies - Hidden Loot Crates or Boxes. Purchased with real money or in-game currency, earned via play, or for watching a video. Contains random items used in-game: power-ups, skins for characters,	

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box with in-game currency	Loot box for cash/other item of value	Loot box tradeable	Loot box which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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Apex Legends	D	Respawn Entertainment	Electronic Arts	Yes	Yes	Yes	Yes	Yes	Yes	No	-	-	Apex Pack. Purchased with real money, earned via game play, given with purchased Battle Passes, or purchased in in-game currency (Apex Coins). Packs
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Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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Assassin's Creed: Odyssey	EI, TGL, D	Ubisoft Quebec	Ubisoft Entertainment	Yes	Yes	No	No	Yes	No	No	No	No	-	contains random cosmetic items (skins) of different rarities. Olympian Gifts. Purchased with a rare in-game currency called Orichalcum Ore which is earned by completing daily or weekly quests. Contains one random item, functional or cosmetic. Third party websites - audit revealed no option to sell items or in-game currency outside of the game.
Assassin's Creed: Origins	EI, TGL, D	Ubisoft Montreal	Ubisoft Entertainment	Yes	Yes	No	Yes	Yes	No	No	No	No	-	Heka Chests. Obtained with in-game credits (Drachmas) or via completing a daily mission. Contains one random item, functional or cosmetic.
Batman: Arkham (series)	EI	Rocksteady Studios, WB Games Montréal,	Eidos Interactive (2009), Square Enix	No	No	-	-	-	-	-	-	-	-	

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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		Splash Damage, Human Head Studios, NetherRealm Studios, Armature Studio, Turbine, Inc.	(2009), Warner Bros. Interactive Entertainment (2009–2019)										
Battlefield (series)	EI, TGL	EA DICE	Electronic Arts	No	Yes	Yes	Yes	Yes	Yes	No		Battlefield 4, Battlefield Hardline, Battlefield 1	Battlepacks. Obtained via game play, purchased with real money or in-game currency, earned via online events/promotions, or dropped for free on special occasions. Contain random items (functional or cosmetic) or experience points boosts. Battlepacks are present in Battlefield 4, Battlefield Hardline,

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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Borderlands (series)	D	Gearbox Software	2K Games	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Borderlands 1, 2, and 3	and Battlefield 1, but were removed in Battlefield V. Containers and Chests. All Borderlands 1, 2, and 3 games have loot systems in the form of containers of all types (e.g., chests, crates, safes, lockers, mail boxes etc) or, as in Borderlands 2, Golden Chests. Loot boxes are obtainable via random drops, located in the game, or rewarded for game achievement. They contain random rewards including functional items, cosmetic items (skins), in-game currency Money, or enemies to fight. Golden Chests need to be opened with a Golden Key, only purchased with in-game currency Skill Points.
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Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Call of Duty: Black Ops 4	EI, TGL, D	Treyarch	Activision Blizzard	Yes	Yes	No	Yes	Yes	Yes	No	-	-	-	Reserve Crates. In CoD: Black Ops 4 are obtainable via purchasing Reserve Cases with in-game currency CoD Points. CoD Points are purchased with real money. Each Reserve Case contains 3 Reserve Crates (loot boxes) which each contain 1 random item which is functional or cosmetic (skin).
Call of Duty: World War II	EI, TGL, D	Sledgehammer Games	Activision Blizzard	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	-	Supply Drop. In CoD: WWII are obtainable via watching other play, completing challenges, or purchased with CoD Points (in-game currency purchased with real money). Loot box contains random skins, in-game currency Armory Credits, experience points (XP), or consumable powerups.

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Candy Crush Saga	EI, TGL	King	Activision Blizzard	Yes	Yes	No	Yes	No	No	No	No	-	Sugar Drop and Daily Booster Wheel. Sugar Drops are rewarded to players after achieving levels and contain random rewards which include in-game currency Gold Bars or consumable 'boosters' which help with game play. Daily Booster Wheels are rewarded daily to get random free booster or a jackpot.
Civilization (series)	D	MicroProse, Activision, Firaxis Games	MicroProse, Activision, Hasbro Interactive, Infogrames, 2K Games	No	No	-	-	-	-	-	-	-	
Clash of Clans	EI, TGL, D	Supercell Oy	Supercell Oy	Yes	Yes	No	Yes	No	Yes	Yes	Yes	-	Loot Cart. Obtainable via game play and daily resource bonuses. When opened contains resources called gold, elixir, or dark elixir.

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Clash Royale	TGL	Supercell Oy	Supercell Oy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	Chests. Purchased with in-game currency (Gems), obtained via a pack purchased with real money, or for free via game play. Randomly contains in-game currencies (Gold or Gems) or functional itmes (Cards).
Counter Strike: Global Offensive	EI, TGL, D	Valve Corporation	Valve Corporation	No	Yes	Yes	Yes	No	Yes	No	Yes	No	-	Weapon Case. Purchased with real money on the Steam Marketplace (online store) or awarded in game. Requires a Key to open, which needs to be purchased with real money. Contains random functional or cosmetic items.
Crash Bandicoot: N. Sane Trilogy	D	Vicarious Visions, Toys for Bob	Activision Blizzard	No	No	-	-	-	-	-	-	-	-	
Crash Bandicoot: Crash Team	D	Beenox	Activision Blizzard	Yes	No	-	-	-	-	-	-	-	-	

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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Racing Nitro-

Fueled

CrossFire	TGL	Smilegate Entertainment, Remedy Entertainment	Smilegate West	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	-	-	Crates. Purchased with in-game currency ZPoints (ZP) via the online game store or received for free at the end of matches (limit 1 per week). A purchased Key is need to open a crate. Contains random items (type unknown) or in-game currency Game Points (GP).
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Cut the Rope (series)	EI	ZeptoLab	Chillingo, Activision, ZeptoLab	Yes	No	-	-	-	-	-	-	-	-	
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Defense of the Ancients (Dota) (series)	EI, TGL, D	Valve Corporation	Valve Corporation	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Dota 2	Treasures. Purchased via Steam Marketplace (online store) with real money, obtained another items called a Charm, or free via the drop system. Contains random functional or cosmetic items.
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Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Destiny (series)	EI, TGL, D	Bungie	Activision Blizzard	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Destiny 1, Destiny 2	Engrams. Purchased with in-game currencies Silver or Bright Dust, earned via game play, or dropped after level achievements. Contains random functional or cosmetic items, in-game currencies, special offers or promotions.
Diablo (series)	EI	Blizzard	Activision Blizzard	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Diablo II, Diablo III	<i>Diablo II - Item Drops</i> . Rewarded for killing monsters or opening a chest. Contain random items, sometimes leading to no reward, in-game currency Gold, or items. <i>Diablo III - Loot Drops</i> . Unclear when drops appear, either random or via game progression or achievement. Contain random items.

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Dungeon Fighter Online (DFO) (series)	EI, TGL	Neople	Neople	Yes	Yes	No	Yes	Yes	Yes	No	DFO 1, 2, 3, 4, and 5	Kaleido Box. Purchased with Cera, the DFO virtual currency which is purchased with real money. On special events boxes are given for free or earned. They contain random items either functional or cosmetic.		
Fallout (series, 2004-2019)	EI, D	Bethesda Game Studios, Obsidian Entertainment	Bethesda Softworks	Yes	Yes	Yes	No	Yes	Yes	Yes	Fallout 76, Fallout Shelter	<i>Fallout 76 - Purveyor Murrgh.</i> In the Wild Appalachia add-on game in-game currency Scrip can be used to purchase from Purveyor Murrgh legendary items, but what items you receive are random. <i>Fallout Shelter - Lunchboxes.</i> Obtainable via completing objectives, purchased with in-game currency, or by completing quests. Contain 5 random cards when drawn one is rare or better.		

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box for cash/other item of value	Loot box tradeable	Loot box in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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Far Cry (series)	D	Crytek (2004), Ubisoft Montreal (2005–2017), Ubisoft Toronto (2018)	Ubisoft Entertainment	Yes	No	-	-	-	-	-	-	-	Rewards from cards include functional items (e.g., weapons), cosmetic items or skins (e.g., outfits), or in-game currencies.
Fate/Grand Order	TGL	Delightworks (Mobile), Sega Interactive (Arcade)	Mobile: Aniplex, Arcade: Sega	Yes	Yes	No	Yes	No	No	No	Yes	-	<i>Gift Box/Present Box</i> . Rewarded to players for free for logging in, redeeming promotional codes, or when purchasing cards. Contains random items or in-game currency (Saint Quartz). Audit doesn't reveal they contain Costume Dresses (skins). <i>Chest Drops</i> . Rewarded to players via game play. Randomly contains items or

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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FIFA 18	EI, TGL, D	EA Vancouver, EA Romania	Electronic Arts (EA) Sports	Yes	Yes	No	Yes	Yes	Yes	No	-	-	-	in-game currency. Such items include Ascension Items that assist in game play. Audit doesn't reveal they contain Costume Dresses (skins). Packs (bronze, silver, gold). Available in FIFA Ultimate Team (FUT) mode, purchased with FUT coins, points, or rewarded via game play. Packs contain one or more random players or items.
FIFA 19	EI, TGL, D	EA Vancouver, EA Romania	Electronic Arts (EA) Sports	Yes	Yes	No	Yes	Yes	Yes	Yes	-	-	-	Packs (bronze, silver, gold). Available in FIFA Ultimate Team (FUT) mode, purchased with FUT coins, points, or rewarded via game play. Packs contain one or more random players, items, and new to FIFA19 FUT coins.

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Final Fantasy (FF) (series)	EI, D	Square, Square Enix	Square, Square Enix, Nintendo	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	FFVII, FFXI, FFXI, FFXIII-2, FFXIV, FFXV	Treasure Chests. Appear in most Final Fantasy (FF) games, but only from FFVII onwards contained random contents. These loot boxes are dropped or found by the player, earned via game achievements. Some chests require keys to open. They contain in-game currency, functional or cosmetic items, or monsters.
Formula 1 (series, 2009-2019)	D	Bizarre Creations	Codemasters	No	No	-	-	-	-	-	-	-	-	
Fortnite (series)	TGL, D	Epic Games	Epic Games	Yes	no (prev loot boxes ended Jan '19)	-	-	-	-	-	-	-	-	

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box for cash/other item of value	Loot box contains skins	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Forza Horizon (series)	D	Turn 10 Studios, Playground Games, Sumo Digital	Xbox Game Studios	No	Yes	No	Yes	Yes	No	Yes	Forza Horizon 4	Super Wheelspin. Purchased with in-game currency Credits or rewarded via game play. Randomly contains Credits or a car.	
Forza Motorsport (series)	D	Turn 10 Studios, Playground Games, Sumo Digital	Xbox Game Studios	No (removed Nov 2018)	No (removed Nov 2018)	-	-	-	-	-	-	-	
Forza Street	D	Turn 10 Studios, Playground Games, Sumo Digital	Xbox Game Studios	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	Prize Cards / Car Packs. Prize Cards, also called Car Packs, are purchased with in-game currencies Chips and Gold, or logging into the game daily for the Free Car Card. Rewards from the loot box include in-game currencies (Gold or Credits) or functional item (car). within the game.	

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box for cash/other item of value	Loot box contains skins	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Fruit Ninja	EI	Halfbrick	Halfbrick	No	No	-	-	-	-	-	-	-	
Gran Turismo 6	EI	Polyphony Digital	Sony Interactive Entertainment	Yes	No	-	-	-	-	-	-	-	
Gran Turismo Sport	EI	Polyphony Digital	Sony Interactive Entertainment	No	No	-	-	-	-	-	-	-	
Grand Theft Auto V (Online)	EI, TGL, D	Rockstar North	Rockstar Games	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	-	Lucky Wheel Spin. Obtained daily for free in the GTA Diamond Casino and Resort. Spin gives random reward of chips, GTA dollars, clothing, or a supercar. Less than 0.005% of getting a rare car. The Casino and Resort itself require GTA \$500 entry.
GWENT: The Witcher Card Game	D	CD Projekt Red	CD Projekt Games	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	-	Card Kegs. Purchased with real money via the game store, with in-game currency Ore, in purchased Card Packs, or randomly rewarded for watching GWENT

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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Halo (series)	EI, D	Bungie (2001–2010), Ensemble Studios (2009), 343 Industries (2011–2019), Creative Assembly (2017)	Xbox Game Studios	No	Yes	Halo 5: Guardians	streams on Twitch. Contain 5 random cards with one guaranteed to be rare or above. Cards are functional items as they give the player different abilities to assist game play. Kegs don't appear to contain in-game currency. Requisition Packs (REQ Packs). Available in Halo 5: Gaurdians. Obtained via purchasing Limited Edition releases, real money via online gaming store, REQ Points (in-game currency), earned via game play, or gifted. Randomly contains in-game currency called REQ Points, skins, or in-game bonuses.							
Hearthstone	TGL, D	Blizzard Entertainment	Blizzard Entertainment	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	-	Card Packs. Purchased with real money or in-game currency Gold,

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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Heroes of the Storm (HoTS) (series)	D	Blizzard Entertainment	Blizzard Entertainment	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	HoTS 2.0	
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dropped on special occasions for free (e.g., Twitch Drop), or earned via game play achievements. Contains 5 random cards, at least one being a rare card, of functional or cosmetic value.

Loot Chests. Available in HoTS 2.0 via purchase with in-game currencies Gold or Gems, earned by game progression (levelling up). In March 2019 Loot Chests could no longer be purchased with Gems, the only in-game currency purchased with real money. They are still purchased with Gold, which is earned via game play. Loot Chests contain random functional items, cosmetic items (skins).

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box contains in-game tradeable currency for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Honour of Kings (aka Arena of Valor)	TGL	Tencent	Tencent	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	-	Lucky Draw/Spin. Obtained via daily logins capped a 3 spins, or purchased with vouchers or in-game currency Gems. Spin rewards random items (functional or cosmetic skins) or in-game currencies Gold or Gems.
Kingdom Hearts (series)	D	Square, Square Enix, Jupiter, h.a.n.d., BitGroove Inc., Success	Square, Square Enix, Disney Interactive Studios, Disney Consumer Products and Interactive Media	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Kingdom Hearts: Union X (previously Kingdom Hearts: Unchained X)	Medal Deals. Only Kingdom Hearts: Union X has these, which purchased with in-game currency Jewels and contain random in-game item Medals of different rarities. Medals are functional items in that the help game play. Medal Deals don't appear to contain in-game currency or skins.
League of Legends	EI, TGL, D	Riot Games	Riot Games	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	-	Chests. Hextech and Masterworks Chests are purchased with in-game currency

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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Little Big Planet	EI	Media Molecule, SCE Cambridge Studio, Tarsier Studios, Double Eleven, Xdev, United Front Games, Sumo Digita	Sony	No	No	-	-	-	-	-	-	-	-	or rewarded via game play. Some need keys to open. When opened contains random contents call Shards (functional and cosmetic skin items), Emotes (power), Essence (in-game currency), Gemstones (in-game currency), Bonus Chests (loot box) or Keys.
Madden NFL (series 2017-2019)	TGL	EA Tiburon	Electronic Arts (EA) Sports	No	Yes	Yes	No	Yes	No	No	No	No	NFL18, NFL19, NFL20	Packs. Available in Madden Ultimate Team (MUT), where players build their NFL fantasy

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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Mario Kart 8	TGL, D	Nintendo	Nintendo	No	Yes	No	Yes	No	No	No	No	No	-	<p>team. Packs are purchased with real money, in-game currency Coins, purchasing the special edition of the game, via Madden Rewards (membership required), or in daily drops to Twitch Prime members. Packs contain random rewards including items (Players used in game) or in-game currency Coins.</p> <p>Item Box. Obtained via game play, when run over it gives player random items to assist with game play or in-game currency Coins. Item boxes don't contain skins. Accumulated coins increase the speed of the kart in the game, as well as unlocking custom parts for karts (skins).</p>
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Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Mass Effect (series, 2007-2019)	EI	BioWare	Electronic Arts	Yes	Yes	No	Yes	Yes	No	No	No	No	Mass Effect 3, Mass Effect: Andromeda	Packs. Available in Mass Effect 3 and Mass Effect: Andromeda. Mass Effect 3 - packs are purchased using in-game currency (credits), rewarded for play, or free in promotional events. Contain random items of different rarities: weapons, mods (skins), characters, supplies, and boosters. Doesn't appear to contain in-game currency. Mass Effect: Andromeda - multiplayer version as packs which are purchased with in-game currency (credits), earned via game play, or purchased with Andromeda Points which are purchased with real money. Contain random items as per Mass Effect 3 are functional or

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box cash/other item of value	Loot box tradeable	Loot box which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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Minecraft	EI, TGL, D	Majang	Majang, Xbox Game Studios, Sony Computer Entertainment	Yes	No	-	-	-	-	-	-	-	cosmetic but not in-game currency.
Monster Hunter: World	TGL	Capcom	Capcom	No	No	-	-	-	-	-	-	-	
Mortal Kombat (series)	D	Avalanche Software, Eurocom, Just Games Interactive, Midway Games, Midway Studios Los Angeles, Other Ocean Interactive,	Midway Games, Williams Entertainment, Warner Bros. Interactive Entertainment	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Mortal Kombat 11	Treasure Chests. Available in Mortal Kombat 11. They are purchased withn the game with in-game currencies (Koins, Hearts, or Souls) which themselves are purchased with real money. Treasure Chests are also obtainable via game play as rewards. They contain random contents including functional items (e.g., Augments), skins to

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Moshi Monsters	EI	Point of View, NetherRealm Studios Mind Candy	Mind Candy	No	Yes	No	No	Yes	No	No	No	No	-	customise characters, and in-game currencies (Koins, Hearts, and Time Krystals). Mystery Boxes. These are furniture items purchased via the game store Paws 'N' Claws with in-game currency Rox or via secret codes. Boxes contain codes for random and mystery Moshlings of various rarities.
NBA 2K (series)	TGL, D	Visual Concepts	2K Sports	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	NBA 2K13, 14, 15, 16, 17, 18, 19, 20	Card Packs. NBA 2K13 (2012) onwards have card packs which are purchased with in-game currencies, which in the latest NBA 2K19 and 20 are purchased with real money called MyTeam (MT) points. Card packs contain random player cards.

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Need for Speed (NFS) (series, 2011-2019)	D	Ghost Games, Firemonkeys Studios	Electronic Arts	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	NFS: Rivals, NFS: No Limits, NFS: Payback	<i>Need for Speed: Payback</i> . Two types of loot boxes - Shipments and Speed Cards. Shipments are earned via game play or purchased with in-game currency Speed Points. They contain random rewards, including items to improve car performance, vanity item (skin), and in-game currency Bank. Speed Points can be bought with real money, but Bank cannot. Speed Cards are earned via completing a race or by opening a Shipment (another loot box). Rotated every 30 minutes, they contain random rewards, including items to improve car performance, vanity item (skin), and in-game currency Bank. NFS Payback also has Bait

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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Overwatch

TGL, D

Blizzard Entertainment

Blizzard Entertainment

No

Yes

Yes

Yes

No

Yes

Yes

-

Crates, but their locations are fixed and unclear whether contents are random.

Need for Speed: No Limits. Has Crates which are purchased with in-game currency Gold or rewarded for free. Gold can be purchased with real money. Random contents of different rarities including car parts, car upgrades, or blueprints to unlock cars.

Loot Box. Purchased with real money, earned via game play, or dropped for free via promotions/special events. Contain random cosmetic items (skins) or in-game currency (credits), but not functional items which assist game play.

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
PlayerUnknown's Battlegrounds (PUBG)	TGL, D	PUBG Corporation	PUBG Corporation (PC, PS4), Microsoft Studios (Xbox One), Tencent Games (mobile)	Yes	Yes	No	No	Yes	Yes	No	-	-	-	Crates. Purchased with in-game currency Battle Points (BP). Some crates require in-game items known as Keys to be purchased with real money to open them. Contains random functional or cosmetic items.
Pokémon (series)	EI, TGL, D	Game Freak	Nintendo, The Pokémon Company	Yes	No	-	-	-	-	-	-	-	-	
Red Dead Redemption 2	TGL, D	Rockstar Studios	Rockstar Games	Yes	No	-	-	-	-	-	-	-	-	
Rocket League	D	Psyonix	Psyonix	No	Yes	No	Yes	No	Yes	No	-	-	-	Crates. Obtained via game achievements or special events. Need a Key to be opened, which is purchased with real money or via a trade. Contain random cosmetic items.

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Sonic (series)	EI, D	Sonic Team, Sega, Dimps, Traveller's Tales, SIMS Co., Backbone Entertainment, BioWare, Sumo Digital, Hardlight, Aspect, Gameloft	Sega	No	No	-	-	-	-	-	-	-	
Spyro: Reignited Trilogy	D	Toys for Bob	Activision	No	No	-	-	-	-	-	-	-	
Spyro: Skylanders (series)	EI	Toys for Bob	Activision Blizzard	Yes	Yes	No	No	Yes	No	No	Skylanders: Ring of Heroes	Summoning Chest. Purchased with in-game currency Gems. Contains random items used to assist game play, such as Soul Stones and Skylanders.	

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box for cash/other item of value	Loot box contains skins	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Star Wars: Battlefront (series)	EI, TGL	EA DICE, Criterion Games, Motive Studios	Electronic Arts	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Star Wars: Battlefront II	Loot Crate. Purchased with in-game currency (credits) or awarded for daily log-in. Random rewards skins or credits.
StarCraft (series)	EI, D	Blizzard Entertainment	Blizzard Entertainment	No	No	-	-	-	-	-	-	-	
Super Mario Odyssey	TGL	Nintendo	Nintendo	No	No	-	-	-	-	-	-	-	
Super Smash Bros.(SSB) (series)	EI, TGL	HAL Laboratory, Game Arts, Sora Ltd, Bandai Namco Studios	Nintendo	No	Yes	No	Yes	No	No	Yes	Yes	Super Smash Bros., SSB Melee, SSB Brawl, SSB4, SSB Ultimate	Containers. Collected in game and when smashed contain random rewards: functional items to assist with game play, collectible cosmetic items (e.g., trophies, stickers), Smash coins, gold, or bonus points. There is also a chance a broken container will explode or contain an enemy instead of releasing items or in-game currency.

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Team Fortress 2	D	Valve Corporation	Valve Corporation	No	Yes	Yes	Yes	No	Yes	No	Yes	No	-	Supply Crate. Purchased with real money on the Steam Marketplace (online store) or awarded in game. Some Supply Crates requires a Key to open, which needs to be purchased with real money. Contains random functional or cosmetic items.
The Elder Scrolls (series)	EI, D	Bethesda Softworks, Bethesda Game Studios	Bethesda Softworks	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	The Elder Scrolls Online, The Elder Scrolls: Blades	<i>Crown Crates in TES Online: Tamriel Unlimited</i> . Purchasable via the online game Crown Store with in-game currency Crowns or rewarded for completing a challenge. Crowns are purchased with real-money, gifted, or received via monthly ESO Plus subscription. Crown Crates contain random functional or cosmetic items, or a min-game

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box with in-game currency	Loot box for cash/other item of value	Loot box tradeable	Loot box which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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The Legend of Zelda: Breath of the Wild	D	Nintendo	Nintendo	No	Yes	No	Yes	No	No	No	No	-	
The Sims (series)	EI, D	The Sims Studio	Electronic Arts	Yes	No	-	-	-	-	-	-	-	

rewarding Crown Gems (another in-game currency).

Chests in TES: Blades. Chests are available in the Abyss mode after unlocking level 3 and are obtained via game achievement or bought with in-game currency (Gems) or real money. Contains random items.

Twitch Drops in TES: Legends. Promotional loot boxes given 2017-2019 by Twitch and randomly contained in-game currency, skin packs, or arena tickets.

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
Tom Clancy's Rainbow Six: Siege	TGL, D	Ubisoft Montreal	Ubisoft	Yes	Yes	No	Yes	Yes	Yes	No	No	-	Outbreak Packs. Obtainable with the premium in-game currency (R6 credits) or by purchasing the special edition of the game. R6 credits are purchased with real money or the special game edition. Packs contain random items (cosmetic skins only) of different rarities.	
Tom Clancy's The Division 2	EI, TGL	Massive Entertainment	Ubisoft	Yes	Yes	No	Yes	Yes	Yes	No	No	-	<i>Hyena Chest, True Son Chest, Outcast Chest.</i> Opened with keys and contain random items, functional or cosmetic. <i>Supply Drops.</i> Available only to Season Pass players, drops twice monthly for completing challenges and contains random items.	
Tomb Raider (series)	D	Core Design, Crystal Dynamics,	Eidos Interactive, Square Enix	No	No	-	-	-	-	-	-	-	-	

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game currency purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box contains in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
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		Nixxes Software, Ubisoft Milan, Eidos Montréal												
Total War: Warhammer	D	Creative Assembly	Sega, Feral Interactive	No	No	-	-	-	-	-	-	-	-	
Uncharted (series)	EI	Naughty Dog, Bend Studio, Bluepoint Games, Playspree	Sony Interactive Entertainment	Yes	No	-	-	-	-	-	-	-	-	
Watch Dogs (series)	EI	Ubisoft Montreal	Ubisoft	No	Yes	No	Yes	No	No	No	Yes		Watch Dogs, Watch Dogs 2	
Where's my water? (series)	EI	Creature Feep	Disney Mobile	Yes	No	-	-	-	-	-	-	-	-	
Wii Sports	D	Nintendo	Nintendo	No	No	-	-	-	-	-	-	-	-	
World Golf Tour (WGT)	D	Chad Nelson and YuChiang Cheng	World Golf Tour Media	Yes	No	-	-	-	-	-	-	-	-	

Video game name	Data source/s*	Game developer/s	Game publisher/s	In game purchasable	Loot box available	Loot box (micro-transaction)	Loot box won in game (without purchase)	Loot box purchasable with in-game currency	Loot box contains skins	Loot box tradeable	Loot box for cash/other item of value	Loot box in-game currency which can be used to purchase skins	If multiple games in series, ones with loot boxes	If loot box, description
World of Tanks	EI, TGL	Wargaming Minsk	Wargaming	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	-	War Chests. Obtainable for purchase with real money during special events. Contain random functional (vehicles, crew) or cosmetic items (collectibles, special decorations), in-game currency (gold, credits), experience point boosts, or account time.
World of Warcraft	EI, TGL, D	Blizzard Entertainment	Blizzard Entertainment	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	-	Loot system. WoW has a loot system where items get looted from a defeated monster and distributed amongst a group of players. Items appear to sometimes be random and there is a system to buy and sell items for in-game currency WoW Tokens.

Appendix C: Video game environmental scan – monetary value of loot box contents

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading:
Age of Empires (series)	No	-	-	-
Angry Birds (series)	Yes	No	Yes	In-game currencies via loot boxes can be used to buy more loot boxes. Audit revealed no option to sell items or in-game currency outside of the game.
Apex Legends	Yes	Yes	No	Loot boxes contains random cosmetic items (skins) of different rarities. Third party websites – items, or game account with items, can be sold for money.
Assassin's Creed: Odyssey	Yes	No	No	-
Assassin's Creed: Origins	Yes	No	No	-
Batman: Arkham (series)	No	-	-	-
Battlefield (series)	Yes	Yes	No	Items cannot be sold for something of value within the game. Third party websites - game account with items can be sold for money.
Borderlands (series)	Yes	Yes	Yes	Loot boxes contain random rewards including functional items, cosmetic items (skins), in-game currency Money, or enemies to fight. Items can be sold for in-game currency Money or traded with other players for items. Money can be used to buy items. In Borderlands 2 Money can be used to play a Slot Machine to win random items and in-game currency. Third party websites - game account with items can be sold for money.

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading:
Call of Duty: Black Ops 4	Yes	Yes	No	Loot boxes each contain 1 random item which is functional or cosmetic (skin). Third party websites - game account with items can be sold for money.
Call of Duty: World War II	Yes	Yes	Yes	Loot box contains random skins, in-game currency Armory Credits, experience points (XP), or consumable powerups. Armory Credits can be used to purchase items or contracts (new game content). Third party websites - game account with items and in-game currency can be sold for money.
Candy Crush Saga	Yes	Yes	Yes	Sugar Drops contain random rewards which include in-game currency Gold Bars or consumable 'boosters' which help with game play. Daily Booster Wheels contain a random free booster or a jackpot. Gold Bars can be used to purchase new lives, extra moves, boosters, or new game content. Third party websites - game account with items and level achievements can be sold for money.
Civilization (series)	No	-	-	-
Clash of Clans	Yes	Yes	Yes	Loot boxes contain Elixirs can be used to purchase skins or functional game items. Third party websites - game account with items and in-game currency can be sold for money.
Clash Royale	Yes	Yes	Yes	Loot boxes randomly contain in-game currencies (Gold or Gems) or functional itmes (Cards). Gold can be used to upgrade and buy cards. Gems can be used to buy Chests.

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading:
Counter Strike: Global Offensive	Yes	Yes	No	Third party websites – items, or game account with items, can be sold for money. Loot boxes contain random functional or cosmetic items, which can be sold or traded on the Steam Marketplace for money or other items. Third party websites – items, or game account with items, can be sold for money. Skins can be used for gambling on third party websites.
Crash Bandicoot: N. Sane Trilogy	No	-	-	-
Crash Bandicoot: Crash Team Racing Nitro-Fueled	No	-	-	-
CrossFire	Yes	Yes	Yes	Loot boxes contain random items (type unknown) or in-game currency Game Points (GP). Within the game store items, including crates, can be sold for in-game currency ZP. Third party websites – items, or game account with items, can be sold for money.
Cut the Rope (series)	No	-	-	-
Defense of the Ancients (Dota) (series)	Yes	Yes	No	Loot boxes contain random functional or cosmetic items, which can be sold or traded on the Steam Marketplace for money or other items. Third party websites – items, or game account with items, can be sold for money. Skins can be used for gambling on third party websites.

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading:
Destiny (series)	Yes	Yes	Yes	Loot boxes contain random functional or cosmetic items, in-game currencies, special offers or promotions. Items gain in loot boxes cannot be traded using the Eververse Trading system. In-game currency Bright Dust gained can be used to purchase items or more Engrams. Third party websites – items, in-game currency, or game account with items and in-game currency can be sold for money.
Diablo (series)	Yes	Yes	Yes	<i>Diablo II</i> : Loot boxes contain random items, sometimes leading to no reward, gold, or items. Gold is the in-game currency used to buy consumables. Items can be sold in-game for gold or traded with other players. <i>Diablo III</i> . Loot boxes contain random items which can be sold or traded with other players for in-game currency or other items. <i>Diablo II and III</i> . Third party websites – items, or game account with items and in-game currency, can be sold for money.
Dungeon Fighter Online (DFO) (series)	Yes	Yes	No	Loot boxes contain random items either functional or cosmetic. Most items can be sold for Gold, an in-game currency, via the Auction Hall. Gold is used to purchase items. Third party websites – items, in-game currency, or game account with items and in-game currency can be sold for money.
Fallout (series, 2004-2019)	Yes	Yes	Yes	<i>Fallout 76</i> . Can trade legendary items for in-game currency Scrip. Third party websites – items, or game account with items, can be sold for money. <i>Fallout Shelter</i> . Rewards from

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading:
Far Cry (series)	No	-	-	-
Fate/Grand Order	Yes	Yes	Yes	<i>Gift Box/Present Box</i> . Contains random items or in-game currency (Saint Quartz). Audit doesn't reveal they contain Costume Dresses (skins). <i>Chest Drops</i> . Randomly contains items or in-game currency. Such items include Ascension Items that assist in game play. Audit doesn't reveal they contain Costume Dresses (skins). <i>Items/in-game currency from Boxes and Drops</i> . Some in-game currencies can be used to buy items in game. Some third party websites allow game account with items to be sold for money.
FIFA 18	Yes	Yes	No	Loot boxes (packs) contain one or more random players or items. These contents can be sold via Electronic Arts (EA) Transfer Market for FUT coins. Third party websites – game account with items and FUT coins can be sold for money.
FIFA 19	Yes	Yes	Yes	Loot boxes (packs) contain one or more random players, items, and new to FIFA19 FUT coins. Contents can be sold via Electronic Arts (EA) Transfer Market for FUT coins. FUT coins can be used to purchase more packs or in-game items (i.e.

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading:
Final Fantasy (FF) (series)	Yes	Yes	Yes	FFVII onwards loot boxes contain random contents including in-game currency, functional or cosmetic items, or monsters. Some items can be sold for the in-game currency Gil, and in-game currency can be used to buy items. Third party websites – items, in-game currency, or game account with items and in-game currency can be sold for money.
Formula 1 (series, 2009-2019)	No	-	-	-
Fortnite (series)	No	-	-	-
Forza Horizon (series)	Yes	Yes	Yes	Loot box randomly contains in-game currency Credits or a car (functional item). Duplicate cars from loot boxes can be sold for 50% of the base value for Credits. Credits can be used to purchase more loot boxes or cars. Third party websites - audit revealed no option to sell items or in-game currency outside of the game.
Forza Motorsport (series)	No	-	-	-
Forza Street	Yes	No	Yes	Rewards from the loot box include in-game currencies (Gold or Credits) or functional item (car). Gold can be used to purchase Prize Cards (loot boxes), consumable items, and Credits. Credits are used for upgrading cars. Items from loot boxes cannot be sold/traded for money or other items of value within

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading:
Fruit Ninja	No	-	-	-
Gran Turismo 6	No	-	-	-
Gran Turismo Sport	No	-	-	-
Grand Theft Auto V (Online)	Yes	Yes	Yes	Lucky Wheel Spin gives random reward of chips, GTA dollars, clothing, or a supercar. Less than 0.005% of getting a rare car. The Casino and Resort itself require GTA \$500 entry, and has a store where chips can be used to purchase cosmetic items. These items can be sold for GTA \$ in the game. Third party websites – game account with items and GTA dollars can be sold for money.
GWENT: The Witcher Card Game	Yes	Yes	No	Card Kegs contain 5 random cards with one guaranteed to be rare or above. No function to sell cards within the game. Third party websites - game account with cards and other items can be sold for money.
Halo (series)	Yes	Yes	Yes	Requisition Packs randomly contain in-game currency called REQ Points, skins, or in-game bonuses. REQ Points can be sold via gaming store for points or used to purchase REQ Packs. Third party websites - audit revealed no option to sell items or in-game currency outside of the game.
Hearthstone	Yes	Yes	No	Card Packs contains 5 random cards, at least one being a rare card, of functional or cosmetic value. Third party websites –

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading:
Heroes of the Storm (HoTS) (series)	Yes	Yes	No	game accounts with cards and/or card packs can be sold for money. Loot Chests contain random functional items, cosmetic items (skins). Duplicate items from Loot Chests are converted to in-game currency Shards. Shards can be used to buy cosmetic items. Third party websites - game account with items can be sold for money.
Honour of Kings (aka Arena of Valor)	Yes	Yes	Yes	Lucky Draw/Spin rewards random items (functional or cosmetic skins) or in-game currencies Gold or Gems. Gems are used to purchase game items. Third party websites – items, in-game currency, or game account with items and in-game currency can be sold for money.
Kingdom Hearts (series)	Yes	Yes	No	Medal Deals contain random in-game items (Medals) of different rarities. Medals are functional items in that they help game play. Medal Deals don't appear to contain in-game currency or skins. Third party websites - game account with items can be sold for money.
League of Legends	Yes	Yes	Yes	Chests contain random contents called Shards (functional and cosmetic skin items), Emotes (power), Essence (in-game currency), Gemstones (in-game currency), Bonus Chests (loot box) or Keys. Essence can be used to purchase skins. Keys can open Chests. There is a gifting system via the game between players of Riot Points. Third party websites - game

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading:
Little Big Planet	No	-	-	-
Madden NFL (series 2017-2019)	Yes	Yes	Yes	Packs contain random rewards including items (Players used in game) or in-game currency Coins. Coins can be used to purchase Packs (loot boxes), Players (functional item), or customised uniforms for teams/players (skins). Players can be traded for Coins. Third party websites - game account with items can be sold for money.
Mario Kart 8	Yes	No	No	-
Mass Effect (series, 2007-2019)	Yes	No	No	-
Minecraft	No	-	-	-
Monster Hunter: World	No	-	-	-
Mortal Kombat (series)	Yes	Yes	Yes	Treasure Chests in Mortal Kombat 11 contain random contents including functional items (e.g., Augments), skins to customise characters, and in-game currencies (Koins, Hearts, and Time Krystals). Augments can be sold for Koins. Koins and Hearts can be used to purchase Treasure Chests and other in-game items. Third party websites - audit revealed no option to sell items or in-game currency from MK11 outside of the game.
Moshi Monsters	Yes	No	No	-

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading:
NBA 2K (series)	Yes	Yes	Yes	Card packs contain random player cards. Within the game Auction House player cards can be sold for in-game currency MT Points, which can be used to purchase player cards, Card Packs, and customise characters (skins). Third party websites - audit revealed no option to sell cards, card packs, or MT Points outside of the game.
Need for Speed (NFS) (series, 2011-2019)	Yes	Yes	Yes	Items from Speed Cards can be traded for in-game currency Part Tokens which can be used to play the Speed Car slot machine to get car parts. In-game currency Bank from loot boxes can be used to purchase in-game items. Third party websites. Audit revealed no option to sell NFS accounts, items, or in-game currency outside of the game.
Overwatch	Yes	Yes	Yes	Loot Box contain random cosmetic items (skins) or in-game currency (credits). Duplicate skins drawn from loot boxes are converted into credits. Credits can be used to unlock in-game items (skins) but not to purchase loot boxes. Third party websites – items, or game account with items and in-game currency, can be sold for money.
PlayerUnknown's Battlegrounds (PUBG)	Yes	Yes	No	Crates contain random functional or cosmetic items. Prior to May 2018 PUBG skins could be sold on Valve's Steam Marketplace platform for money. Third party websites – items, or game account with items, can be sold for money. PUBG

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading:
Pokémon (series)	No	-	-	-
Red Dead Redemption 2	No	-	-	-
Rocket League	Yes	Yes	No	Crates contain random cosmetic items. Within the game, items can be traded with other players for other items (but not money) including: item drops, crates, crate items, and keys. There is a 7-day trade hold for keys. Third party websites – items, or game account with items, can be sold for money.
Sonic (series)	No	-	-	-
Spyro: Reignited Trilogy	No	-	-	-
Spyro: Skylanders (series)	Yes	No	No	-
Star Wars: Battlefront (series)	Yes	Yes	Yes	Loot Crate contains random rewards skins or credits. Credits can be used to purchase more loot boxes, skins are other items. Third party websites – items, or game account with items, can be sold for money.
StarCraft (series)	No	-	-	-
Super Mario Odyssey	No	-	-	-
Super Smash Bros.(SSB) (series)	Yes	Yes	Yes	Containers contain random rewards: functional items to assist with game play, collectible cosmetic items (e.g., trophies, stickers), Smash coins, gold, or bonus points. Collectible items can be sold for in-game currency Spirit Points. Gold and Spirit Points can be used to purchase items. Third party websites -

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading:
Team Fortress 2	Yes	Yes	No	audit revealed no option to sell items or in-game currency outside of the game. Supply Crate contains random functional or cosmetic items, which can be sold or traded on the Steam Marketplace for money or other items. Third party websites – items (Keys, Supply Crates), or game account with items, can be sold for money. Skins can be used for gambling on third party websites.
The Elder Scrolls (series)	Yes	Yes	Yes	<i>Crown Crates in TES Online: Tamriel Unlimited</i> randomly contain random functional or cosmetic items, or a min-game rewarding Crown Gems (another in-game currency). <i>Chests in TES: Blades</i> contains random items. <i>Twitch Drops in TES: Legends</i> randomly contain in-game currency, skin packs, or arena tickets. Crown Gems can be used in store to buy items including Crown Crates. There is a gifting feature via the Crown Store which allows the trading of skins player-to-player. TES Online game account with items and in-game currency can be sold for money on third party websites.
The Legend of Zelda: Breath of the Wild	No	-	-	-
The Sims (series)	No	-	-	-

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading:
Tom Clancy's Rainbow Six: Siege	Yes	Yes	No	Outbreak Packs contain random items (cosmetic skins only) of different rarities. Third party websites - game account with items can be sold for money.
Tom Clancy's The Division 2	Yes	Yes	No	Chests and Supply Drops contain random items, functional or cosmetic. Items from both loot boxes can be deconstructed, bought, or sold using in-game currency. Third party websites – items, or game account with items, can be sold for money.
Tomb Raider (series)	No	-	-	-
Total War: Warhammer	No	-	-	-
Uncharted (series)	No	-	-	-
Watch Dogs (series)	No	-	-	-
Where's my water? (series)	No	-	-	-
Wii Sports	No	-	-	-
World Golf Tour (WGT)	No	-	-	-
World of Tanks	Yes	Yes	Yes	War Chest contain random functional (vehicles, crew) or cosmetic items (collectibles, special decorations), in-game currency (gold, credits), experience point boosts, or account time. In-game currency from War Chests can be used to purchase items. Third party websites - game account with items can be sold for money.
World of Warcraft	Yes	Yes	No	Loot system. WoW has a loot system where items get looted from a defeated monster and distributed amongst a group of players. There is a system to buy and sell items for in-game

Video game name	Loot box available	Loot box contains skins or other items of value tradeable for cash/other items of value	Loot box contains in-game currency which can be used to purchase skins or other items of value	Description skin, items, or in-game currency selling/trading: currency WoW Tokens. WoW Tokens can then be sold for \$USD via Battlenet Blizzard Balance. Third party websites – items, in-game currency, or game account with items and in-game currency can be sold for money.
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Appendix D: Video game Titles with Loot Boxes

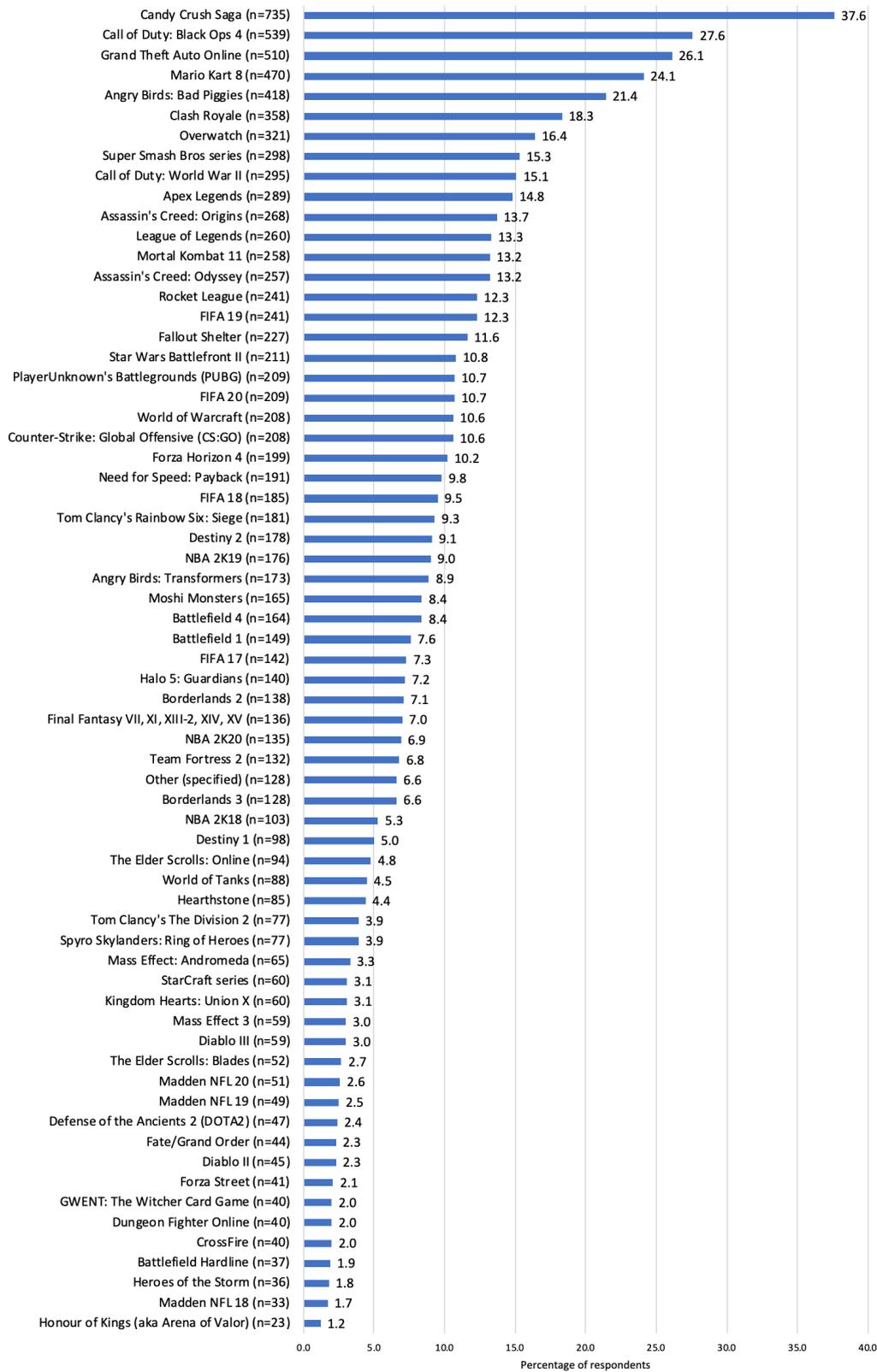


FIGURE 4. PERCENTAGE OF RESPONDENTS WHO REPORTED PLAYING EACH GAME (TOTAL SAMPLE, *N*=1,954).

Note: 908 additional responses were provided for games that the respondent thought included loot boxes, but which were not on the list. Please see the measures section for how these games were dealt with.

TABLE 11. ALTERNATIVE ANALYSES USING THE CATEGORICAL CLASSIFICATION, RATHER THAN THE CONTINUOUS SCORE FOR DSM-IV-MR-J AND NON-LOTTERY GAMBLING INTENTIONS AND STATUS.

Independent variables	Dependent variables		
	Gambling Intent when 18 (adol, non-lottery forms, ref = no)	Gambling status (young adults, non-lottery forms, ref = no)	DSM-IV-MR-J problem gambler classification
Played games with loot boxes (ref = no)^	0.034 (0.066)	0.196** (0.065)	^
Opened loot boxes (ref = no)	0.139** (0.049)	0.260 (0.144)	0.983* (0.391)
Buying loot boxes (amongst people who play games with loot boxes in them) (ref = no)	0.423 (0.153)	1.109*** (0.161)	1.261* (0.291)
Selling loot boxes (amongst people who play games with loot boxes in them) (ref = no)	0.135 (0.096)	0.428*** (0.090)	0.545*** (0.100)
Age when first opened a loot box (amongst those who had opened loot boxes (years))	-0.069 (0.120)	0.122 (0.078)	0.089 (0.228)

Note: *p<.01, **p<.05, ***p<.001. ^ There is an empty cell in the 2x2 table for DSM-IV-MR-J by playing games. No respondents who did not play games were classified as a problem gambler under the DSM-IV-MR-J. Thus this analysis had a highly inflated error term and is not reported here.

Appendix E: Gambling Activities

TABLE 12. GAMBLING FORMS INCLUDED IN THE SURVEY FOR QUESTIONS RELATING TO GAMBLING BEHAVIOUR (YOUNG ADULTS) AND GAMBLING INTENT (ADOLESCENTS)

Gambling Activities List	
Playing pokies or poker machines	Betting on sporting events (but NOT sweeps, fantasy sports, and eSports)
Betting on horse or greyhound races (including virtual races such as "Trackside", but NOT including Melbourne Cup sweeps	Betting on eSports events like CS:GO, League of Legends or DOTA2
Buying lottery tickets either online or in person	Betting on fantasy sports games for money such as Draftstars
Betting on lotteries or Keno via online sites like Lottoland or Planet Lottery	Betting on a non-sporting event, such as who will win an Academy Award, a political event, or a reality TV show
Buying instant scratchies for my own use	Playing casino games, such as Blackjack, Roulette, or poker machine games, on the Internet (including via a mobile phone) FOR MONEY
Playing Keno at a club, hotel or casino	Playing poker games online FOR MONEY
Playing Bingo or Housie for money	Taking part in informal private betting FOR MONEY, like playing cards, Mahjong or betting on sports with family, friends or colleagues
Playing table games at a casino such as Blackjack or Roulette	

Appendix F: Ancillary Findings on Gambling Intentions, Attitudes, Gambling Activities, Gambling Expenditure and Internet Gambling Disorder

Gambling - intention when 18 (adolescents)

Of the 919 adolescents, 663 (72.1%) indicated that they were likely or very likely to take part in gambling on at least one form after they turn 18. One-third ($n=221$) indicated that they intended to take part on one or two of the 15 surveyed forms, with the remaining 442 respondents indicating that they intended to gamble on three or more forms.

The forms with the highest intention were instant scratchies and lottery tickets (from a venue), just over half of the respondents indicating that they intended to take part in these forms when they turned 18. For all other forms, less than 30% of the adolescent sample indicated an intention to take part when 18 (Figure 5).

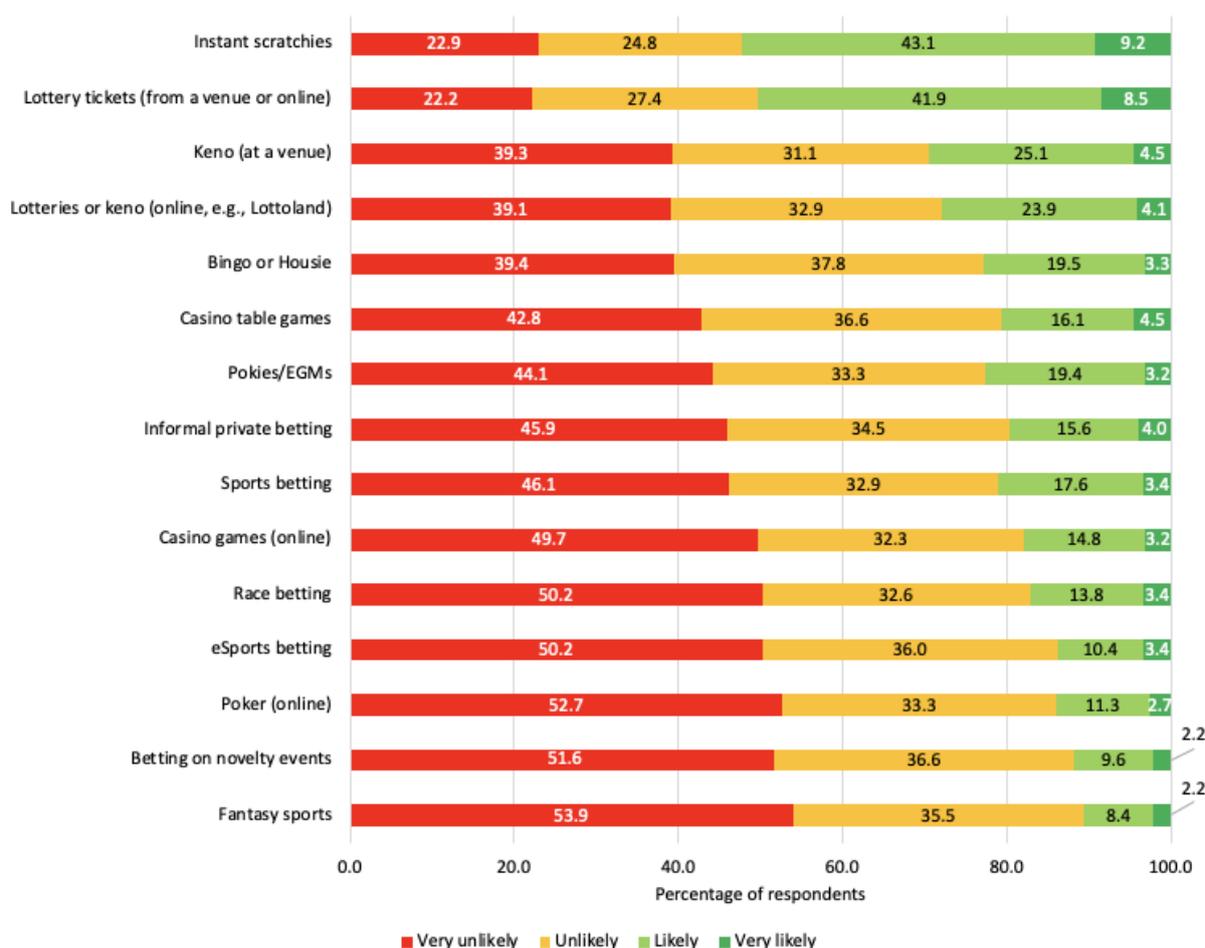


FIGURE 5. INTENTION TO GAMBLE WHEN 18 BY FORM - ADOLESCENT SAMPLE (N=919).

Attitudes towards gambling

Scores on the Attitudes towards Gambling scale were generally negative, with means of 28.8 ($SD=6.7$) and 29.3 ($SD=6.3$) for the adolescent and adult samples, respectively, out of a possible score of 76, with higher scores indicating more positive attitudes towards gambling. There was no significant difference between the adult and adolescent sample in terms of attitudes towards gambling, $t(1952)=-1.62$, $p = .107$.

Gambling - behaviour (young adults)

Of the 1,035 young adults in the sample, 745 (72.0%) reported engaging in at least one form of gambling. Of those who gambled, more than half (50.4%) reported taking part in one, two or three forms of gambling. As can be seen in Figure X below, the most common forms were buying lottery tickets from a venue, instant scratchies and pokies/EGMs.

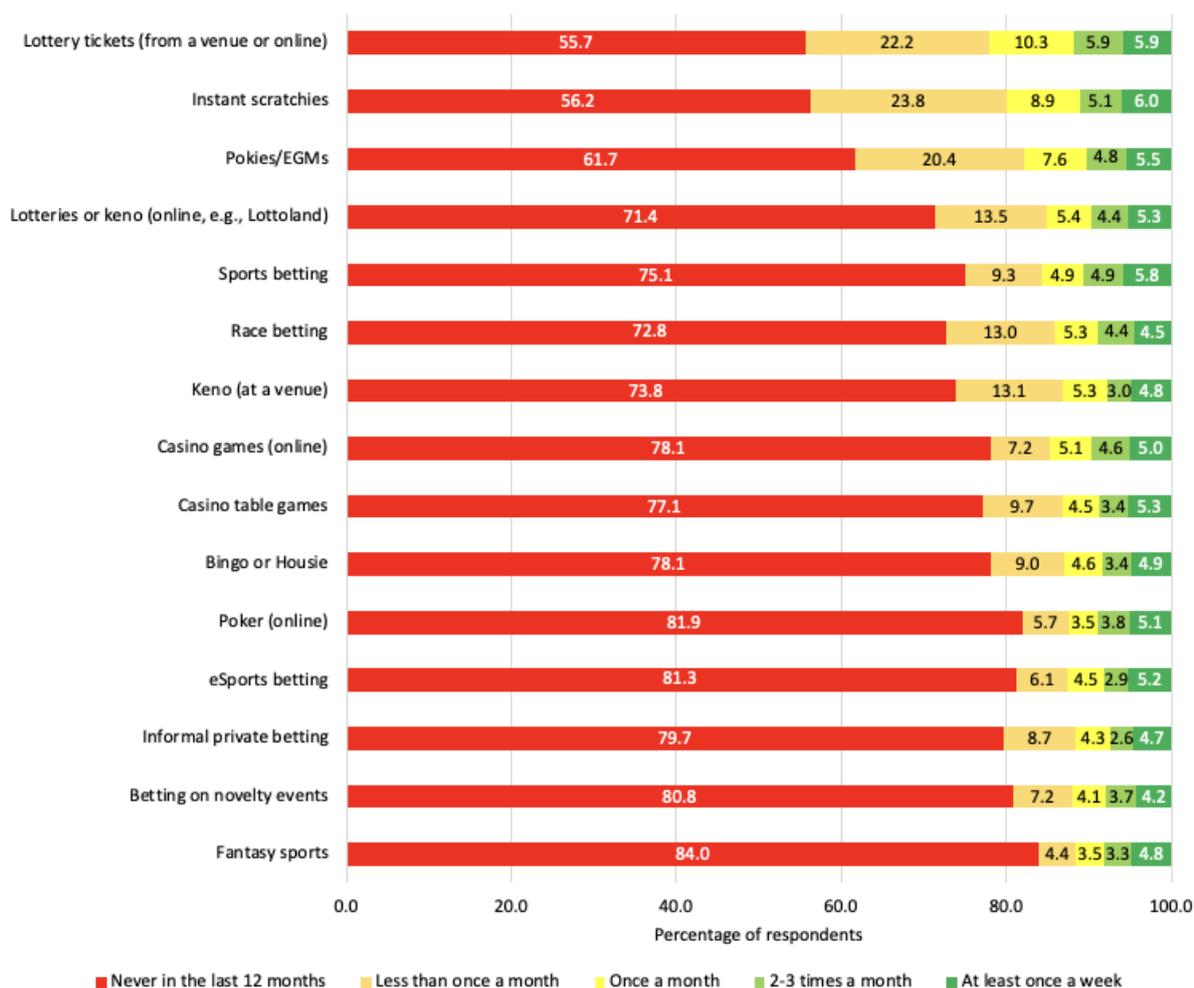


FIGURE 6. ENGAGEMENT IN EACH GAMBLING FORM, ADULT SAMPLE ($N=1035$).

Note: The top three response categories (once a week, 2-3 times a week, 4 or more times a week) were collapsed into “at least once a week” due to relatively low numbers for all forms.

Gambling - Expenditure (young adults)

Median monthly expenditure on each form ranged from was \$10 for almost all forms. The exceptions were casino table games at venues and pokies (both \$20). Median expenditure across all forms per month was \$45.

Gaming-related problems - Internet Gaming Disorder (IGD)

Of the total sample of 1,954 respondents, 335 (17.1%) were classified as having IGD. This figure was significantly higher amongst the adolescent sample (19.7%) compared to 14.9% of young adults, $\chi^2(1, N=1954) = 7.95, p = .005$. Furthermore, the adolescent sample had a higher overall IGD score ($M=3.66, SD=2.81$) compared to the adult sample ($M=3.35, SD=2.50$), *Welch t*(1850.96)=2.56, $p = .011$.