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Unfair play? Video games as exploitative monetized services: An examination of game patents from a consumer protection perspective



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ABSTRACT

Video games as a consumer product have changed significantly with the advent of in-game purchasing systems (e.g., microtransactions, 'loot boxes'). This review examines consumer protections related to in-game purchasing by anticipating some of the potential design strategies that might contribute to higher risk consumer behavior. Attention was directed towards the analysis of patents for potential in-game purchasing systems, with 13 identified on *Google Patents*. The design features were analysed in relation to the consumer rights and guarantees described in the terms of use agreements of the patent assignees. The analysis revealed that some in-game purchasing systems could be characterized as unfair or exploitative. These systems describe tactics that capitalize on informational advantages (e.g., behavioral tracking) and data manipulation (e.g., price manipulation) to optimize offers to incentivize continuous spending, while offering limited or no guarantees or protections (e.g., refund entitlement), with the potential to exploit vulnerable players (e.g., adolescents, problematic gamers). These findings are critically discussed in relation to behavioral economics, addiction psychology, and the clinical conceptualization of gaming disorder. Appropriate policy and consumer protection measures, psychologically informed interventions, and ethical game design guidelines are needed in order to protect the interests and wellbeing of consumers.

1. Introduction

Video games as a consumer product have changed significantly in recent years, with the monumental rise of 'games as a service'. Games as a service refer to a broad class of online games which provides in-game content on a continuing revenue model (Lehdonvirta, 2009). Examples of such games include the extremely popular online 'battle royale' genre (e.g., *Fortnite*), online subscription-based games such as massively multiplayer online (MMO) games (e.g., *World of Warcraft*), and free-to-play game apps on smartphones and tablets (e.g., *Clash of Clans*). Games as a service are designed to encourage users to make 'in-game purchases' or 'microtransactions', which involves spending money, usually in small amounts (e.g., between \$1 and \$5), to access (or have the possibility of accessing) virtual items or currency within the game. In

2017, the publisher *Activision Blizzard* declared a \$4 billion revenue from microtransactions (Activision Blizzard, 2017). Many other major 'AAA' game companies, including *Ubisoft* and *Electronic Arts*, have been very active in this area by incorporating microtransactions into their franchise game titles, such as *Madden*, *FIFA*, *Star Wars: Battlefront* and *Assassin's Creed* (Drummond & Sauer, 2018). The basic design and implementation of in-game purchasing options, particularly their rapid pace, repeatability, and inherent randomness in some formats, has invited some comparisons to gambling products, particularly electronic gaming machines (King & Delfabbro, 2018). In-game purchasing systems have also generated a great deal of debate on the need for gaming-specific regulation and consumer protection across many jurisdictions (Griffiths, 2018; Environment and Communications References Committee, 2018; King, 2018; King & Delfabbro, 2019; Király et al.,

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2018; UK Gambling Commission, 2017).

Despite these concerns, a major challenge for online gaming regulation and consumer protection measures has continued to be the lack of consensus or clarity regarding the legal status of certain types of in-game purchases (Griffiths, 2018; King & Delfabbro, 2019a, 2019b; Teichert, Gainsbury, & Mühlbach, 2017). In some jurisdictions, such as Belgium and the Netherlands, regulators and politicians have made recommendations that some in-game purchases, such as the purchase of randomly determined items via ‘loot box’ mechanics, should be considered a form of gambling (BBC News, 2018). However, the situation in other countries remains less clear and in a state of development. A common point of contention is whether in-game purchases involve items of value that can be won (and lost) by the player, as is the case in gambling. In legal proceedings in the United States where claimants have argued that they experienced harms resulting from ‘financial losses’ due to microtransactions, the assumption that the gaming activity involved ‘gambling’ has consistently been rejected, notwithstanding a recent Washington case involving the social casino game series *Big Fish Casino* (Gatto & Patrick, 2018; Solana, 2018). Recently, in the US, senator Josh Hawley has proposed a bill that would ban the inclusion of ‘pay-to-win’ microtransactions and loot boxes in games oriented to child users (Kelly and May, 2019). In other jurisdictions, there have been measures introduced to increase the transparency of in-game purchases to assist consumers in evaluating the value proposition of these transactions. For example, the Chinese government passed legislation in 2016 that required game developers to disclose the odds of receiving certain items from loot boxes to assist players to make more informed decisions (Grayson, 2017). Finally, some segments of the gaming industry are considering self-regulation measures for certain types of in-game purchases. In 2018, Jen Maclean, the Executive Director of the International Game Developers Association (IGDA) posted a ‘call to action’ that urged developers to immediately implement several self-regulation measures, including age-appropriate marketing, consumer advice on odds for random in-game rewards, and parental controls (Maclean, 2018).

Consumer protection issues related specifically to in-game purchases (i.e., microtransactions) have generally not been examined in the courts. However, in Australia, one particular high-profile consumer protection case involving online game software purchases was *Australian Competition and Consumer Commission (ACCC) vs Valve Corporation* which was filed in 2014 and resolved in 2018. In its final ruling, the Federal Court found that the company Valve Corporation (Valve), through its online game distribution platform Steam and its Steam website, had engaged in misleading or deceptive conduct and made false or misleading representations to Australian consumers about the consumer guarantees under Australian consumer law. Although not specifically relating to micro-transactions (but still relevant to digital goods), the Court reached the important finding that Valve could be held liable for false or misleading representations to consumers. In the terms and conditions contained in its Steam subscriber agreement and refund policy: (1) consumers were not entitled to a refund for digitally downloaded games purchased from Valve in any circumstances; (2) Valve had excluded statutory guarantees and/or warranties that goods would be of acceptable quality; and (3) Valve had restricted or modified statutory guarantees and/or warranties of acceptable quality (ACCC, 2016). Valve was ordered to pay \$3 million in penalties. According to ACCC chairman, Rod Sims, this ruling set a precedent that overseas-based companies that sell digital goods to Australians must abide by Australian law, and these goods come with automatic consumer guarantees that they are of acceptable quality and fit for the purpose for which they were sold, even if the business is based overseas (ACCC, 2017).

The case of *ACCC vs Valve* has provided a precedent that has brought online games and in-game purchases under the jurisdiction of consumer law. For regulators, this has extended the potential avenues for action beyond the need to find gaming to be form of illegal gambling

(often a difficult undertaking, despite the outcomes in Belgium), and as another product or service that could be seen to contravene certain obligations legally entitled to the consumer. Following this line of reasoning, King and Delfabbro (2018) proposed that some in-gaming purchasing options could be considered ‘predatory’ because certain attributes of the gaming product bore similarities to gambling products, even though they may not have met the strict legal definition. Such predatory monetization schemes were defined as “in-game purchasing systems that disguise or withhold the true long-term cost of the activity until players are already financially and psychologically committed” (p.1967). King and Delfabbro noted that some schemes may employ tactics that make in-game transactions more likely to be misunderstood or vexing for some users. In particular, they drew attention to the large number of younger users who commonly make in-game purchases, as evidenced by recent research by the eSafety Commissioner which reported that 34% of young people aged 8–17 years had made in-game purchases in the previous 12-month period (Office of the eSafety Commissioner, 2018).

There is also a growing discourse on player exploitation in relation to video game monetization among members of the gaming community, including players, journalists, and the developers themselves. These groups are perhaps more aware than many outside observers that the gaming industry's use of microtransaction systems is becoming more sophisticated and generating massive revenue. Critical evaluation of these developments has emerged from discussions of the design tactics within so-called ‘casual’ games (typically found on smartphones and tablet devices), where games are made freely available to players but there are options to make unlimited, small purchases. However, because game companies often seek to keep their intellectual property confidential, there are very few objective and transparent or ‘complete’ accounts on the precise nature of the in-game spending systems in these games. As an example of typical analysis in this discourse, some players may share their experiences based on spending a certain amount of money in these games, which provides a crude indication of in-game probabilities, but this provides only limited information about the actual game's mechanics. Nevertheless, some useful information about how these games work may, on occasion, be disclosed by game developers. One such case, in 2015, involved an anonymous game producer for a ‘free-to-play’ game company who disclosed that their games employed various sales and manipulation tactics to encourage certain players to spend more money in their game. These strategies involved, for example, searching the company's player metrics to identify highly active players and then developing monetized in-game content tailored and offered to these players. In-game content was personalised based on these players' unique interests and preferences (e.g., game items that match the colour of their favourite sports team), which involved using information gathered from players' linked social network pages (e.g., Facebook page) (Hodapp, 2015).

Given the rapid expansion and uptake of video games that offer in-game purchasing options for consumers, it would appear timely to evaluate these products from a consumer protection perspective. Psychologists and other academic experts are often called upon by government committees and regulators to comment upon the potential risks of certain gaming products. The scope of such discussion has expanded in recent years to cover not only the potential behavioral effects of gaming excessively, particularly among children and adolescents (e.g., mental health, social and developmental impacts, addictive use of video games, negative impact on school performance) (Chen & Leung, 2016; James & Tunney, 2017; King & Potenza, 2019; Long et al., 2018; Männikkö, Billieux, & Kääräinen, 2015; Ream, Elliott, & Dunlap, 2013), but also the potential monetary risks of these activities (e.g., overspending, debt) and links to other behavioral problems (King, Delfabbro, & Griffiths, 2010; Laconi, Pirès, & Chabrol, 2017; Mäntymäki & Salo, 2015). There has been academic conjecture in this area, for example, that some monetized games may offer a pathway to some types of gambling (Gainsbury, Hing, Delfabbro, Dewar, & King,

2015; Gainsbury, Russell, King, Delfabbro, & Hing, 2016a; Gainsbury, King, Russell, Hing, & Delfabbro, 2017; Dussault et al., 2017; Kim, Wohl, Gupta, & Derevensky, 2017; Hayer, Kalke, Meyer, & Brosowski, 2018; Jacques et al., 2016; Teichert et al., 2017; Wohl, Salmon, Hollingshead, & Kim, 2017), including the use of monetized game content to drive activities such as gambling on esports and games of chance using ‘skins’ (i.e., monetized cosmetic in-game items; see Hardenstein, 2017; Holden & Ehrlich, 2017; Macey & Hamari, 2018a, 2018b; UK Gambling Commission, 2017).

To date, there has been very limited discussion of how monetized gaming and in-game purchases may be implicated within the phenomenon of problematic gaming and gaming disorder. The prevailing view of video games within the literature on problematic gaming appears to be that these activities are primarily governed by skill and strategy, which is clearly not the case for many new and emerging forms of monetized games. There has been a lack of analysis of how monetized games are structured to elicit in-game purchases, with extant papers on this topic tending to focus on their potential similarities to electronic forms of gambling. This literature has thus overlooked the unique properties of monetized games as an entertainment product that has evolved its own strategies at the design level, particularly the use of systems that may exploit the inequalities in information between purchaser and provider (King & Delfabbro, 2018). At the same time, there has been limited industry acknowledgement of its responsibilities concerning harms associated with gaming products (King & Gaming Industry Response Consortium, 2018), despite growing anecdotal evidence of some users spending thousands of dollars on microtransactions (Gach, 2017) and strong support and evidence for gaming disorder as an official diagnosis in clinical nomenclature (King et al., 2018; Mihara & Higuchi, 2017; Rumpf et al., 2018; Saunders et al., 2017). The aim of this review was to contribute to further critical discussions at the nexus of monetized gaming, consumer protection, behavioral economics, and the psychology of problematic gaming behaviors.

1.1. The present review

The primary aim of this review was to examine video game monetization schemes from an Australian consumer protection perspective and for this discussion to form the basis of further psychological analysis of in-game purchasing conceptualized as a risky behavior. Following the recent case law example of *ACCC vs Valve*, this review was designed to evaluate design features for in-game purchasing systems using an ACCC consumer protection framework, with a focus on basic consumer rights and guarantees for these products. Attention was directed, in particular, to utility patents for microtransactions and their associated terms of use. Such patents were selected because the functional description of patents discloses the key design attributes and explains the developer's intended purpose and range of implementations. In our view, such analysis has distinct advantages over simply observing monetized games in action, for example, which may be fraught with error and lack the ability to inspect underlying design features (e.g., programming logic). Game patent analysis may provide insights into how consumer behaviors may be impacted by games that would otherwise require special access to game intellectual property, design documents, or other inside information on how these systems work. The second aim of this review was to more broadly consider the psychological and clinical implications of the reviewed game design features for different types of consumers. A focus of this analysis was how these features might affect gaming motivations and behaviors among vulnerable users, particularly individuals who have become problematically involved in games and may be more inclined to overspend on gaming activities.

2. Methods

2.1. Review protocol

This review was designed to examine consumer protection issues pertinent to in-game monetization features (e.g., microtransactions, such as ‘loot boxes’), with a focus on in-game purchasing systems that employ selling tactics that incentivize repeat in-game purchases. The scope of the review included the legal terms of service associated with in-game goods and services (e.g., virtual items and currency) insofar as these documents pertain to conditions of sale for these purchases and associated consumer rights and guarantees. Although a systematic approach was taken to identify utility patents, it should be noted that this review was not intended to be a comprehensive analysis of all such game systems and offerings, and readers should be aware that many game-related intellectual properties are not patented in order to avoid their public disclosure. As a note on terminology: this review refers broadly to game design which includes game structural properties (i.e., mechanics and aesthetics); however, the term ‘utility’ is used when referring specifically to legal patents which refer to game mechanics because ‘design’ in patents refers to appearance or ornamental structure. This review thus constitutes a selective evaluation of some of the publicly disclosed technical capabilities and research and development (R&D) priorities within some segments of the gaming industry. In other words, this review provides an overview of some of the capabilities of certain monetized video games rather than being representative of all such gaming products on the whole. This review follows, and is distinct from, a previous narrative review on social responsibility measures for monetized games based on the literature on electronic gambling machines (King & Delfabbro, 2019b).

To identify game utility patents, a search of the *Google Patents* database was conducted. *Google Patents* was used because this database includes over 87 million patents, including full text from 17 patent offices including the United States Patent and Trademark Office (USPTO), European Patent Office (EPO), China's National Intellectual Property Administration (CNIPA), Japan Patent Office (JPO), and Korean Intellectual Property Office (KIPO). The patent database was searched using the following keywords and logic: ‘microtransaction’ AND ‘game’. This broad search was designed to identify in-game systems or features that related to in-game purchases. A total of 429 patents were identified. The titles of all results were screened for relevance to consumer interaction with monetization schemes, which excluded 401 results. Excluded patents referred only to technical characteristics of the payment systems (e.g., e-commerce systems, online exchange of information and user authentication, security measures for online payment) and not to the desired human interaction with these systems. The abstracts (i.e., ‘functional description’) of the remaining patents were checked for relevance to in-game purchases. Fifteen patents were excluded due to high similarity to other patents (e.g., patent US9799059B1 referred to a system that ‘adjusts the user cost associated with virtual purchasable items’ which had some similarities to the reviewed patents US9808708B1 and US9138639B1; see Table 1). A total of 13 patents were retained for analysis.

For the second part of this review, the terms of service and user agreements (henceforth, ‘terms of use’) of the four gaming companies that had registered or had sought to register each of the 13 identified patents were examined. In addition, this section examined the terms of use of the top 10 gaming companies according to total software and in-game purchasing revenue. The rationale for including these additional companies was to ensure the representation of companies that have very successful (profitable) corporate strategies related to game software and in-game purchases. A leading market research company reported that the top 10 gaming companies for the 2016–2017 financial year (Newzoo, 2017) were (in descending order): *Tencent*, *Sony*, *Activision Blizzard*, *Microsoft*, *Apple*, *NetEase*, *Electronic Arts*, *Google*, *Nintendo*, and *Bandai Namco*. This list was based on annual and quarterly

Table 1
An overview of patents (n = 13) for video game monetization systems.

Registration ID	Assignee	Patent title	Summary of the patent ^a	Player perspective	Sales methods
US2016005270A1	Activision	System and method for driving microtransactions in multiplayer video games	The system matches an experienced player with a novice player to encourage the novice player to make purchases of items used by the experienced player. A novice player may wish to emulate the marquee player by obtaining weapons or other items used by the marquee player. A player's profile and/or behavioral data may be used to create a customized messaging campaign that may be delivered to the player through one or more channels, at predetermined time intervals, including promotions relating to microtransactions (e.g., offers, discounts, etc.). The system extracts player data including payment and game behavior data and classifies players according to different payment levels. Non-paying players with other similar behaviors to paying players are targeted with purchasing opportunities at the price level of paying players.	A player purchases an item of perceived superior utility due to being selectively match-made into situations against a superior player with that item	Exploitation of player data; Limited disclosure of the product
US2017100676A1	Activision	System and method for generating personalised messaging campaigns for video game players	A player's profile and/or behavioral data may be used to create a customized messaging campaign that may be delivered to the player through one or more channels, at predetermined time intervals, including promotions relating to microtransactions (e.g., offers, discounts, etc.). The system extracts player data including payment and game behavior data and classifies players according to different payment levels. Non-paying players with other similar behaviors to paying players are targeted with purchasing opportunities at the price level of paying players.	Playing more frequently or losing/quitting the game results in receiving more purchasing offers	Exploitation of player data; Adaptive solicitation
CN106557938A ^b	NetEase	Pushing method for virtual articles in games	The system extracts player data including payment and game behavior data and classifies players according to different payment levels. Non-paying players with other similar behaviors to paying players are targeted with purchasing opportunities at the price level of paying players.	A player who does not make in-game purchases receives offers based on analytics that optimize price level	Exploitation of player data; Adaptive solicitation
US9138639B1	Kabam	System and method for providing in-game pricing relative to player statistics	The system involves manipulating the availability and prices of in-game virtual items for different players depending on their experience and their progress in the game, including past spending activity. The system incentivizes players to alter virtual item balances. For example, the player may be set the goal of reaching a target balance of 3000 gems within 48 h to receive a premium virtual item. The player has the option to use real-world money to receive the premium virtual item. After the 48-h period passes, another goal may be set that specifies a target balance of maximum 1000 gems in the user inventory to receive another premium item. This encourages the player to spend the newly acquired gems that were purchased using real-world money.	A player may have to pay more/less for items based on their behavioral data, irrespective of the contextual value of the item	Exploitation of player data; Price manipulation
US9582965B1	Kabam	Incentivizing users to alter virtual item balances in an online game	The system incentivizes players to alter virtual item balances. For example, the player may be set the goal of reaching a target balance of 3000 gems within 48 h to receive a premium virtual item. The player has the option to use real-world money to receive the premium virtual item. After the 48-h period passes, another goal may be set that specifies a target balance of maximum 1000 gems in the user inventory to receive another premium item. This encourages the player to spend the newly acquired gems that were purchased using real-world money.	A player purchases or consumes items to reach a balance goal, which generates new time-limited balance goals determined by factors that include player's typical in-game activities and other user information	Exploitation of player data; Limited disclosure of the product
US8920243B1	Kabam	System and method for providing in-game timed offers	This system involves an in-game offer to players that have newly joined the game and/or to players that have not yet made a purchase. In some implementations, the offer may incentivize purchase upon entry into the game and may only be made available briefly to a qualifying player.	A new player purchases in-game items presented in a time-sensitive offer with limited information about its contents	Exploitation of player data; Limited disclosure of the product
US9623335B1	Kabam	Access to an exclusive virtual section of an online game based on past spending behavior	Players' spending history is compared with a spend threshold to determine which users should be provided with access to an exclusive virtual section of the game. Certain offers are exclusive to users based on spending history to facilitate presentation of expensive virtual items to users that have demonstrated an appetite for making purchases at a higher level. Prices and currency value may be altered according to analytics.	A player who makes purchases at a certain historical level will receive specific access/offers determined by their behavior, and the prices and value of their currency may be altered according to the player's data.	Exploitation of player data; Price and currency value manipulation; Limited disclosure of the product
US9403093B2	Kabam	System and method for dynamically adjusting prizes or awards based on a platform	The system provides incentives for users to participate in cross platform game play by providing incentives to accomplish tasks on a different platform. Players are then directed to new offers to make purchases that enhances a conversion rate of purchases made by a player in the game.	A player is incentivized to make purchases on multiple game platforms and pay prices determined by their player data, including available funds	Exploitation of player data; Price manipulation
US9626475B1	Kabam	Event-based currency	The system facilitates a time-limited event-based currency. During such an event, players may acquire a second type of virtual currency in addition to other forms	A player receives offers for items with prices configured to encourage purchase of a time-limited	Exploitation of player data; Price manipulation; Limited possession

(continued on next page)

Table 1 (continued)

Registration ID	Assignee	Patent title	Summary of the patent ^a	Player perspective	Sales methods
US9666026B1	Aftershock Services	Systems and methods for providing offers within a game space that decrease in value based on previous acceptances of the offers	of virtual currency. The event-based currency may be purchasable with real-world money. After the event, the event virtual currency may become unusable by or unavailable to the users. To create a sense of urgency in relation to virtual items, the system provides offers that decrease in value based on previous acceptances of the offers. The offers may include a first value that progressively decreases based on the number of users that have previously accepted the first offer to incentivize early acceptance of the offer. The system enables game providers to enhance revenue opportunities by periodically rotating drop rates associated with mystery boxes containing virtual items. Drop rates are adjusted according to a user's purchase history including amount of real currency exchanged for virtual goods.	currency that becomes unusable after a period of time A player is encouraged to make urgent purchases of an item with the value of the purchase being altered on the basis of player data	Exploitation of player data; Limited disclosure of the product
WO2015179450A1	Kabam	Mystery boxes that adjust due to past spending behavior	The system is configured to facilitate chance-based wait time reductions. Offers to purchase items that reduce wait times are presented where specific waiting time reductions may not be apparent to the user at the time of sale. The reduction time associated with the purchased item may not be apparent to the user prior to the activation of the purchased item. Player data may be used to determine pricing of an item bundle in the online game. The pricing of the item bundles may be altered based on the user type. An item bundle may increase in price for a user with less cost sensitivity associated with items that the user enjoys.	The player may be unaware that the likelihood of receiving an item from a mystery draw is determined by past spending	Exploitation of player data; Limited disclosure of the product; Item value manipulation
US2016346677A1	Kabam	Chance-based wait time reductions	The system is configured to facilitate chance-based wait time reductions. Offers to purchase items that reduce wait times are presented where specific waiting time reductions may not be apparent to the user at the time of sale. The reduction time associated with the purchased item may not be apparent to the user prior to the activation of the purchased item. Player data may be used to determine pricing of an item bundle in the online game. The pricing of the item bundles may be altered based on the user type. An item bundle may increase in price for a user with less cost sensitivity associated with items that the user enjoys.	A player spends money to reduce time spent waiting for a period of time that is not disclosed at the time of sale	Manipulation of reward outcome; Limited disclosure of the product
US9808708B1	Kabam	Dynamically adjusting virtual item bundles available for purchase based on user gameplay information	The system is configured to facilitate chance-based wait time reductions. Offers to purchase items that reduce wait times are presented where specific waiting time reductions may not be apparent to the user at the time of sale. The reduction time associated with the purchased item may not be apparent to the user prior to the activation of the purchased item. Player data may be used to determine pricing of an item bundle in the online game. The pricing of the item bundles may be altered based on the user type. An item bundle may increase in price for a user with less cost sensitivity associated with items that the user enjoys.	A player pays more/less for some items based on their playing history, irrespective of the contextual value of the item	Exploitation of player data; Price manipulation

Patent references: Curtis et al., 2014, Curtis et al., 2017, Ernst, 2017, Harrington and Wakeford, 2016, Koh et al., 2017, Marr et al., 2017, McLellan et al., 2017a,b, Santini and Lai, 2016, Schultz and Caldarone, 2017, Schultz et al., 2017, Wakeford et al., 2017, Yu et al., 2017, Kim et al., 2016, Kim et al., 2017a, Lynch and Kanouse, 2017, Pieron et al., 2015

^a Reproduced where possible, i.e., a quoted description is provided. For parsimony, some descriptions have been edited for length but original wording was preserved.

^b Patent not included in reference list due to publication in Mandarin; retrieved from: <https://patents.google.com/patent/CN106557938A/en>.

Table 2
Summary of top gaming companies' terms of service and user agreements related to in-game purchasing.

Company	Age restrictions	Right to refund ^a	Warranty disclaimer	Value disclosure	Product ownership
Tencent	Not for under 13 years; Parent consent for underage	Service-specific; Erroneous charges within 30 days	All services provided 'as is'; Service may not be 'error-free'	No compensation for loss of content or data	Limited, revocable, non-exclusive licence; Updates may affect availability
Sony	Legal age of majority; Parent agrees for underage use	No refunds; No obligation to reverse unauthorized charges	No warranty given about the quality, functionality, availability or performance. Content provided 'as is' with faults	Virtual currency has no value; No benefit or compensation for loss of virtual items	Limited, revocable, non-exclusive licence; User has no ownership of property
Activision	Not for under 13 years; Parent liable for underage purchases	Australia: Entitled to refund in event of "major failure"	No warranty or representation that the product complies with any applicable local law	Virtual currency has no value; No compensation for loss	Limited, revocable licence; No ownership rights; Product may be disabled without notice
Microsoft	Adult age; Parent consent for underage and bound by terms	No refunds; Must contact Microsoft within 90 days for charges in error	Product is licenced 'as is', 'with all faults' and 'as available'; User bears all risk of using it.	Virtual currency has no value; No compensation for loss	Limited, revocable licence; Microsoft granted licence to use the user's content
Apple	Not for under 13 years; Parent consent for underage	No refunds on electronic software downloads	Product is licenced 'as is', 'with all faults' and 'as available'; User bears all risk	No compensation for loss or damages	Limited, revocable, non-transferable licence
Google Play	Not for under 13 years; Parent permission for under legal age	All sales are final; Request within 48 h	All warranties excluded	No compensation for loss or damages	Limited, non-exclusive licence
NetEase	Not for under 13 years; Parent permits use and is bound by terms; 18 + to buy virtual goods	No refunds	Product is provided 'as is' without warranty of any kind	Virtual currency has no value; No compensation for loss	Limited, revocable licence; No ownership; Licence may be revoked any time
Electronic Arts	Not for under 13 years; Parent consent for underage	No refunds; No refund for unused virtual currency	Product is licenced 'as is', 'with all faults' and 'as available'; User bears all risk	Virtual currency has no value; No compensation for loss	Limited, revocable, non-exclusive licence
Nintendo	Adult age; Parent supervision for those under 18 years	No refunds	Product is provided 'as is' without warranty of any kind	Rewards cannot be redeemed for cash and may expire; No compensation for loss	The services contain content that are proprietary property of Nintendo
Bandai Namco	Not for under 13 years; Parent has read the agreement	No refunds	Product is licenced 'as is' and 'as available' without warranty	No compensation for loss of content	Personal, limited, non-exclusive licence; Right to remove or disable content
Kabam	Not for under 13 years; Parent consent for underage	No refunds	Product is provided 'as is' without warranty of any kind	Virtual currency has no value; No compensation for loss	Limited, revocable, non-exclusive licence
Aftershock	Not for under 18 years for purchases	No refunds	Product is provided 'as is' without warranty of any kind	No compensation for loss; No records of transactions	Limited, revocable, non-exclusive licence

^a Statutory laws apply in some regions.

Table 3
Summary of consumer protection issues related to in-game purchases and their terms of use.

Consumer protection measures ^a	In-game purchases and virtual assets
Test of acceptable quality: Products must be of acceptable quality, that is: safe, lasting, with no faults; look acceptable; do all the things someone would normally expect them to do.	In-game items may not be lasting (e.g., expire or become unavailable after a period of time); items may have qualities that are difficult to evaluate until purchased; and may not meet the player's expectations of utility and value.
Refund entitlement: Consumers can ask for a replacement or refund if the problem with the product is 'major'. It is against the law for businesses to inform consumers or display signs stating that they do not give refunds under any circumstances.	Purchases of in-game items are non-refundable according to companies' terms of use; Virtual goods are considered to have 'no value' and therefore no losses can be associated with this good; Obtaining a refund may prevent use of the game product.
Major problem with a product/service: A product or good has a major problem when: it has a problem that would have stopped someone from buying it if they had known about it; it is significantly different from the sample or description.	In-game items and currency may have features and/or drawbacks (e.g., limited use or value to the player) that a reasonable consumer would consider a 'major problem'; offers may not provide a complete or accurate description of goods.
Product/service guarantees: Products must: come with full title and ownership; not carry any hidden debts or extra charges; come with undisturbed possession, so no one has a right to take the goods away or prevent you from using them.	In-game items are not 'owned' by the player; in-game items may have hidden charges (e.g., costs of 'maintaining' the item in the player's inventory); items may be removed or altered at the developer's discretion at any time.
Exceptions to guarantees: Consumer guarantees do not apply if you know of or were made aware of the faults before you bought the product.	Consumers are informed by the terms of use that items are 'as is' and there are no guarantees and no compensation for losses associated with these goods.
False/misleading impressions of the product: Businesses are not allowed to make statements that are incorrect or likely to create a false impression. If the overall impression left by a business's advertisement, promotion, quotation, statement or other representation is misleading—such as to the price, value or the quality of any goods and services—then the behavior is likely to breach the law.	Terms of use state that players do not own or have any property interest in virtual assets; Prices of in-game items may be determined by factors that are not disclosed to the player (e.g., an algorithm that takes into account the player's available funds and cost sensitivity to certain items); The availability, value, and quality of goods, including those in the user's inventory, may be changed at any time.
Claiming a remedy: Consumer can claim a remedy directly from the manufacturer or importer if the goods do not meet consumer guarantees, e.g., unacceptable quality; does not match the description.	Consumers have limited options to claim a remedy. The terms of use state that in-game purchases are not refundable and that users waive their right to pursue some legal options (e.g., file a class action).

^a Text reproduced from Australian Competition and Consumer Commission: <https://www.accc.gov.au/consumers/consumer-rights-guarantees/consumer-guarantees>.

financial reports, excluding company revenues from hardware sales and other non-game sales. Two of the top companies (*Activision*, *NetEase*) had already been identified in the first part of the review. In addition to these top companies, the companies *Kabam* and *Aftershock* were added from the patent assignee list. A total of 12 terms of use documents were summarized according to their conditions related to age restrictions, refund entitlement, warranty disclaimer, value disclosure (i.e., the status of virtual goods/currency) and ownership or possession of the game property including in-game goods. The terms of use documents were retrieved from each company's official website.

2.2. Utility patents evaluation

All 13 patents were summarized according to the following characteristics: (1) *registration details* (i.e., identification code); (2) *assignee* (i.e., company ownership); (3) *title of patent* (i.e., name of the patent); (4) *description of the feature* (i.e., summary of the functional description, extracted from the patent document); and (5) *player perspective* (i.e., the player's experience of the system); and (6) *sales methods* (i.e., the tactics used to elicit repeat player spending). It should be noted that the patent evaluation was not intended to be comprehensive, but selective of specific systems and types of implementations related to the focus of this review. With regard to (4), each patent document was read and all references to 'spend*', 'money', 'purchas*', 'microtransaction', and 'currency' were identified. The descriptions of the patent were extracted as direct quotes from the document, with only slight modifications in some cases (i.e., removal of descriptions of additional systems that support the patent, or illustrative examples of different implementations) for the sake of parsimony and word count. With respect to (5), the patent description was reframed to explain the player behavior, based on the description of the patent. For validity purposes, the first author provided the original patent statement, the patent description in the table (if different in any way), and the player perspective summary to two co-authors for comparison. Three of the authors (DLK, PHD, and JB) were responsible for evaluating the patents and agreed on the summaries of each patent in Table 1.

Sales methods included (1) *exploitation of player data* (i.e., the use of individual and/or player population data to optimize the type and scheduling of purchasing offers or discounts for each player, such that important conditions of the product [e.g., price, availability]: are

manipulated or determined by factors that take advantage of personal information [e.g., available funds] rather than basic supply or demand factors); (2) *limited disclosure of the product* (i.e., referring broadly to non-disclosure or misrepresentation of important conditions of the purchase, including the long term value or utility of a purchased item, and/or that product features are affected by player analytics); (3) *adaptive solicitation* (i.e., purchasing offers that are triggered by certain player behaviors and other analytics); (5) *limited possession* (i.e., granting a player temporary possession of an item to encourage urgent use and/or additional purchasing); and (6) *price and/or currency manipulation* (i.e., altering the prices of items or the value of currency based on player analytics and/or other non-player factors to encourage purchasing).

2.3. Terms of use evaluation

Analysis of the terms of use documents sought to identify product information and consumer protection measures related specifically to in-game purchasing. As noted in Section 2.1, this evaluation was concerned with: (1) consumer protection issues, such as company statements on age restrictions, informed consent for product use, end user responsibility and/or liability for in-game purchases, and refund and compensation entitlements; and (2) product information and guarantees, such as game product warranty and disclaimers, product value disclosure (e.g., monetary equivalent or other value of the product), and product ownership and licencing agreements.

2.4. Consumer protection issues related to in-game purchases

The final part of this review examined the game patents and terms of use in relation to Australian consumer protection principles and consumer rights and guarantees that have been outlined by the Australian Competition and Consumer Commission (ACCC) (<https://www.accc.gov.au>). The aim was to compare in-game product attributes and the basic legal conditions of in-game purchases with principles of consumer protection law. This was undertaken with the caveat that virtual items differ from tangible goods and services, with the principal distinction being that virtual goods are claimed by game companies to be licenced temporarily to users as entertainment only. Seven consumer protection areas were considered, including: *tests of acceptable quality*,

refund entitlement, resolving a major problem with a product, exceptions to a guarantee, product/service guarantees, false or misleading impressions of a product, and claiming a remedy. Table 3 provides the definitions for each of these consumer protection areas.

3. Results

3.1. Patents for in-game monetization schemes

Table 1 presents a summary of the 13 patents that refer to systems and methods that encourage repeat in-game purchases. Most patents ($n = 12$) described sophisticated systems that involve the collection of player data and analytics to present individually tailored offers or purchasing opportunities to the player. The systems are designed to optimize the nature and scheduling of purchasing offers to increase the probability that the offer will be desirable to the player. In some patented systems, this may be achieved by accounting for certain metrics that affect the likelihood of purchasing behavior, such as product features (e.g., price, function, or contextual value) in combination with data on player characteristics (e.g., purchasing tendencies, available funds, item preferences, inventory). In this way, the patent descriptions refer to systems that may be considered a form of *machine learning* (Alpaydin, 2014), or the ability of systems to ‘learn’ from player’s actions, in this case to improve the game’s capability to make desirable offers to players. This learning process was evident, for example, in patent CN106557938A which refers to a system that classifies each user according to a specific payment level based on population purchasing data and other analytics. Those players who have not yet made purchases are presented with offers known to be commonly accepted by other players with similar profile characteristics. Similarly, the patent US9138639B1 describes a system that adjusts the price of virtual items for each user, with that price determined by user-based metrics that affect price sensitivity, such as the user’s level of experience and progress in the game.

Further examination of the patents indicated that player data was used to influence other sales tactics to encourage in-game purchases, including: (1) *solicitations*, or purchasing offers that appear onscreen at calculated intervals or due to certain triggers, which may: (a) interrupt play, employ ‘pressuring’ tactics (e.g., ‘limited time offer’ with a countdown timer), and/or (b) be embedded or implemented within the broader architecture of the game world, such as being positioned in a central, unavoidable location in the game, in ways that gate-keep or accompany player access to non-monetized content; and (2) *limited disclosure of the product*, referring to: (a) limited disclosure or non-disclosure of the fact that player data is a major determinant of purchasing-related in-game variables and situations, including the contextual value of virtual goods or currency or the probability of receiving a reward in a ‘lucky dip’ situation, and (b) giving a misleading impression or an incomplete description of the effectiveness, availability, and/or rarity of an in-game product.

A noteworthy feature across patents was that the game system is described as being calibrated to present in-game offers based on two main sources of information: (1) individual player metrics; and (2) population metrics. In the case of an individual having a particular behavioral repertoire (e.g., an identified regular pattern of play, such as daily use for 2 h) but does not spend money on microtransactions, the system may draw upon its population data (i.e., other players with comparable characteristics) to determine the possible price sensitivity of this non-spending player based on otherwise comparable players who do spend money. The system is therefore capable of knowing a lot about the player’s actions to the extent that it generates a predictive model of this individual in absolute terms. At the same time, the system may describe players in relative terms, by identifying the precise behavioral differences between individuals and the wider player population (i.e., how some individuals may deviate from any given norm). It may be presumed, based on population statistics, that the system’s

ability to make accurate predictions about the game is strengthened as the population grows.

3.2. Terms of use for in-game purchases

Table 2 presents a summary of the terms of use for in-game purchases to provide legal context for the 13 utility patents. Most terms of use ($n = 8$) specified that products were for use by users at least 13 years of age, and these documents also specified that an underage user’s parent or legal guardian consents to in-game purchases being made by the user and is bound by the terms of the agreement (i.e., parents assume responsibility for their actions). All documents state that sales are final and that there are no refund entitlements for in-game purchases, with the exception of erroneous charges which may be claimed under stringent conditions (e.g., a claim is made within a short time-frame, e.g., 48 h). Relatedly, all documents state that virtual currency has ‘no value’ and therefore there is no compensation for loss of this in-game content. These documents also explain that users do not technically ‘own’ or possess in-game goods, but instead purchase a limited licence to use the product that can be revoked at any time without notice at the discretion of the company.

3.3. In-game purchases and consumer protection

Table 3 provides a summary of consumer protection issues related to in-game purchases. This consumer protection framework was provided by the Australian Competition and Consumer Commission (ACCC). An important issue that arises across many jurisdictions, when evaluating the rights of consumers who make in-game purchases, is determining whether a virtual good should be considered to have equivalent status to tangible real-world products or services. In Australia, the ACCC and the Australian Communications and Media Authority (ACMA; www.acma.gov.au) state that purchases of virtual goods must comply with Australian consumer laws and regulations, but these authorities also recognize that exercising consumer rights, such as seeking refunds, can often be difficult and time-consuming. Available consumer advice on in-game purchases is predominantly relevant only to situations that involve ‘unauthorized’ (e.g., illegal, unwanted) purchases of such goods (e.g., when a child makes a purchase using a parent’s credit card without the parent’s knowledge), rather than standard transactions where the consumer had intended to make the purchase.

The present review shows that there may be significant challenges and complexities in evaluating virtual goods against some consumer protection measures. For example, the test of acceptable quality may be difficult to apply to a virtual good without any recognized standard of quality for virtual items. Similarly, the test of whether a virtual good has a ‘major problem’ may be difficult to evaluate in the absence of a product description or statement that might inform a reasonable consumer’s expectations of that product. As noted in Section 3.2, the terms of use for in-game purchases refer to in-game transactions as the purchase of a limited, non-exclusive licence for an entertainment property of no value that may be revoked at any time. Each company may contend, therefore, that it has fulfilled its legal responsibility to inform the consumer that in-game purchases are valueless and that consumers have no guarantees nor should they have any expectations concerning quality, functionality, or appearance of purchased in-game goods. Such statements indicate that consumers may be able to seek a remedy for the purchase itself (i.e., financial transaction), on the grounds that the consumer did not authorize the payment, but it may be difficult to seek a remedy on the basis of the quality or performance of the virtual good (e.g., the acceptability of the virtual item).

4. Discussion

This review has found that some major video game companies have

developed unique technical systems designed to encourage repeat in-game purchases in ways that could be characterized as potentially unfair or exploitative. An examination of 13 patents revealed that an important feature of some in-game purchasing systems, which distinguishes these gaming activities from standard video games and electronic gambling machines, for example, is the ability to modify the play experience based on individual player and/or population behavioral data. Most patents described sophisticated systems that involve the collection of player data and analytics to present individually tailored offers or purchasing opportunities. Behavioral data are used to optimize the type and delivery of purchasing offers in order to incentivize players to make continuous in-game purchases within the context of a game service that can be continually updated and thus has uncertain and ever-changing long-term costs. These findings demonstrate that there is an emerging class of monetized games which differ from many pre-existing games with respect to the requirement of player skill and strategy to make progress. In contrast to games where the player may become more proficient with practice, these monetized video games appear to be capable of tracking various player metrics and adjusting their design in automated ways that elicit in-game purchasing. Systems that dynamically adjust in-game item prices and value based on individual player analytics (e.g., purchasing tendencies, available funds, item preferences, inventory), primarily implemented by developers to serve monetary goals (maximizing revenue) and which lack basic transparency to the player, may have the potential to exploit certain types of vulnerable players under certain conditions.

This review has also found that the top gaming companies' terms of use related to in-game purchases refer to these types of transactions as involving a limited, non-exclusive licence for content of no recognized monetary value, which may limit the consumer's rights and guarantees related to these purchases. This suggests that, internationally, certain monetized games or game situations may have very few consumer protections, which could pose substantial financial risks for some players and, in the case of underage players, parents and those legally responsible for their actions. These findings highlight the need for psychological and other academic disciplines that study video games to recognize the increasing importance, and indeed the centrality, of in-game purchasing behavior to certain types of gaming activities. These findings also contribute to growing discussions about protections for underage and other vulnerable users of monetized games who may be exploited financially by these games. In addition, with the official inclusion of gaming disorder in the ICD-11 as of May 2019, it has become even more important for clinicians helping clients with problems related to gaming to understand the financial elements of some games. In-game purchasing is particularly relevant to the study of problematic gaming and gaming disorder, given that purchasing may be the user's central motivation for playing; it may be engaged in repeatedly and in an uncontrolled way; and may generate significant distress and financial and interpersonal harms (Dreier et al., 2017; Paik, Cho, Chun, Jeong, & Kim, 2017).

The notion that game systems collect player data to modify or adapt the game situation to each individual user has many historical precedents in video game design. It is well known, for example, that games have long employed 'rubber-banding' or dynamic difficulty to ensure that the game is consistently challenging irrespective of the player's skill level (e.g., a racing game where the computer opponents are matched to the player's skill level) (Hunicke, 2005). This design approach aims to ensure that players regularly experience close victories and losses to build and maintain excitement (Griffiths & Nuyens, 2017; King et al., 2010; Wood, Griffiths, Chappell, & Davies, 2004). The patents in this review apply this same principle of 'rubber-banding' to in-game purchasing by ensuring that the game's financial requirements are adjusted to match the players' desire and capacity to pay. In this sense, the 'difficulty' of a monetized game may be considered analogous to the player's cost sensitivity, or the willingness of the player to make continued in-game purchases. If an item costs too much, then the player

may feel frustrated; if an item costs too little, then the player may lose interest in the game (see also 'flow'; Csikszentmihalyi, 1997). In a pure skill-based game, players may often identify methods of gaining an advantage over the system, by honing their skills or developing new strategies, such as memorizing the game's challenges and obstacles (e.g., learning where race opponents tend to be positioned on the track, finding optimal routes to objectives, and so on) (Salen & Zimmerman, 2004). However, in a monetized game, there may be very few, if any, other options available to the player that will bypass or affect financial obstacles (e.g., price of items) and for this reason these types of systems are often referred to as 'paywalls' (e.g., a racing game with the requirement of spending real money on virtual fuel to drive the car). Thus, players of monetized games cannot 'strategize' to win but instead must decide between making in-game purchases or not playing at all (or potentially, playing without paying but doing so with significantly diminished in-game capabilities that generate regular feelings of frustration). This review shows there is an emerging technical sophistication to these purchasing systems that aims to reduce the player's uncertainty or reluctance regarding purchasing decisions.

The concept of *information asymmetry* (Aboody & Lev, 2000) may be usefully applied to understand players' uncertainty across these types of purchasing decisions and how some transactions may be particularly exploitative of this uncertainty. Information asymmetry in the context of in-game purchasing refers to a relationship between the game and the player whereby the game system has significantly more information about the player than the player has (or is able to acquire) about the game. Information of relevance includes that which enables either the player or the game system to anticipate and respond to the actions of the other to achieve its goals. The goal of the player may be to win or make progress in the game, which requires information about how the game tends to work, whereas the goal of the game system may be to keep the player engaged and spending money, which requires information about how the player tends to behave. It bears noting that player-game information asymmetries are commonly found in many video games, to some degree, due to the superior memory and processing capabilities of a computer system, which may inadvertently generate artificially difficult challenges, much like an opponent that knows all of the player's available strategic options before it should. Beyond this common disadvantage that arises in digital games, this review has identified game systems that appear to be intended to modify in-game variables that affect player spending in various ways that would not necessarily be apparent or detectable to the player. Further, the reviewed patents suggest that the resulting information asymmetry may not only be sustained over time but may also become more imbalanced in ways that favor the computer system. In other words, as a player invests more time in the game (i.e., demonstrating his or her preferences, choices, actions, and so on), the system becomes more capable of anticipating and responding to the player, which enables fine-tuning of offers to achieve optimal odds of consumer acceptance. In this sense, the game may become more 'difficult' or expensive to play over time.

Information asymmetry in online games may not be limited only to the dynamic between the player and the game system, as described above. Inspection of the utility patents revealed another layer of asymmetry that arises when the game system has access to a sufficiently large population dataset to enable assessments of players relative to other players. As the game system gathers more data on how various types of players behave under certain conditions, it becomes better equipped to present in-game events and purchasing situations that will elicit the desired behavioral outcome (i.e., spending, or playing longer). Thus, as the playing population as a collective invest more and more time in the game, the game system may become more adept at 'knowing' each player both individually and as part of its group. The capacity of the playing population to understand the game mechanics may depend on its ability to recognize the machine's adaptive capacities that enable it to present individualized experiences. In this sense, the

system may be compared to a panopticon (Bentham, 2012), or a system capable of monitoring its participants without its participants' awareness of being monitored at all times. Unlike a standard panopticon, however, each player's gaming experience may be modified to such an extent (e.g., unique game offerings, different difficulty, different events triggered by in-game actions) that it may be difficult to share and synthesize individual datum to form a coherent whole. In other words, whereas in traditional online games players may collectively overcome a fixed in-game challenge (e.g., a difficult boss or level) by sharing the results of their trialed tactics until an optimal strategy is devised, individual players of monetized games that employ the above mentioned systems may be less able to rely on the 'wisdom of the crowd' due an information asymmetry that compartmentalises the player base and selectively adjusts its experiences to the extent that it cannot easily aggregate its observations.

While some gaming activities have been compared to gambling, it is noteworthy that the learning capabilities of the reviewed monetization schemes appear to be dissimilar to an electronic gambling machine (EGM), where each 'spin' (i.e., game) is wholly independent of the previous spin's outcome and other factors such as the identity of the player who pressed the button. An EGM does not 'learn' from the player and must adhere to certain regulatory standards that apply regardless of who is playing, such as fixed long-term payout or 'return to player' (RTP), although it bears noting that some so-called 'skill-based EGMs' may operate differently (see Hwang, 2017; Lapetina, 2019; Young, 2018). Thus, while a gambler may erroneously believe that he or she can accurately predict randomly determined events (e.g., wins and losses), the gamer may erroneously believe that offers in the monetized game were simply fortuitous ('lucky') rather than determined by the player's past in-game actions. Another possibility is that some players may develop a special relationship with the game (i.e., a stable preference for the game over all others) on the belief that the game seems to understand and anticipates the player's needs (see Allison, von Wahlde, Shockley, & Gabbard, 2006; Beard & Wickham, 2016; King & Delfabbro, 2014).

Terms of use documents provide an important legal context for consumer protection issues related to in-game purchasing. These documents state that purchased items are not 'owned' by the user. Rather, in-game items are considered licensed entertainment with indefinite 'as is' properties. The user pays the provider for a limited, non-exclusive licence to participate in the game and the purchase of virtual items is part of this limited experience. Accordingly, a video game may include an 'inventory' of 'collected' items that can be 'used' or 'equipped' but the internal language of the game and its terms of use avoid the term 'own' or 'ownership' in relation to the consumer. A video game differs therefore from gambling activities with respect to the purchase of in-game currency. Whereas gamblers are entitled to 'cash out' their chips at any time, a gamer cannot obtain a refund on virtual currency because: (a) the currency has no recognized monetary value, and (b) the transaction was considered final at the time of purchase. This may restrict a player's available options to seek a remedy for a perceived fault that arises in the game that affects purchased currency. In addition, in some video games, there may be very limited quantifiable information about the specific effect or benefit of purchased items, or what exactly the player will receive from a given transaction. For example, some game developers may refer to some in-game purchases as a 'mystery prize' without displaying the odds of receiving a prize, and the odds may not be fixed but adjusted according to factors such as the user's payment history (see patent WO201579450A1). Applying standard consumer protection measures to evaluate the fairness of such purchases, such as the test of acceptable quality (i.e., meeting the reasonable expectation of utility and value), presents challenges for consumers when the developer provides very limited disclosure of the product (e.g., a 'mystery' item; see US8920243B1) and states that purchases have no associated ownership or monetary value.

This review's observations of in-game purchasing systems suggest

that, in some situations, a player who makes in-game purchases often does so at his or her own risk, with limited or no guarantees that this transaction will yield the desired outcome. These findings have implications for the study of problematic gamers, including individuals who may have gaming disorder, who tend to demonstrate strong decision-making biases related to gaming (Bailey, West, & Kuffel, 2013; Decker & Gay, 2011; Ko et al., 2017; Pawlikowski & Brand, 2011; Yao et al., 2015). Current addiction models suggest that these individuals tend to have difficulties in delaying gratification and may be particularly vulnerable to overspending on in-game purchases, particularly when presented with offers that provide immediate short-term gains or benefits in the game (Brand, Young, Laier, Wöfling, & Potenza, 2016; Dong & Potenza, 2014). However, current criteria for gaming disorder (e.g., *Internet gaming disorder* in the *Diagnostic and Statistical Manual of Mental Disorders*, 5th Edition [DSM-5]) refer to the time investment in gaming activities, including the need to spend an increasing amount of time in a game, but do not refer to a user's escalating financial investment. The DSM-5 adds that gaming disorder "is separate from gambling disorder because money is not at risk" (APA, 2013, p.797). With in-game purchasing becoming an increasingly central part of some video games, it may become more necessary for the DSM and other guidelines to recognize the financial aspects of problematic gaming behavior. Some of the criteria for gambling disorder in the DSM-5 that refer to 'money' and 'losses' may be applicable (e.g., borrowing money, deception about losses, and harm due to losses). A problematic gamer who overspends on in-game items would not be trying to recover financial losses, like a problem gambler, but may continue to spend money due to feeling trapped or to justify continued expenditure due to sunk cost effects. While the level of financial expenditure by problematic gamers may not generally rival that of problem gamblers, some players may nevertheless become quite financially involved and spend more than they can afford on in-game purchases.

The question of why some individuals are willing to spend so much money on virtual items is likely to be the subject of further psychological research (Gainsbury, King, Russell, Hing, & Delfabbro, 2016; Kim, Hollingshead, & Wohl, 2017; Molesworth & Watkins, 2016). Some additional concepts in behavioral economics may inform our understanding of the psychology of in-game purchases that appear to have limited monetary value. For example, the *endowment effect* states that individuals tend to ascribe more value to things if they own them (Kahneman, Knetsch, & Thaler, 1990; Nunes & Drèze, 2006; Thaler, 1980); for example, a player who considers certain game items to be worth more than their in-game price once they are stored in the player's inventory (i.e., the item becomes 'special'). A related concept is the status quo *bias* (Samuelson & Zeckhauser, 1988), which refers to the preference for doing nothing or maintaining one's current position or decision; for example, a player spending money on in-game items that ensure the player's other in-game resources or standing are 'safe' from an enemy or other threat. Although no player technically 'owns' video game content, the endowment effect suggests that players perceive some induced value for items that they have obtained and/or purchased in the game. Relatedly, the status quo bias would suggest that these players prefer to retain ownership of (and upkeep for) such items (De Sousa & Munro, 2012). It is not currently known how the endowment effect may apply differently to 'earned' versus 'purchased' virtual goods. Research could test this experimentally, following the example of recent studies that have found individuals who play video games to escape from reality prefer virtual over real-world stimuli (Deleuze et al., 2019), and that problem gamblers may be more sensitive to monetary rewards than non-monetary ones (Sescousse, Barbalat, Domenech, & Dreher, 2013). Further research on how players perceive value in games may provide treatment insights, which may assist individuals who feel unable to abandon a large inventory of virtual items to pursue alternative activities and seek psychological recovery.

Another economic concept, termed *entrapment* (Brockner, Shaw, & Rubin, 1979) (i.e., the belief that one has invested too much to quit),

may also explain why some players escalate their financial commitment to in-game purchases. In some games, such as those which employ the systems identified in this review, players may spend an increasing amount of money that begets further spending on the game. For example, the patent US9582965B1 referred to a system that presents a series of time-sensitive offers that are designed to escalate the user's financial investment and encourage the user to spend unused virtual credit to minimize *loss aversion* (Tversky & Kahneman, 1991). The investment of an irretrievable sum of money in pursuit of desired virtual items may be perceived by players as an investment to the extent that it will increase the likelihood of obtaining these items (Rubin & Brockner, 1975). In this connection, spending more and more money on virtual items may have a 'sunk cost' effect that serves to justify continued expenditure. Entrapment by in-game purchases may occur because the direct costs are less salient because these transactions are represented as virtual credits or credit card debt (King, Russell, Gainsbury, Delfabbro, & Hing, 2016). Sunk cost effects in online games may also operate vicariously (Gunia, Sivanathan, & Galinsky, 2009) via exposure to proximal online players who are entrapped and who make similar maladaptive purchasing decisions. The patent US9808708B1, for example, is designed to adjust prices to ensure that the user is continually presented with offers that match his or her cost sensitivity level (i.e., the price predicted by the system to be acceptable to the player). Observing other players' making in-game purchases with favorable outcomes, such as when a system selectively matches the user with players who already possess desired items (e.g., patent US2016005270A1), may provoke counterfactual comparisons (e.g., 'If only I had spent more ...') that increase or sustain the player's spending (Markman, Gavanski, Sherman, & McMullen, 1993).

The findings of this review may inform basic player education and psychoeducation content. Understanding the gaming industry and its products has become increasingly relevant because some clients will hold strong beliefs about the positive qualities of games (e.g., video games are an art form) and overlook the systems and structures that exploit the player's time and finances. Education for problematic gamers may share some features in common with psychoeducation for problem gambling, which involves explaining the industry's tactics and features of gambling machines that tend to contribute to false expectations of turning a long-term profit (Raylu & Oei, 2010). Highlighting some similar commercial realities that guide the design of video games may help some clients to challenge maladaptive beliefs about gaming and in-game purchasing. As this review has shown, some in-game items may be designed to be artificially scarce or expensive to encourage continual playing and spending, which in turn may encourage some players to believe they are 'special', for example, if they acquire certain items. Some players may benefit from information that explains how certain game systems are designed to increase the player's time commitment and financial expenditure over time. Problematic gamers may also benefit from financial literacy training to learn skills that enable more adaptive choices in in-game purchasing situations.

This review has some limitations that should be acknowledged. First, video game design is continually changing with new technological innovations and market demands. This review aimed to provide an overview of some of the capabilities of certain monetized video games but was not intended to be comprehensive in its scope. Rather, the review of patents was based on a selected sample and does not represent all systems and methods related to game monetization. Not all systems and methods are patented, and some patented systems may not be implemented. Similarly, the functional description of a patent, such as its specific configuration in a game, may ultimately differ from its implementation. Thus, this review may only refer to the intended purpose of each design but not its final implemented form. It bears noting, however, that imitation and innovation of game software features is very common in video gaming development, and many game developers may employ the same or similar types of systems detailed in this review without being the patent assignee. Some patents were at the

preregistration stage and may not be approved (but this does not rule out that the feature is in use). The search protocol may not have identified all systems and methods that directly or indirectly encourage in-game purchasing. It may be difficult to develop a search protocol that can identify all potentially relevant patents without having inside knowledge of the research and development processes across major gaming companies. Another limitation of this review was its lack of consideration of other international jurisdictions in relation to consumer protection law. Different regions may differ in relation to statutory laws related to consumer rights (e.g., right to a refund).

4.1. Conclusions

Innovations in game design and monetization have many implications for consumer protection. This review suggests that understanding the distinctive characteristics of video games may identify some features that may be considered 'unfair' to consumers. A deeper analysis of video games may improve the quality of our understanding of problematic gaming and aid efforts to reduce gaming-related harm. Some in-game purchasing systems may represent financial hazards that contribute to player over-commitment to gaming activities and increase risk of negative financial and psychological consequences. Gaming behaviors and problems may differ according to interactions with different products and services. Some video games may be programmed to change as the user becomes more involved, by adapting to the actions and preferences of the user. It may be speculated that the artificial intelligence of gaming systems, much like social media (Rader, 2014), will become even more sophisticated in the future, leading to new gaming products that are more adept at predicting and responding to player preferences and behaviors. Behavioral tracking data from a minority of highly involved gamers may be used to influence the design of certain games to make them more 'addictive' (i.e., time-consuming and profitable). Further, as online gaming becomes more publicly accessible via streaming and esports, and players become more connected as participants and observers, there are greater opportunities for gaming systems to gather user information for design and promotional purposes. While the focus of this review was on monetized content, many of the systems in this review may be adaptable to non-monetary implementations (e.g., behavioral analytics affecting manipulation of in-game reward payout for *time investment* in the game). Appropriate policy and consumer protection measures, psychologically informed interventions, and ethical game design guidelines are needed in order to protect the interests and wellbeing of consumers, particularly adolescents who tend to be most avid players but may also be the most vulnerable and least well-informed consumer group.

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Contributors

DLK designed the review and wrote the protocol, with approval of all authors. DLK conducted literature searches and provided summaries of previous research studies. DLK wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

Conflicts of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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