Assessing video games’ compliance with loot box warning label industry self-regulation

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Abstract
Loot boxes in video games are a form of in-game transactions with randomised elements. Concerns have been raised about loot boxes’ similarities with gambling and their potential harms (e.g., overspending). Recognising players’ and parents’ concerns, in mid-2020, the Entertainment Software Rating Board (ESRB) and PEGI (Pan-European Game Information) announced that games containing loot boxes or any forms of in-game transactions with randomised elements will be marked by a new label stating ‘In-Game Purchases (Includes Random Items)’ and ‘In-game Purchases (Includes Paid Random Items),’ respectively. This measure is intended to provide more information to consumers and allow them to make more informed purchasing decisions. This measure is not legally-binding and has been adopted as industry self-regulation or corporate social responsibility. Previous research has suggested that industry self-regulation might not be effectively complied with due to conflicting commercial interests. The present study proposes to assess (i) whether the ESRB and PEGI applied the warning to games consistently and (ii) whether games that contain loot boxes accurately display the warning on the Google Play Store. Conclusions will be drawn as to whether the measure has been complied with by companies to an adequate degree and whether the measure has achieved its self-regulatory aims or require improvements.

Keywords (10 Max):
Loot boxes; Video games; Video gaming regulation; Interactive entertainment law; Information technology law; Consumer protection; Industry self-regulation; Social corporate responsibility
Conflict of Interest

L.Y.X. was employed by LiveMe, then a subsidiary of Cheetah Mobile (NYSE:CMCM), as an in-house counsel intern from July to August 2019 in Beijing, People’s Republic of China. L.Y.X. was not involved with the monetisation of video games by Cheetah Mobile or its subsidiaries. L.Y.X. undertook a brief period of voluntary work experience at Wiggin LLP (Solicitors Regulation Authority (SRA) number: 420659) in London, England in August 2022. L.Y.X. has met with and discussed policy, regulation, and enforcement with the Belgian Gaming Commission [Belgische Kansspelcommissie] (June 2022), the Danish Competition and Consumer Authority [Konkurrence- og Forbrugerstyrelsen] (August 2022) and the Department for Digital, Culture, Media and Sport (DCMS) of the UK Government (August 2022). L.Y.X. has been invited to provide advice to the DCMS on the technical working group for loot boxes and the Video Games Research Framework. L.Y.X. was the recipient of an AFSG (Academic Forum for the Study of Gambling) Postgraduate Research Support Grant that was derived from ‘regulatory settlements applied for socially responsible purposes’ received by the UK Gambling Commission and administered by Gambling Research Exchange Ontario (GREO) (March 2022). L.Y.X. has accepted funding to publish academic papers open access from GREO that was received by the UK Gambling Commission as above (October & November 2022). L.Y.X. has accepted conference travel and attendance grants from the Socio-Legal Studies Association (February 2022), the Current Advances in Gambling Research Conference Organising Committee with support from Gambling Research Exchange Ontario (GREO) (February 2022), the International Relations Office of The Jagiellonian University (Uniwersytet Jagielloński), the Polish National Agency for Academic Exchange (NAWA; Narodowa Agencja Wymiany Akademickiej) and the Republic of Poland (Rzeczpospolita Polska) with co-financing from the European Social Fund of the European Commission of the European Union under the Knowledge Education Development Operational Programme (May 2022), and the Society for the Study of Addiction (November 2022). L.Y.X. was supported by academic scholarships awarded by The Honourable Society of Lincoln’s Inn and The City Law School, City, University of London. L.Y.X. was employed by LiveMe, a subsidiary of Cheetah Mobile (NYSE:CMCM) as an in-house counsel intern from July to August 2019 in Beijing, People’s Republic of China. L.Y.X. was not involved with the monetisation of video games by Cheetah Mobile or its subsidiaries. L.Y.X. undertook a brief period of voluntary work experience at Wiggin LLP (Solicitors

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1. Introduction

Paid loot boxes are products within video games that players buy to obtain randomised rewards\cite{1,2}. Some loot boxes are ‘non-paid’ and can be obtained without spending real-world money; however, the present study focuses on paid loot boxes. Hereinafter, ‘loot boxes’ refers to all forms of randomised video game monetisation methods, i.e., any ‘in-game transactions with randomised elements’\cite{3}. Concerns have been raised about loot boxes’ similarities with gambling and the risks that consumers might overspend money and experience harm\cite{4-9}. Children and other vulnerable consumers (e.g., people experiencing problem gambling issues) might be at particular risk of harm\cite{10,11}. Many countries are considering imposing legal regulation and a few countries have already taken regulatory actions\cite{12-16}. However, in most countries at present, paid loot boxes are specifically regulated only through industry self-regulation\cite{17}. There are two prominent loot box self-regulatory measures: probability disclosures and text-based warning labels attached to age ratings.

The Apple App Store, similar to many other hardware and software platforms\cite{18}, imposes the self-regulatory requirement that all games available on that platform ‘offering “loot boxes” or other mechanisms that provide randomized virtual items for purchase’\cite{19} must disclose the probabilities of obtaining those items to customers prior to purchase. Xiao et al. assessed companies’ compliance with Apple’s self-regulatory measure amongst the 100 highest-grossing iPhone games in the UK and found that only 64% of games containing loot boxes disclosed probabilities. This compliance rate was significantly lower than the 95.6% observed in Mainland China where probability disclosures were (and continue to be) required by law\cite{20}.

The second self-regulatory measure is to prewarn players about the presence of loot boxes. The Entertainment Software Rating Board (ESRB), established by the Entertainment Software Association (ESA), reviews the content of video games and provides age ratings depending on the inclusion of certain material, e.g., the amount and degree of violence and sexual content\cite{21}. The ESRB is adopted in North America generally\cite{22}. Recognising the concerns that have been raised about loot boxes, on 13 April 2020, the ESRB and PEGI announced that they will attach an additional text-based warning to the age ratings of video games containing loot boxes\cite{23}. The ESRB
uses the ‘In-Game Purchases (Includes Random Items)’ ‘interactive element’[^3], whilst PEGI uses the ‘In-game Purchases (Includes Paid Random Items)’ ‘content descriptor’[^24]. These two largely identical labels are intended to cover, according to the ESRB, ‘all transactions with randomized elements.’[^3] The ESRB and PEGI both consciously chose to specifically *not* use the term ‘loot boxes’ to ‘avoid confusing consumers’[^3], particularly parents who might not have sufficient knowledge about video games or ‘ludoliteracy.’

According to the ESRB, their label accounts for:

‘… loot boxes and all similar mechanics that offer random items in exchange for real-world currency or in-game currency that can be purchased with real money.’[^3]

According to PEGI, their label covers:

‘… all in-game offers to purchase digital goods or premiums where players don’t know exactly what they are getting prior to the purchase (e.g. loot boxes, card packs, prize wheels).’[^24]

These definitions accord with the wide definition for ‘loot boxes’ adopted by the present study. These labels were intended to ‘provide the additional information if the game features paid random items’[^24], such that ‘…consumers can make more informed decisions when purchasing or downloading a game, instead of finding out after the fact.’[^3] Notably, the presence of these labels, or rather the presence of loot boxes, does not affect a game’s age rating because neither the ESRB nor PEGI recognises loot boxes as actual ‘gambling’ or ‘simulated gambling’[^25,26]. These labels can therefore attach to games containing loot boxes but are rated suitable for young children (*i.e.*, ESRB’s ‘E’ or ‘Everyone’ rating and PEGI’s ‘PEGI 3’ rating[^24]). This is unlike how other content, such as depiction of ‘realistic violence,’ ‘illegal drugs, alcohol or tobacco’ or ‘simulated gambling,’ would (in certain situations, automatically[^27]) attract higher age ratings[^28,29]. Xiao has previously criticised the labels for not providing sufficient information to truly help players and parents make more informed purchase decisions[^23]. The labels fail to identify and explain where and how the loot boxes in a specific game can be purchased and so players
and children cannot easily actively avoid engaging with the mechanics. The labels also do not signify whether or not the relevant mechanic provides rewards that can then be transferred to other players and ‘cashed-out’\[30\] (\textit{i.e.}, have real-world monetary value), which is a relevant consideration for many gambling regulators\[9,16,17\]. The labels might be of some assistance by providing information at the initial point of purchasing or downloading the game; however, once the player has begun playing the game, the labels are no longer helpful. An improvement might be to specifically describe the loot box mechanics to help players actively avoid them and to provide a choice in the options menu to turn the ability to purchase loot boxes on or off (potentially even with the default option set to ‘off’).

Through experimental studies, Garrett \textit{et al.} have concluded that these labels fail to adequately warn consumers about the potential risks involved with loot boxes and therefore ‘fail to adequately inform consumer spending decisions’\[31\].

The ESRB’s and PEGI’s wide definitions for ‘in-game transactions with randomised elements’\[3\] and what the present study refers to as ‘loot boxes’ are effectively identical, despite trivial variations in the wording of the definitions and of the labels. Therefore, the reasonable expectation is that a game containing loot boxes should be labelled with the ‘In-Game Purchases (Includes Random Items)’ interactive element after being rated by the ESRB in North America and with the ‘In-game Purchases (Includes Paid Random Items)’ content descriptor after being rated by PEGI in Europe. The ESRB and PEGI should be \textit{consistent} when deciding whether a game contains loot boxes. If one of them fails to label a game with the loot box warning when the other has done so, then the former has highly likely inaccurately rated said game’s loot box presence by failing to identify it. The only highly unlikely exception being that a game potentially has separate North American and European versions and only one of which contained loot boxes: such a situation has never been popularly reported.

Research Question 1: Are video games being consistently given the loot box self-regulatory warning label by the ESRB and PEGI?

Hypothesis 1: All games that have been labelled with the ‘In-Game Purchases (Includes Random Items)’ interactive element by the ESRB should also have been
labelled with the ‘In-game Purchases (Includes Paid Random Items)’ content descriptor by PEGI and *vice versa*.

The ESRB and PEGI only play a direct role when rating physically published games and are only *indirectly* involved in the rating of each individual digitally released game. Both the ESRB and PEGI are ‘participating rating authorities’ of the IARC (International Age Rating Coalition), which is a simplified system that allows game companies to simultaneously obtain multiple age ratings for use in different territories for digitally delivered games[32]. After companies fill in a single questionnaire about their games’ content, the IARC will produce age ratings that ‘also include content descriptors and interactive elements, identifying games and apps that [inter alia] offer in-app/game purchases (as well as those that are randomized)’ (emphasis added).[32] Specifically, the IARC uses the ‘In-Game Purchases (Includes Random Items)’ interactive element, which is the ESRB’s label and whose wording differs slightly from that of the PEGI label. The IARC is not implemented on the Apple App Store (which uses its own age rating system[33]) but is adopted by the Google Play Store and other major platforms[32]. Depending on which national version of the Google Play Store is visited, the appropriate age rating for that territory is shown. For example, for the game *Guns of Glory* (FunPlus, 2017), the US Google Play Store displays the ESRB rating of Everyone 10+ ([https://play.google.com/store/apps/details?id=com.diandian.gog&hl=en&gl=us](https://play.google.com/store/apps/details?id=com.diandian.gog&hl=en&gl=us)), whilst the Danish Google Play Store displays the PEGI rating of 7 ([https://play.google.com/store/apps/details?id=com.diandian.gog&hl=en&gl=dk](https://play.google.com/store/apps/details?id=com.diandian.gog&hl=en&gl=dk)). *Guns of Glory* has previously been identified as containing loot boxes in multiple studies[18,34,35]. Indeed, the IARC has attached the ‘In-Game Purchases (Includes Random Items)’ label to the game on both the US and Danish Google Play Stores alongside the respective ESRB and PEGI age ratings.

Notably, the IARC explains that ‘Interactive Elements are assigned *universally*, providing notice about the ability to make in-game purchases (including randomized ones)...’ (emphasis added)[36]. This contrasts with the IARC’s assignment of ‘Age Rating and Content Descriptors,’ which will differ by region[36]. In other words, a game containing loot boxes can receive different age ratings in different regions under the IARC system, but the loot box warning label, which is an interactive element, should be attached to that game regardless of region. Universal
or global assignment of the label means that the IARC has effectively extended the ‘jurisdictional’ scope of the loot box self-regulatory warning label requirement to countries beyond those covered by the ESRB and PEGI. For example, Germany, despite being in Europe, does not use PEGI and instead adopts the alternative USK (Unterhaltungssoftware Selbstkontrolle) to provide age ratings. The USK does not assess the presence of loot boxes and does not require the use of a label to signify their presence in relation to physical games marketed in Germany[337]. Notably, as of 18 September 2022, the official USK webpage explaining the integration of the USK age ratings within the IARC system has not been updated to explain that the IARC will now additionally attach ‘In-Game-Käufe (zufällige Objekte möglich) [In-Game Purchases (Includes Random Items)]’ to games containing loot boxes and, instead, the webpage still only states that games allowing for additional in-game purchases will be attached with the generic ‘In-Game-Einkäufe [In-Game Purchases]’[338]. However, the USK is a ‘participating rating authority’ of the IARC[332], and so games containing loot boxes are being attached with ‘In-Game-Käufe (zufällige Objekte möglich)’ on the German Google Play Store: for example, Guns of Glory (https://play.google.com/store/apps/details?id=com.diandian.gog&hl=de&gl=de).

Draft laws in the US that have failed to pass[339] tried to require games containing loot boxes to ‘prominently disclose to the consumer at the time of … purchase a bright red label that is easily legible and which reads: “Warning: contains in-game purchases and gambling-like mechanisms which may be harmful or addictive”’[40,41]. Another Bill intending to require the following (arguably note entirely scientifically inaccurate) loot box warning label within the US state of Illinois remains under consideration:

‘Attention Parents: A Loot Box System exists in this game that permits an unlimited amount of REAL MONEY to be spent without any age restriction. REAL MONEY is exchanged for random digital items. This process has been linked to REAL LIFE GAMBLING ADDICTIONS in both children and adults. Please regulate your own spending as well as your children’s spending.’[42].

Other countries might be considering imposing similar information-based warning labels to address the potential harms of loot boxes. Previous research has found that
other industries, such as alcohol, tobacco, and gambling, have all taken various corporate actions that likely reduced the effectiveness of product warnings. Loot box probability disclosures are known to have been implemented sub-optimally by video game companies: specifically, lacking prominence and being difficult to access. Compliance with Belgium’s ‘ban’ on loot boxes through applying pre-existing gambling law has also been poor.

When filling in the content rating questionnaire, Google warns that: ‘Misrepresentation of your app’s content may result in removal or suspension, so it is important to provide accurate responses to the content rating questionnaire.’ The IARC also recognises that ratings can be changed through ‘post-release modification’ and states that: ‘IARC rating authorities [inter alia, the ESRB and PEGI] monitor ratings assigned to games and apps to ensure accuracy. Corrections, if needed, are implemented promptly by storefronts.’ However, considering prior research, reasonable doubt must be cast on the compliance rate with the self-regulatory requirement of attaching loot box warning labels.

Rather than to assess the 100 presently highest-grossing Google Play Store games as to whether they contain loot boxes (as previous studies have done) and then to check whether they are displaying the label, it is more economical and efficient to instead examine games previously known to contain loot boxes. If a game that was known to contain loot boxes is displaying the label, then it is no longer necessary to assess whether said game still contains loot boxes through gameplay, as this can be reasonably assumed. Only those games previously known to contain loot boxes but are not displaying the label need to be re-assessed through gameplay. This expediency is desirable because it is hoped that the present study’s results could be published promptly and thereby contribute to the efforts of the UK Government’s Department for Digital, Culture, Media & Sport’s technical working group that is developing industry self-regulation for loot boxes with the aim of reducing harm.

The sample selection (as detailed below) will be based on previously highest-grossing games (many of which will likely still remain high-grossing and popular games presently). This therefore represents a sample of particular interest for players, parents, policymakers, and the age rating organisations. However, some limitations should be noted. Firstly, the compliance rate amongst this sample of historically (and potentially presently) high-grossing games is not necessarily
representative of that of financially worse performing games (which might be less
scrutinised by players and other companies and therefore less likely to comply or,
contrastingly, might be performing worse financially because they have accurately
displayed the label) or the overall situation on the Google Play Store. Secondly, these
games were previously highlighted in published academic work as having contained
loot boxes[18,20,34,35], and, therefore, their operating companies might have since
become more likely to comply (when compared to a newly published game that has
not yet gained any notoriety), as companies have reportedly complied with the
Belgian ‘ban’ on loot boxes only following the publication of Xiao and media
reporting thereof[35,48] and four years after they were originally supposed to have
done so.

Research Question 2: Are video games previously known to be high-grossing and
contain loot boxes and presently containing loot boxes on the Google Play Store
accurately displaying the IARC ‘In-Game Purchases (Includes Random Items)’ label?

Hypothesis 2: All video games previously known to be high-grossing and
containing loot boxes and presently containing loot boxes on the Google
Play Store will accurately display the IARC ‘In-Game Purchases (Includes Random
Items)’ label.

The present series of two studies will not seek to assess the efficacy of the loot box
self-regulatory labels on consumer behaviour[see 31] and instead will seek to assess (i)
whether the ESRB and PEGI have consistently applied the loot box self-regulatory
warning label and (ii) whether companies have complied with this self-regulation by
accurately labelling games containing loot boxes with the relevant notice.

2. Method
2.1. Study 1
The ESRB provides a public search tool for identifying the age ratings, content
descriptors, and, importantly for Study 1, interactive elements, including the ‘In-
Game Purchases (Includes Random Items)’ label, for specific games[49]. However, it is
not possible to use the search tool to specifically identify only games with the ‘In-
Game Purchases (Includes Random Items)’ label. Using the relevant filter for the
label unhelpfully brings up all games with ‘No Interactive Elements’ (the
overwhelming majority) and those with the relevant label. The ESRB also publishes a list of all games that it has rated in reverse chronological order. By using the ‘Refine Search’ function of the search tool and limiting the ‘Time Frame’ to ‘Past Year’ (the longest period that could be chosen) and applying no other filters, a list of all games that were rated in the year leading up to 21 September 2022 were extracted through data scraping. This timeframe restriction was adopted because it was deemed impractical to analyse all 31,636 individual historical entries (existing on 21 September 2022) and the ESRB provided no information as to the exact date that a rating was given, besides allowing an inference to be drawn through the Time Frame filter. This list consisted of 698 individual entries (a few games appeared as multiple entries as different editions and platforms were sometimes rated and listed separately). In total, 20 entries (2.9%) were labelled by the ESRB with the ‘In-Game Purchases (Includes Random Items)’ interactive element. Two entries were excluded for bearing the exact same name as another entry. A third entry was excluded because although it bears an additional subtitle (FIFA 22 Legacy Edition), it is the same game as another entry (FIFA 22) and appear to have likely been rated on the same date. A list of 17 individual video game titles that were labelled by the ESRB with the loot box self-regulatory warning in the year leading up to 21 September 2022 was thereby produced. Based on how many games appeared as results when the Time Frame filter was set to ‘Past Year,’ it can be estimated (appreciating that seasonable variability and COVID-19 impacts cannot be accounted for) that the ESRB rated approximately 700 games per year historically. This information can be used to infer that the ESRB rated approximately 992 games in the 17 months between 13 April 2020 (the date on which the Labels were announced and began to be assigned) and 21 September 2021 (the date after which the list of games rated in the past year leading up to 21 September 2022 started). The 1,000 games that immediately precede the 698 entries that have already been collected on the reverse chronological order list will be collated through data scraping. The entries labelled by the ESRB with the ‘In-Game Purchases (Includes Random Items)’ interactive element will be identified, and any entries bearing the same or a substantially similar name will be excluded as above. These entries will be combined with the 17 previously identified entries to form an approximately complete list of games that have been labelled by the ESRB with the loot box self-regulatory warning since 13 April 2020 (hereinafter, the ‘ESRB List’). The ESRB List will be generated thusly because it was deemed impractical to analyse all 31,636
individual historical entries (existing on 21 September 2022) and the ESRB provided no information as to the exact date that a rating was given, besides allowing an inference to be drawn through the Time Frame filter. Certain games are also published months after a rating has been granted, so the release date of games also cannot be used to determine the relevant rating date. It was deemed unwise and potentially leading to a conflict of interest (and a change in compliance behaviour) to contact the ESRB and ask for a complete list of games that it has labelled with the warning, although this might be done following the publication of the present study.

PEGI similarly provides a search tool for identifying the age ratings and content descriptors (including the ‘In-game Purchases (Includes Paid Random Items)’ label) for specific games[51]. Unlike the ESRB search tool, the PEGI search tool can be used to produce a list of all games ever rated by PEGI that were given the ‘In-game Purchases’ content descriptor, if the ‘DESCRIPTOR’ of ‘In-Game Purchases’ is selected in the ‘EXTENDED SEARCH’ options[52]. The ‘In-game Purchases (Includes Paid Random Items)’ is treated as a subtype of the overarching ‘In-game Purchases’ content descriptor, and therefore all games that have been given the loot box self-regulatory warning are included in said list. On 21 September 2022, a list of 523 individual results of games that have ever been labelled by PEGI with the ‘In-game Purchases’ content descriptor was produced. Again, a number of games appeared as multiple entries as different editions and platforms were sometimes rated and listed separately. In total, 125 results (23.9%) were ever labelled by PEGI with the ‘In-game Purchases (Includes Paid Random Items)’ content descriptor. Entries were excluded for bearing the same name as another entry (55 entries) and being the same game as another entry despite minor changes to the title (e.g., ‘World of Tanks on PlayStation 4’ as compared to ‘World of Tanks;’ 6 entries). A list of all 64 individual video game titles that have ever been labelled by PEGI with the loot box self-regulatory warning was thereby produced (hereinafter, the ‘PEGI List’).

The following variable will be measured:

Presence of the loot box self-regulatory warning label on the other system

The games on the ESRB List will be entered into the PEGI search tool[51] and vice versa with the PEGI List and the ESRB search tool[49]. Screenshots will be taken of the relevant ratings, content descriptors, and/or interactive elements. If the
corresponding loot box self-regulatory label can be found for the game on the other
age rating system, then this game will be marked as ‘consistent,’ but if not, then
‘inconsistent.’ If a game appears on both the ESRB List and the PEGI List, then it will
be analysed only once. Some reasonable flexibility is allowed when searching for a
corresponding game if a game with the exact same title cannot be found. Any
deviation will be recorded. If a game cannot be found on the other system even after
allowing a reasonable amount of flexibility with the search term, then it will be
excluded from analysis.

The ‘consistency rate’ between the ESRB’s and PEGI’s usage of the loot box warning
self-regulation will be calculated as follows:

\[
\text{Consistency Rate} = \frac{1 - \frac{\text{Games that have been labeled with the loot box warning by both the ESRB and PEGI}}{(\text{All games on the ESRB and PEGI Lists} - \text{Any duplicate or excluded games})}}{1}
\]

Hypothesis 1 will be accepted if the consistency rate is ≥ 95%. Otherwise, Hypothesis
1 will be rejected. In terms of the interpretation of results, a consistency rate of ≥ 95%
will be viewed as the ESRB and PEGI having been sufficiently consistent. A
consistency rate of ≥ 80% but < 95% will be deemed as the self-regulatory measure
not having been applied sufficiently consistently by the ESRB and PEGI, and thus
the rating processes require improvements to enhance cohesion. A consistency rate
of < 80% will be seen as the measure having been applied inconsistently, and thus
the rating processes being in need of significant improvements. These cut-offs and
corresponding potential interpretations were based on the author’s own opinion on
what is a ‘satisfactory’ self-regulatory measure and what he deemed most
policymakers would agree with.

Study 1 achieves level 3 of bias control as recognised by PCI RR, as it was necessary
to attempt to collate the ESRB and PEGI Lists to affirm the study’s practical
feasibility. I certify that I have ‘not yet observed ANY part of the data/evidence,’[53]
specifically, I have not searched for games on either List using the other rating
system’s search tool.

2.2. Study 2

The sample of 100 (or potentially fewer) games will be selected using the following
steps:
1. The sample will be derived from the samples of four previous studies assessing loot box prevalence amongst mobile games in different countries, which examined 531 separate instances of video games and identified whether they contained loot boxes\textsuperscript{[18,20,34,35]}. 

2. Amongst those 531 games, 100 were originally studied in Chinese and not in English\textsuperscript{[20]}. Those 100 Chinese games were reviewed in 2021 to identify a subset of 31 games that were also then available in English, which were and reassessed in a UK study\textsuperscript{[18]}. The present study is less interested with the compliance situation of games available only in Chinese and more concerned with the compliance situation in North America and Europe (i.e., ‘Western’ countries) where the ESRB and PEGI self-regulate; therefore, those 100 Chinese games will not be reviewed again as the previously distilled list of 31 games that were available in both languages will be taken into account. 

3. A list of 431 games combining the results of three previous studies will be collated\textsuperscript{[18,20,34]}. Any duplicates and any games assessed to have not previously contained loot boxes will be removed. Some reasonable flexibility as the game’s title is allowed when searching for and removing duplicate games (e.g., changes to the subtitle to reflect a content update). Any deviation will be recorded. The remaining games will therefore form a list of non-duplicate games that were known to contain loot boxes. 

4. It is known that two so-called ‘sand box’ games (specifically, Roblox (Roblox Corporation, 2006) and Minecraft (Mojang Studios, 2011)) will be included on that list. These two games contain a significant amount of third-party user-generated content, including loot boxes\textsuperscript{[18,35]}. This represents a particular compliance difficulty as these ‘platform’ games’ developers and publishers would need to ensure not only compliance by themselves but also compliance by many third parties creating content for these games\textsuperscript{[48,54]}. To ensure that at least one such both of these game will be assessed, these two games they will be removed from the list and not form part of the sample will hereby be preregistered to include Roblox. Their compliance situation will be separately reported. If either game becomes unavailable for download and incapable of being assessed, then this would be noted in lieu.
Therefore, the present study’s sample will be a total of 100 games formed of Roblox and 99 random games from the list of non-duplicate games that were known to contain loot boxes.

Alternatively, if that list contains fewer than 100 games, the entire list (in addition to both Roblox and Minecraft) will form the sample.

If any game in the sample will no longer be available for download from the Google Play Store by the data collection period then it will be excluded from the sample and replaced with another random game from the list. If that list will contain fewer than 100 games or if no games will be left on that list to replace the excluded game, then the study will proceed with the available games even if the sample will be formed of fewer than 100 games.

The same exclusion and replacement (if possible) procedure will apply if Guns of Glory is to be included. This game is specifically being excluded as it has been used as an example to test and illustrate the present study’s methodology for the stage 1 registered report submission and its ‘results’ have already been observed.

If Roblox specifically will be unavailable, then it will be replaced with Minecraft. If both Roblox and Minecraft will be unavailable, then the study will proceed without including either of them in the sample and instead with a random replacement game from the list (if any is available).

The following variables will be measured:

Presence of the interactive element of ‘In-Game Purchases (Includes Random Items)’

The Google Play Store page of the relevant game will be reviewed to check whether the IARC interactive element of ‘In-Game Purchases (Includes Random Items)’ has been noted alongside the game’s age rating. The US and Danish Google Play Stores for each game will be checked to see whether the label has been attached to both the ESRB and the PEGI ratings, respectively. A simple change of the parameter ‘gl=[country code]’ in the game’s Google Play Store URL allows for the switching of regions. The country code for the US is ‘us,’ whilst Denmark uses ‘dk.’ To illustrate using the example of Guns of Glory, the US store can be visited through the following URL:

https://play.google.com/store/apps/details?id=com.diandian.gog&hl=en&gl=us,
whilst the Danish store can be visited through:


A PDF printout of the relevant webpages (showing the URL visited) will be made.

Presence of paid loot boxes (newly assessed)

If the Google Play Store page of a game known to previously contain paid loot boxes will not show the IARC interactive element of ‘In-Game Purchases (Includes Random Items)’ alongside the game’s age rating, then that game will be played for up to an hour to identify whether paid loot boxes are still being implemented and sold in that game. Any identified paid loot boxes will be screenshoted. If a paid loot box cannot be identified within that timeframe, then the game will be coded as not containing paid loot boxes.

To align with the methodology of prior studies[18,20,35], a ‘paid loot box’ will be defined as being either an Embedded-Isolated random reward mechanism (which are video game mechanics that players must pay real-world money to activate and which provide randomised rewards that do not possess direct real-world monetary value) or an Embedded-Embedded random reward mechanism (whose activation also must be paid for by players with real-world money but which do provide randomised rewards that possess direct real-world monetary value), as defined by Nielsen & Grabarczyk (2019)[4].

In particular, it is emphasised that so-called ‘social casino games,’ or ‘simulated casino games,’ in which the player is able to spend real-world money to participate in simulated traditional gambling activities (i.e., ‘games of chance’ or ‘mixed games of chance and skill,’ e.g., slot machines, poker, and blackjack) and win or lose virtual currency randomly[35], will not be distinguished and will be counted as games containing ‘loot boxes,’ for the purposes of Hypothesis 2, despite some debate on that point within the academic literature[55,56]. This is because spending real-world money to participate in a social casino game constitutes an in-game ‘[transaction] with randomized elements,’ per the ESRB’s definition[3]. The present study’s definition of ‘paid loot box,’ encompasses both mechanics that are commonly known as ‘loot boxes’ and social casino games. This therefore, accords with both the ESRB’s and PEGI’s definitions for mechanics that the loot box warning labels are supposed to cover[3][24]. However, the relevant compliance rate (see below) amongst ‘social
casino games’ (which will be identified using the definition above) and non-‘social casino games’ will be additionally separately reported to provide nuance.

Further, again aligning with the methodology of prior studies\(^{18,35}\), so-called ‘sandbox’ games, such as Minecraft or Roblox, that contain a significant amount of third-party user-generated content will be assumed to contain paid loot boxes without the need for such a mechanic to be specifically identified and screenshotted.

**Date and time of data collection**

The date and time, based on Central European Time (or Central European Summer Time, depending on which will be used by Denmark at the data collection period), on and at which the interactive element and paid loot boxes will be searched for, will be recorded.

Inter-rater reliability through dual-coding will not be calculated because the methodology has been repeatedly used and refined and is known to be reliable\(^{57}\). The raw data and a full library of PDF printouts and screenshots showing, *inter alia*, the relevant Google Play Store webpage sections and in-game loot box purchase pages for each game will be made available via <[OSF deposit link]> for public scrutiny.

The ‘compliance rate’ with the loot box warning self-regulation will be calculated as follows:

\[
1 - \frac{\text{Games newly assessed as containing loot boxes but not displaying the interactive element}}{\text{(All games previously known to previously contain loot boxes)} - \text{Games newly assessed as not containing loot boxes}}
\]

Hypothesis 2 will be accepted if the compliance rate is $\geq 95\%$. Otherwise, Hypothesis 2 will be rejected. In terms of the interpretation of results, a compliance rate of $\geq 95\%$ will be viewed as the self-regulatory measure having been nearly perfectly complied with and worthy of commendation. A compliance rate of $\geq 80\%$ but $< 95\%$ will be deemed as the self-regulatory measure having been mostly complied with, although improvements are needed. A compliance rate of $< 80\%$ will be seen as the measure having not been adequately complied with and in need of significant improvements to achieve its regulatory aim. Again, these cut-offs and corresponding potential
interpretations were based on the author’s own opinion on what is a ‘satisfactory’ self-regulatory measure and what he deemed most policymakers would agree with.

Study 2 achieves level 6 of bias control as recognised by PCI RR as the relevant data do not yet exist.[53]

The sample sizes for both studies are justified on the basis of resources constraints: specifically, the researcher has limited time and is seeking to promptly complete the study in time to assist in the government-supported, industry self-regulatory efforts regarding loot boxes currently underway in the UK[47].

In accordance with the Danish Code of Conduct for Research Integrity[58], as adopted by the IT University of Copenhagen, the present series of two studies will not require research ethics assessment and approval because no human participants or personal data will be involved and only publicly available information will be examined and recorded.

3. Results

4. Discussion

5. Conclusion
Positionality Statement

In terms of the author’s personal engagement with loot boxes, he plays video games containing loot boxes, but he has never purchased any loot boxes with real-world money.

Data Availability Statement

The raw data and a full library of PDF printouts and screenshots showing, *inter alia*, the relevant Google Play Store webpage sections and in-game loot box purchase pages for each game will be publicly available in the Open Science Framework at [OSF LINK TO BE CREATED].

Acknowledgement

Thanks to David Zendle for inspiring this study, discussing potential methodologies with the author, and graciously allowing the author to pursue this project independently. Credit is also due to all the co-authors of Zendle *et al.* (2021) for making the underlying data publicly available for further study and reanalysis[^34]. Thanks to Rune Kristian Lundedal Nielsen and Laura L. Henderson for helpful comments on earlier drafts of this manuscript.

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https://rr.peercommunityin.org/PCIRegisteredReports/help/guide_for_automated_testing


https://doi.org/10.1111/add.15829

https://doi.org/10.1111/add.15976


## Appendix 1. Study Design Table

<table>
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<th>Question</th>
<th>Hypothesis</th>
<th>Sampling plan</th>
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<th>Interpretation given different outcomes</th>
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<tr>
<td>Research Question 1: Are video games being consistently given the loot box self-regulatory warning label by the ESRB and PEGI?</td>
<td>Hypothesis 1: All games that have been labelled with the ‘In-Game Purchases (Includes Random Items)’ interactive element by the ESRB should also have been labelled with the ‘In-game Purchases (Includes Paid Random Items)’ content descriptor by PEGI and vice versa.</td>
<td>A combined list of (i) a list of 17 individual video game titles that were labelled by the ESRB with the loot box self-regulatory warning in the year leading up to 21 September 2022 and (ii) a list of all 64 individual video game titles that have ever been labelled by PEGI with the loot box self-regulatory warning.</td>
<td>Hypothesis 1 will be accepted if the consistency rate is $\geq 95%$. Otherwise, Hypothesis 1 will be rejected.</td>
<td>Absolute null is not optimal. 5% of type I error control will be included to account for potential false positives.</td>
<td>A consistency rate of $\geq 95%$ will be viewed as the ESRB and PEGI having been sufficiently consistent. A consistency rate of $\geq 80%$ but $&lt; 95%$ will be deemed as the self-regulatory measure not having been applied sufficiently consistently by the ESRB and PEGI, and thus the rating processes require improvements to enhance cohesion. A consistency rate of $&lt; 80%$ will be seen as the measure having been applied</td>
<td>The self-regulatory loot box label has been consistently applied by the ESRB and PEGI.</td>
<td>Tbd…</td>
</tr>
<tr>
<td>Research Question 2: Are video games previously known to be high-grossing and contain loot boxes and presently containing loot boxes on the Google Play Store accurately displaying the IARC 'In-Game Purchases (Includes Random Items)' label?</td>
<td>Hypothesis 2: Video games previously known to be high-grossing and contain loot boxes and presently containing loot boxes on the Google Play Store will accurately display the IARC 'In-Game Purchases (Includes Random Items)' label.</td>
<td>Hypothesis 2 will be accepted if the compliance rate is $\geq 95%$. Otherwise, Hypothesis 2 will be rejected.</td>
<td>Absolute null is not optimal. 5% of type 1 error control will be included to account for potential false positives.</td>
<td>A compliance rate of $\geq 95%$ will be viewed as the self-regulatory measure having been nearly perfectly complied with and worthy of commendation. A compliance rate of $\geq 80%$ but $&lt; 95%$ will be deemed as the self-regulatory measure having been mostly complied with, although improvements are needed. A compliance rate of $&lt; 80%$ will be seen as the measure having not been adequately complied with and in need of significant improvements to achieve its regulatory aim.</td>
<td>Games containing loot boxes are displaying the self-regulatory loot box warning label.</td>
<td>TBD...</td>
<td></td>
</tr>
</tbody>
</table>