

34 **Conflict of Interest**

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

91 **1. Introduction**

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

106

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

116

117 The second self-regulatory measure is to prewarn players about the presence of loot
118 boxes. The Entertainment Software Rating Board (ESRB), established by the
119 Entertainment Software Association (ESA), reviews the content of video games and
120 provides age ratings depending on the inclusion of certain material, *e.g.*, the amount
121 and degree of violence and sexual content^[21]. The ESRB is adopted in North America.
122 PEGI (Pan-European Game Information) performs a similar function in Europe
123 generally^[22]. Recognising the concerns that have been raised about loot boxes, on 13
124 April 2020, the ESRB and PEGI announced that they will attach an additional text-
125 based warning to the age ratings of video games containing loot boxes^[23]. The ESRB

126 uses the 'In-Game Purchases (Includes Random Items)' 'interactive element'^[3], whilst
127 PEGI uses the 'In-game Purchases (Includes Paid Random Items)' 'content
128 descriptor'^[24]. These two largely identical labels are intended to cover, according to
129 the ESRB, 'all transactions with randomized elements.'^[3] The ESRB and PEGI both
130 consciously chose to specifically *not* use the term 'loot boxes' to 'avoid confusing
131 consumers'^[3], particularly parents who might not have sufficient knowledge about
132 video games or 'ludoliteracy.'

133

134 According to the ESRB, their label accounts for:

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

139

140 According to PEGI, their label covers:

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

145

146 These definitions accord with the wide definition for 'loot boxes' adopted by the
147 present study. These labels were intended to 'provide the additional information if
148 the game features paid random items'^[24], such that '...consumers can make more
149 informed decisions when purchasing or downloading a game, instead of finding out
150 after the fact.'^[3] Notably, the presence of these labels, or rather the presence of loot
151 boxes, does not affect a game's age rating because neither the ESRB nor PEGI
152 recognises loot boxes as actual 'gambling' or 'simulated gambling'^[25,26]. These labels
153 can therefore attach to games containing loot boxes but are rated suitable for young
154 children (*i.e.*, ESRB's 'E' or 'Everyone' rating and PEGI's 'PEGI 3' rating)^[24]. This is
155 unlike how other content, such as depiction of 'realistic violence,' 'illegal drugs,
156 alcohol or tobacco' or 'simulated gambling,' would (in certain situations,
157 automatically^[27]) attract higher age ratings^[28,29]. Xiao has previously criticised the
158 labels for not providing sufficient information to truly help players and parents
159 make more informed purchase decisions^[23]. The labels fail to identify and explain
160 where and how the loot boxes in a specific game can be purchased and so players

161 and children cannot easily actively avoid engaging with the mechanics. The labels
162 also do *not* signify whether or not the relevant mechanic provides rewards that can
163 then be transferred to other players and ‘cashed-out’^[30] (*i.e.*, have real-world
164 monetary value), which is a relevant consideration for many gambling
165 regulators^[9,16,17]. The labels might be of some assistance by providing information at
166 the initial point of purchasing or downloading the game; however, once the player
167 has begun playing the game, the labels are no longer helpful. An improvement
168 might be to specifically describe the loot box mechanics to help players actively
169 avoid them and to provide a choice in the options menu to turn the ability to
170 purchase loot boxes on or off (potentially even with the default option set to ‘off’).
171 Through experimental studies, Garrett *et al.* have concluded that these labels fail to
172 adequately warn consumers about the potential risks involved with loot boxes and
173 therefore ‘fail to adequately inform consumer spending decisions’^[31].
174

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

189
190 Research Question 1: Are video games being consistently given the loot box self-
191 regulatory warning label by the ESRB and PEGI?

192
193 Hypothesis 1: All games that have been labelled with the ‘In-Game Purchases
194 (Includes Random Items)’ interactive element by the ESRB should also have been

195 labelled with the 'In-game Purchases (Includes Paid Random Items)' content
196 descriptor by PEGI and *vice versa*.

197

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

222

223 Notably, the IARC explains that 'Interactive Elements are assigned *universally*,
224 providing notice about the ability to make in-game purchases (including
225 randomized ones)...' (emphasis added)^[36]. This contrasts with the IARC's
226 assignment of 'Age Rating and Content Descriptors,' which will differ by region^[36].
227 In other words, a game containing loot boxes can receive different age ratings in
228 different regions under the IARC system, but the loot box warning label, which is an
229 interactive element, should be attached to that game regardless of region. Universal

230 or global assignment of the label means that the IARC has effectively extended the
231 'jurisdictional' scope of the loot box self-regulatory warning label requirement to
232 countries beyond those covered by the ESRB and PEGI. For example, Germany,
233 despite being in Europe, does not use PEGI and instead adopts the alternative USK
234 (Unterhaltungssoftware Selbstkontrolle) to provide age ratings. The USK does not
235 assess the presence of loot boxes and does not require the use of a label to signify
236 their presence in relation to physical games marketed in Germany^[37]. Notably, as of
237 18 September 2022, the official USK webpage explaining the integration of the USK
238 age ratings within the IARC system has not been updated to explain that the IARC
239 will now additionally attach 'In-Game-Käufe (zufällige Objekte möglich) [In-Game
240 Purchases (Includes Random Items)]' to games containing loot boxes and, instead,
241 the webpage still only states that games allowing for additional in-game purchases
242 will be attached with the generic 'In-Game-Einkäufe [In-Game Purchases]'^[38].
243 However, the USK is a 'participating rating authority' of the IARC^[32], and so games
244 containing loot boxes are being attached with 'In-Game-Käufe (zufällige Objekte
245 möglich)' on the German Google Play Store: for example, *Guns of Glory*
246 (<https://play.google.com/store/apps/details?id=com.diandian.gog&hl=de&gl=de>)
247 .

248
249 Draft laws in the US that have failed to pass^[39] tried to require games containing loot
250 boxes to 'prominently disclose to the consumer at the time of ... purchase a bright
251 red label that is easily legible and which reads: "Warning: contains in-game
252 purchases and gambling-like mechanisms which may be harmful or addictive"^[40,41].
253 Another Bill intending to require the following (arguably note entirely scientifically
254 inaccurate) loot box warning label within the US state of Illinois remains under
255 consideration:

256
257 'Attention Parents: A Loot Box System exists in this game that permits an
258 unlimited amount of REAL MONEY to be spent without any age restriction.
259 REAL MONEY is exchanged for random digital items. This process has been
260 linked to REAL LIFE GAMBLING ADDICTIONS in both children and adults.
261 Please regulate your own spending as well as your children's spending'^[42].
262

263 Other countries might be considering imposing similar information-based warning
264 labels to address the potential harms of loot boxes. Previous research has found that

265 other industries, such as alcohol^[43], tobacco^[44], and gambling^[45], have all taken
266 various corporate actions that likely reduced the effectiveness of product warnings.
267 Loot box probability disclosures are known to have been implemented sub-
268 optimally by video game companies: specifically, lacking prominence and being
269 difficult to access^[18,20]. Compliance with Belgium’s ‘ban’ on loot boxes through
270 applying pre-existing gambling law has also been poor^[35].

271

272 When filling in the content rating questionnaire, Google warns that:
273 ‘Misrepresentation of your app’s content may result in removal or suspension, so it
274 is important to provide accurate responses to the content rating questionnaire.’ The
275 IARC also recognises that ratings can be changed through ‘post-release
276 modification’^[46] and states that: ‘IARC rating authorities [*inter alia*, the ESRB and
277 PEGI] monitor ratings assigned to games and apps to ensure accuracy. Corrections,
278 if needed, are implemented promptly by storefronts.’ However, considering prior
279 research, reasonable doubt must be cast on the compliance rate with the self-
280 regulatory requirement of attaching loot box warning labels.

281

282 Rather than to assess the 100 presently highest-grossing Google Play Store games as
283 to whether they contain loot boxes (as previous studies have done^[18,20,34,35]) and then
284 to check whether they are displaying the label, it is more economical and efficient to
285 instead examine games previously known to contain loot boxes. If a game that was
286 known to contain loot boxes is displaying the label, then it is no longer necessary to
287 assess whether said game still contains loot boxes through gameplay, as this can be
288 reasonably assumed. Only those games previously known to contain loot boxes but
289 are not displaying the label need to be re-assessed through gameplay. This
290 expediency is desirable because it is hoped that the present study’s results could be
291 published promptly and thereby contribute to the efforts of the UK Government’s
292 Department for Digital, Culture, Media & Sport’s technical working group that is
293 developing industry self-regulation for loot boxes with the aim of reducing harm^[47].
294 The sample selection (as detailed below) will be based on previously highest-
295 grossing games (many of which will likely still remain high-grossing and popular
296 games presently)^[18,20,34,35]. This therefore represents a sample of particular interest for
297 players, parents, policymakers, and the age rating organisations. However, some
298 limitations should be noted. Firstly, the compliance rate amongst this sample of
299 historically (and potentially presently) high-grossing games is not necessarily

300 representative of that of financially worse performing games (which might be less
301 scrutinised by players and other companies and therefore less likely to comply or,
302 contrastingly, might be performing worse financially because they have accurately
303 displayed the label) or the overall situation on the Google Play Store. Secondly, these
304 games were previously highlighted in published academic work as having contained
305 loot boxes^[18,20,34,35], and, therefore, their operating companies might have since
306 become more likely to comply (when compared to a newly published game that has
307 not yet gained any notoriety), as companies have reportedly complied with the
308 Belgian ‘ban’ on loot boxes only following the publication of Xiao and media
309 reporting thereof^[35,48] and four years after they were originally supposed to have
310 done so.

311
312 Research Question 2: Are video games previously known to be high-grossing and
313 contain loot boxes and presently containing loot boxes on the Google Play Store
314 accurately displaying the IARC ‘In-Game Purchases (Includes Random Items)’ label?
315

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

320
321 The present series of two studies will not seek to assess the efficacy of the loot box
322 self-regulatory labels on consumer behaviour^[see 31] and instead will seek to assess (i)
323 whether the ESRB and PEGI have *consistently* applied the loot box self-regulatory
324 warning label and (ii) whether companies have complied with this self-regulation by
325 *accurately* labelling games containing loot boxes with the relevant notice.
326

327 **2. Method**

328 **2.1. Study 1**

329 The ESRB provides a public search tool for identifying the age ratings, content
330 descriptors, and, importantly for Study 1, interactive elements, including the ‘In-
331 Game Purchases (Includes Random Items)’ label, for specific games^[49]. However, it is
332 not possible to use the search tool to specifically identify only games with the ‘In-
333 Game Purchases (Includes Random Items)’ label. Using the relevant filter for the
334 label unhelpfully brings up all games with ‘No Interactive Elements’ (the

335 overwhelming majority) and those with the relevant label. The ESRB also publishes
336 a list of all games that it has rated in reverse chronological order^[50]. By using the
337 'Refine Search' function of the search tool and limiting the 'Time Frame' to 'Past
338 Year' (the longest period that could be chosen) and applying no other filters, a list of
339 all games that were rated in the year leading up to 21 September 2022 were extracted
340 through data scraping. This timeframe restriction was adopted because it was
341 deemed impractical to analyse all 31,636 individual historical entries (existing on 21
342 September 2022) and the ESRB provided no information as to the exact date that a
343 rating was given, besides allowing an inference to be drawn through the Time Frame
344 filter. This list consisted of 698 individual entries (a few games appeared as multiple
345 entries as different editions and platforms were sometimes rated and listed
346 separately). In total, 20 entries (2.9%) were labelled by the ESRB with the 'In-Game
347 Purchases (Includes Random Items)' interactive element. Two entries were excluded
348 for bearing the exact same name as another entry. A third entry was excluded
349 because although it bears an additional subtitle (*FIFA 22 Legacy Edition*), it is the
350 same game as another entry (*FIFA 22*) and appear to have likely been rated on the
351 same date. A list of 17 individual video game titles that were labelled by the ESRB
352 with the loot box self-regulatory warning in the year leading up to 21 September
353 2022 was thereby produced. Based on how many games appeared as results when
354 the Time Frame filter was set to 'Past Year,' it can be estimated (appreciating that
355 seasonable variability and COVID-19 impacts cannot be accounted for) that the
356 ESRB rated approximately 700 games per year historically. This information can be
357 used to infer that the ESRB rated approximately 992 games in the 17 months between
358 13 April 2020 (the date on which the Labels were announced and began to be
359 assigned) and 21 September 2021 (the date after which the list of games rated in the
360 past year leading up to 21 September 2022 started). (hereinafter, the 'ESRB List').The
361 1,000 games that immediately precede the 698 entries that have already been
362 collected on the reverse chronological order list will be collated through data
363 scraping. The entries labelled by the ESRB with the 'In-Game Purchases (Includes
364 Random Items)' interactive element will be identified, and any entries bearing the
365 same or a substantially similar name will be excluded as above. These entries will be
366 combined with the 17 previously identified entries to form an approximately
367 complete list of games that have been labelled by the ESRB with the loot box self-
368 regulatory warning since 13 April 2020 (hereinafter, the 'ESRB List'). The ESRB List
369 will be generated thusly because it was deemed impractical to analyse all 31,636

370 individual historical entries (existing on 21 September 2022) and the ESRB provided
371 no information as to the exact date that a rating was given, besides allowing an
372 inference to be drawn through the Time Frame filter. Certain games are also
373 published months after a rating has been granted, so the release date of games also
374 cannot be used to determine the relevant rating date. It was deemed unwise and
375 potentially leading to a conflict of interest (and a change in compliance behaviour) to
376 contact the ESRB and ask for a complete list of games that it has labelled with the
377 warning, although this might be done following the publication of the present study.
378

379 PEGI similarly provides a search tool for identifying the age ratings and content
380 descriptors (including the 'In-game Purchases (Includes Paid Random Items)' label)
381 for specific games^[51]. Unlike the ESRB search tool, the PEGI search tool *can* be used
382 to produce a list of all games ever rated by PEGI that were given the 'In-game
383 Purchases' content descriptor, if the 'DESCIRPTOR' of 'In-Game Purchases' is
384 selected in the 'EXTENDED SEARCH' options^[52]. The 'In-game Purchases (Includes
385 Paid Random Items)' is treated as a subtype of the overarching 'In-game Purchases'
386 content descriptor, and therefore all games that have been given the loot box self-
387 regulatory warning are included in said list. On 21 September 2022, a list of 523
388 individual results of games that have ever been labelled by PEGI with the 'In-game
389 Purchases' content descriptor was produced. Again, a number of games appeared as
390 multiple entries as different editions and platforms were sometimes rated and listed
391 separately. In total, 125 results (23.9%) were ever labelled by PEGI with the 'In-game
392 Purchases (Includes Paid Random Items)' content descriptor. Entries were excluded
393 for bearing the same name as another entry (55 entries) and being the same game as
394 another entry despite minor changes to the title (*e.g.*, 'World of Tanks on PlayStation 4'
395 as compared to 'World of Tanks'; 6 entries). A list of all 64 individual video game
396 titles that have ever been labelled by PEGI with the loot box self-regulatory warning
397 was thereby produced (hereinafter, the 'PEGI List').
398

399 The following variable will be measured:

400
401 *Presence of the loot box self-regulatory warning label on the other system*

402 The games on the ESRB List will be entered into the PEGI search tool^[51] and *vice versa*
403 with the PEGI List and the ESRB search tool^[49]. Screenshots will be taken of the
404 relevant ratings, content descriptors, and /or interactive elements. If the

405 corresponding loot box self-regulatory label can be found for the game on the other
406 age rating system, then this game will be marked as 'consistent,' but if not, then
407 'inconsistent.' If a game appears on both the ESRB List and the PEGI List, then it will
408 be analysed only once. Some reasonable flexibility is allowed when searching for a
409 corresponding game if a game with the exact same title cannot be found. Any
410 deviation will be recorded. If a game cannot be found on the other system even after
411 allowing a reasonable amount of flexibility with the search term, then it will be
412 excluded from analysis.

413

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

416

$$417 \quad \frac{\text{Games that have been labeled with the loot box warning by both the ESRB and PEGI}}{\text{(All games on the ESRB and PEGI Lists - Any duplicate or excluded games)}}$$

418

419 Hypothesis 1 will be accepted if the consistency rate is $\geq 95\%$. Otherwise, Hypothesis
420 1 will be rejected. In terms of the interpretation of results, a consistency rate of $\geq 95\%$
421 will be viewed as the ESRB and PEGI having been sufficiently consistent. A
422 consistency rate of $\geq 80\%$ but $< 95\%$ will be deemed as the self-regulatory measure
423 not having been applied sufficiently consistently by the ESRB and PEGI, and thus
424 the rating processes require improvements to enhance cohesion. A consistency rate
425 of $< 80\%$ will be seen as the measure having been applied inconsistently, and thus
426 the rating processes being in need of significant improvements. These cut-offs and
427 corresponding potential interpretations were based on the author's own opinion on
428 what is a 'satisfactory' self-regulatory measure and what he deemed most
429 policymakers would agree with.

430

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

436

437 2.2. Study 2

438 The sample of 100 (or potentially fewer) games will be selected using the following
439 steps:

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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^[18,20,34,35].
2. Amongst those 531 games, 100 were originally studied in Chinese and not in English^[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^[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^[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^[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^[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.

473 ~~4.5.~~Therefore, the present study's sample will be a total of 100 ~~games formed of~~
474 ~~Roblox and 99~~ random games from the list of non-duplicate games that were
475 known to contain loot boxes.

476 ~~5.6.~~Alternatively, if that list contains fewer than 100 games, the entire list (~~in~~
477 ~~addition to both Roblox and Minecraft~~) will form the sample.

478 ~~6.7.~~If any game in the sample will no longer be available for download from the
479 Google Play Store by the data collection period then it will be excluded from
480 the sample and replaced with another random game from the list (~~and if that~~
481 ~~list has been exhausted, with Minecraft~~). If that list will contain fewer than 100
482 games or if no games will be left on that list to replace the excluded game,
483 then the study will proceed with the available games even if the sample will
484 be formed of fewer than 100 games.

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

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

494
495 The following variables will be measured:

496
497 *Presence of the interactive element of 'In-Game Purchases (Includes Random Items)'*

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

507 [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)

508 whilst the Danish store can be visited through:
509 <https://play.google.com/store/apps/details?id=com.diandian.gog&hl=en&gl=dk>.

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

511

512 *Presence of paid loot boxes (newly assessed)*

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

520

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

529

530 In particular, it is emphasised that so-called 'social casino games,' or 'simulated
531 casino games,' in which the player is able to spend real-world money to participate
532 in simulated traditional gambling activities (i.e., 'games of chance' or 'mixed games
533 of chance and skill;' e.g., slot machines, poker, and blackjack) and win or lose virtual
534 currency *randomly*^[35], will not be distinguished and will be counted as games
535 containing 'loot boxes,' for the purposes of Hypothesis 2, despite some debate on
536 that point within the academic literature^[55,56]. This is because spending real-world
537 money to participate in a social casino game constitutes an in-game '[transaction]
538 with randomized elements,' per the ESRB's definition^[3]. The present study's
539 definition of 'paid loot box,' encompasses both mechanics that are commonly known
540 as 'loot boxes' and social casino games. This therefore, accords with both the ESRB's
541 and PEGI's definitions for mechanics that the loot box warning labels are supposed
542 to cover^{[3][24]}. However, the relevant compliance rate (see below) amongst 'social

543 casino games' (which will be identified using the definition above) and non-'social
544 casino games' will be additionally separately reported to provide nuance.

545
546 Further, again aligning with the methodology of prior studies^[18,35], so-called 'sand
547 box' games, such as *Minecraft* or *Roblox*, that contain a significant amount of third-
548 party user-generated content will be assumed to contain paid loot boxes without the
549 need for such a mechanic to be specifically identified and screenshotted.

550
551 *Date and time of data collection*

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

556
557 Inter-rater reliability through dual-coding will not be calculated because the
558 methodology has been repeatedly used and refined and is known to be reliable^[57].
559 The raw data and a full library of PDF printouts and screenshots showing, *inter alia*,
560 the relevant Google Play Store webpage sections and in-game loot box purchase
561 pages for each game will be made available via <[OSF deposit link]> for public
562 scrutiny.

563
564 The 'compliance rate' with the loot box warning self-regulation will be calculated as
565 follows:

566
567
$$1 - \frac{\text{Games newly assessed as containing loot boxes but not displaying the interactive element}}{(\text{All games previously known to previously contain loot boxes} - \text{Games newly assessed as not containing loot boxes})}$$

568
569 Hypothesis 2 will be accepted if the compliance rate is $\geq 95\%$. Otherwise, Hypothesis
570 2 will be rejected. In terms of the interpretation of results, a compliance rate of $\geq 95\%$
571 will be viewed as the self-regulatory measure having been nearly perfectly complied
572 with and worthy of commendation. A compliance rate of $\geq 80\%$ but $< 95\%$ will be
573 deemed as the self-regulatory measure having been mostly complied with, although
574 improvements are needed. A compliance rate of $< 80\%$ will be seen as the measure
575 having *not* been adequately complied with and in need of significant improvements
576 to achieve its regulatory aim. Again, these cut-offs and corresponding potential

577 interpretations were based on the author’s own opinion on what is a ‘satisfactory’
578 self-regulatory measure and what he deemed most policymakers would agree with.

579

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

582

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

587

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

593

594 **3. Results**

595 **tbd**

596

597 **4. Discussion**

598 **tbd**

599

600 **5. Conclusion**

601 **tbd**

602 **Positionality Statement**

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

606

607 **Data Availability Statement**

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

612

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620

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Appendix 1. Study Design Table

Question	Hypothesis	Sampling plan	Analysis Plan	Rationale for deciding the sensitivity of the test for confirming or disconfirming the hypothesis	Interpretation given different outcomes	Theory that could be shown wrong by the outcomes	Results
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.	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.	Hypothesis 1 will be accepted if the consistency rate is $\geq 95\%$. Otherwise, Hypothesis 1 will be rejected.	Absolute null is not optimal. 5% of type 1 error control will be included to account for potential false positives.	<p>A consistency rate of $\geq 95\%$ will be viewed as the ESRB and PEGI having been sufficiently consistent.</p> <p>A consistency rate of $\geq 80\%$ 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.</p> <p>A consistency rate of $< 80\%$ will be seen as the measure having been applied</p>	The self-regulatory loot box label has been consistently applied by the ESRB and PEGI.	Tbd...

					inconsistently, and thus the rating processes being in need of significant improvements.		
<p><u>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?</u>Research Question 2: Are video games containing loot boxes on the Google Play Store accurately displaying the IARC 'In-Game Purchases (Includes Random Items)' label?</p>	<p><u>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.</u>Hypothesis 2: All video games containing loot boxes on the Google Play Store will accurately display the IARC 'In-Game Purchases (Includes Random Items)' label.</p>	<p>A list of 100 (or potentially fewer) random games known to contain loot boxes derived from previous loot box prevalence studies (with inclusion and exclusion criteria detailed in the manuscript).</p>	<p>Hypothesis 2 will be accepted if the compliance rate is $\geq 95\%$. Otherwise, Hypothesis 2 will be rejected.</p>	<p>Absolute null is not optimal. 5% of type 1 error control will be included to account for potential false positives.</p>	<p>A compliance rate of $\geq 95\%$ will be viewed as the self-regulatory measure having been nearly perfectly complied with and worthy of commendation.</p> <p>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.</p> <p>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.</p>	<p>Games containing loot boxes are displaying the self-regulatory loot box warning label.</p>	<p>Tbd...</p>