Addictive Behaviors 148 (2024) 107860

Contents lists available at ScienceDirect

Addictive Behaviors

journal homepage: www.elsevier.com/locate/addictbeh

Loot boxes, gambling-related risk factors, and mental health in Mainland China: A large-scale survey

Leon Y. Xiao [a,b,c,d,*], Tullia C. Fraser [e], Rune Kristian Lundedal Nielsen [a], Philip W.S. Newall [f]

[a] Center for Digital Play, IT University of Copenhagen, København, Denmark
[b] School of Law, Queen Mary University of London, London, UK
[c] Department of Computer Science, University of York, Heslington, UK
[d] The Honourable Society of Lincoln's Inn, London, UK
[e] University of Glasgow, Glasgow, UK
[f] School of Psychological Science, University of Bristol, Bristol, UK

ARTICLE INFO

Keywords:
Loot boxes
Video games
Gambling law
Video gaming regulation
Consumer protection
Mainland China
People's Republic of China

ABSTRACT

Loot boxes can be bought with real-world money to obtain random content inside video games. Loot boxes are viewed by many as gambling-like and are prevalently implemented globally. Previous Western and international studies have consistently found loot box spending to be positively correlated with problem gambling. Previous Western studies presented mixed results as to the correlations between loot box purchasing and gambling-related risk factors, mental wellbeing, and psychological distress. A large-scale survey of adult video game players from the People's Republic of China (PRC) ($N = 2601$) was conducted through Tencent Survey. The positive correlations between loot box spending and problem gambling, and between loot box spending and problem videogaming, were successfully replicated. However, other potential risk factors (*i.e.*, impulsivity/impulsiveness; binary past-year gambling participation status; and sensation-seeking tendencies) either did not positively correlate with loot box spending or only did so weakly. Contrary to expectations, high impulsivity was negatively associated with loot box engagement. The Risky Loot Box Index (RLI) most strongly positively correlated with, and was the best predictor in multiple linear regression models for, loot box spending. The RLI may be effective at measuring loot box harms cross-culturally. A surprising weak *positive* correlation was found between loot box engagement and PRC players' mental wellbeing, and high psychological distress unexpectedly *negatively* predicted loot box purchasing. Although gambling-like, the risk and protective factors of loot boxes are seemingly different, meaning they should rightfully be treated as novel products. Cross-cultural research can contribute to a better understanding of loot box harms.

1. Introduction

'Loot boxes' are virtual items in video games that provide randomised rewards (Xiao, Henderson, Nielsen, Grabarczyk, & Newall, 2021). Some loot boxes can be obtained through gameplay, whilst other loot boxes require the player to spend real-world money to purchase (Nielsen & Grabarczyk, 2019). The present study focuses on 'paid loot boxes,' which are, hereinafter, simply referred to as 'loot boxes.' Loot boxes are presently frequently implemented in video games internationally, particularly on mobile phone platforms (Xiao, 2023; Xiao, Henderson, & Newall, 2022; Xiao, Henderson, & Newall, 2023; Xiao, Henderson, Yang, & Newall, 2021; Zendle, Meyer, Cairns, et al., 2020; Zendle, et al., 2022). Researchers have argued that loot boxes are conceptually, structurally, psychologically, and economically similar to gambling (Close et al., 2021; Close et al., 2022; Drummond & Sauer, 2018; Drummond, Sauer, Hall et al., 2020; Larche et al., 2021; Zendle, Petrovskaya, & Wardle, 2020). The proposition that loot boxes should be conceptualised as a form of gambling is further supported by repeated findings of a positive correlation between loot box expenditure and self-reported problem gambling severity (Garea et al., 2021; Spicer et al., 2021), which has been consistently replicated in 'Western' countries (Brooks & Clark, 2019; Drummond, Sauer, Ferguson, & Hall, 2020; González-Cabrera et al., 2021; Kristiansen & Severin, 2019; Rockloff et al., 2021; von Meduna et al., 2020; Wardle & Zendle, 2021; Zendle, 2019; Zendle & Cairns, 2019) and internationally in general based on samples consisting predominantly of Western participants (Etchells

* Corresponding author.
E-mail address: lexi@itu.dk (L.Y. Xiao).

https://doi.org/10.1016/j.addbeh.2023.107860
Received 10 April 2023; Received in revised form 8 September 2023; Accepted 11 September 2023
Available online 15 September 2023

et al., 2022; Hall et al., 2021; Li et al., 2019; Macey & Hamari, 2019; Zendle, 2019; Zendle & Cairns, 2018; Zendle, Cairns, et al., 2019; Zendle, Meyer, & Over, 2019).

However, the presence of this positive correlation does not inherently demonstrate that harm has been experienced by the players as a consequence of spending highly on loot boxes. It is well established that problem gambling in a traditional context is associated with poor mental health (Lorains, Cowlishaw, & Thomas, 2011). In contrast, few studies have considered whether loot box spending was associated with worse mental health (note, however, that any such correlation would still not show that loot boxes have *caused* the associated mental health issues), and those that did so presented conflicting results. Drummond et al. (2022) found that loot box engagement is associated with significantly higher risk of experiencing severe psychological distress, and that this is true 'even for players without problem gambling symptoms' (p. 1). However, in contrast, Etchells et al. (2022), despite reaffirming the strong evidence of the link between loot box spending and problem gambling, found no evidence that loot box spending is associated with worse mental wellbeing or experiencing more psychological distress. Further replication is therefore needed, especially in non-Western cultures, where little research has been conducted.

Xiao, Fraser, and Newall's study (2023) in the People's Republic of China (PRC)[1] failed to replicate the correlation between loot box spending and problem gambling. However, that study was statistically underpowered when it came to assessing this relationship. Although a total of 879 participants were recruited, the relevant analysis was conducted only on the 87 participants who reported participating in gambling in the past 12 months. The study's findings might have been affected by that very low rate of gambling engagement (only 9.9 %, compared to international rates of 40–60 % (Calado & Griffiths, 2016)) and the PRC's more restricted commercial gambling industry environment generally. However, Xiao, Fraser, and Newall (2023) did find a negligible positive correlation between loot box spending and the binary variable of gambling participation, possibly due to how the structural and psychological similarities shared by the two activities may attract the same audience (p. 652). (The present study adopts the recommendation by Ferguson (2023) and interprets statistically significant effect sizes of $r < 0.1$ as 'negligible,' and those that are $r > 0.1$ but $r < 0.2$ with caution as 'weak' (p. 3).).

The traditional gambling literature has identified many risk factors for developing problem gambling, which should be less sensitive to jurisdictional differences in commercial gambling availability, including sensation seeking (Nower, Derevensky, & Gupta, 2004) and, in particular, impulsivity/impulsiveness (Browne et al., 2019). Previous loot box studies have also identified sensation seeking (Garrett et al., 2023), impulsivity (Garrett et al., 2023; Wardle and Zendle, 2021; cf. Spicer et al., 2022), and problem videogaming (Spicer et al., 2021) as potential risk factors for problematic loot box purchasing, although findings have been mixed. Spicer et al. (2022) identified that many participants who self-reported that their loot box purchasing was influenced by their previous gambling behaviour or *vice versa* stated that this was because of their sensation-seeking tendencies, which was defined as 'Replicating thrill, excitement, adrenaline rush of [either activity] in a different format' (pp. 4–5). Sensation-seeking tendencies may therefore be a predictor for higher loot box engagement. Sensation-seeking tendencies may also be viewed as one aspect of the broader construct of impulsivity: Garett et al. (2023) (published after the present study was conducted) found that certain aspects of impulsivity are relevant to loot box spending, and those aspects that are relevant to loot boxes differ from those that are relevant to traditional gambling. Loot box spending may therefore correlate with impulsivity, although this might not have been captured by the unidimensional instruments used to measure the construct in previous studies (which the present study also used) (pp. 2–3, 12). Problem videogaming may be positively correlated with loot box engagement because players who are more invested in a video game might spend more on loot boxes in that game, and the rewards obtained from those loot boxes might in turn create new gameplay experiences that encourage the player to spend more time playing (Li et al., 2019, pp. 27–28).

Further, the traditional gambling literature has recently innovated with measures of gambling-related harm that are distinct from, and yet partially overlap with, problem gambling constructs (Browne & Rockloff, 2017; Browne & Rockloff, 2020). Out of existing measures in the loot box field, the 'Risky Loot Box Index' (RLI) (Brooks & Clark, 2019) may be the most closely related to this distinct concept of behaviour-related harms. The RLI asks participants to rate their agreement on a five-point Likert-scale with items such as 'I have put off other activities, work, or chores to be able to earn or buy more Loot Boxes.' Indeed, the RLI more strongly correlates with loot box spending than problem gambling does (Drummond, Sauer, Hall, Zendle, & Loudon, 2020, p. 8). Although previously used in English (Drummond, Sauer, Ferguson et al., 2020; Hall et al., 2021; Lloyd et al., 2021) and translated for use in Swedish (Forsström et al., 2022), the RLI has not been introduced to a non-Western context. Better identifying the potential risk factors of problematic loot box purchasing would assist future studies in more effectively collecting data and building better theoretical frameworks.

Xiao, Fraser, and Newall (2023), the only previous loot box study on Mainland Chinese players, followed the traditional methodology of gambling prevalence surveys (Harrison et al., 2020; Sturgis & Kuha, 2022) and gave the problem gambling assessment scale only to participants who self-reported past-year gambling participation because of concerns with inaccurate responses (see also Sidloski et al., 2022). In contrast, other previous loot box studies generally gave the problem gambling assessment scale to all participants regardless of their gambling participation status (*inter alia*, Drummond, Sauer, Ferguson et al., 2020; Zendle & Cairns, 2018). Sidloski et al. (2022) has since identified that some participants in loot box studies interpreted the problem gambling assessment scale in a way that was different from how the survey designers intended: specifically, some participants who did not participate in traditional gambling deemed loot boxes to be a form of 'gambling' and may therefore have been referring to problems with their loot box purchasing when answering questions concerning problems with their 'gambling', thus giving rise to a false, tautological relationship. The present study sought to achieve the 'the best of both worlds' by amending the survey delivery as follows: the methodology of previous studies was directly replicated such that the problem gambling severity assessment scale was given to all participants, regardless of their gambling participation status; however, a question about the participant's gambling participation status was asked to allow for gambling participants to be distinguished from non-gambling participants. The respective correlations amongst all participants and past-year gamblers can then be separately reported, which neither previous studies nor Xiao, Fraser, and Newall (2023) could accomplish. This helps to identify whether the older methodology might indeed be prone to potential misinterpretation by participants. Our primary aim when preregistering the present study was to emulate the vast majority of previous studies in reporting results derived from the whole sample. However, we also report the situation amongst the subsample of gambling participants excluding non-gambling participants.

For context, the PRC also more strictly regulates video gaming than other countries; however, the regulatory measures are generally targeted at young people under 18 (*e.g.*, restricting when online games may be played and for how long (Xiao, 2020; Xiao, 2021; Xiao, 2022; Zendle et al., 2023)). The limits on how much money can be spent on in-game purchases do not apply to adults (Xiao, 2020), which our sample consisted entirely of. The prevalence of loot boxes amongst iPhone games was higher in the PRC than in the UK (Xiao, Henderson, Yang et al.,

[1] In this paper, the PRC refers to Mainland China and excludes the Special Administrative Regions of Hong Kong and Macau, and Taiwan, as product availability and gambling regulation in these areas are different.

2021). The PRC is additionally one of the few regions to require loot box probability disclosures by law (Xiao, 2023; Xiao, Henderson, Yang, & Newall, 2021), but most players reported that this regulatory measure did not affect their purchasing behaviour (Xiao, Fraser, & Newall, 2023). In any case, most major platforms require probability disclosures by industry self-regulation in other countries, although compliance has been worse than in the PRC (Xiao, Henderson, & Newall, 2023). The PRC's regulatory approach to video games is notable and may cause its players to experience loot boxes differently from players of other regions; however, considering the aforementioned contextual information, this appears unlikely in an adult PRC sample.

The present study aimed to measure associations between loot box purchasing and other constructs (specifically, sensation-seeking tendencies (Chen et al., 2013); impulsivity/impulsiveness (Steinberg et al., 2013); problem videogaming severity (Yang et al., 2021), binary past-year gambling participation status; (Steinberg et al., 2013) and 'risky loot box use' (Brooks & Clark, 2019)) in the PRC, both through bivariate analyses and in multivariate regression models. The present study thereby extends the discussion beyond only using problem gambling severity as a measurement of potential loot box 'harms,' which previous Western studies have used to build the existing conceptual and methodological framework (Etchells et al., 2022; Sidloski et al., 2022). This would help to support the use of alternative measurements, which do not explicitly refer to 'gambling' (which is a social taboo in many non-Western cultures), to identify and assess loot box-related harms with more cultural sensitivity. Finally, the relationships between loot box purchasing and (a) mental wellbeing (Stewart-Brown et al., 2009) and (b) psychological distress (Kessler et al., 2003) were assessed to consider potential negative associations between loot box engagement and players' mental health.

The following hypotheses were tested.

Hypothesis 1: Loot box expenditure will positively correlate with problem gambling severity.

Hypothesis 2: Loot box expenditure will positively correlate with problem videogaming severity, impulsivity, past-year gambling participation status, 'risky loot box use,' and sensation seeking tendencies.

Hypothesis 3: Loot box expenditure will negatively correlate with mental wellbeing and positively correlate with psychological distress.

Finally, the present study sought to identify the relative importance of various constructs on loot box spending through multivariate analyses.

The present study (including hypotheses, data collection method, survey materials, exclusion criteria, and analysis plan) was preregistered at https://osf.io/6d3fy.

2. Method

A large-scale Simplified Chinese online survey was circulated through the Tencent Survey [腾讯问卷] platform. The platform automatically filtered and invited only respondents (i) aged 18 years or older; (ii) lived in Mainland PRC (*i.e.*, did *not* live in the Special Administrative Regions of Hong Kong and Macau, Taiwan, the Diaoyu Islands, or a foreign territory); and (iii) whose profiles were marked as a 'video game player [游戏玩家].' Participants were required to register and log in to the platform before being allowed to complete the survey, and each user was only allowed to complete the survey once.

The sample size is justified on resource constraints: the largest possible sample was recruited based on available research funding after *a priori* power analysis confirmed that sufficient funding was available to recruit the minimum sample size needed to achieve sufficient statistical power to detect the smallest effect size of interest (preregistered to be $r \geq 0.1$ or conversely $r \leq -0.1$). Participants were compensated ¥3 Renminbi (or Chinese Yuan; approximately £0.37 or US$0.44), which was automatically determined as appropriate by the Tencent Survey platform based on the survey's short length and minimal difficulty level and could not be amended by the research team. Considering the difference between the gross domestic product per capita for the PRC when compared to that of richer Western countries, this amount of compensation appeared appropriate in context. The present study was conducted in accordance with the *Danish Code of Conduct for Research Integrity* (Ministry of Higher Education and Science (Denmark), 2014), as adopted by the IT University of Copenhagen, with due consideration of ethical issues during the research planning process. The present study received ethics approval from the Pro-Rector of the IT University of Copenhagen after consultation with the University's Research Ethics Committee.

Overall, 6117 users viewed the survey, and 3348 completed responses were received (54.7 % response rate) between 23 and 25 January 2023. The preregistered exclusion criteria were applied. Amongst all 3348 complete responses collected, 61 were excluded for not being aged 18+; nine were excluded for responding from outside Mainland China or for self-reporting living outside of Mainland China; 156 were excluded for not playing video games in the past 12 months; 140 were excluded for failing two or three of the nuisance response detection questions; 100 were excluded for self-reporting extreme income and spending values (3 SDs away from the mean, as preregistered); nine were excluded for self-reporting being older than 99 years; 190 responses were excluded for self-reporting a disposable income higher than their total income; and 82 responses were excluded for providing inconsistent gambling participation and gambling spending answers. The remaining 2601 responses (77.7 % of all responses collected) were considered valid responses and constituted the sample.

Only participants that failed at least two of the three nuisance responding detection tasks were excluded as preregistered and justified therein. Only one participant failed all three (0.03 %), 139 participants (4.5 %) failed two, and 812 participants failed one (26.0 %).

The following variables were measured.

2.1. Demographics

All participants' *gender*, *age*, *education level*, *resident Chinese region* (specifically, province, city, and civic district) were collected.

2.2. Income

Total average monthly income minus tax and *average monthly disposable income* (defined as total income minus tax and minus essential living costs, such as rent and food costs) were collected. The two income variables were collected to provide demographic information and were not intended to be used for inferential analysis herein as preregistered.

2.3. Loot box, video gaming, and other monetary spending

Participants were presented with a definition for paid loot boxes, adapted from the PRC Ministry of Culture's definitions (文化部 [Ministry of Culture] (PRC), 2016) and the definition used by Xiao, Fraser, and Newall (2023), as shown in Fig. 1. Participants were then asked to quantify their *loot box spending*; videogaming *spending* (other than on loot boxes); *digital spending* (other than on loot boxes and videogaming; *e.g.*, purchasing music, electronic books (e-books), and non-gaming computer software and mobile apps); and *entertainment spending* (other than on gambling, loot boxes, videogaming, and digital purchases). The *digital spending* and *entertainment spending* variables were collected to follow the design of Etchells et al. (2022) and allow the dataset (which has been publicly shared under a CC-BY licence) to be more comparable for potential future research, but were not intended to be used for inferential analysis herein as preregistered.

Loot box mechanics are in-game microtransactions that are paid for with real money and which provide the player with randomised rewards. Players do not know what rewards they will get when they purchase loot boxes.

This includes both randomised 'pull' mechanics and randomised 'fusion' mechanics.

Randomised 'pull' mechanics are those through which the player obtains rewards through a paid randomised process.

Randomised 'fusion' mechanics are those that, for example, allow the player to upgrade a specific weapon at a cost (spending other weapons) but only with a randomised (non-100%) chance of success.

Loot boxes may be represented as 'loot crates,' 'treasure chests,' 'gacha,' 'card packs' (*Hearthstone*), 'scratch cards,' 'prize wheels,' and 'character summoning systems' (*Genshin Impact*).

Fig. 1. An English translation of the definition of 'loot boxes' presented in Simplified Chinese to participants.

2.4. Risky loot box use

Risky loot box use was assessed using the Risky Loot Box Index (RLI) (Brooks & Clark, 2019) which has demonstrated high internal reliability when previously used by Western loot box studies (e.g., Drummond, Sauer, Ferguson et al., 2020). The RLI was translated from English to Simplified Chinese using the back-translation technique (Brislin, 1970). The English RLI was first translated into Simplified Chinese by a bilingual Chinese–English speaker. Then, a second bilingual Chinese–English speaker, who was blind to the original English text of the RLI, translated the translated Simplified Chinese RLI back into English. The original English and the back-translated English versions were then compared by the two translators, who conferred and finalised the Simplified Chinese RLI, which was used. Internal reliability was good (Cronbach's $\alpha = 0.83$).

2.5. Problem videogaming severity

Problem videogaming severity was measured using an adapted version of the DSM-5 IGD (Internet Gaming Disorder) Symptoms Checklist for Adolescents (DISCA) which was developed and validated amongst Mainland Chinese adolescents in Yang et al. (2021). The Traditional Chinese version provided by whose authors was used after two adaptions. Firstly, a conversion to Simplified Mandarin Chinese and one minor modification to the original Cantonese vocabulary (references to the Cantonese term of '打机 [literally, hit machine]' were changed to the Mandarin term of '玩电子游戏 [literally, play digital games]') were made to accommodate non-Cantonese-speaking survey participants. Secondly, emulating the English IGD Checklist (Przybylski et al., 2017) (which was used by previous Western loot box studies (Drummond, Sauer, Ferguson et al., 2020; Etchells et al., 2022; Hall et al., 2021)) and the Nine-Item Internet Gaming Disorder Scale–Short Form (IGDS9-SF) (whose Chinese translation's wording is largely identical to the DISCA and has been validated (Leung et al., 2020; Qin et al., 2020; Yam et al., 2019)), the DISCA scoring system was changed from a binary 'has not'/'has' to a 5-point Likert scale ranging from 'never' to 'very often' for each of the nine items. All versions and changes were documented at the data deposit link. Notably, although IGD refers to '*internet* gaming disorder,' the English IGD Checklist, the IGDS9-SF and the DISCA do *not* refer to videogaming only in an exclusively online context, and all instead describe videogaming in general (*i.e.*, in both online and offline contexts). Therefore, this variable sought to assess *problem videogaming severity* generally regardless of internet connectivity and was described as such. Internal reliability was good (Cronbach's $\alpha = 0.88$).

2.6. Past-year gambling participation and spending

Participants were presented with a definition for 'gambling,' adapted from the definition used by Xiao, Fraser, and Newall (2023). Specifically, participants were instructed that 'gambling' is inclusive of: (i) buying lottery tickets and scratch cards (the only legalised forms of gambling in the PRC (Xiao, Fraser, & Newall, 2023; Ye et al., 2012; Zeng & Zhang, 2007)); (ii) any other bets placed for money, including casual gambling on games like Mahjong between friends and relatives; and (iii) participating in legalised forms of gambling, such as sports betting and casino games, in other territories. The definition did not explicitly refer to illegal gambling but also did not exclude illegal gambling. Participants were not given any instructions on whether or not loot boxes should be viewed as gambling: this was a conscious design decision to ensure that the present study replicated the previous Western methodology, even though that previous Western methodology has been critiqued (see Sidloski et al., 2022). Noise was likely introduced through this arguably flawed methodology, but this was specifically permitted to ensure that a similar level of noise as experienced by previous Western studies were also incorporated (barring cultural differences). Participants were then asked whether they participated in 'gambling' in the past 12 months and how much they spent during that period.

2.7. Problem gambling severity

Problem gambling severity was measured using the Problem Gambling Severity Index (PGSI) (Ferris & Wynne, 2001), which all participants were asked to complete regardless of their *past-year gambling participation status*, following previous Western loot box studies (e.g., Zendle & Cairns, 2018; Zendle & Cairns, 2019). A translated Chinese version of the PGSI has been validated (Loo et al., 2011). Each participant scored between *0* and *27*. Participants were categorised using the revised PGSI scoring system of Currie et al. (2013). Internal reliability was good (Cronbach's $\alpha = 0.88$).

2.8. Impulsivity

Impulsivity was measured using the Barratt Impulsiveness Scale-Brief (BIS-Brief) (Steinberg et al., 2013). A translated Chinese version of the

Table 1
Demographics (N = 2601).

Characteristic	Percentage of participants
Age	
18–24	60.6 %
25–29	21.6 %
30–34	9.0 %
35–39	5.3 %
40–45	1.9 %
45+	1.7 %
Gender	
Male	46.1 %
Female	53.6 %
Other	0.3 %
Education level	
Middle school or below	2.3 %
High school or equivalent	13.8 %
Post-secondary vocational school	28.1 %
Bachelor's degree	50.5 %
Master's degree or above	5.3 %

Table 2
Income and loot box and video game spending (N = 2601).

Characteristic	
Total income (previous month; Chinese Yuan)	
Mean (SD)	5786 (10,235)
95 % CI	[5392, 6179]
Minimum–Maximum	0–200,000
Disposable income (previous month; Chinese Yuan)	
Mean (SD)	2882 (3644)
95 % CI	[2741, 3022]
Minimum–Maximum	−1000–50,000
Loot box spending (previous 12 months; Chinese Yuan)	
Mean (SD)	400 (1094)
95 % CI	[358, 442]
Minimum–Maximum	0–10,006
Video game spending excluding loot box spending (previous 12 months; Chinese Yuan)	
Mean (SD)	374 (997)
95 % CI	[335, 412]
Minimum–Maximum	0–15,000

Note. Around the data collection period, ¥1000 Renminbi (or Chinese Yuan) was worth approximately £120 or US$150.

BIS-Brief has been validated (Wang et al., 2019). The BIS-Brief was chosen due to its relatively short length to reduce the burden on participants' time and research resources. The BIS-Brief is arguably sufficient for measuring general impulsivity but is not detailed enough to capture specific components of impulsivity (Steinberg et al., 2013, p. 224), and the BIS-Brief may indeed not capture the aspects of impulsivity that are relevant to loot boxes, as a study published after data collection has suggested (Garrett et al., 2023, pp. 2–3, 12). Internal reliability was acceptable (Cronbach's α = 0.70).

2.9. Sensation seeking tendencies

Sensation seeking tendencies was measured using the Brief Sensation Seeking Scale for Chinese (BSSS-C) (Chen et al., 2013), which is a culturally adapted and validated version of the Brief Sensation Seeking Scale (BSSS) (Hoyle et al., 2002) that substantially revised Western culture-specific references (*e.g.*, 'bungee jumping' and 'wild parties') to be more general (*e.g.*, 'socialize with adventurous people' and 'go for … exciting and stimulating [things]') and thereby rendered the BSSS-C to be more culturally sensitive and reflective of the experiences of people from developing countries. A further revised version of the BSSS-C provided by the corresponding author of Chen et al. (2013) was used. Internal reliability was acceptable (Cronbach's α = 0.77).

2.10. Mental wellbeing

Mental wellbeing was measured using the Short Warwick–Edinburgh Mental Well-being Scale (SWEMWBS) (Stewart-Brown et al., 2009), which is a shortened version of the Warwick–Edinburgh Mental Well-being Scale (WEMWBS) (Tennant et al., 2007). A translated Chinese version of the SWEMWBS has been validated in Mainland China and been found to be more reliable than the longer WEMWBS (Dong et al., 2016; Fung, 2019). A Simplified Chinese translation provided by the corresponding author of Fung (2019) was used. The raw SWEMWBS score was converted into the metric SWEMWBS score in accordance with Stewart-Brown et al. (2009). Internal reliability was good (Cronbach's α = 0.87).

2.11. Psychological distress

Psychological distress was measured using the 6-item Kessler Psychological Distress Scale (K6+) (Kessler et al., 2003). A translated Chinese version of the K6+ has been validated in Kang et al. (2015), and a Simplified Chinese translation provided by whose corresponding author was used. Internal reliability was good (Cronbach's α = 0.89).

3. Results

3.1. Descriptive Statistics: Sample characteristics

Sample characteristics are shown in Table 1. Participants were predominantly young (M_{age} = 25.0, *SD* = 6.3). However, unlike Xiao, Fraser, and Newall (2023) and many previous Western loot box studies that recruited between 80 % and 90 % males (e.g., Macey & Hamari, 2019; Zendle & Cairns, 2018; Zendle et al., 2019), 53.6 % of the present sample identified as female. Participants were well-educated.

Amongst all participants, 65.1 % spent money on video games in any form; 56.6 % spent money on non-loot box aspects of video games (including purchasing software and making in-game microtransactions that do not involve randomisation); and 51.4 % spent money on loot boxes. The vast majority (79.2 %) of all participants played games containing loot boxes. Amongst 2060 participants who played games containing loot boxes, 64.0 % spent money purchasing loot boxes.

Further information on income and video game and loot box spending are shown in Table 2.

Overall, 28.1 % of participants gambled in the previous 12 months. The problem gambling status of participants was determined using Currie et al.'s revised PGSI scoring system (2013), as the full breakdown in Table 3 shows. Overall, 25.0 % of gamblers, or 7.0 % of all participants, were deemed to be problem gamblers.

Table 3
Problem gambling severity categories (N = 2601).

Problem gambling severity category	Percentage of participants	Percentage of gamblers (*n* = 732)	Loot box spending (previous 12 months; Chinese Yuan); Mean (SD)
Non-gamblers	71.9 %	N/A	303 (901)
Non-problem gamblers	4.3 %	15.4 %	459 (1512)
Low risk gamblers	11.7 %	41.4 %	531 (1213)
Moderate risk gamblers	5.1 %	18.2 %	603 (1221)
Problem Gamblers	7.0 %	25.0 %	992 (1823)

Table 4
Correlation coefficients for loot box spending and various potential risk factors and mental health indicators amongst all participants (N = 2601).

	Problem gambling	Problem videogaming	Impulsivity	Risky loot box use	Sensation seeking tendencies	Mental wellbeing	Psychological distress	Binary past-year gambling participation status
Problem videogaming	0.35***	1						
Impulsivity	0.12***	0.27***	1					
Risky loot box use	0.28***	0.34***	0.01	1				
Sensation seeking tendencies	0.21***	0.23***	0.07***	0.25***	1			
Mental wellbeing	0.03	−0.11***	−0.44***	0.09***	0.07***	1		
Psychological distress	0.17***	0.28***	0.36***	0.02	0.06**	−0.46***	1	
Binary past-year gambling participation status	0.34***	0.13***	0.02	0.16***	0.06**	0.05*	−0.02	1
Loot box spending	0.22***	0.28***	−0.05**	0.42***	0.11***	0.10***	−0.02	0.14***

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.
Note. df = 2599. The correlation coefficients involving *Loot box spending* were calculated using Spearman's rank-order correlation tests, whilst others were tested using Pearson's correlation tests, except those involving *Binary past-year gambling participation status* were tested using point-biserial correlation tests.

3.2. Preregistered analyses

Hypothesis 1 was supported: loot box spending was positively correlated with raw problem gambling severity scores ($r_s(2599) = 0.22$, $p < .001$). The correlation held amongst both gamblers ($r_s(730) = 0.27$, $p < .001$) and non-gamblers ($r_s(1867) = 0.11$, $p < .001$) when tested separately.

A correlation matrix between loot box spending and various potential risk factors and mental health indicators is shown in Table 4.

Hypothesis 2 was partially supported: loot box spending was positively correlated with problem videogaming severity, past-year gambling participation status, risky loot box use, and sensation seeking tendencies. However, loot box spending was negligibly negatively correlated with impulsivity, contrary to Hypothesis 2.

Hypothesis 3 was not supported. Contrary to Hypothesis 3, loot box spending was weakly positively correlated with mental wellbeing. No statistically significant relationship was found between loot box spending and psychological distress.

Finally, in a multiple linear regression model shown in Table 5, all independent variables were statistically significant except for sensation seeking tendencies and mental wellbeing. Risky loot box use was the best predictor for loot box spending, and problem videogaming was a better predictor than problem gambling. Surprisingly, high impulsivity and high psychological distress *negatively* predicted loot box engagement. As shown in Table 4, multicollinearity was not an issue as all relevant correlations were below the preregistered $r = 0.7$ threshold, so no further models were explored to address that point.

3.3. Exploratory analyses: gamblers-only subsample: addressing the noise created by the non-screening PGSI administration methodology

Recognising that a majority of the whole sample (71.9 %) did not participate in traditional gambling in the past year, the relationships between loot box spending and various constructs were reanalysed amongst the subsample of 732 participants who *did* gamble to confirm that the results would remain consistent amongst active gamblers. We were able to conduct such exploratory analyses only because the present study screened participants about their past-year gambling participation: previous studies that did not do so could not conduct these analyses. This exploratory approach also reduces potential noise that might stem from the tautological issue identified in Sidloski et al. (2022) and detailed in the Introduction, by not including nongamblers who provided a non-*0* PGSI score. (However, this approach does not entirely remove all such noise because, *inter alia*, even gambling participants may still have provided PGSI responses that were partially affected by the tautology issue.) No reanalyses were conducted using *binary past-year gambling participation status* amongst the gamblers-only subsample as doing so would be nonsensical given that every participant in the subsample would have by definition been a past-year gambler. The bivariate and multivariate results are shown in Table 6 and Table 7, respectively.

As to the correlational analyses, when the results from the whole sample and the subsample were compared, no major differences arose as to the relationships involving loot box spending. However, notably, the positive correlations between problem gambling and various known risk factors thereof were stronger, some markedly so. As to the linear regression model, again, no major directional differences were identified. However, notably, amongst the gambler subsample, the surprising findings that impulsivity and psychological distress negatively predicts loot box spending were even more striking.

3.4. Exploratory analyses: construct validity of the RLI

A confirmatory factor analysis (CFA) was conducted with the five items of the RLI as indicators of the one latent construct of *risky loot box use*: $\chi^2(5) = 136.49$, $p < .001$, RMSEA = 0.101, 90 % CI [0.086, 0.115], CFI = 0.970, TLI = 0.940, SRMR = 0.029. The model fit indices lead to conflicting interpretations but overall suggest that the model may not be

Table 5
Linear regressions predicting loot box spending amongst all participants (N = 2601).

Variables	B	95 % CI	SE	β	t	p-value
Constant	−14.7	−29.3, −0.076	7.45	N/A	−3.56	<0.001
Risky loot box use	3.08	2.72, 3.45	0.185	0.324	16.7	<0.001
Problem videogaming	0.909	0.676, 1.14	0.119	0.158	7.64	<0.001
Problem gambling	0.824	0.474, 1.17	0.178	0.090	4.61	<0.001
Mental wellbeing	0.317	−0.078, 0.712	0.201	0.034	1.57	0.116
Sensation seeking tendencies	-0.189	−0.473, 0.095	0.145	−0.024	−1.30	0.192
Psychological distress	−0.454	−0.779, −0.128	0.166	−0.057	−2.73	0.006
Impulsivity	−1.11	−1.58, −0.648	0.237	−0.096	−4.69	<0.001

Note. β = standardized coefficient.

Table 6
Correlation coefficients for loot box spending and various potential risk factors and mental health indicators amongst gamblers only (n = 732).

	Problem gambling	Problem videogaming	Impulsivity	Risky loot box use	Sensation seeking tendencies	Mental wellbeing	Psychological distress
Problem videogaming	0.47***	1					
Impulsivity	0.22***	0.28***	1				
Risky loot box use	0.31***	0.30***	−0.05	1			
Sensation seeking tendencies	0.28***	0.25***	0.07	0.26***	1		
Mental wellbeing	−0.01	−0.13***	−0.45***	0.09*	0.03	1	
Psychological distress	0.32***	0.35***	0.37***	0.03	0.09*	−0.38***	1
Loot box spending	0.27***	0.26***	−0.09*	0.45***	0.14***	0.09*	−0.04

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.
Note. df = 730. The correlation coefficients involving *Loot box spending* were calculated using Spearman's rank-order correlation tests, whilst others were tested using Pearson's correlation tests.

Table 7
Linear regressions predicting loot box spending amongst gamblers only (n = 732).

Variables	B	95 % CI	SE	β	t	p-value
Constant	−10.7	−43.2, 21.8	16.5	N/A	−0.65	0.518
Risky loot box use	3.80	3.01, 4.59	0.402	0.341	9.45	< 0.001
Problem videogaming	0.898	0.400, 1.40	0.254	0.141	3.54	< 0.001
Problem gambling	1.21	0.526, 1.89	0.347	0.137	3.48	0.001
Mental wellbeing	0.039	−0.793, 0.871	0.424	0.004	0.09	0.927
Sensation seeking tendencies	−0.067	−0.638, 0.504	0.291	−0.008	−0.23	0.817
Impulsivity	−1.38	−2.35, −0.407	0.495	−0.108	−2.79	0.005
Psychological distress	−1.10	−1.79, −0.409	0.353	−0.121	−3.12	0.002

Note. β = standardized coefficient.

a good fit to the data, as indicated by the significant chi-square test, high RMSEA (>0.06), and low TLI (<0.95), despite the relatively high CFI (>0.95) and low SRMR (<0.08) (Hu & Bentler, 1999, p. 27). The relatively large sample size needs to be taken into consideration when interpreting this finding. All five items did show significant positive loadings on the latent variable, ranging from 0.681 to 0.737 ($ps <$ 0.001), as elaborated in Table 8.

4. Discussion

The correlation between loot box spending and problem gambling was successfully replicated in the PRC, thus dispelling the concerns that the relationship potentially does not exist amongst said country's players (Xiao, Fraser, & Newall, 2023). Notably, the PRC does not represent all non-Western countries, so further studies in other countries (particularly in the Global South) and more granular studies on various diverse regions of a country should be conducted (Ghai, 2021). The strength of the correlation in the PRC ($r = 0.22$) is comparable to that found in Western and international contexts by meta-analyses: $r = 0.26$ (Garea et al., 2021) or $r = 0.27$ (Spicer et al., 2021).

The present study screened participants as to whether or not they gambled in the past year, but still asked all participants to complete the PGSI. This allowed for the sample to be subdivided into non-gamblers and gamblers. The correlation between loot box spending and problem gambling was much weaker amongst non-gamblers ($r = 0.11$) as compared to amongst gamblers ($r = 0.27$). However, what is most interesting is that a correlation existed at all amongst non-gamblers. Sidloski et al. (2022) raised concerns about participants counting loot boxes as a type of 'gambling' and reporting problematic loot box use when asked to complete the problem 'gambling' scale (which is supposed to, at least as intended by the researchers, be restricted to problem use of traditional gambling only). In the present sample, 25.5 % of participants reported *not* participating in gambling in the past year but then received a non-*0* PGSI score. Following the prior literature, participants were not given any instructions as to whether loot boxes should or should not be viewed as a type of gambling prior to completing the PGSI. This one-fourth of participants may have therefore (i) considered loot boxes to be a type of gambling; (ii) been referring to legacy harms that persisted after they have stopped gambling (Sidloski et al., 2022, p. 5); (iii) been reminded that they did actually participate in gambling after being pressed to answer the more detailed PGSI questions; or (iv) provided nuisance responses. By considering gamblers and non-gamblers separately, the present study shows that the inclusion of non-gambling participants affects the strength of the correlation. Researchers should consider whether participants should be screened for gambling participation before being presented with the problem gambling scale whose wording often assumes the participant to have previously gambled, which some participants might find inappropriate (Xiao, Fraser, & Newall, 2023). Not screening participants may also lead to limited measurement errors, although this has been shown not to affect the existence of the relationship and only affect the degree of association minorly (Xiao et al., 2023).

The correlation between loot box spending and problem videogaming, which has been inconsistently observed in Western and international contexts (Spicer et al., 2021), was successfully replicated in the PRC. (Although beyond the ambit of this study, note, however, that there is debate within the literature as to whether problem videogaming and harm thereof are being effectively measured by various scales purporting to do so (Przybylski et al., 2017; see also Ballou & Van Rooij, 2021; Ballou and Zendle, 2022; King et al., 2020; Nielsen et al., 2022).) Impulsivity was previously found to be negligibly positively correlated with loot box spending in the PRC (Xiao, Fraser, & Newall, 2023), whilst the present results contrastingly showed a negligible negative correlation. In the linear regression model, impulsivity contrarily negatively predicted loot box spending, which is surprising. Mixed results were previously found in Western and international contexts as to the association between loot box engagement and impulsivity (Garrett et al., 2023; Wardle & Zendle, 2021, p. 269; cf. Zendle et al., 2019, pp. 15–16; Spicer et al., 2022, p. 4), which might be explained by how only certain aspects of impulsivity are relevant and the aspects that were measured in any particular study depended on the researcher's choice of instrument (Garrett et al., 2023, pp. 2–312). The BIS-Brief used by the present study

Table 8
Standardized factor loadings, standard errors, and 95 % confidence intervals for the CFA model (N = 2601).

RLI Items	Standardised factor loading	95 % CI	SE	*z*	*p*-value
(1) 打开开宝箱机制的快感促使了我购买更多。 / [The thrill of opening Loot Boxes has encouraged me to buy more.]	0.686	0.661, 0.712	0.013	53.06	< 0.001
(2) 为了获得宝箱, 我经常玩游戏的时间比我打算的要长。 / [I frequently play games longer than I intend to, so I can earn Loot Boxes.]	0.697	0.671, 0.722	0.013	54.36	< 0.001
(3) 以便能够赚取或购买更多的开宝箱机制, 我推迟了其他活动、工作或家务。 / [I have put off other activities, work, or chores to be able to earn or buy more Loot Boxes.]	0.681	0.655, 0.706	0.013	52.05	< 0.001
(4) 一旦我打开一个开宝箱机制, 我经常会觉得有必要打开另一个。 / [Once I open a Loot Box, I often feel compelled to open another.]	0.737	0.714, 0.760	0.012	62.79	< 0.001
(5) 在未能从开宝箱机制获得价值高的奖励后, 我购买了更多个。 / [I have bought more Loot Boxes after failing to receive valuable items.]	0.714	0.690, 0.738	0.012	57.74	< 0.001

Note. β = standardized coefficient.

is unidimensional (and was chosen for its conciseness), but future studies should consider using alternative, multifactorial measurements as impulsivity is a complex construct (Garrett et al., 2023, p. 12). Sensation seeking tendencies and binary gambling participation status were also only weakly correlated with loot box spending. Future studies should explore why some of these factors were inert and consider other potential risk factors for loot box harms.

The Simplified Chinese version of the RLI was moderately positively correlated with loot box spending and was also the best multivariate predictor for loot box spending. The RLI appears suitable for being translated cross-culturally to measure risky loot box consumption (Forsström et al., 2022), although attention should be paid to how 'loot boxes' are defined and described. In Simplified Chinese, there is no direct translation for 'loot boxes,' so it was necessary to provide a lengthy introduction before presenting the RLI. The academic literature does not agree as to how inclusive the term 'loot boxes' is even in English (Xiao et al., 2022; cf. Zendle et al., 2022). Players also likely understand the term 'loot boxes' to encompass different mechanics, and these interpretations may further vary across cultures. Gambling has negative social connotations in many cultures (Horch & Hodgins, 2008; Zeng & Zhang, 2007, p. 267), which may cause problem gambling scales to encounter measurement issues, such as inaccurate self-reporting. The RLI does not explicitly reference 'gambling' and is presumably a better international measure for the potential harms of high loot box engagement. The RLI also reflects the gambling literature's recent development of measures of gambling-related harm as an overlapping and yet distinct construct from gambling problems (Browne & Rockloff, 2017; Browne & Rockloff, 2020). Notwithstanding, the CFA revealed that the Simplified Chinese RLI translated by the present study can be improved upon: Forsström et al. (2022) proposed a revised seven-item Swedish RLI that was based on two factors, which respectively focused on the *overconsumption of time* and the *overconsumption of money*, rather than unidimensional as originally introduced by Brooks and Clark (2019).

Mental wellbeing was weakly *positively* correlated with loot box spending. In the linear regression model, surprisingly, psychological distress *negatively* predicted loot box spending. Mixed results were also previously presented in Western and international contexts as to whether loot box engagement was associated with worse mental wellbeing and psychological distress (Etchells et al., 2022; cf. Drummond et al., 2022). No evidence was found that loot box engagement correlated negatively with mental wellbeing or positively with psychological distress amongst PRC video game players. In fact, there was weak support for the opposite. The practical harms of engaging with loot boxes (if any) need further elucidation. The mere correlation between problem gambling and loot box spending does not indicate that loot box purchasing players are experiencing financial or other harms.

The present results indicate that loot box spending is indeed positively linked with gambling- and video gaming-related pathology (specifically, problem gambling, problem videogaming, and risky loot box use). However, surprisingly, loot box spending is *negatively* related to certain trait factors (specifically, high impulsivity and high psychological distress) that are known to be *positively* linked with other traditional forms of addiction-related pathology, such as problem gambling itself. These counter-intuitive results might be due to two factors or a combination of them. Firstly, social and cultural factors about the PRC (*e.g.*, social stigma associated with traditional gambling (Zeng & Zhang, p. 267)) might have affected the results, as the present findings on these specific points are not broadly consistent with previous Western results (cf. Drummond et al., 2022; Garrett et al., 2023). Secondly, the risk and protective factors that are relevant to loot boxes appear to be different from those associated with traditional gambling, at least in the PRC. Hence, loot boxes appear to be novel and unique products that should not be treated merely as a form of traditional gambling in future research and clinical practice. Insights derived from previous research on gambling, for example, might be relevant; however, further research is needed to understand what unique underlying construct(s) about loot

boxes can explain these seemingly conflicting findings. These dissimilarities between loot boxes and traditional gambling should be duly highlighted and further scrutinised, rather than dismissed as simply not conforming to the hypotheses stemming from the assumption that loot boxes are gambling-like in every respect (which previous drafts of this paper were guilty of).

As to limitations, this sample was not representative of the general video game player population in the PRC. Samples recruited from the Tencent Survey platform likely have inflated gambling participate rates and problem gambling rates, similarly to paid online convenience samples in Western and international contexts (Pickering & Blaszczynski, 2021). Although unrepresentative of the PRC general public, this platform is well-suited to cost-effectively recruiting specific samples of interest for gambling research (*e.g.*, gambling participants and people experiencing gambling harms) (Russell et al., 2022, p. 108). Further, similar to those used in previous loot box studies (e.g., Drummond, Sauer, Ferguson, & Hall, 2020; Etchells et al., 2022; Zendle & Cairns, 2018), the variables measured in the present study were based on self-reports, which are known to be inaccurate to a certain degree and therefore must be interpreted with due caution (e.g., Heirene et al., 2021). Indeed, in particular, the definition provided for 'gambling' was not necessarily accepted and applied by all participants uniformly when self-reporting their gambling spending. As previous Western studies have recognised (e.g., Zendle & Cairns, 2019, p. 11;see also Etchells et al., 2022, p. 12), more objective sources of spending data that are not self-reported (such as actual data held, but not yet shared, by the industry or data measured by hardware devices (see Petrovskaya & Zendle, 2023)) would help us to better understand the relationship between loot boxes and gambling. Additionally, the instruments chosen to measure certain variables did not necessarily capture all facets of a trait: for example, the BIS-Brief scale used to measure impulsivity, albeit validated (Steinberg et al., 2013; Wang et al., 2019), did not encompass all elements of the impulsivity construct. The results may have been different had other measuring instruments been used instead (see Garrett et al., 2023, p. 12). Finally, due to limited resources, relationships between loot box purchasing and time spent playing video games, other potential risk factors, and other addictive behaviours previously linked with excessive risk-taking, such as smoking and alcohol use, were not considered.

5. Conclusion

The positive correlations between loot box spending and problem gambling ($r = 0.22$) and between loot box spending and problem videogaming ($r = 0.28$) were replicated in the PRC. These correlations likely hold beyond Western contexts and across cultures. Most other potential risks factors (such as impulsivity and sensation seeking tendencies) did not prove useful at reflecting loot box harm. No evidence was found that loot box engagement correlates with negative mental health (*i.e.*, experiencing worse mental wellbeing or severer psychological distress) amongst PRC video game players. Surprisingly, on the contrary, a weak *positive* correlation was found between loot box purchasing and mental wellbeing, and regression analyses revealed that high impulsivity and high psychological distress actually *negatively* predicted loot box spending. These results suggests that (at least in the PRC, potentially due to social and cultural factors) loot boxes are unique products that do not necessarily share the same risk and protective factors as traditional forms of addiction-related pathology, such as problem gambling itself. Further research is required to better explain this apparent conflict. Finally, the Risky Loot Box Index does not explicitly reference 'gambling' and is a more culturally aware tool for measuring loot box harms than problem gambling scales. We hope the present results can shift the debate beyond Western countries and stimulate further cross-cultural research for the better understanding of loot box harms globally.

CRediT authorship contribution statement

Leon Y. Xiao: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Visualization, Funding acquisition, Writing - original draft, Writing - review & editing. **Tullia C. Fraser:** Methodology, Writing - review & editing. **Rune Kristian Lundedal Nielsen:** Conceptualization, Methodology, Resources, Supervision, Writing - review & editing. **Philip W.S. Newall:** Conceptualization, Methodology, Resources, Supervision, Writing - original draft, Writing - review & editing.

Declaration of Competing 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 contributed and continues to contribute to research projects that were enabled by data access provided by the video game industry, specifically Unity Technologies (NYSE:U) (October 2022 – Present). L.Y.X. has met and discussed policy, regulation, and enforcement with the Belgian Gaming Commission [Belgische Kansspelcommissie] (June 2022 & February 2023), the Danish Competition and Consumer Authority [Konkurrence- og Forbrugerstyrelsen] (August 2022), the Department for Digital, Culture, Media and Sport (DCMS) and its successor of the UK Government (August 2022 & August 2023), PEGI (Pan-European Game Information) (January & March 2023), a member of the European Parliament (February 2023), the US Federal Trade Commission (February 2023), the Finnish Gambling Administration at the National Police Board [Poliisihallituksen arpajaishallinto / Polisstyrelsens lotteriförvaltning] (March 2023), the Danish Gambling Authority [Spillemyndigheden] (April 2023), the Netherlands Authority for Consumers and Markets [Autoriteit Consument & Markt] (May & June 2023), and the Swedish Gambling Authority [Spelinspektionen] (June 2023). 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 two AFSG (Academic Forum for the Study of Gambling) Postgraduate Research Support Grants that were 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 & January 2023). 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, & December 2022). L.Y.X. has accepted conference travel and attendance grants from the Socio-Legal Studies Association (February 2022 & February 2023); the Current Advances in Gambling Research Conference Organising Committee with support from 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); the Society for the Study of Addiction (November 2022 & March 2023); and the organisers of the 13th Nordic SNSUS (Stiftelsen Nordiska Sällskapet för Upplysning om Spelberoende; the Nordic Society Foundation for Information about Problem Gambling) Conference, which received gambling industry sponsorship (January 2023). L.Y.X. has received an honorarium from the Center for Ludomani for contributing a parent guide about a mobile game for Tjekspillet.dk, which is funded by the Danish Ministry of Health's gambling addiction pool (Sundhedsministeriets Ludomanipulje) (March 2023). The up-to-date version of L.Y.X.'s conflict of

interest statement is available via: https://sites.google.com/view/leon-xiao/about/conflict-of-interest. T.C.F. declares no conflicts of interest. R.K.L.N. has received an honorarium from the Center for Ludomani for contributing parent guides about different games for Tjekspillet.dk, which is funded by the Danish Ministry of Health's gambling disorder pool (Sundhedsministeriets Ludomanipulje). R.K.L.N. has served as an expert witness in a legal case about whether 'loot boxes' should be considered a form of gambling, R.K.L.N. did not receive an honorarium or any other type of payment for this work; the honorarium was instead donated to an unknown charity. The content of the expert witness statement was identical to arguments made in R.K.L.N.'s published research. P.W.S.N. is a member of the Advisory Board for Safer Gambling –an advisory group of the Gambling Commission in Great Britain, and in 2020 was a special advisor to the House of Lords Select Committee Enquiry on the Social and Economic Impact of the Gambling Industry. In the last three years, P.W.S.N. has contributed to research projects funded by the Academic Forum for the Study of Gambling, Clean Up Gambling, Gambling Research Australia, NSW Responsible Gambling Fund, and the Victorian Responsible Gambling Foundation. P. W.S.N. has received open access fee grant income from Gambling Research Exchange Ontario.

Data availability

The raw data, survey materials, and analysis scripts and results are available via the Open Science Framework at https://doi.org/10.17605/OSF.IO/MCJD6.

Acknowledgements

Thanks to Xinguang CHEN for providing the BSSS-C; Sai-fu FUNG for providing a Simplified Chinese translation of the SWEMWBS; Wan-jun GUO for providing a Simplified Chinese translation of the K6+; and Sherry Xue YANG and Xuewen JIANG for providing the Traditional Chinese DISCA. Thanks to Aaron Drummond and David Zendle for helpful, critical feedback on previous drafts.

Funding Information

This study was funded by an Academic Forum for the Study of Gambling (AFSG) Postgraduate Research Support Grant awarded to L.Y. X. 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). The funder had no involvement in study design, collection, analysis, or interpretation of data, writing the manuscript, and the decision to submit the manuscript for publication. L.Y.X. is supported by a PhD Fellowship funded by the IT University of Copenhagen (IT-Universitetet i København), which is publicly funded by the Kingdom of Denmark (Kongeriget Danmark).

References

Ballou, N., & Van Rooij, A. J. (2021). The relationship between mental well-being and dysregulated gaming: A specification curve analysis of core and peripheral criteria in five gaming disorder scales. *Royal Society Open Science, 8*(5), Article 201385. https://doi.org/10.1098/rsos.201385

Ballou, N., & Zendle, D. (2022). "Clinically significant distress" in internet gaming disorder: An individual participant meta-analysis. *Computers in Human Behavior, 129*, Article 107140. https://doi.org/10.1016/j.chb.2021.107140

Brislin, R. W. (1970). Back-Translation for Cross-Cultural Research. *Journal of Cross-Cultural Psychology, 1*(3), 185–216. https://doi.org/10.1177/135910457000100301

Brooks, G. A., & Clark, L. (2019). Associations between loot box use, problematic gaming and gambling, and gambling-related cognitions. *Addictive Behaviors, 96*, 26–34. https://doi.org/10.1016/j.addbeh.2019.04.009

Browne, M., Hing, N., Rockloff, M., Russell, A. M. T., Greer, N., Nicoll, F., et al. (2019). A Multivariate Evaluation of 25 Proximal and Distal Risk-Factors for Gambling-Related Harm. *Journal of Clinical Medicine, 8*(4), Article 4. https://doi.org/10.3390/jcm8040509

Browne, M., & Rockloff, M. J. (2017). The dangers of conflating gambling-related harm with disordered gambling: Commentary on: Prevention paradox logic and problem gambling (Delfabbro & King, 2017). *Journal of Behavioral Addictions, 6*(3), 317–320. https://doi.org/10.1556/2006.6.2017.059

Browne, M., & Rockloff, M. J. (2020). Measuring Behavioural Dependence in Gambling: A Case for Removing Harmful Consequences from the Assessment of Problem Gambling Pathology. *Journal of Gambling Studies, 36*(4), 1027–1044. https://doi.org/10.1007/s10899-019-09916-2

Calado, F., & Griffiths, M. D. (2016). Problem gambling worldwide: An update and systematic review of empirical research (2000–2015). *Journal of Behavioral Addictions, 5*(4), 592–613. https://doi.org/10.1556/2006.5.2016.073

Chen, X., Li, F., Nydegger, L., Gong, J., Ren, Y., Dinaj-Koci, V., et al. (2013). Brief Sensation Seeking Scale for Chinese – Cultural adaptation and psychometric assessment. *Personality and Individual Differences, 54*(5), 604–609. https://doi.org/10.1016/j.paid.2012.11.007

Close, J., Spicer, S. G., Nicklin, L. L., Lloyd, J., & Lloyd, H. (2022). Loot box engagement: Relationships with educational attainment, employment status and earnings in a cohort of 16,000 UK gamers. *Addiction, 117*(8), 2338–2345. https://doi.org/10.1111/add.15837

Close, J., Spicer, S. G., Nicklin, L. L., Uther, M., Lloyd, J., & Lloyd, H. (2021). Secondary analysis of loot box data: Are high-spending "whales" wealthy gamers or problem gamblers? *Addictive Behaviors, 117*, Article 106851. https://doi.org/10.1016/j.addbeh.2021.106851

Currie, S. R., Hodgins, D. C., & Casey, D. M. (2013). Validity of the Problem Gambling Severity Index Interpretive Categories. *Journal of Gambling Studies, 29*(2), 311–327. https://doi.org/10.1007/s10899-012-9300-6

Dong, A., Chen, X., Zhu, L., Shi, L., Cai, Y., Shi, B., et al. (2016). Translation and validation of a Chinese version of the Warwick-Edinburgh Mental Well-being Scale with undergraduate nursing trainees. *Journal of Psychiatric and Mental Health Nursing, 23*(9–10), 554–560. https://doi.org/10.1111/jpm.12344

Drummond, A., Hall, L. C., & Sauer, J. D. (2022). Surprisingly high prevalence rates of severe psychological distress among consumers who purchase loot boxes in video games. *Scientific Reports, 12*(1), Article 1. https://doi.org/10.1038/s41598-022-20549-1

Drummond, A., & Sauer, J. D. (2018). Video Game Loot Boxes Are Psychologically Akin to Gambling. *Nature Human Behaviour, 2*(8), 530–532. https://doi.org/10.1038/s41562-018-0360-1

Drummond, A., Sauer, J. D., Ferguson, C. J., & Hall, L. C. (2020). The relationship between problem gambling, excessive gaming, psychological distress and spending on loot boxes in Aotearoa New Zealand, Australia, and the United States—A cross-national survey. *PLOS ONE, 15*(3), Article e0230378. https://doi.org/10.1371/journal.pone.0230378

Drummond, A., Sauer, J. D., Hall, L. C., Zendle, D., & Loudon, M. R. (2020). Why loot boxes could be regulated as gambling. *Nature Human Behaviour, 4*, 986–988. https://doi.org/10.1038/s41562-020-0900-3

Etchells, P. J., Morgan, A. L., & Quintana, D. S. (2022). Loot box spending is associated with problem gambling but not mental wellbeing. *Royal Society Open Science, 9*(8), Article 220111. https://doi.org/10.1098/rsos.220111

Ferguson, C. J. (2023). An evolutionary model for aggression in youth: Rethinking aggression in terms of the Catalyst Model. *New Ideas in Psychology, 70*, Article 101029. https://doi.org/10.1016/j.newideapsych.2023.101029

Ferris, J., & Wynne, H. (2001). *The Canadian Problem Gambling Index: Final Report.* Canadian Centre on Substance Abuse. https://www.greo.ca/Modules/EvidenceCentre/files/Ferris%20et%20al(2001)The_Canadian_Problem_Gambling_Index.pdf.

Forsström, D., Chahin, G., Savander, S., Mentzoni, R. A., & Gainsbury, S. (2022). Measuring loot box consumption and negative consequences: Psychometric investigation of a Swedish version of the Risky Loot Box Index. *Addictive Behaviors Reports, 16*, Article 100453. https://doi.org/10.1016/j.abrep.2022.100453

Fung, S. (2019). Psychometric evaluation of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) with Chinese University Students. *Health and Quality of Life Outcomes, 17*(1), 46. https://doi.org/10.1186/s12955-019-1113-1

Garea, S. S., Drummond, A., Sauer, J. D., Hall, L. C., & Williams, M. N. (2021). Meta-analysis of the relationship between problem gambling, excessive gaming and loot box spending. *International Gambling Studies, 21*(3), 460–479. https://doi.org/10.1080/14459795.2021.1914705

Garrett, E. P., Drummond, A., Lowe-Calverley, E., de Salas, K., Lewis, I., & Sauer, J. D. (2023). Impulsivity and loot box engagement. *Telematics and Informatics, 78*, Article 101952. https://doi.org/10.1016/j.tele.2023.101952

Ghai, S. (2021). It's time to reimagine sample diversity and retire the WEIRD dichotomy. *Nature Human Behaviour, 5*(8), 971–972. https://doi.org/10.1038/s41562-021-01175-9

González-Cabrera, J., Basterra-González, A., Montiel, I., Calvete, E., Pontes, H. M., & Machimbarrena, J. M. (2021). Loot boxes in Spanish adolescents and young adults: Relationship with internet gaming disorder and online gambling disorder. *Computers in Human Behavior, 107012*. https://doi.org/10.1016/j.chb.2021.107012

Hall, L. C., Drummond, A., Sauer, J. D., & Ferguson, C. J. (2021). Effects of self-isolation and quarantine on loot box spending and excessive gaming—Results of a natural experiment. *PeerJ, 9*, Article e10705. https://doi.org/10.7717/peerj.10705

Harrison, G. W., Lau, M. I., & Ross, D. (2020). The Risk of Gambling Problems in the General Population: A Reconsideration. *Journal of Gambling Studies, 36*(4), 1133–1159. https://doi.org/10.1007/s10899-019-09897-2

Heirene, R. M., Wang, A., & Gainsbury, S. M. (2021). Accuracy of self-reported gambling frequency and outcomes: Comparisons with account data. *Psychology of Addictive Behaviors, 36*(4), 333–346. https://doi.org/10.1037/adb0000792

Horch, J. D., & Hodgins, D. C. (2008). Public Stigma of Disordered Gambling: Social Distance, Dangerousness, and Familiarity. *Journal of Social and Clinical Psychology, 27*(5), 505–528. https://doi.org/10.1521/jscp.2008.27.5.505

Hoyle, R. H., Stephenson, M. T., Palmgreen, P., Lorch, E. P., & Donohew, R. L. (2002). Reliability and validity of a brief measure of sensation seeking. *Personality and Individual Differences, 32*(3), 401–414. https://doi.org/10.1016/S0191-8869(01)00032-0

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Kang, Y., Guo, W., Xu, H., Chen, Y., Li, X., Tan, Z., et al. (2015). The 6-item Kessler psychological distress scale to survey serious mental illness among Chinese undergraduates: Psychometric properties and prevalence estimate. *Comprehensive Psychiatry, 63*, 105–112. https://doi.org/10.1016/j.comppsych.2015.08.011

Kessler, R. C., Barker, P. R., Colpe, L. J., Epstein, J. F., Gfroerer, J. C., Hiripi, E., et al. (2003). Screening for Serious Mental Illness in the General Population. *Archives of General Psychiatry, 60*(2), 184–189. https://doi.org/10.1001/archpsyc.60.2.184

King, D. L., Chamberlain, S. R., Carragher, N., Billieux, J., Stein, D., Mueller, K., et al. (2020). Screening and assessment tools for gaming disorder: A comprehensive systematic review. *Clinical Psychology Review, 77*, Article 101831. https://doi.org/10.1016/j.cpr.2020.101831

Kristiansen, S., & Severin, M. C. (2019). Loot box engagement and problem gambling among adolescent gamers: Findings from a national survey. *Addictive Behaviors, 103*, Article 106254. https://doi.org/10.1016/j.addbeh.2019.106254

Larche, C. J., Chini, K., Lee, C., Dixon, M. J., & Fernandes, M. (2021). Rare Loot Box Rewards Trigger Larger Arousal and Reward Responses, and Greater Urge to Open More Loot Boxes. *Journal of Gambling Studies, 37*, 141–163. https://doi.org/10.1007/s10899-019-09913-5

Leung, H., Pakpour, A. H., Strong, C., Lin, Y.-C., Tsai, M.-C., Griffiths, M. D., et al. (2020). Measurement invariance across young adults from Hong Kong and Taiwan among three internet-related addiction scales: Bergen Social Media Addiction Scale (BSMAS), Smartphone Application-Based Addiction Scale (SABAS), and Internet Gaming Disorder Scale-Short Form (IGDS-SF9) (Study Part A). *Addictive Behaviors, 101*, Article 105969. https://doi.org/10.1016/j.addbeh.2019.04.027

Li, W., Mills, D., & Nower, L. (2019). The Relationship of Loot Box Purchases to Problem Video Gaming and Problem Gambling. *Addictive Behaviors, 97*, 27–34. https://doi.org/10.1016/j.addbeh.2019.05.016

Lloyd, J., Nicklin, L. L., Spicer, S. G., Fullwood, C., Uther, M., Hinton, D. P., et al. (2021). Development and Validation of the RAFFLE: A Measure of Reasons and Facilitators for Loot Box Engagement. *Journal of. Clinical Medicine, 10*(24), Article 24. https://doi.org/10.3390/jcm10245949

Loo, J. M. Y., Oei, T. P. S., & Raylu, N. (2011). Psychometric Evaluation of the Problem Gambling Severity Index-Chinese Version (PGSI-C). *Journal of Gambling Studies, 27*(3), 453–466. https://doi.org/10.1007/s10899-010-9221-1

Lorains, F. K., Cowlishaw, S., & Thomas, S. A. (2011). Prevalence of comorbid disorders in problem and pathological gambling: Systematic review and meta-analysis of population surveys. *Addiction, 106*(3), 490–498. https://doi.org/10.1111/j.1360-0443.2010.03300.x

Macey, J., & Hamari, J. (2019). eSports, Skins and Loot Boxes: Participants, Practices and Problematic Behaviour Associated With Emergent Forms of Gambling. *New Media & Society, 21*(1), 20–41. https://doi.org/10.1177/1461444818786216

Ministry of Higher Education and Science (Denmark). (2014). *Danish Code of Conduct for Research Integrity*. https://ufm.dk/en/publications/2014/the-danish-code-of-conduct-for-research-integrity.

Nielsen, R. K. L. (2022). Gaming Disorder – a "lousy" and "meaningless" label. In J. Aguilar Rodríguez, F. Alvarez Igarzábal, M. S. Debus, C. L. Maughan, S.-.-J. Song, M. Vozaru, & C. L. Maughan (Eds.), *Mental Health | Atmospheres | Video Games: New Directions in Game Research II* (pp. 21–34). transcript Verlag. https://doi.org/10.1515/9783839462645-004.

Nielsen, R. K. L., & Grabarczyk, P. (2019). Are Loot Boxes Gambling? Random Reward Mechanisms in Video Games. *Transactions of the Digital Games Research Association, 4*(3), 171–207. https://doi.org/10.26503/todigra.v4i3.104

Nower, L., Derevensky, J. L., & Gupta, R. (2004). The Relationship of Impulsivity, Sensation Seeking, Coping, and Substance Use in Youth Gamblers. *Psychology of Addictive Behaviors, 18*, 49–55. https://doi.org/10.1037/0893-164X.18.1.49

Petrovskaya, E., & Zendle, D. (2023). The relationship between psycho-environmental characteristics and wellbeing in non-spending players of certain mobile games. *Royal Society Open Science, 10*(1), Article 221129. https://doi.org/10.1098/rsos.221129

Pickering, D., & Blaszczynski, A. (2021). Paid online convenience samples in gambling studies: Questionable data quality. *International Gambling Studies, 21*(3), 516–536. https://doi.org/10.1080/14459795.2021.1884735

Przybylski, A. K., Weinstein, N., & Murayama, K. (2017). Internet Gaming Disorder: Investigating the Clinical Relevance of a New Phenomenon. *American Journal of Psychiatry, 174*(3), 230–236. https://doi.org/10.1176/appi.ajp.2016.16020224

Qin, L., Cheng, L., Hu, M., Liu, Q., Tong, J., Hao, W., et al. (2020). Clarification of the Cut-off Score for Nine-Item Internet Gaming Disorder Scale-Short Form (IGDS9-SF) in a Chinese Context. *Frontiers in Psychiatry, 11*. https://doi.org/10.3389/fpsyt.2020.00470

Rockloff, M., Russell, A. M. T., Greer, N., Lole, L., Hing, N., & Browne, M. (2021). Young people who purchase loot boxes are more likely to have gambling problems: An online survey of adolescents and young adults living in NSW Australia. *Journal of Behavioral Addictions, 10*(1). https://doi.org/10.1556/2006.2021.00007

Russell, A. M. T., Browne, M., Hing, N., Rockloff, M., & Newall, P. (2022). Are any samples representative or unbiased? Reply to Pickering and Blaszczynski. *International Gambling Studies, 22*(1), 102–113. https://doi.org/10.1080/14459795.2021.1973535

Sidloski, B., Brooks, G., Zhang, K., & Clark, L. (2022). Exploring the association between loot boxes and problem gambling: Are video gamers referring to loot boxes when they complete gambling screening tools? *Addictive Behaviors, 107318*. https://doi.org/10.1016/j.addbeh.2022.107318

Spicer, S. G., Fulwood, C., Close, J., Louise Nicklin, L., Lloyd, J., & Lloyd, H. (2022). Loot boxes and problem gambling: Investigating the "gateway hypothesis". *Addictive Behaviors, 107327*. https://doi.org/10.1016/j.addbeh.2022.107327

Spicer, S. G., Nicklin, L. L., Uther, M., Lloyd, J., Lloyd, H., & Close, J. (2021). Loot boxes, problem gambling and problem video gaming: A systematic review and meta-synthesis. *New Media & Society, 14614448211027175*. https://doi.org/10.1177/14614448211027175

Steinberg, L., Sharp, C., Stanford, M. S., & Tharp, A. T. (2013). New tricks for an old measure: The development of the Barratt Impulsiveness Scale-Brief (BIS-Brief). *Psychological Assessment, 25*(1), 216–226. https://doi.org/10.1037/a0030550

Stewart-Brown, S., Tennant, A., Tennant, R., Platt, S., Parkinson, J., & Weich, S. (2009). Internal construct validity of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS): A Rasch analysis using data from the Scottish Health Education Population Survey. *Health and Quality of Life Outcomes, 7*(1), 15. https://doi.org/10.1186/1477-7525-7-15

Sturgis, P., & Kuha, J. (2022). How survey mode affects estimates of the prevalence of gambling harm: A multisurvey study. *Public Health, 204*, 63–69. https://doi.org/10.1016/j.puhe.2021.12.014

Tennant, R., Hiller, L., Fishwick, R., Platt, S., Joseph, S., Weich, S., et al. (2007). The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): Development and UK validation. *Health and Quality of Life Outcomes, 5*(1), 63. https://doi.org/10.1186/1477-7525-5-63

von Meduna, M., Steinmetz, F., Ante, L., Reynolds, J., & Fiedler, I. (2020). Loot boxes are gambling-like elements in video games with harmful potential: Results from a large-scale population survey. *Technology in Society, 63*, Article 101395. https://doi.org/10.1016/j.techsoc.2020.101395

Wang, M.-C., Deng, Q., Shou, Y., Lai, H., Deng, J., Gao, Y., et al. (2019). Assessing Impulsivity in Chinese: Elaborating Validity of BIS Among Male Prisoners. *Criminal Justice and Behavior, 46*(3), 492–506. https://doi.org/10.1177/0093854818806033

Wardle, H., & Zendle, D. (2021). Loot Boxes, Gambling, and Problem Gambling Among Young People: Results from a Cross-Sectional Online Survey. *Cyberpsychology, Behavior, and Social Networking, 24*(4), 267–274. https://doi.org/10.1089/cyber.2020.0299

Xiao, L. Y. (2020). People's Republic of China Legal Update: The Notice on the Prevention of Online Gaming Addiction in Juveniles (Published October 25, 2019, Effective November 1, 2019). *Gaming Law Review, 24*(1), 51–53. https://doi.org/10.1089/glr2.2019.0002

Xiao, L. Y. (2021). People's Republic of China Legal Update: The Notice on Further Strictly Regulating and Effectively Preventing Online Video Gaming Addiction in Minors (Published August 30, 2021, Effective September 1, 2021). *Gaming Law Review, 25*(9), 379–382. https://doi.org/10.1089/glr2.2021.0026

Xiao, L. Y. (2022). Reserve Your Judgment on "Draconian" Chinese Video Gaming Restrictions on Children. *Journal of Behavioral Addictions, 11*(2), 249–255. https://doi.org/10.1556/2006.2022.00022

Xiao, L. Y. (2023). Loot Box State of Play 2023: Law, Regulation, Policy, and Enforcement Around the World. *OSF Preprints*. https://doi.org/10.31219/osf.io/q2yv6

Xiao, L. Y., Henderson, L. L., & Newall, P. W. S. (2022). Loot boxes are more prevalent in United Kingdom video games than previously considered: Updating Zendle et al. (2020). *Addiction, 117*(9), 2553–2555. https://doi.org/10.1111/add.15829.

Xiao, L. Y., Henderson, L. L., & Newall, P. (2023). What are the odds? Lower compliance with Western loot box probability disclosure industry self-regulation than Chinese legal regulation. *PLOS ONE*. https://doi.org/10.1371/journal.pone.0286681

Xiao, L. Y., Fraser, T. C., & Newall, P. W. S. (2023). Opening Pandora's Loot Box: Weak Links Between Gambling and Loot Box Expenditure in China, and Player Opinions on Probability Disclosures and Pity-Timers. *Journal of Gambling Studies, 39*(2), 645–668. https://doi.org/10.1007/s10899-022-10148-0

Xiao, L. Y., Henderson, L. L., Nielsen, R. K. L., Grabarczyk, P., & Newall, P. W. S. (2021). In *Loot Boxes, Gambling-Like Mechanics in Video Games*. Encyclopedia of Computer Graphics and Games. Springer. https://doi.org/10.1007/978-3-319-08234-9_459-1.

Xiao, L. Y., Henderson, L. L., Yang, Y., & Newall, P. W. S. (2021). Gaming the system: Suboptimal compliance with loot box probability disclosure regulations in China. *Behavioural Public Policy, Advance Online Publication, 1–27*. https://doi.org/10.1017/bpp.2021.23

Xiao, L. Y., Newall, P., & James, R. (2023). To screen, or not to screen: An experimental comparison of two methods for correlating video game loot box expenditure and problem gambling severity. *OSF Preprints*. https://doi.org/10.31219/osf.io/cefnv

Xiao, L. Y. (2023). Breaking Ban: Belgium's Ineffective Gambling Law Regulation of Video Game Loot Boxes. *Collabra: Psychology, 9*(1), Article 57641. https://doi.org/10.1525/collabra.57641.

Yam, C.-W., Pakpour, A. H., Griffiths, M. D., Yau, W.-Y., Lo, C.-L.-M., Ng, J. M. T., et al. (2019). Psychometric Testing of Three Chinese Online-Related Addictive Behavior Instruments among Hong Kong University Students. *Psychiatric Quarterly, 90*(1), 117–128. https://doi.org/10.1007/s11126-018-9610-7

Yang, X., Jiang, X., Wu, A. M. S., Ma, L., Cai, Y., Wong, K. M., & Lau, J. T. F. (2021). Validation of the Internet Gaming Disorder Symptoms Checklist Based on the Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders in Chinese Adolescents. *Child Psychiatry & Human Development*. https://doi.org/10.1007/s10578-021-01213-7

Ye, Y., Gao, W., Wang, Y., & Luo, J. (2012). Comparison of the addiction levels, sociodemographics and buying behaviours of three main types of lottery buyers in China. *Addiction Research & Theory, 20*(4), 307–316. https://doi.org/10.3109/16066359.2011.629764

Zendle, D. (2019). Problem gamblers spend less money when loot boxes are removed from a game: A before and after study of Heroes of the Storm. *PeerJ, 7*, e7700. https://doi.org/10.7717/peerj.7700

Zendle, D., & Cairns, P. (2018). Video game loot boxes are linked to problem gambling: Results of a large-scale survey. *PLOS ONE, 13*(11), Article e0206767. https://doi.org/10.1371/journal.pone.0206767

Zendle, D., & Cairns, P. (2019). Loot boxes are again linked to problem gambling: Results of a replication study. *PLOS ONE, 14*(3), Article e0213194. https://doi.org/10.1371/journal.pone.0213194

Zendle, D., Cairns, P., Barnett, H., & McCall, C. (2019). Paying for loot boxes is linked to problem gambling, regardless of specific features like cash-out and pay-to-win. *Computers in Human Behavior, 102*, 181–191. https://doi.org/10.1016/j.chb.2019.07.003

Zendle, D., Petrovskaya, E., & Wardle, H. (2020). *How do loot boxes make money? An analysis of a very large dataset of real Chinese CSGO loot box openings*. https://doi.org/10.31234/osf.io/5k2sy.

Zendle, D., Cairns, P., Meyer, R., Waters, S., & Ballou, N. (2022). If everything is a loot box, nothing is: Response to Xiao. *Addiction, 117*(9), 2555–2556. https://doi.org/10.1111/add.15976

Zendle, D., Flick, C., Gordon-Petrovskaya, E., Ballou, N., Xiao, L. Y., & Drachen, A. (2023). No evidence that Chinese playtime mandates reduced heavy gaming in one segment of the video games industry. *Nature Human Behaviour*. https://doi.org/10.1038/s41562-023-01669-8

Zendle, D., Meyer, R., Cairns, P., Waters, S., & Ballou, N. (2020). The prevalence of loot boxes in mobile and desktop games. *Addiction, 115*(9), 1768–1772. https://doi.org/10.1111/add.14973

Zendle, D., Meyer, R., & Over, H. (2019). Adolescents and loot boxes: Links with problem gambling and motivations for purchase. *Royal Society Open Science, 6*, Article 190049. https://doi.org/10.1098/rsos.190049

Zendle, D. (2019). *Gambling-like video game practices: A cross-sectional study of links with problem gambling and disordered gaming*. PsyArXiv. https://doi.org/10.31234/osf.io/fh3vx.

Zeng, Z., & Zhang, D. (2007). A Profile of Lottery Players in Guangzhou, China. *International Gambling Studies, 7*(3), 265–280. https://doi.org/10.1080/14459790701601430

文化部 [Ministry of Culture] (PRC). (2016, December 1). *文化部关于规范网络游戏运营加强事中事后监管工作的通知 [Notice of the Ministry of Culture on Regulating the Operation of Online Games and Strengthening Concurrent and Ex-Post Supervisions] 文市发〔2016〕32号*. https://web.archive.org/web/20171220060527/http://www.mcprc.gov.cn:80/whzx/bnsjdt/whscs/201612/t20161205_464422.html.