2022-02-07

Loot box engagement: relationships with educational attainment, employment status and earnings in a cohort of 16,000 UK gamers

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http://hdl.handle.net/10026.1/18807

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TITLE PAGE

Loot box engagement: relationships with educational attainment, employment status and earnings in a cohort of 16,000 UK gamers.

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Running head: Demographics of loot box purchasers.

Word count: 2,060

Conflict of interest declaration: none

Abstract
Background and Aims

Loot boxes are purchasable randomised rewards in video games that share structural and psychological similarities with gambling. Systematic review evidence has established reproducible associations between loot box purchasing and both problem gambling and problem video gaming. We aimed to measure the association between loot box engagement and socioeconomic correlates.

Design

Cross-sectional online survey using the recruitment platform, Prolific.

Setting

United Kingdom.

Participants

A cohort of 16,196 UK adults (18+ years) self-reporting as video gamers.

Measurements

Respondents were asked about their game-related purchasing behaviour (including loot boxes), recent monthly spend on loot boxes, and gambling engagement (gambling in any form; gambling online; playing 'social casino' games). A range of demographic variables were simultaneously captured, including age, sex, ethnicity, earnings, employment and educational attainment.

Findings

Overall, 17.16% of gamers in our cohort purchased loot boxes, with a mean self-reported monthly spend of £29.12. These loot box purchasers are more likely to gamble (45.97% gamble) than people who make other types of game-related purchases (on aggregate, 28.13% of non-loot box purchasers gamble), and even greater still than those who do not make any game related purchases (24.38% gamble $p < .001$). Loot box engagement (as binary yes/no or as monthly spend normalised to earnings) was significantly associated with younger age ($p < 0.001$ and $p < 0.001$; respectively for binary yes/no and monthly spend, adjusted for False Discovery Rate correction), male sex ($p < 0.001$ and $p = 0.025$), non-university educational attainment ($p < 0.001$ and $p < 0.001$), and unemployment ($p = 0.003$

and $p = < 0.001$),. Lower earners spent a higher proportion of monthly earnings on loot boxes ($p < 0.001$).

Conclusions

The demographic associations of video game loot box engagement (younger age, male sex, non-university educational attainment, and unemployment) mirror those of other addictive and problematic behaviours, including disordered gambling, drug and alcohol misuse..

INTRODUCTION

Loot boxes are purchasable randomised content available in video games. They are defined as: (a) being available for real money (even when 'free' offers available) and (b) having randomised outcomes, where digital contents (which could offer gameplay advantages or cosmetic upgrades) have varying financial/psychological value (1,2). Loot boxes are available in a substantial number of desktop, console games and mobile games; often accessible to children (1).

With structural and psychological similarities to gambling (3), systematic reviews have established robust associations between loot box engagement and both problem gambling and problem video gaming behaviours (4,5). Whilst motivations for purchasing are complex (6), it is known that high spenders on loot boxes (i.e. more than $100/month) are disproportionately represented by problem gamblers, but not higher earners (7). This suggests that games developers are deriving outsized profits from at-risk individuals – likely including problem gamblers, problem gamers, and other at-risk cohorts – but not from higher earners.

There has been much commentary that any dangers posed by loot boxes may disproportionately affect specific demographics, especially younger people (3,8), and males (9–11), who are prone to greater impulsivity (12,13) and problem gambling behaviours (14–16) – both of which are associated, in turn, with loot box purchasing (17). Indeed, nascent evidence appears to confirm that links with problem gambling are stronger amongst adolescents (12).

Furthermore, a lower socio-demographic profile is associated with multiple types of addiction, including gambling (16,18–21); alcohol (22,23); substance misuse (24–26) and problematic video gaming (27,28). There are likely several overlapping drivers, including negative stressors associated with deprivation and subsequent escape motivations (27,29,30); perhaps acting alongside aspirational and escapist consumer behaviours that can drive problematic, over-consumptive behaviours, especially for those at the lower end of economic divisions (31).

Similar demographic associations may also exist with loot box engagement. Specifically, we hypothesised that loot box engagement would be associated with younger age, male sex, lower earnings, lower educational attainment, and lower level of employment. This was investigated using a brief survey with a large sample of UK gamers, identifying those engaged with gambling and various types of game related purchases (including loot boxes, non-randomised purchases, "add-ons" such as expansion packs and downloadable content, and season passes/subscriptions).

Whilst such a cross-sectional approach cannot establish causation, any relationships with lower socioeconomic correlates have implications for ongoing policy debates around loot box legislation for harm-minimisation purposes, which are currently being investigated across jurisdictions including the UK, Australia and the USA (2,32–34).

METHODS

We targeted an adult (18+) UK cohort from Prolific, previously self-reporting as playing video games during Prolific's screening process, confirming 'playing at least occasionally' one of the following: *computer games; console game; handheld console games; free-to-play mobile games "f2p"; premium mobile games (pay to download); Esports games; virtual reality games*. Responses for each category (as yes/no) were available for analysis (see below). We sampled from a maximum possible pool of around 24,000 Prolific users meeting these criteria, from 22nd October to 30th November 2020.

The questionnaire, completed on the Qualtrics platform, utilised 'forced responses' to ensure data completeness, comprising an initial 4 items, asking which of the following participants regularly do: *Gambling (any form); gambling online; playing 'social casino' games* (i.e. "gambling", but not for real money, which we do not classify as gambling)*; playing video/computer games (any format, including mobile phones, tablets etc.)* This final question was used to confirm the pre-existing screening on Prolific – i.e. verifying participants remained active videogamers ('gamers' hereon).

For gamers, we asked an additional 4-items about purchasing the following in the previous 12 months: *Expansion packs, add-ons or other downloadable content* ('Add Ons'); *season passes or subscriptions* ('Season passes'); *Loot boxes*; *in-game / in-app purchases which do not have randomised outcomes* ('In Game'). For those respondents who had purchased loot boxes, we asked past monthly spend (GBP) on loot boxes.

Our analysis makes use of demographic variables available from Prolific. This includes age, sex, ethnicity (in a simplified form; see results for categories), highest education level completed, employment status and personal income. Availability of the demographic information varied across participants (see Table 2).

In addition to aforementioned integrity check (confirming 'active gamer' status matched previous response to Prolific), were two attention check questions (i.e. 'please select option two below'), and one logic/attention check (respondents who selected 'gambled online' were instructed "*if you select this, then also select previous option" for gambling (any form)*); any respondents failing this were removed). Participants were also removed if 'RecaptchaScore' from Qualtrics indicated a possible 'bot' response.

Statistical analyses involved comparing loot box purchasing behaviour (i.e. yes/no) across demographic variables (i.e. male/female, etc.) and gambling engagement (yes/no); establishing significance using False Discovery Rate (FDR) adjusted (35) Chi-Square tests.

For loot box monthly expenditure, outliers were removed (=> £1000/month). As we were interested in identifying correlates of potentially unsustainable spending, we also normalised loot box expenditure to monthly earnings. Earnings were calculated as the mid-point of binned earnings (i.e. earnings of "£20,000-£29,999" = monthly salary of £25,000/12). Due to violations of parametric assumptions, significant differences in loot box spend across demographic categories was established using FDR adjusted Kruskall-Wallis tests. The study was not pre-registered on a publicly available platform, and all results should therefore be considered exploratory.

RESULTS

We received a total of 23,465 complete responses to the survey (66 partial completions; removed), with a total of 20,787 respondents passing integrity checks, with 5 removed as high-spending outliers (=> £1000/month). From these, 16,196 identified as active video gamers; all other respondents were removed. From these, we identified 2,780 loot box purchasers (17.16% in last 12 months), spending a mean of £29.12 in the past month (median = £10; lower quartile = £5; upper quartile = £20; SD = £247.77).

Patterns of game types, game purchasing, and gambling

See Table 1 for a comparison of how engagement in various gaming and gambling behaviours relates to types of gamer-related purchases. Here, loot box purchasers gamble the most (45.97% gamble); higher than any other types of purchasing behaviour (on aggregate, 28.13% of non-loot box purchasers gamble). Moreover, those who do not make game-related purchases were least likely to gamble (24.38%). These differences in gambling participation are significant (X^2 (1, N = 16196) = 327, $p < .001$).

The results also provide a broader view of variation in gambling and game-related purchasing across those who participate in different types of gaming (i.e. console; hand-held games; eSports, etc.; see Table 2). Those reporting playing eSports were the most likely to both purchase loot boxes and to gamble, while f2p mobile gamers were the least likely to buy loot boxes (however, these categories of 'gamer' were not mutually exclusive.)

Demographic characteristics and loot box purchasing

See Table 2 for a comparison of loot box purchasing across demographic characteristics. Engagement with loot boxes (as binary yes/no) was associated with male sex, younger age, non-university education and lower employment status (i.e. those currently unemployed and 'due to start job in the month' had the highest engagement). Similar results were observed when engagement with loot boxes was investigated as mean loot box spend; although here, there was no significant difference across age or educational attainment categories. However, when loot box spend was normalised to earnings (as percentage of monthly earnings spent on loot boxes) differences between ages and educational attainments were again significant, with lower earners spending a significantly higher proportion of their monthly income on loot boxes.

DISCUSSION

It has been suggested that risks associated with loot boxes may disproportionately affect specific cohorts (9–11). Our survey of 16,196 UK gamers appears to support such notions. Higher proportional engagement with loot boxes was associated with male sex, younger age, non-university educational attainment and unemployment.

These results, however, become more nuanced when investigating monthly spend on loot boxes. Here, demographic associations with age and education were no longer observed. Personal earnings, however, are related to age, education and employment, meaning that some cohorts have a greater disposal income (i.e. for potentially spending on loot boxes). Subsequently, relationships between earnings and loot box engagement are likely complex: for example, whilst lower socioeconomic status may drive higher loot box engagement, so might higher earnings. It is these complexities that prompted us to normalise loot box earnings to monthly income, where results become unambiguous: here, the lowest earners spent the largest proportion of their income on loot boxes, as high as 3.84% in the lowest category of earners (£10,000 or less). Furthermore, after normalisation of loot box spend to earnings, relationships with age and education once again become significant. In other words, younger gamers, those with non-university educational attainment, and lower earners spent a *higher proportion* of their income on loot boxes.

This pattern of sociodemographic relationships mirrors those observed with other, well-studied addictive/problematic behaviours, including gambling (16,18–21), alcohol (22,23) and substance misuse (24–26). Such findings reinforce the proposition that loot box engagement may be driven by overlapping psychological and sociological factors, possibly including traits such as peer pressure and social reinforcement (13), impulsive traits (12,13,36,37), and escape motivations (30).

These overlapping motivations are liable to translate into overlapping behaviours. Here, our study establishes that loot box purchasers are more likely to gamble than people who only partake in non-chance types of game related purchases – the first time links between loot

boxes and gambling have been established in a cohort of such magnitude. Whilst loot box purchasers had the highest rates of gambling, non-purchasers (i.e. those who do not make any kind of game-related purchase) have the lowest rates of gambling participation. Interestingly, participants who made other types of purchases (i.e. add-ons, season passes, in-game purchases) gambled at rates somewhere between these extremes (speculatively, this might be explained by gamblers having more liberal consumer habits than non-gamblers.)

This observation helps explain a conflicted finding in the loot box literature, where evidence is equivocal about whether problem gambling is also associated with other, non-loot box, types of game related purchasing (38,39). Our data suggests that gambling-behaviours (and, by logical association, problem gambling behaviours) may indeed be associated with other types of purchase – albeit at a lower level than loot boxes. Such findings have implications for arguments around more generalised forms of 'predatory monetisation' (11,38), suggesting that at-risk individuals may also be at risk from other types of game related monetisation strategies – albeit at a lower rate.

Our results also enable a broader view of types of gaming associated with loot box purchasing. Here, our results confirm that eSports are most highly linked with both loot boxes and gambling behaviours (see Table 1)(40). Somewhat surprisingly, f2p mobile gamers were the least likely to buy loot boxes – despite evidence that f2p games are heavily monetised via loot boxes (1,41,42). One likely explanation is that a small number of f2p gamers contribute disproportionate loot box revenue (7).

Finally, despite widespread presence of loot boxes across various gaming platforms (1), overall, this type of monetisation was the least engaged with. This suggests that the unintended consequences of policy action on loot boxes (i.e. reduced developer revenue) should be mitigated by alternative monetisation approaches.

Limitations

Whilst our short survey enabled rapid data from a large cohort, this was limited to a convenience sample of UK adults. Future work should involve children, demographically representative cohorts, and other nations. Furthermore, whilst sociodemographic categories on Prolific are convenient, they fall short of standards for national monitoring, especially around ethnic categorisation (43). Furthermore, whilst our paid-for cohort of Prolific ensured a high completion rate, it is difficult to assess the impact of this approach on sampling bias, liable to under-represent cohorts including high-paid workers and individuals with low digital literacy. Similar to earlier work, our survey uses cross-sectional approaches: directions of causality cannot be established, and it is unknown the extent to which loot boxes act as a 'gateway' into gambling, versus gamblers being more heavily engaged with loot boxes (nonetheless, a risk of harm still exists (12)). Moreover, whilst our survey confirmed links between loot boxes and gambling, the brevity of the survey precluded measures for problematic behaviours or psychological distress: any links between problem

gaming, problem gambling and sociodemographic variables are implied; not established. Finally, data was collected during the COVID-19 pandemic, covering a period when the second UK lockdown was imposed (44); events liable to strengthen relationships between spend, gaming and gambling (45).

Conclusions

The nature of the observed sociodemographic correlations reiterates narratives that loot box engagement shares psychological and social drivers with other addictive and problematic behaviours. Whilst further research is required, outsized loot box expenditure – already linked with problem gambling (7) – may act to exacerbate social inequalities and disproportionally affect marginalised populations. Such results have implications for future policy. The observed link with gambling in a large-scale cohort, alongside clear demographic trends, suggest that loot box intervention – including both legislation and education – may have utility for harm minimisation in at-risk populations.

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Table 1. Percent of participants who engage in various gaming/gambling behaviours, versus types of in-game purchases that they engage in. Column and row for loot boxes and gambling are highlighted in bold.

	Gambling Type Behaviours			Loot Box Related Purchasing			Other Purchases		
	Gamble	Gamble Online	Play Social Casino	Loot Boxes	non-LB purchases	Buy Nothing	Add Ons	Season Passes	In Game
% of all Gamers	30.12%	26.21%	12.39%	**17.17%**	54.24%	28.59%	45.96%	33.03%	39.54%
% of those who Gamble	**100.00%**	**100.00%**	**62.33%**	**45.97%**	**28.13%**	**24.38%**	**33.60%**	**37.49%**	**36.07%**
% of Computer Gamers	30.60%	26.65%	13.15%	**19.14%**	56.95%	23.91%	54.34%	37.22%	41.48%
% of Console Gamers	32.77%	28.80%	13.49%	**19.52%**	58.23%	22.26%	54.24%	41.57%	42.42%
% of Handheld Gamers	31.30%	27.29%	14.43%	**20.93%**	57.60%	21.47%	57.14%	41.89%	44.19%
% of f2p Gamers	30.40%	26.49%	13.36%	**18.13%**	52.47%	29.41%	44.26%	31.94%	41.77%
% of Premium Mobile Gamers	40.36%	36.28%	18.88%	**29.64%**	56.16%	14.19%	64.19%	49.52%	57.34%
% of eSports Gamers	42.46%	38.62%	20.49%	**36.22%**	51.11%	12.68%	68.55%	58.33%	55.77%
% of VR Gamers	35.03%	30.51%	18.42%	**24.65%**	57.71%	17.64%	61.14%	44.75%	49.52%

Table 2: Demographic comparison of LB engagement from 16k UK gamers. Left panel shows numbers (n) and percent of LB buyers within each demographic category, followed by Chi-Square test results for each demographic variable. Middle panel shows mean loot box spend (for those who indicate that they buy LBs) for each demographic category, followed by Kruskall-Wallis test results. Right side of table shows % of monthly income that LB purchasers spend on LBs, according to demographic categories, followed by Kruskall-Wallis test results. For all tests, results that are significant at p<0.05 level after FDR correction are indicated, in bold and with asterisk. Demographic data was downloaded from Prolific (rather than obtained via our survey), and hence has differing levels of missing data – this is indicated by totals for "No Data" subcategories on same demographics (excluded from relevant statistical test). Due to space constraints, earnings greater than £50k are collapsed into a single bin.

	n	Percent LB buyers	Chi-Square	(df)	p	£ monthly LB spend	Statistic	p	% monthly LBers income	Statistic	p
Total from all gamers	16196	17.16%				£29.12			2.01%		
Gender: Males purchase higher proportion of LBs than females			139.18	(2)	<.001*		48.70	<.001*		7.36	0.025*
Female	9676	14.31%				£16.71			1.69%		
Male	6492	21.44%				£41.66			2.32%		
Prefer not to say	28	4.17%				£7.00			0.28%		
Age: A higher proportion of young people purchase LBs			76.36	(10)	<.001*		12.05	0.28		59.29	<.001*
18-25	4881	19.55%				£38.76			2.88%		
25-30	3131	18.17%				£29.36			1.77%		
30-35	2716	16.61%				£21.54			1.74%		

	N	%	χ^2	(df)	p	£	stat	p	%	stat	p
35-40	1889	17.15%				£24.12			1.66%		
40-45	1271	16.44%				£24.98			1.76%		
45-50	813	14.27%				£14.96			1.22%		
50-55	632	12.03%				£23.47			0.92%		
55-60	410	10.24%				£11.42			0.93%		
60-65	235	8.09%				£17.89			1.52%		
65-70	113	7.96%				£11.63			0.88%		
70-75	42	7.14%				£10.00			0.80%		
No Data	63	n/a				n/a			n/a		
Ethnicity: no relationship			4.36	(4)	0.359		8.35	0.08		8.58	0.07
Asian	973	18.50%				£43.45			2.87%		
Black	410	18.78%				£23.75			1.85%		
Mixed	636	19.18%				£24.56			1.79%		
Other	124	14.52%				£22.22			2.27%		
White	13687	17.07%				£28.49			1.96%		
No Data	366	n/a				n/a			n/a		
Education: A lower proportion of university educated purchase LBs			37.47	(5)	<.001*		9.99	0.07		55.31	<.001*
Secondary education (e.g. GED/GCSE)	849	15.57%				£30.75			2.65%		
High school diploma/A-levels	2597	16.72%				£50.53			2.17%		
Technical/community college	932	18.88%				£43.33			2.09%		

Undergraduate degree (BA/BSc/other)	3521	12.89%				£16.92		1.36%	
Graduate degree (MA/MSc/MPhil/other)	1407	12.79%				£40.47		1.19%	
Doctorate degree (PhD/other)	193	10.88%				£10.48		0.32%	
No Data	6697	n/a				n/a		n/a	
Employment: A higher proportion of unemployed purchase LBs			**17.81**	**(5)**	**0.003***		**16.94**	**<.001***		**77.64**	**<.001***
Full-Time	7892	17.79%				£37.10		1.33%	
Part-Time	3309	15.99%				£18.77		2.35%	
Due to start job in the month	188	18.62%				£26.44		2.06%	
Unemployed (and job seeking)	1905	19.00%				£24.69		4.27%	
Not in paid work (e.g. homemaker, retired)	1579	14.63%				£15.54		2.59%	
Other	1235	16.44%				£24.45		4.27%	
No Data	88	n/a				n/a		n/a	
Personal Income: lower earners spend higher proportion of income on LBs			**22.43**	**(11)**	**0.02**		**39.33**	**<.001***		**261.56**	**<.001***
£10,000 or less	3375	15.47%				£21.73		3.84%	
£10,000 - £19,999	2893	17.46%				£47.26		1.88%	

£20,000 - £29,999	2737	17.21%	£27.76		1.13%
£30,000 - £39,999	1261	17.61%	£26.95		0.92%
£40,000 - £49,999	471	18.90%	£27.04		0.72%
£50,000+	448	19.42%	£30.13		0.52%
No Data	5011	n/a	n/a		n/a