

Microtransaction Spending and Problematic Gambling of UK University Call of Duty Gamers

Abstract

Increased implementation of loot boxes within computer games has received widespread concern for the wellbeing of gamers, especially given the increased engagement during COVID-19 restrictions. Loot boxes share similarities with traditional gambling mechanisms that influence addiction-like behaviours and the amount of money spent on in-game items. The present study investigated loot box expenditure alongside peer engagement, perceptions of gaming value, self-worth, and problematic gambling behaviours of 130 Call of Duty players. Results identified significantly higher Risky Loot Box Index and visual authority scores for high-risk and medium-risk problem gamblers than non-problem gamblers. High-risk problem gamblers were also found to have higher purchase intention and validation seeking scores than non-problem gamblers. However, problem gambling risk and all but three self-worth and perceived value subscale behaviours were not associated with loot box expenditure, contrasting previous findings. Concerning peer influence, non-problem gamblers were significantly less likely to play any Call of Duty game with friends whilst having all or most friends purchase loot boxes were also found to be associated with higher RLBI scores. The findings continue to support the associations between loot box engagement and problematic gambling and suggests the need to continue to explore individual in-game motivations for engaging with microtransactions.

Keywords: Call of Duty; Gaming; Gambling Disorder; Loot Box; Microtransaction.

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With the advancement of technological innovations in gaming and the increased engagement of playing video games during the global COVID-19 pandemic (Barr & Copeland-Stewart, 2021; Hall, Drummond, Sauer & Ferguson, 2021), understanding gambling disorder has become increasingly difficult to explore (King, Koster, & Billieux, 2019). One popular video game feature includes the use of 'loot boxes' which are containers comprising of randomised digital rewards that are purchasable for lesser amounts of real-world money, also known as a microtransaction (Brock & Johnson, 2021; Drummond, Sauer, Ferguson & Hall, 2020; Kristiansen & Severin, 2020; Zendle et al., 2020). Microtransaction spending has increased concerns for the wellbeing of gamers due to the randomness of the contents within loot boxes in addition to the visual and psychological impacts associated with their acquisition. This is argued to be similar to gambling-like mechanisms and therefore increases the likelihood of problematic gaming disorders (Derrington et al., 2021; von Meduna et al., 2020). Although research exploring loot boxes is growing (e.g., Brooks & Clark, 2019; Drummond et al., 2020; King, Russell, Delfabbro & Polisena, 2020; Kristiansen & Severin, 2020; Zendle & Cairns, 2018, 2019; Zendle, Meyer & Over, 2019), understanding the association between loot box engagement and problematic gambling disorders remains in its infancy, particularly during the increased engagement during the COVID-19 pandemic (Hall et al., 2021).

Loot boxes provide digital rewards that may allow gamers to receive significant in-game advantages such as exclusive characters, weapons and armour, skill enhancements, and in-game currency, as well as less significant in-game rewards that include new appearance items (Drummond, et al., 2020; Schwidessen & Karius, 2018). However, when a player

purchases a loot box, they are not always aware of the item they will receive and have a high probability of receiving duplicate or low-value items (Zendle et al., 2020). This encourages the likelihood of increased risk-taking and the purchasing of additional loot boxes until the required rewards are achieved. Moreover, the purchasing and opening processes of loot boxes share numerous psychological criteria associated with traditional gambling activities that captivates players and influences increased engagement (Drummond & Sauer, 2018; Drummond et al., 2020). For instance, many loot box opening sequences include the use of energetic sounds and light displays to make opening the loot box much more exciting in addition to the increased psychological anticipation and excitement of winning significant game-enhancing items (Abarbanel, 2018; Brock & Johnson, 2021; Clark et al., 2012; King & Delfabbro, 2018, 2019; Macey & Hamari, 2019).

These mechanisms have not risen by accident but have come about due to the strategized manner of predatory monetary-driven designs due to pressures on financial stability and consumer requirements (King & Delfabbro, 2018, 2019; O'Malley, 2020). Many game developers rely heavily on microtransaction purchases as part of their substantial net revenues with approximately 94% of mobile games and 35% of desktop games featuring loot boxes (Derrington et al., 2021; Zendle et al., 2020). For instance, game developer *EA* made 28% of its net revenue in 2019 for its *FIFA Ultimate Team* service alone (Electronic Arts, 2019), whilst the popular free-to-play *Fortnite* game has generated over \$1 billion in microtransactions since its development in 2017 (Henry, 2018). Moreover, the free-to-play *League of Legends* (2009) game provides players with the opportunity to only purchase cosmetic 'skins' for their avatars with no competitive in-game advantages available (Jarrett, 2021). This design generated over \$2.1 billion in microtransaction sales worldwide despite providing no in-game advantages like other games' loot boxes can provide for players (Nutt, 2014).

Whilst diverse, monetisation practices are not novel. Initially, players of arcade games did not own the games and had to engage in a pay-to-play format whereby individuals could pay small amounts of money to play the game for a limited period of time, or until their gaming skills were insufficient to continue (Johnson & Brock, 2020). Thus, arcade gaming systems sought to maximise player attention and encourage players to continue paying money to advance in the game. However, with the development and popularity of digital games providing the opportunity to now own the game for personal enjoyment as opposed to renting them, game developers only receive a single purchasing fee rather than a continuation of monetary gain (Johnson & Brock, 2020). In addition, the cost of making digital games to match increased consumer demands has also significantly increased. For example, in 1996 it cost approximately \$1.7 million to make *Crash Bandicoot* whereas the more recent *Red Dead Redemption 2 (2018)* game cost over a quarter of a billion dollars to make (Johnson & Brock, 2020).

The increased pressure to match consumer needs in addition to the average cost of purchasing the game remaining relatively stable has resulted in innovative approaches required by game developers to maintain financial stability, players' attention, and remain fiercely competitive. Consequently, the opportunity to offer loot boxes provides game publishers with the ability to overcome these challenges as providing additional content for the game allows the publishers to maintain player engagement. Moreover, allowing players to purchase these items at a minor expense allows an opportunity to maintain a consistent financial revenue in addition to the initial finance received from purchasing the full game thus making loot boxes generate large profits (Johnson & Brock, 2020). It is important to note however that not all digital games use loot boxes. The gaming industry is vast and comprises of independent small-scale publishers as well as 'world-leading,' 'triple-A' publishers with larger financial backing (Wardle, 2021, p.6). Gaming practices are equally diverse, although it is the majority of these popular blockbuster games that include the use of loot boxes and other microtransaction

opportunities for consumers with other small-scale independent publishers typically disdaining this practice (Wardle, 2021). Therefore, whilst only a small percentage of games within the gaming environment includes the use of microtransactions, those that do include them are usually within the most popular gaming series.

Nevertheless, concerns over loot boxes and player wellbeing have risen due to researchers finding significant associations between loot box engagement and the development of problematic gambling behaviours (Brooks & Clark, 2019; Zendle & Bowden-Jones, 2020; Zendle & Cairns, 2018, 2019; Zendle et al., 2019). For example, Zendle and Cairns' (2018) large-scale survey with over 7,000 gamers explored participants' spending habits on loot boxes and the severity of gambling behaviours using a newly developed problem gambling severity index. The study found a significant association between the severity of problem gambling and the total amount of money spent on loot boxes. Likewise, Zendle et al. (2019) explored problematic gambling and loot box purchasing behaviours of over 1,000 adolescents and found a significant and positive association. More recently, Drummond et al. (2020) explored the association between loot box engagement and gambling symptoms finding those who scored highly on problematic gambling behaviours spend more money on loot boxes and engage with them more frequently. Those with higher gambling symptoms and greater loot box expenditure were also found to experience greater negative mood and higher psychological distress (Drummond et al., 2020). However, Hall et al. (2021) contrast this association as they found no significant differences in spending on loot boxes and no significant differences between risky loot box scores for participants who were isolating and those who were not isolating during the COVID-19 restrictions. In addition, the mean average spending on loot boxes was just \$2.98 with 85.45% ($n = 989$) of the total participants ($n = 1144$) not spending on loot boxes at all (Hall et al., 2021). This study, therefore, suggests that the association between loot box expenditure and problematic gambling may not be as extreme as suggested.

Due to the psychological risks and underlying monetization schemes associated with microtransactions and loot box engagement, they have been likened to traditional forms of gambling risk because of the low pay-out rate of the highly valued items which influence individuals to make repeat purchases (Abarbanel, 2018; Derrington et al., 2021; King & Delfabbro, 2018, 2019). Individuals will repeat their engagement with loot boxes in the hope of acquiring that highly valued item which results in psychological gratification once acquired and subsequently justifies the expenditure on loot boxes that encourages future engagement to experience the same gratification (Derrington et al., 2021; King & Delfabbro, 2018). As such, the World Health Organisation (WHO) recently classified gaming disorder as an addictive behaviour disorder within the ICD-11 due to shared similarities in an individual's symptomology, neurobiology and epidemiology found within traditional gambling disorders (von Meduna et al., 2020; WHO, 2020). Gaming disorder, in particular the use of microtransactions and loot box engagement, has been found to cause impairments in an individual's personal and family life, socialisation, education and occupation, as well as general functioning and psychological distress (WHO, 2020). However, despite the increasing concerns for consumer wellbeing, the commerciality of loot box purchases presents a difficult challenge for gambling regulators and lawmakers as they are required to balance the commercial entities of the game developers with the competing interests of the gaming consumers (Brock & Johnson, 2021).

Nonetheless, although the exploration into the association between loot box expenditure and problematic gaming is increasing (e.g., Brooks & Clark, 2019; Drummond et al., 2020; Kristiansen & Severin, 2020; Zendle & Cairns, 2019; Zendle, Meyer & Over, 2019), the majority of these studies have so far only explored this association generically across multiple games and platforms without consideration of differentiating these behaviours within individual games or series. King et al. (2020) investigated how microtransaction spending in

Fortnite (2017) may be influenced by gamers' cognitive factors, gaming behaviour, and social influences across 428 adult participants. The study found that microtransaction spending was significantly associated with the participants' in-game level, frequency of peer microtransaction spending, and having access to *Fortnite* via multiple devices (King et al., 2020). In addition, problematic gambling symptoms were also associated with the amount of time spent playing *Fortnite*, the perception of self-worth in the real world, and microtransaction spending by a peer (King et al., 2020). Spenders were also found to score significantly higher than non-spenders across several subscales of the Adapted Perceived Fortnite Value (PFV) and the Gaming-Contingent Self-Worth (GCSW) measures. Namely, spenders scored significantly higher on the PFV subscales of monetary value, game satisfaction, enjoyment, and purchase intention, but not character competency, character identification, or visual authority (King et al., 2020), which explores a gamer's in-game character appearance (Park & Lee, 2011). Spenders also scored significantly higher on the GCSW total score and subscales of validation seeking, competition-focus, and reward orientation, but not detachment. Thus, this study continues to support the notion that the level of microtransaction spending on loot boxes could be associated with higher problematic gambling difficulties.

Purpose of the Present Study

The present study builds upon the previous research by investigating the association between microtransaction spending and problematic gambling behaviour during the recent COVID-19 pandemic. Moreover, as the majority of previous research has explored this association across different games, the present study will explore gaming behaviours and microtransaction expenditure with *Call of Duty* (2003-present) players. The *Call of Duty* game series is one of the most popular video game series available comprising two of the top ten game positions based on the highest unit sales within the United Kingdom (Statista, 2021). The

Call of Duty series comprises of many individual games which range from the first published game in 2003 with the title *Call of Duty*, to the most recent title available, *Call of Duty: Vanguard*, which was released in 2021 (Duwe, 2021; Payne, 2012). Each of these games within the series can be played across different device types such as PC, gaming consoles and mobile, and comprises of both paid and free-to-play gaming concepts within them. Therefore, the *Call of Duty* game series was chosen for the current study due to its popularity and its microtransaction engagement that are offered to players within time-limited periods. However, it is important to note that some of the earlier *Call of Duty* games that were released before 2007 did not use any microtransaction practices and so it is important to recognise that player engagement with microtransactions may vary within individual games of the franchise. In the present study, a loot box is defined as a “consumable virtual item which can be redeemed to receive a randomized selection of further virtual items” (Schwiddessen & Karius, 2018, p.18). Therefore, the present study aims are to (1) explore whether there is an association between loot box expenditure and problematic gambling; (2) investigate if there is an association between problematic gambling risk and individual perceptions of gaming value and self-worth; (3) determine whether loot box expenditure is associated with perceptions of gaming value and self-worth; and (4) consider the influence of peer engagement on problematic gaming behaviours.

Method

The School Research Ethics and Integrity Committee at the [Author’s University] had fully reviewed and approved this study (SREIC/2020/106).

Sample

Participants were requested to participate if they frequently played any *Call of Duty* game using any type of device and were over the age of 18. A total of 151 participants completed the study via the university's experimental participation system which allows students to acquire partial course credits for participating within a range of available research studies. A total of 17 responses were removed due to incompleteness and 4 responses were removed due to extreme outliers during the preliminary data checks as detailed below. Therefore, the final sample size of the current study comprised of 130 participants who were predominantly female ($n = 86, 65.60\%$), with 37 males (28.20%), 2 identifying as non-binary (1.50%), and 6 preferring not to disclose this information (4.60%). Participant age ranged from 18 to 48 ($M = 20.95, SD = 4.48$) with participant ethnic background being White ($n = 74, 56.50\%$), Asian ($n = 40, 30.50\%$), Black or African American ($n = 4, 3.10\%$), Chinese, Japanese, or South Korean ($n = 3, 2.30\%$), Middle Eastern ($n = 1, .80\%$), and 'other' ($n = 8, 6.10\%$). One participant did not disclose this information ($.80\%$).

Materials

Participants completed one online questionnaire that comprised of the following.

Call of Duty Gaming Behaviours and Expenditure

Three questions were presented to explore gaming behaviours of *Call of Duty* players. These questions include how often the *Call of Duty* game was played in the last month that ranged from *never* (1) to *almost every day* (4), which platform(s) the *Call of Duty* game is typically used to play on (*PC, Xbox, PlayStation, Mobile, and Other*), and the estimated length of time spent playing *Call of Duty* in each gaming session that ranged from *less than 1 hour* (1) to *more than 10 hours* (7). An additional two questions are presented to explore expenditure behaviours that were the estimated amount of money that was spent on in-game items (open-

response), and how these purchases were made (*own credit card, own debit card, gift card, parent credit card, parent gift card, other*).

Social Interaction

Social interaction was explored by two questions that were how often the participant plays with friends on the game (*never, sometimes, about half the time, most of the time, always*), and an estimation on how many of their friends have spent money on *Call of Duty* (*none of my friends, some of my friends, most of my friends, all of my friends, not sure*).

Non-Gaming Gambling Behaviour

Non-gaming gambling behaviours were explored by two questions. The first question relates to which offline gambling-related activities have been participated in the last 12 months (*buying lotteries and/or scratch cards, betting on horse races, online sports betting, playing online casino games, online eSports betting, none of these*). The second question asked how often these activities were engaged with in the last month (*not applicable, daily, once a week, multiple times a week, once a month*).

Risky Loot-Box Index

The Risky Loot-Box Index (Brooks & Clark, 2019) is a short five-item measure to assess the problematic characteristics of loot box usage and all items are scored on a Likert scale that ranges from *Strongly Disagree* (1) to *Strongly Agree* (5). Items included within the index include: (1) *The thrill of opening loot boxes has encouraged me to buy more*; (2) *I frequently play games longer than I intend to so I can earn loot boxes*; (3) *I have put off other activities, work, or chores to be able to earn or buy more loot boxes*; (4) *Once I open a loot*

box I often feel compelled to open another; and (5) I have bought more loot boxes after failing to receive valuable items. Internal reliability for this scale was high ($\alpha = .852$).

Adapted Perceptions of Call of Duty Value

Park and Lee's (2011) 24-item scale assesses the perceived value of purchasing online game items and was adapted to fit to the *Call of Duty* games. The scale comprises of seven subscales to explore perceived value associated with *enjoyment, character competency, visual authority, monetary value, character identification, game satisfaction, and purchase intention*. All items are scored using a Likert scale that ranges from *strongly disagree* (1) to *strongly agree* (5). Internal reliability for the full-scale total was high ($\alpha = .927$).

Gaming-Contingent Self-Worth Scale

The Gaming-Contingent Self-Worth Scale ([GCWS]; Beard & Wickham, 2016) is a 29-item scale differentiated into four subscales: *reward orientation, competition focus, validation seeking, and detachment*. All scale items are measured using a Likert scale that ranges from *strongly disagree* (1) to *strongly agree* (5) with a total GCWS score calculated by summing the four individual subscale scores. Internal reliability for the full-scale total was high ($\alpha = .917$).

Adapted Problem Gambling Severity Index

Ferris and Wynne's (2001) Problem Gambling Severity Index (PGSI) is a 10-item measure to assess problem gambling in the last 12 months and has been considered as the gold standard self-report measure for gambling problems (Brooks & Clark, 2019; Dowling et al., 2018). All items are rated on a Likert scale ranging from *never* (0) to *almost always* (3) with a total scale range of 0-30. The PGSI also categorises individuals into groups of varying risk

with non-problem gamblers acquiring a score of 0, low-risk problem gamblers scoring between 1-2, medium-risk problem gamblers scoring between 3-7, and high-risk problem gamblers scoring 8 and above. The internal reliability of the scale was high ($\alpha = .821$).

Demographic Background

The demographic survey section requested participants to provide some generic background details that related to their current age, gender, ethnic background, highest level of education completed, current employment status, current marital status, and estimated annual income before taxes. All questions provided pre-determined responses for participants to select except for age which was open-ended.

Procedure

The study was performed using Qualtrics survey software (www.qualtrics.com). Participants initially read the study details on the experimental recruitment system and were requested to sign up to participate if they were eligible. Eligible participants were those who frequently played any *Call of Duty* game on any device type and were over the age of 18. When participants signed up, they were presented with a weblink that redirected them to the Qualtrics survey. Participants read a full information sheet of the study and a consent form to participate in the study. Participants were then presented with the *Call of Duty* gaming and expenditure questions that asked how often they had played any *Call of Duty* game in the last month, what device(s) they used, and how long on average each individual gameplay session lasted. Participants were also asked to include an estimated amount of money they had spent on loot boxes and which type of payment option was used. In addition, participants were presented with the social play questions relating to gameplay with friends, followed by the offline gambling behaviours section. Upon completion, participants were then presented with the 5-

item Risky Loot Box Index survey, the 24-item Adapted Perceptions of *Call of Duty* Gaming value, and the 29-item Gaming-Contingent Self-Worth scale. Finally, participants were requested to complete the short 10-item inventory of the Adapted Problem Gambling Severity Index followed by a short demographic survey. Participants were then presented with a full debrief page that concluded the study.

Data Screening and Analysis

All questions presented to participants included a pre-defined response option except for current age and how much money has been spent on loot boxes in the previous month which were both open-ended response questions. During preliminary data screening checks, 4 participant responses were identified as being extreme outliers for RLBI, Perceptions of *Call of Duty* value, GCSW, and the PGSI. Upon further investigation, one participant had selected the maximum available item (i.e., strongly agree) for every Likert-scale question, and 3 participants had selected the minimum available item (i.e., strongly disagree) for every Likert-scale question. Thus, due to the extreme response of items, these 4 responses were removed from data analysis. Data were analysed using SPSS v26.

Results

Descriptive Statistics

Table 1 presents a summary of the frequency and percentage values for time spent playing *Call of Duty* per session, frequency of gameplay, device used, frequency of social play, friend loot box purchases, and offline gambling behaviours.

[INSERT TABLE 1 HERE]

Loot Box Expenditure

A total of 16 (12.20%) participants had spent money on loot boxes in the previous month spending an average of £26.88 ($SD = 24.28$) on loot boxes ranging from £5 to £100. The most popular type of payment was made from a personal debit card ($n = 16$, 66.67%), followed by personal credit card ($n = 5$, 20.83%), gift card ($n = 2$, 8.33%), and parental credit card ($n = 1$, 4.17%). A total of 114 (87.80%) participants reported not spending money on loot boxes.

Problematic Gambling Risk

Table 2 presents the relationships between loot box spending and the independent predictors of the RLBI and the adapted PGSI, with both predictors having significant associations with increased expenditure on loot boxes.

[INSERT TABLE 2 HERE]

Exploring problem gambling risk further, participants were categorised by severity of risk as identified by the PGSI score. A total of 25 (19.10%) participants were identified as high-risk problem gamblers, 61 (46.60%) participants as medium-risk problem gamblers, 28 (21.40%) participants as low-risk problem gamblers, and 17 (13.00%) participants as non-problem gamblers. To explore loot box expenditure based on problem gambling risk, a one-way ANOVA was performed finding a non-significant difference, $F(3, 127) = .700$, $p = .554$, $\omega^2 = .007$. On average, high-risk problem gamblers ($M = £5.00$, $SD = 11.90$) spent more money on loot boxes than medium-risk ($M = £3.93$, $SD = 15.28$), low-risk ($M = £2.32$, $SD = 6.87$), and non-problem gamblers ($M = £0.00$, $SD = 0.00$).

A second one-way ANOVA was performed to explore problem gambling risk and RLBI scores, finding a significant difference, $F(3, 127) = 15.990, p = <.001, \omega^2 = .256$. Post-hoc analyses identified that high-risk problem gamblers ($M = 15.44, SD = 4.21$) had significantly higher RLBI scores than non-problem ($M = 6.76, SD = 3.23$), and low-risk problem gamblers ($M = 9.71, SD = 4.61$). However, there were no significant difference in RLBI scores between high-risk ($M = 15.44, SD = 4.21$) and medium-risk problem gamblers ($M = 13.00, SD = 4.83$). Likewise, medium-risk problem gamblers ($M = 13.00, SD = 4.83$) had significantly higher RLBI scores than non-problem ($M = 6.76, SD = 3.23$) and low-risk problem gamblers ($M = 9.71, SD = 4.61$). There was no significant difference in RLBI scores between low-risk ($M = 9.71, SD = 4.61$) and non-problem gamblers ($M = 6.76, SD = 3.23$).

Perception of Value and Gaming-Contingent Self-Worth

Table 3 shows the Spearman rank-order correlations between loot box expenditure, perception of *Call of Duty* value, and GCSW. All but three variables identified non-significant associations in that perception of *Call of Duty* value and GCSW overall are not associated with increased loot box expenditure. The adapted perception of value subscales for purchase intention ($r_s = .306, p = <.001$) and visual authority ($r_s = .188, p = .031$), were found to have significant associations with increased loot box expenditure. Within the GCSW scale, only the reward orientation subscale ($r_s = .187, p = .033$) was found to have a significant association with increased loot box expenditure.

[INSERT TABLE 3 HERE]

To explore the association between perception of *Call of Duty* value scores and problem gambling risk, a multinomial logistic regression was performed. As shown in table 4, low-risk

problem gamblers did not significantly differ from non-problem gamblers across the perception of *Call of Duty* value sub-scale scores. Likewise, medium-risk problem gamblers did not significantly differ from non-problem gamblers across all but one of the perceptions of *Call of Duty* value sub-scale scores. The sub-scale item of visual authority significantly predicted the likelihood of being identified as a medium-risk problem gambler than non-problem gambler, $b = .32$, Wald $\chi^2(1) = 5.03$, $p = .025$, $OR = 1.37$ (95% CI: 1.04, 1.80). Multinomial logistic regression analyses also identified that high-risk problem gamblers did not significantly differ from non-problem gamblers across all but two of the perceptions of *Call of Duty* value sub-scale scores. Similar to medium-risk problem gamblers, the sub-scale item of visual authority significantly predicted the likelihood of being identified as a high-risk problem gambler than non-problem gambler, $b = .43$, Wald $\chi^2(1) = 6.71$, $p = .010$, $OR = 1.54$ (95% CI: 1.11, 2.13). In addition, the sub-scale item of purchase intention significantly predicted the likelihood of being identified as a high-risk problem gambler than non-problem gambler, $b = .54$, Wald $\chi^2(1) = 5.38$, $p = .020$, $OR = 1.72$ (95% CI: 1.09, 2.71).

[INSERT TABLE 4 HERE]

To explore the association between GCSW scores and problem gambling risk, a multinomial logistic regression was performed. As shown in table 5, low-risk problem gamblers did not significantly differ from non-problem gamblers. Likewise, medium-risk problem gamblers did not significantly differ from non-problem gamblers across all but one of the GCSW sub-scale scores. The full GCSW scale total was found to significantly predict the likelihood of being identified as a medium-risk problem gambler than non-problem gambler, $b = .13$, Wald $\chi^2(1) = 6.79$, $p = .009$, $OR = 1.14$ (95% CI: 1.03, 1.25). Multinomial logistic regression analyses also identified that high-risk problem gamblers did not significantly differ

from non-problem gamblers across all but one of the GCSW sub-scale scores. The sub-scale item of validation seeking significantly predicted the likelihood of being identified as a high-risk problem gambler than non-problem gambler, $b = .41$, Wald $\chi^2(1) = 8.06$, $p = .005$, $OR = 1.50$ (95% CI: 1.14, 1.99).

[INSERT TABLE 5 HERE]

Social Engagement and Problematic Gambling Risk

To explore whether the level of engagement with friends influences an individual's RLBI score, a one-way ANOVA was performed finding a non-significant difference, $F(4, 126) = 1.102$, $p = .358$, $\omega^2 = .003$. However, a second one-way ANOVA exploring peer expenditure of loot boxes on an individual's RLBI score found a significant difference, $F(4, 126) = 7.126$, $p = <.001$, $\omega^2 = .158$. Post-hoc analyses identified that having all of their friends purchase loot boxes ($M = 17.86$, $SD = 5.21$) had significantly higher RLBI scores than having no friends purchase loot boxes ($M = 9.29$, $SD = 4.45$), some friends purchase loot boxes ($M = 12.42$, $SD = 5.03$), and being unsure if friends purchased loot boxes ($M = 8.71$, $SD = 3.48$). There were no significant differences between having all friends purchase loot boxes ($M = 17.86$, $SD = 5.21$) and having most of their friends purchase loot boxes ($M = 13.52$, $SD = 5.06$) on RLBI.

Similarly, post-hoc analyses identified that most of their friends who purchase loot boxes ($M = 13.52$, $SD = 5.06$) had significantly higher RLBI scores than having no friends purchase loot boxes ($M = 9.29$, $SD = 4.45$) and being unsure if friends purchase loot boxes ($M = 8.71$, $SD = 3.48$). There were no significant differences between having most of their friends purchase loot boxes ($M = 13.52$, $SD = 5.06$) and having some friends purchase loot boxes ($M = 12.42$, $SD = 5.03$) on RLBI scores. There were also no significant differences between having some friends purchase loot boxes ($M = 12.42$, $SD = 5.03$) and having no friends purchase loot

boxes ($M = 9.29$, $SD = 4.45$), or between having no friends purchase loot boxes ($M = 9.29$, $SD = 4.45$) and being unsure whether friends purchased loot boxes ($M = 8.71$, $SD = 3.48$) on RLBI scores.

To explore whether the level of engagement with friends influenced the PGSI score, a Kruskal-Wallis test was performed finding a significant difference, $H(3) = 10.10$, $p = 0.018$. Pairwise comparisons showed that there were no significant differences in being identified as a low-risk problematic gambler compared to medium-risk ($p = .645$, $r = -.05$), or high-risk gamblers ($p = .418$, $r = -.11$) on level of engagement with friends. Likewise, there were no significant differences between being identified as a medium-risk problematic gambler compared to being identified as a high-risk problematic gambler ($p = .621$, $r = -.05$) on level of engagement with friends. There were, however, significant differences identified when being identified as a non-problem gambler compared to low-risk ($p = .024$, $r = -.34$), medium-risk ($p = .004$, $r = -.33$), and high-risk problematic gamblers ($p = .004$, $r = -.45$). Thus, non-problem gamblers are significantly less likely to engage with friends when playing Call of Duty compared to the remaining three problematic gambling severity groups. A second Kruskal-Wallis test was performed to explore peer expenditure of loot boxes on an individual's PGSI score, finding a non-significant difference, $H(3) = 5.86$, $p = 0.119$. Thus, peer expenditure was not associated with individual loot box expenditure.

Discussion

Researchers have suggested that gamers are becoming increasingly vulnerable to developing problematic gaming behaviours due to the addictive nature of loot boxes (e.g., Drummond et al., 2020; Kristiansen & Severin, 2020; Zendle & Cairns, 2019). With increased video game engagement during the COVID-19 pandemic, the present study investigated gaming

behaviours associated with loot box expenditure, problematic gaming, perceptions of gaming value and self-worth, and peer engagement on problematic gambling risk for *Call of Duty* players.

The first aim of the study sought to explore whether there is an association between microtransaction expenditure and problematic gambling. The results showed that microtransaction expenditure was not significantly associated with problematic gambling risk which contrasts previous findings. For instance, Zendle and Cairns' (2018) study with over 7,400 participants found a strong association between problem gambling severity and the amount of money spent on loot boxes. Likewise, Zendle et al. (2019) also identified an association between problem gambling and microtransaction expenditure of over 1,000 adolescents. This contrast could be explained by the small number of participants that had spent money on loot boxes as only 16 of the 130 participants (12.31%) had engaged in microtransactions. However, these findings support Hall et al.'s (2021) study that also identified no significant differences between loot box expenditure and risk between individuals who were isolating and those who were not isolating due to COVID-19 restrictions. In addition, only 13.55% of participants ($n = 155$) had spent money on loot boxes. Similarly, DeCamp (2021) also identified that only 24.90% of eighth-grade participants and 17.00% of eleventh-grade participants had spent money on loot boxes which provide additional support for the current findings.

Nevertheless, whilst not significant, frequency analyses identified that those who were found to be high-risk problematic gamblers had spent more money on average than medium-risk, low-risk, and non-problem gamblers. Moreover, the majority of research exploring microtransaction engagement have only explored this association across multiple games without any consideration of differentiating these behaviours within individual games. It could be argued that levels of microtransaction engagement could differ between games and so

comparative investigations between microtransaction engagement within individual games could highlight games that increase vulnerability to developing problematic gambling behaviours. Zendle et al.'s (2019) findings also argued that the association between problem gambling and loot box expenditure was stronger with their adolescent sample than with their adult sample, and so the current findings may also contrast previous results due to the use of an adult-only sample.

The current study also sought to explore the association between gambling risk and RLBI scores that assesses problematic characteristics of loot box usage. The results identified a significant association in which those identified as high-risk problematic gamblers had significantly higher RLBI scores than those identified as being low-risk and non-problem gamblers. Likewise, those identified as medium-risk problematic gamblers were also found to have significantly higher RLBI scores than those who were identified as low-risk and non-problem gamblers. These findings align with Drummond et al.'s (2020) study of loot box engagement of over 1,000 participants in which those that were identified as having high-risk gambling symptoms and had higher RLBI scores were significantly more likely to engage with, and spend more money on, loot boxes when compared to those who were not identified as being high-risk problematic gamblers.

The second aim of the study sought to investigate if there are associations between problematic gambling risk and perceptions of gaming value and gaming contingent self-worth. The results identified non-significant differences between problematic gambling severity and perceptions of value scores across all sub-scores excluding visual authority and purchase intention that were found to be of significance. Individuals who scored higher on the visual authority subscale of the perceptions of value inventory were significantly more likely to be identified as being a high-risk or a medium-risk problematic gambler than a non-problem gambler. In addition, purchase intention scores were also found to be significantly higher for

individuals who were identified as being high-risk problematic gamblers than non-problem gamblers. This finding was also identified by King et al. (2020) whereby out of 428 participants, microtransaction spenders scored significantly higher on the purchase intention subscale than non-spenders. Visual authority scores however were found to be non-significant which contrasts the current findings. Visual authority explores a gamer's in-game character appearance (Park & Lee, 2011), and so it could be possible that *Call of Duty* players place more value on their in-game character appearance than *Fortnite* players do that influences their decision to engage in microtransactions for new minor appearance items. However, this difference needs to be explored further and adds to the need for differentiating between games when exploring microtransaction engagement and gaming behaviours as each individual game may hold different motivational factors that influence players' engagement in microtransactions.

Concerning gaming contingent self-worth, the current study found that all scores on the GCSW inventory were not significantly associated with problematic gambling severity, except for validation seeking. The finding, therefore, fails to support previous research that identified significant associations between gaming contingent self-worth and loot box expenditure for reward orientation, competition-focus, and the overall GCSW score (King et al., 2020). The present study found that high-risk problematic gamblers were significantly more likely to have higher validation seeking scores than non-problem gamblers. This finding was also identified by King et al. (2020) whereby validation seeking, reward orientation, competition-focus, and the total GCSW scores were significantly higher for microtransaction spenders when compared to non-spenders. Validation seeking explores an individual's perceived risk of diminished self-worth if they stop gaming and is associated with a greater reliance on positive feedback from other players as a form of self-worth (Beard & Wickham, 2016). Therefore, the current findings suggest that high-risk problematic gamblers may lack validation from external sources and so

experience higher internal pressures to address threats towards their self-esteem via online gaming (Beard & Wickham, 2016). This internal pressure could therefore increase microtransaction engagement to continue to improve their in-game experience that would, in turn, increase the level of in-game validation and level of perceived self-worth.

The current study also aimed to determine whether an individual's perception of gaming value and their GCSW is associated with loot box expenditure. The results found that individuals with higher scores on the purchase intention subscale of the perception of value inventory were significantly more likely to spend more money on loot boxes than those with lower scores. Likewise, those who scored higher on the visual authority subscale of the perception of value inventory were significantly more likely to spend more money on loot boxes than those with lower scores. These findings continue to support previous work such as King et al. (2020) whereby microtransaction spenders scored significantly higher on the purchase intention subscale than non-spenders, although visual authority scores were found to be non-significant. Similarly, King et al. (2020) also identified significant associations between higher scores on the enjoyment, monetary value, and game satisfaction subscales on the perceptions of gaming value for loot box expenditure which was not the case in the current study. However, this contrast could be due to *Call of Duty* players placing more value on their in-game character appearance as opposed to *Fortnite* players but this requires further investigation.

In relation to GCSW, the current study found that those who scored higher on the reward orientation subscale were more likely to spend more money on loot boxes than those who scored lower. King et al. (2020) support this further as their results showed that higher scores on reward orientation were significantly associated with higher engagement for microtransaction spending for spenders when compared to non-spenders. Reward orientation reflects an individual's transfer of positive self-esteem derived from a virtual environment to a

real-world environment (Beard & Wickham, 2016). Individuals who engage in behaviours associated with reward orientation are believed to satisfy basic psychological needs such as improved competence and relatedness (Przybylski et al., 2010). The results, therefore, suggest a cyclical influence whereby increased engagement with microtransactions to improve gameplay subsequently increases the level of in-game positive self-esteem due to in-game performance. Thus, the increased gaming performance and subsequent in-game positive self-esteem continue to motivate the increased engagement of microtransactions to continue receiving in-game enhancements that continue to fuel in-game positivity.

Finally, the current study also sought to explore the influence of peer engagement on problematic gaming behaviours. The results identified that there was not a significant difference between RLBI scores and the level of engagement with peers. However, the results showed that individuals who had all of their friends purchase loot boxes had significantly higher RLBI scores than those who had no friends, some friends, or were unsure of how many of their friends purchase loot boxes. The results also found that those who had most of their friends purchase loot boxes were also more likely to have significantly higher RLBI scores than those who had no friends, or were unsure how many of their friends, purchase loot boxes. In relation to peer expenditure on loot boxes and problematic gambling severity, the current study found non-problem gamblers were significantly less likely to have friends who frequently purchase loot boxes when compared to low-risk, medium-risk, and high-risk problematic gamblers. There were no significant differences found between the level of engagement with peers and individual problematic gambling severity. These results contrast previous findings by King et al. (2020) who found gaming disorder symptoms were not associated with peer expenditure of loot boxes. This may be explained with the measure of risk used by King et al. (2020) as the gaming disorder criteria explores harmful time invested by the gamers as opposed

to problematic gambling behaviours that address a range of behaviours associated with problem gambling and adverse consequences of gambling.

Limitations and Future Directions

The current study has limitations that should be taken into consideration. The study only explored problematic gambling behaviours and microtransaction engagement of UK adult student gamers and so may not fully represent the wider gamer community of non-students who may have higher financial income that could motivate increased loot box engagement. Future studies could therefore use different populations to determine whether there is an association between loot box expenditure and problematic gambling behaviours when age, gender and occupation types are controlled. The study was also cross-sectional by design which allows the study to explore numerous factors associated with loot box engagement but fails to allow the exploration of causal relationships. Whilst an association was identified, longitudinal studies are needed to explore whether problematic gambling behaviours lead to gambling-like loot box engagement, or whether loot box engagements promote the onset of problematic gambling behaviours.

The study was also a self-report design whereby participants freely input their loot box expenditure, general engagement, and social interaction when playing *Call of Duty*. Whilst this allows the study to explore these factors further in relation to problematic gambling, the data provided by participants may not be accurate. Gamers purchase in-game money and items for a small amount of real-world money and so it could be argued that gamers may lose track of their true expenditure on the game over time. Likewise, the current study explored social interaction and peer expenditure of loot boxes which were also self-reported which could also reflect inaccurate responses provided on how much their friends spend on loot boxes and how frequently they purchase them. Thus, future research could use a more objective measure of

loot box expenditure to collect more accurate details but this would require additional support from the participants and potentially the game developers too.

Finally, it is worth noting that *Call of Duty* is a gaming series comprising of numerous individual electronic and non-electronic games that can be played across several device types such as consoles and mobile phones. Each individual game within the *Call of Duty* franchise uses a variety of different microtransaction gaming practices such as the use of battle passes, loot boxes, or game-map and character purchases. As the study did not explore individual games played by participants, it could be argued that perhaps certain games contribute to higher engagement with microtransactions and loot boxes than other games within the franchise. As a result, future research could explore one specific game, or compare individual games, within the *Call of Duty* series to determine whether more recent or older games within the series contributes to increased or decreased levels of engagement with loot boxes.

Conclusion

The present study continues to contribute to discussions around the impact of microtransaction engagement on problematic gambling behaviours (e.g., Brooks & Clark, 2019; Drummond et al., 2020; King et al., 2020; Kristiansen & Severin, 2020; Zendle & Cairns, 2018, 2019; Zendle et al., 2019). Moreover, the study continues to put forward the notion for additional research to explore microtransaction engagement and problematic gambling behaviours with individual games as opposed to the current exploration of gaming in general across multiple games to fully understand differentiated in-game motivations for engaging with microtransactions. Given the advancement in technological innovations within gaming, in addition to the increased engagement of playing video games during the most recent global COVID-19 pandemic (Barr & Copeland-Stewart, 2021; Hall, et al., 2021), research must continue to understand these problematic behaviours further and identify individual

problematic behaviours to enable preventative initiatives to be developed with a view of minimising gaming-related harm to individual gamers.

References

- Abarbanel, B. (2018). Gambling vs. gaming: A commentary on the role of regulatory, industry, and community stakeholders in the loot box debate. *Gaming Law Review*, 22(4), 231-234. <https://doi.org/10.1089/glr2.2018.2243>
- Barr, M., & Copeland-Stewart, A. (2021). Playing video games during the COVID-19 pandemic and effects on players' well-being. *Games and Culture*, 1-18. <https://doi.org/10.1177/15554120211017036>
- Beard, C. L., & Wickham, R. E. (2016). Gaming-contingent self-worth, gaming motivation, and internet gaming disorder. *Computers in Human Behavior*, 61, 507-515. <https://doi.org/10.1016/j.chb.2016.03.046>
- Brock, T., & Johnson, M. (2021). The gamblification of digital games. *Journal of Consumer Culture*, 21(1), 3-13. <https://doi.org/10.1177/1469540521993904>
- 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>
- Clark, L., Crooks, B., Clarke, R., Aitken, M. R. F., & Dunn, B. D. (2012). Physiological responses to near-miss outcomes and personal control during simulated gambling. *Journal of Gambling Studies*, 28(1), 123-137. <https://doi.org/10.1007/s10899-011-9247-z>
- DeCamp, W. (2021). Loot boxes and gambling: similarities and dissimilarities in risk and protective factors. *Journal of Gambling Studies*, 37(1), 189-201. <https://doi.org/10.1007/s10899-020-09957-y>
- Derrington, S., Star, S., & Kelly, S. J. (2021). The case for uniform loot box regulation: A new classification typology and reform agenda. *Journal of Gambling Issues*, 46, 302-332. <https://doi.org/10.4309/jgi.2021.46.15>
- Dowling, N. A., Merkouris, S. S., Manning, V., Volberg, R., Lee, S. J., Rodda, S. N., & Lubman, D. I. (2018). Screening for problem gambling within mental health services: a comparison of the classification accuracy of brief instruments. *Addiction*, 113(6), 1088–1104. <https://doi.org/10.1111/add.14150>
- Drummond, A., & Sauer, J. D. (2018). Video game loot boxes are psychologically akin to gambling. *Nature Human Behavior*, 2, 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), 1-16. <https://doi.org/10.1371/journal.pone.0230378>
- Duwe, S. (2021, November 1). *All Call of Duty games in release order*. Dot Esports. <https://dotesports.com/call-of-duty/news/all-call-of-duty-games-in-release-order>
- Electronic Arts. (2019). Fiscal Year 2019: Proxy statement and annual report. https://s22.q4cdn.com/894350492/files/doc_financials/2019/Proxy-Statement-Annual-Report-Combined-Book-2019.pdf
- Ferris, J. A., & Wynne, H. J. (2001). *The Canadian problem gambling index*. Ottawa: Canadian Centre on Substance Abuse. Retrieved from: [https://www.greo.ca/Modules/EvidenceCentre/files/Ferris%20et%20al\(2001\)The_Canadian_Problem_Gambling_Index.pdf](https://www.greo.ca/Modules/EvidenceCentre/files/Ferris%20et%20al(2001)The_Canadian_Problem_Gambling_Index.pdf)
- 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*, e10705. <https://doi.org/10.7717/peerj.10705>.
- Henry, J. (2018). Fortnite has made more than \$1 billion from microtransactions. Retrieved 24/05/2020 from: <https://gamerant.com/fortnite-1-billion-dollars-microtransactions/>
- Jarrett, J. (2021). Gaming the Gift: The affective economy of League of Legends ‘fair’ free-to-play model. *Journal of Consumer Culture*, *21*(1), 102-119. <https://doi.org/10.1177/1469540521993932>
- Johnson, M. R., & Brock, T. (2020). The ‘gambling turn’ in digital monetization. *Journal of Gaming & Virtual Worlds*, *12*(2), 145-163. https://doi.org/10.1386/jgvw_00011_1
- King, D. L., & Delfabbro, P. H. (2018). Predatory monetization schemes in video games (e.g. ‘loot boxes’) and internet gaming disorder. *Addiction*, *113*(11), 1967-1969. <https://doi.org/10.1111/add.14286>
- King, D. L., & Delfabbro, P. H. (2019). Video game monetization (e.g., ‘Loot boxes’): A blueprint for practical social responsibility measures. *International Journal of Mental Health and Addiction*, *17*(1), 166-179. <https://doi.org/10.1007/s11469-018-0009-3>
- King, D., Koster, E., & Billieux, J. (2019). Study what makes games addictive. *Nature*, *573*(7774), 346-346. <https://doi.org/10.1038/d41586-019-02776-1>
- King, D. L., Russell, A. M. T., Delfabbro, P. H., & Polisena, D. (2020). Fortnite microtransaction spending was associated with peers’ purchasing behaviors but not

- gaming disorder symptoms. *Addictive Behaviors*, *104*, 1-7. <https://doi.org/10.1016/j.addbeh.2020.106311>
- Kristiansen, S., & Severin, M. C. (2020). Loot box engagement and problem gambling among adolescent gamers: Findings from a national survey. *Addictive Behaviors*, *103*, 1-6. <https://doi.org/10.1016/j.addbeh.2019.106254>
- 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>
- Nutt, C. (2014). Riot games' Marc Merrill spells out his studio's mission... on reddit. Game Developer. Available at: <https://www.gamedeveloper.com/business/riot-games-marc-merrill-spells-out-his-studio-s-mission-on-reddit>
- O'Malley, N. (2020, February 10). Video games with gambling features should be banned from children. The Sydney Morning Herald. <https://www.smh.com.au/technology/video-games/video-games-with-gambling-features-should-be-bannedfrom-children-20200209-p53z36.html>
- Park, B., & Lee, K. C. (2011). Exploring the value of purchasing online game items. *Computers in Human Behavior*, *27*(6), 2178-2185. <https://doi.org/10.1016/j.chb.2011.06.013>
- Payne, M. T. (2012). Marketing Military Realism in Call of Duty 4: Modern Warfare. *Games and Culture*, *7*(4), 305-327. <https://doi.org/10.1177/1555412012454220>
- Przybylski, A. K., Weinstein, N., & Murayama, K. (2017). Internet gaming disorder: Investigating the clinical relevance of a new phenomenon. *The American Journal of Psychiatry*, *174*(3), 230-236. <https://doi.org/10.1176/appi.ajp.2016.16020224>
- Schwiddessen, S., & Karius, P. (2018). Watch your loot boxes! - recent developments and legal assessment in selected key jurisdictions from a gambling law perspective. *Interactive Entertainment Law Review*, *1*(1), 17-43. <https://doi.org/10.4337/ielr.2018.01.02>
- Statista (2021). *Video games ranked by unit sales in the United Kingdom (UK) in 2020*. Retrieved: February 23, 2021, from <https://www.statista.com/statistics/274072/most-popular-games-in-the-united-kingdom-uk-by-unit-sales/>
- 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*, 1-12. <https://doi.org/10.1016/j.techsoc.2020.101395>
- Wardle, H. (2021). *Games Without Frontiers?: Socio-historical Perspectives at the Gaming/Gambling Intersection*. Palgrave.

- World Health Organization [WHO] (2020). Addictive behaviors. https://www.who.int/health-topics/addictive-behaviours#tab=tab_3
- Zendle, D., & Bowden-Jones, H. (2020). Loot boxes and the convergence of video games and gambling. *The Lancet Psychiatry*, *6*, 724–725. [https://doi.org/10.1016/S2215-0366\(19\)30285-8](https://doi.org/10.1016/S2215-0366(19)30285-8)
- Zendle, D., & Cairns, P. (2018). Video game loot boxes are linked to problem gambling: Results of a large-scale survey. *PloS One*, *13*(11), 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), e0213194. <https://doi.org/10.1371/journal.pone.0213194>
- Zendle, D., Meyer, R., Ballou, N., & Perales, J. C. (2020). The changing face of desktop video game monetisation: An exploration of exposure to loot boxes, pay to win, and cosmetic microtransactions in the most-played steam games of 2010-2019. *PloS One*, *15*(5), 1-13. <https://doi.org/10.1371/journal.pone.0232780>
- Zendle, D., Meyer, R., & Over, H. (2019). Adolescents and loot boxes: Links with problem gambling and motivations for purchase. *Royal Society Open Science*, *6*(6), 1-18. <https://doi.org/10.1098/rsos.190049>

Table 1

Frequency values of gaming behaviour, social play, and offline gambling behaviours in the previous month.

| Gaming and Gambling Variables | <i>n</i> | % |
|---|----------|-------|
| Gaming Behaviour - Time | | |
| < 1 hour | 25 | 19.10 |
| 1-2 hours | 58 | 44.30 |
| 3-4 hours | 45 | 34.40 |
| 5-6 hours | 3 | 2.30 |
| Gaming Behaviour - Frequency | | |
| Never played in previous month | 34 | 26.00 |
| Sometimes played in previous month | 69 | 52.70 |
| Played most days in previous month | 22 | 16.80 |
| Played almost every day in previous month | 6 | 4.60 |
| Device^a | | |
| PC | 14 | 8.81 |
| Xbox | 40 | 25.16 |
| PlayStation | 76 | 47.80 |
| Mobile | 29 | 18.23 |
| Social Play - Frequency | | |
| Not played with friends | 16 | 12.25 |
| Played with friends sometimes | 40 | 30.50 |
| Played with friends about half the time | 20 | 15.25 |
| Played with friends most of the time | 38 | 29.00 |
| Always played with friends | 17 | 13.00 |
| Social Play – Friend Loot Box Purchase | | |
| None of my friends purchase loot boxes | 21 | 16.00 |
| Some friends purchase loot boxes | 59 | 45.00 |
| Most friends purchase loot boxes | 27 | 20.60 |
| All of my friends purchase loot boxes | 7 | 5.30 |
| Unsure if friends purchase loot boxes | 17 | 13.00 |
| Offline Gambling Behaviour | | |
| Lotteries/Scratch cards | 39 | 48.75 |
| Horsrace Betting | 13 | 16.25 |
| Online Casino Gambling | 12 | 15.00 |
| Online Sports Betting | 11 | 13.75 |
| eSports Betting | 5 | 6.25 |

^a Please note: Cumulative percentages may be above 100% due to participants having the option to select more than one response.

Table 2

Spearman's rho correlations between loot box expenditure, the Risky Loot Box Index, and the adapted Problem Gambling Severity Index.

| Problem Gambling Variables | <i>M</i> | <i>SD</i> | Loot Box Expenditure |
|---------------------------------|----------|-----------|-----------------------------|
| Risky Loot Box Index | 11.95 | 5.21 | .288*** BCa CI [.129, .437] |
| Problem Gambling Severity Index | 4.49 | 3.83 | .173* BCa CI [.015, .330] |

Note: *** $p < .001$; * $p < .05$.

Table 3

Spearman's rho correlations between loot box expenditure, adapted perceptions of Call of Duty value, and gaming-contingent self-worth.

| Variables | <i>M</i> | <i>SD</i> | Range | Loot Box Expenditure |
|-------------------------------------|--------------|--------------|---------------|---------------------------------|
| Adapted Perception of Value | | | | |
| Enjoyment | 10.12 | 2.97 | 3-15 | .144 BCa CI [-.031, .288] |
| Character Competency | 9.14 | 3.26 | 3-15 | .045 BCa CI [-.136, .231] |
| Visual Authority | 12.69 | 4.46 | 4-20 | .188* BCa CI [.040, .323] |
| Monetary Value | 7.44 | 3.15 | 3-15 | .162 BCa CI [-.023, .324] |
| Character Identification | 8.77 | 4.27 | 4-20 | .059 BCa CI [-.127, .240] |
| Game Satisfaction | 14.35 | 3.94 | 4-20 | .032 BCa CI [-.134, .203] |
| Purchase Intention | 7.37 | 3.48 | 3-15 | .306*** BCa CI [.098, .461] |
| Gaming-Contingent Self-Worth | 77.09 | 19.91 | 29-117 | .167 BCa CI [.014, .311] |
| Validation Seeking | 17.87 | 7.54 | 9-37 | .158 BCa CI [.003, .301] |
| Reward Orientation | 22.27 | 7.50 | 7-35 | .187* BCa CI [.037, .320] |
| Competition Focus | 17.47 | 7.60 | 7-35 | .057 BCa CI [-.122, .233] |
| Detachment | 19.48 | 6.90 | 6-30 | .050 BCa CI [-.106, .208] |

*Note: **** $p < .001$, * $p < .05$.

Table 4

Multinomial logistic regression of problem gambler risk group and adapted Perceptions of Call of Duty Value sub-scores.

| | <i>b</i> (<i>SE</i>) | 95% CI for Odds Ratio | | |
|---|------------------------|-----------------------|------------|-------|
| | | Lower | Odds Ratio | Upper |
| Low-risk problem gambler vs non-problem gambler | | | | |
| Intercept | -5.37 (2.39)* | | | |
| Enjoyment | .14 (.17) | .83 | 1.15 | 1.61 |
| Character Competency | .23 (.18) | .89 | 1.26 | 1.79 |
| Visual Authority | .10 (.14) | .84 | 1.10 | 1.44 |
| Monetary Value | -.41 (.26) | .40 | .66 | 1.12 |
| Character Identification | .05 (.15) | .78 | 1.05 | 1.40 |
| Game Satisfaction | .16 (.11) | .94 | 1.17 | 1.46 |
| Purchase Intention | .36 (.22) | .93 | 1.43 | 2.19 |
| Medium-risk problem gambler vs non-problem gambler | | | | |
| Intercept | -8.29 (2.60)*** | | | |
| Enjoyment | .33 (.18) | .99 | 1.40 | 1.97 |
| Character Competency | .10 (.18) | .77 | 1.10 | 1.57 |
| Visual Authority | .32 (.14)* | 1.04 | 1.37 | 1.80 |
| Monetary Value | -.41 (.26) | .40 | .66 | 1.10 |
| Character Identification | .13 (.14) | .86 | 1.14 | 1.51 |
| Game Satisfaction | .14 (.12) | .92 | 1.15 | 1.44 |
| Purchase Intention | .34 (.22) | .92 | 1.41 | 2.15 |
| High-risk problem gambler vs non-problem gambler | | | | |
| Intercept | -9.73 (3.06)*** | | | |
| Enjoyment | .25 (.22) | .84 | 1.28 | 1.96 |
| Character Competency | -.02 (.21) | .66 | .98 | 1.47 |
| Visual Authority | .43 (.17)** | 1.11 | 1.54 | 2.13 |
| Monetary Value | -.41 (.28) | .39 | .66 | 1.14 |
| Character Identification | .20 (.16) | .90 | 1.22 | 1.66 |
| Game Satisfaction | .04 (.13) | .81 | 1.04 | 1.35 |
| Purchase Intention | .54 (.23)* | 1.09 | 1.72 | 2.71 |

Note: $R^2 = .45$ (Cox-Snell), $.49$ (Nagelkerke). Model $\chi^2(21) = 77.91, p = <.001$. *** $p < .001$, ** $p < .01$, * $p < .05$.

Table 5

Multinomial logistic regression of problem gambler risk group and Gaming-Contingent Self-Worth total scale score and sub-scale scores.

| | <i>b</i> (<i>SE</i>) | 95% CI for Odds Ratio | | |
|---|------------------------|-----------------------|------------|-------|
| | | Lower | Odds Ratio | Upper |
| Low-risk problem gambler vs non-problem gambler | | | | |
| Intercept | -5.26 (1.84)** | | | |
| GCSW Total | .03 (.05) | .94 | 1.03 | 1.13 |
| Validation Seeking | .21 (.14) | .95 | 1.24 | 1.62 |
| Reward Orientation | .15 (.09) | .98 | 1.16 | 1.38 |
| Competition Focus | -.09 (.10) | .75 | .92 | 1.12 |
| Detachment | - | - | - | - |
| Medium-risk problem gambler vs non-problem gambler | | | | |
| Intercept | -8.40 (2.07)*** | | | |
| GCSW Total | .13 (.05)** | 1.03 | 1.14 | 1.25 |
| Validation Seeking | .23 (.14) | .96 | 1.26 | 1.64 |
| Reward Orientation | .02 (.09) | .86 | 1.02 | 1.21 |
| Competition Focus | -.14 (.10) | .72 | .87 | 1.06 |
| Detachment | - | - | - | - |
| High-risk problem gambler vs non-problem gambler | | | | |
| Intercept | -10.87 (2.46)*** | | | |
| GCSW Total | .11 (.06) | .99 | 1.12 | 1.26 |
| Validation Seeking | .41 (.14)** | 1.14 | 1.50 | 1.99 |
| Reward Orientation | .00 (.11) | .82 | 1.00 | 1.23 |
| Competition Focus | -.16 (.11) | .69 | .86 | 1.07 |
| Detachment | - | - | - | - |

Note: $R^2 = .46$ (Cox-Snell), $.50$ (Nagelkerke). Model $\chi^2(12) = 81.09, p = <.001$. *** $p < .001$, ** $p < .01$.