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FULL-LENGTH REPORT

Are esports bettors a new generation of harmed gamblers? A comparison with sports bettors on gambling involvement, problems, and harm

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ABSTRACT

Background and aims: Esports betting is expanding in popularity, yet little is known about who participates in this niche gambling activity. This study aimed to determine whether esports bettors are more vulnerable to harms and problems than gamblers engaged in traditional sports betting. *Methods:* Data were collected from 298 regular esports bettors and 300 sports bettors (who regularly bet on traditional sports, but not esports). These groups were compared on demographics, gambling involvement, problem gambling, and gambling-related harms. *Results:* Compared to sports bettors, esports bettors were more likely to be younger, university-educated, employed (lower income earners), and speak a non-English language at home. Esports bettors gambled on fewer traditional gambling activities in the last 12 months, but compared to sports bettors, gambled more frequently on some activities, were more likely to meet problem gambler criteria (64.8.% vs 17.3%), and experience at least one gambling-related harm (81.9% vs 45.3%). Being an esports bettor significantly predicted greater problem gambling severity and gambling-related harms. More frequent esports skin betting and skin gambling (on games of chance) were significant predictors of gambling problems amongst esports bettors. *Discussion and conclusion:* The results provide preliminary evidence that esports bettors are more likely to experience gambling problems compared to their sports betting counterparts, potentially stemming from their involvement in emerging video-game related gambling products.

KEYWORDS

esports betting, problem gambling, gambling-related harm, skin gambling; sports betting

INTRODUCTION

With the rapid developments in digital technology over the last decade, esports viewership has become increasingly popular. Betting on these professional video-game competitions closely resembles traditional sports betting, in that monetary bets are made on the outcomes of esports events (between players or teams), and that it is available via regulated domestic (as well as illegal, offshore) gambling operators (King, 2018). Unlike traditional forms of gambling, virtual in-game items can also be used to bet on esports, mainly via unregulated third-party online marketplace websites (e.g., *Steam*, Valve Corporation; Greer, Rockloff, Browne, Hing, & King, 2019). These items, known as 'skins,' are purchased with money, rewarded via game play, or obtained via loot boxes (virtual items opened to reveal random contents), and can, themselves, be exchanged for money (Gambling Commission, 2017; Greer et al., 2019). While decades of research have informed the current understanding of the

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risk factors associated with experiencing harm due to traditional gambling activities, presently little is known about who engages in esports betting, or whether their demographic profile and gambling behaviours differ to those who choose to only engage in traditional monetary forms of gambling.

Common risk factors associated with experiencing harm due to traditional gambling activities include, but are not limited to: being male, young, and from low socio-economic status backgrounds; gambling with greater intensity (e.g., more activities, greater frequency, greater expenditure); and early exposure to gambling (Abbott et al., 2018; Browne, Hing, et al., 2019; Miller, 2015). Many of the common risk factors associated with traditional gambling (being young, male, greater gambling intensity) also appear to be associated with esports betting (Abarbanel, Macey, Hamari, & Melton, 2020; Browne, Rockloff, et al., 2019; Gainsbury, Abarbanel, & Blaszczynski, 2017a, 2017b; Gambling Commission, 2018, 2019, 2020; Macey, Abarbanel, & Hamari, 2020; Macey & Hamari, 2018a; Rockloff et al., 2020; Wardle, Petrovskaya, & Zendle, 2020). In addition to being male and younger, an Australian study found other distinct demographic differences between esports bettors and sports bettors (Gainsbury et al., 2017a). Esports bettors were significantly more likely than sports bettors to be employed, have obtained a higher education level, earn a higher income, be of an Asian (versus European or other) background, and speak a language other than English at home (Gainsbury et al., 2017a). Young video gamers and esports spectators are likely to be exposed to gambling products early in their development, due to the presence of gambling operators' advertising in environments they 'frequent,' including online streaming services (e.g., *YouTube, Twitch*, etc.), social influencers, social media, and esports competitions (Abarbanel & Phung, 2019; Ipsos MORI, 2020; Kelly & Gerrish, 2019; King, 2018; Parent Zone, 2018; Smith, Rossi, Jones-Demos, & Inskip, 2020). This situation justifiably raises questions as to whether esports bettors are at an elevated risk for involvement in other traditional forms of gambling activities and subsequent gambling problems and harm.

Recent studies suggest a positive association between esports betting and participation in traditional forms of gambling (Gainsbury et al., 2017b; Macey & Hamari, 2018b; Macey et al., 2020; Wardle et al., 2020). While esports bettors typically participate in traditional forms of gambling, they also gamble more frequently, and on more activities, than sports bettors (Gainsbury et al., 2017b) and bettors on sports/other events (Wardle et al., 2020). In a sample of adult video gamers and/or esports viewers, Macey et al. (2020) found increased participation in traditional forms of gambling was positively associated with esports betting. The option of using skins for esports betting and on games of chance also appears to be an important factor in traditional gambling participation. Wardle et al. (2020) included betting with skins on external websites or privately into their analysis (of UK youth aged 16–24 years), finding more frequent skin gambling was predictive of being an esports bettor. In addition, Macey and Hamari (2018b) found greater consumption of online gambling amongst video gamers (the majority aged 15–29 years) was positively associated with greater consumption of video game-related gambling, specifically including esports betting and skin gambling.

Esports bettors' high involvement in traditional forms of gambling could mean that their risk for experiencing gambling-related harm is already elevated. Esports bettors may also engage in other types of video game-related gambling activities that contribute to their gambling issues, such as betting with in-game items or skins (Hing et al., 2020; Russell et al., 2020; Wardle, 2019). Early evidence shows a relationship between esports betting participation and greater gambling problems and harm (Browne, Rockloff, et al., 2019; Gainsbury et al., 2017b, 2019; Macey & Hamari, 2018a, 2018b; Rockloff et al., 2020; Russell et al., 2020; Wardle et al., 2020; Zendle, 2020); however, it is not clear to what extent esports betting uniquely contributes to harm/problems *above* participation in other gambling activities. There are two ways to potentially overcome this limitation: the first is to compare the gambling harm experienced by esports bettors against other types of gamblers not engaged in video game-related gambling; the second is to partial out participation effects via multivariate analyses.

Employing this dual approach, this present exploratory study sought to determine whether esports bettors are unique in their demographic composition and gambling behaviours (as well as problem gambling and gambling-related harm), compared with sports bettors who do not engage in esports betting. The extent to which gambling problems and harm were associatively attributable to esports betting, compared to other video game-related gambling (i.e., skin gambling) and traditional gambling was also investigated.

METHODS

Participants and procedures

Data were obtained from an online survey conducted May-July 2019 with Australian residents aged 18 years or over (71.2% male; ages ranged between 18 and 77 years, M = 38.92, SD = 12.03 with: 13.4% 18–24 years, 27.4% 25–34 years, 25.6% 35–44 years, 24.1% 45–54 years, 7.4% 55–64 years, and 2.2% 65 years or older). Participants were recruited via Qualtrics and compensated via panel points.

Two sub-groups were sampled: esports bettors (n = 298) and sports bettors (n = 300). Esports bettors met inclusion criteria if they bet on esports regularly ('at least fortnightly') in the last 12 months, with either money (including debit, credit, or cryptocurrency), or with skins or skin deposits (defined as, 'virtual game items or other tradeable items: does not include loot box purchases.'). Esports bettors were not excluded based on participation in other forms of gambling, such as sports betting.

Sports bettors met inclusion criteria if they: 1) bet regularly ('at least fortnightly') in the last 12 months on sports, excluding esports or fantasy sports; 2) did not bet on esports in the last 12 months with money or skins; and 3)

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did not watch esports in the last 12 months. Of the 298 esports bettors, over half bet on esports regularly with both money and skins (53.7%), followed by cash-only betting (30.9%), then skins-only betting (15.4%).

Measures

Demographics. Age, gender, main language spoken at home, country of residence, residential state/territory and postcode, marital status, highest level of education completed, employment status, and annual personal income information was collected. Main language spoken at home was used as a measure for culturally and linguistically diverse (CALD) community identification.

Gambling behaviours. Data were collected on three 'video game-related gambling' activities: 1) *esports cash betting*, defined as using money (debit, credit, or cryptocurrency) to bet on esports, 2) *esports skin betting*, defined as using skins or skin deposits to bet on esports, and 3) *skin gambling*, defined as using skins or skin deposits to bet on games of chance (e.g., roulette, jackpot, coinflip). Skins were defined as 'virtual game items or other tradeable items' and participants were instructed that this excluded loot box purchases. Information on involvement in ten 'traditional gambling' activities (i.e., those which were commercially available to Australian consumers and did not involve video games) was also collected.

Frequency of gambling in the last 12 months (*at least weekly, at least fortnightly, at least monthly, not monthly but within the last 12 months, more than 12 months ago, never*) was collected for each video game-related gambling activity, as well as for the ten traditional gambling activities.

Problem gambling. Problem gambling was measured using the *Problem Gambling Severity Index* (PGSI; Ferris & Wynne, 2001). A total score, between 0 and 27, was calculated by summing together all responses to the nine-items of the PGSI, and level of problem gambling severity coded into categories by risk (0 = no problems, 1–2 = low risk, 3–7 = moderate risk, 8+ problem). Higher scores indicated higher problem gambling severity.

Gambling-related harm. The *Short Gambling Harm Screen* (SGHS; Browne, Goodwin, & Rockloff, 2018) was used to assess the degree of harm caused by gambling, that is distinguishable from problem gambling (which is defined as a mental health condition). SGHS score is calculated by summing together the dichotomous responses (0 = *no*, 1 = *yes*) of the 10 items. Higher scores indicate higher gambling-related harm.

Statistical analyses. Independent groups t-tests and chi-square tests were used to compare differences between *gambler type* (*esports bettors, sports bettors*) on demographics, gambling involvement (last 12 months, fortnightly, number of traditional gambling activities, PGSI, and SGHS. Three separate multiple linear regressions were conducted to determine whether *gambler type* (*esports bettors* = 0, *sports bettors* = 1) predicted three dependent variables: *number of traditional gambling activities, problem gambling severity score* (PSGI), and *gambling-related harm score* (SGHS). A log-transformation of PGSI score was required to reduce the positive skew. *Age* (scale) and *gender* (0 = male, 1 = female) were entered into the regression as covariates to control for any age and gender differences between gambler type which interact with the DVs. Two of the dependent variables (PGSI and SGHS) were highly correlated (r = 0.557). The results for these analyses are, therefore, expected to be similar and should not be interpreted as entirely independent results. Both PGSI and SGHS are reported, due to current issues around the measurement of problem severity and harms in gambling research (see Browne & Rockloff, 2017). We also conducted the analysis as a MANOVA, but note that, because PGSI and SGHS are highly correlated and may not be completely distinct dependent variables, this may not be the best approach. However, we provide the output from the MANOVA analysis for an interested reader at osf.io/h2fu8.

Two additional multiple linear regressions were also conducted to identify which video game-related and traditional gambling activities (as measured by frequency) uniquely predicted greater gambling problems (PGSI) and gambling-related harms (SGHS), while controlling for age (scale) and gender (0 = *male*, 1 = *female*) amongst esports bettors. Assumptions of multicollinearity were addressed via the calculation of variance inflation factors (VIFs) for each regression. The VIFs for frequency of buying scratch tickets and playing bingo were both 52, showing multicollinearity; the remaining variables' VIFs were below 4, indicating a relative lack of multicollinearity. Regressions were rerun, excluding scratch tickets and bingo.

Ethics

The research was carried out in accordance with CQUniversity Human Research Ethics Committee (HREC clearance number: 21504). All participants provided informed consent to participate.

RESULTS

Demographics

As shown in Table 1, although both groups were mostly male in composition, a significantly higher proportion of esports bettors were female, compared to sports bettors. Esports bettors were, on average, significantly younger than sports bettors, more likely to have completed a university degree, be employed full or part-time, and speak a language other than English at home.

Involvement in traditional gambling

Gambling participation last 12 months. As shown in Fig. 1, almost all esports bettors participated in at least one of the

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Table 1. Demographic profiles of esports bettors ($N = 298$) and sports bettors ($N = 300$)

Sample characteristic	Esports bettor ($N = 298$) *n* (%)	Sports bettor ($N = 300$) *n* (%)	Statistic	*P* value
Gender				
Male	172 (57.7)	254 (84.7)	$\chi^2(1, 597) = 52.99$, $P < 0.001$, $\Phi = -0.298$	<0.001
Female	126 (42.3)	46 (15.3)		<0.001
Age (years)				
18–24	69 (23.2)	11 (3.7)	$\chi^2(3, 595) = 136.22$, $P < 0.001$, $\Phi = 0.477$	<0.001
25–34	118 (39.6)	46 (15.3)		<0.001
35–44	65 (21.8)	88 (29.3)		0.035
45+	46 (15.4)	155 (51.7)		<0.001
Mean *(SD)*	33.28 *(10.44)*	44.53 *(10.83)*	$t(596) = -12.94$	<0.001
Australian Residential State or Territory				
New South Wales	102 (34.2)	91 (30.3)	$\chi^2(7, 591) = 5.22$, $P = 0.634$, $\Phi = 0.093$	>0.05, ns
Victoria	86 (28.9)	95 (31.7)		>0.05, ns
Queensland	46 (15.4)	56 (18.7)		>0.05, ns
South Australia	30 (10.1)	25 (8.3)		>0.05, ns
Western Australia	26 (8.7)	20 (6.7)		>0.05, ns
Australian Capital Territory	4 (1.3)	5 (1.7)		>0.05, ns
Tasmania	4 (1.3)	7 (2.3)		>0.05, ns
Northern Territory	0 (0.0)	1 (0.3)		>0.05, ns
Marital status				
Not in a relationship (single, never married/divorced/separated/ widowed)	109 (36.6)	112 (37.3)	$\chi^2(1, 597) = 0.037$, $P = 0.848$ *ns*, $\Phi = -0.008$	>0.05, ns
Married/domestic partnership	189 (63.4)	188 (62.7)		>0.05, ns
Education level				
Secondary education or less	71 (23.8)	106 (35.3)	$\chi^2(2, 596) = 31.15$, $P < 0.001$, $\Phi = 0.228$	0.002
Post-secondary/tertiary education	54 (18.1)	88 (29.3)		0.001
Bachelor/master/doctoral or equivalent	173 (58.1)	106 (35.3)		<0.001
Speak language other than English at home				
Yes	90 (30.2)	34 (11.3)	$\chi^2(1, 597) = 32.38$, $P < 0.001$, $\Phi = -0.233$	<0.001
No	208 (69.8)	266 (88.7)		<0.001
Employment status				
Employed	260 (87.2)	233 (77.7)	$\chi^2(1, 597) = 9.48$, $P = 0.002$, $\Phi = -0.126$	0.002
Unemployed	38 (12.8)	67 (22.3)		0.002
Annual personal income				
20,799 or less	52 (18.0)	32 (11.8)	$\chi^2(3, 557) = 4.34$, $P = 0.227$ ns $\Phi = 0.088$	0.041
$20,800–41,599	43 (14.4)	42 (14.0)		>0.05, ns
$41,600–77,999	89 (29.9)	87 (29.0)		>0.05, ns
$78,000 or more	105 (36.3)	110 (40.6)		>0.05, ns

ten traditional gambling activities in the last 12 months (98.0%), and most participated in traditional sports betting (95.3%). A significantly higher proportion of sports bettors participated Australian lotteries, horse or greyhound race wagering, buying scratch tickets, and keno: whereas higher proportions of esports bettors gambled on casino table games, bet privately for money, played bingo, and bet on fantasy sports.

On average, esports bettors participated in fewer traditional gambling activities in the last 12 months ($M = 4.09$, $SD = 2.14$) than sports bettors ($M = 4.59$, $SD = 2.05$), $t(596) = -2.93$, $P = 0.004$. As shown in Table 2, a linear regression found *gambler type* (esports bettor, sports bettor), *age*, and *gender* explained 3.50% of the adjusted variance in the number of traditional gambling activities that participants engaged in. Being a sports bettor and older in age were predictive of participation in a greater number of traditional gambling activities.

Gambling frequency. As shown in Fig. 2, a significantly greater proportion of esports bettors engaged in frequent gambling (at least fortnightly) compared to sports bettors, on several traditional gambling activities, including casino table games, private betting for money, slot machines/ pokies/electronic gaming machines (EGMs), keno, and fantasy sports. A high proportion of esports bettors bet on

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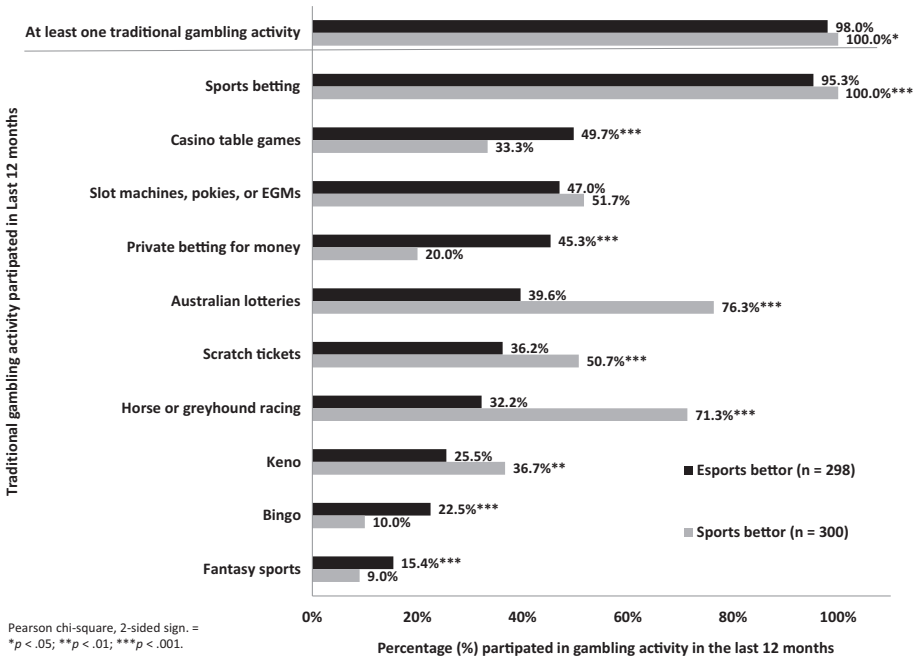


Fig. 1. Comparison of participation in traditional gambling activities in the last 12 months between esports bettors (N = 298) and sports bettors (N = 300)

Table 2. Linear regressions predicting number of traditional gambling activities, problem gambling (log10 PGSI scores) and gambling-related harm (SGHS score) by gambler type, age and gender (N = 598 for each model)

Predictors	B (SE)	Beta	t	Cor.	sr^2
		Dependent variable: number of traditional gambling activities			
Gambler type (0 = EB, 1 = SB)	0.244 (0.198)	0.058	1.232	0.119^{**}	0.25%
Age in years (scale)	0.030 (0.008)	0.170	3.728^{***}	0.186^{***}	2.25%
Gender (0 = Male, 1 = Female)	0.285 (0.196)	0.061	1.451	0.015	0.34%
SUM					2.83%
		Dependent variable: problem gambling (log10 PGSI scores)			
Gambler type (0 = EB, 1 = SB)	−0.420 (0.038)	−0.458	-10.933^{***}	-0.484^{***}	15.32%
Age in years (scale)	−0.003 (0.002)	−0.069	−1.710	-0.280^{***}	0.37%
Gender (0 = Male, 1 = Female)	−0.020 (0.038)	−0.020	−0.523	0.128^{**}	0.04%
SUM					15.73%
		Dependent variable: gambling-related harm (SGHS score)			
Gambler type (0 = EB, 1 = SB)	−2.362 (0.292)	−0.361	-8.088^{***}	-0.362^{***}	9.55%
Age in years (scale)	0.007 (0.012)	0.026	0.611	-0.150^{***}	0.05%
Gender (0 = Male, 1 = Female)	0.311 (0.289)	0.043	1.075	0.146^{***}	0.17%
SUM					9.77%

Notes: $^{*}P < 0.05$; $^{**}P < 0.01$; $^{***}P < 0.001$; EB = esports bettor; SB = sports bettor; B = unstandardized coefficient; SE = standard error; Beta = standardized coefficient; t = independent t-test statistic Cor = Pearson correlation, 2-tailed; sr^2 = squared semi-partial correlation coefficient. Model fit statistics: Number of traditional activities R^2 = 3.9%, adjusted R^2 = 3.5%, residual standard error = 2.074, F(3, 594) = 8.139, $P < 0.001$. Problem gambling: R^2 = 23.8%, adjusted R^2 = 23.5%, residual standard error = 0.402, F(3, 594) = 62.010, $P < 0.001$. Gambling-related harm R^2 = 13.3%, adjusted R^2 = 12.9%, residual standard error = 3.055, F(3,594) = 30.367, $P < 0.001$.

sports regularly (72.8%), although still significantly less than the specifically-recruited regular sports bettors (100%, by definition). Sports bettors, in turn, were more likely than esports bettors to engage in regular horse/greyhound race wagering and spending money on Australian lotteries.

To examine the relationship between gambling frequency and problems or harms, Spearman correlations were calculated. These calculated the associations between frequency on each traditional and video-game related gambling activity and PGSI, as well as SGHS scores, for esports bettors. The results shown in Table 3.

Problem gambling severity

Levels of problem gambling were compared between esports bettors and sports bettors using the PGSI. On average, PGSI scores were significantly higher for esports bettors (M = 10.03, SD = 6.59) than sports bettors (M = 3.70, SD =

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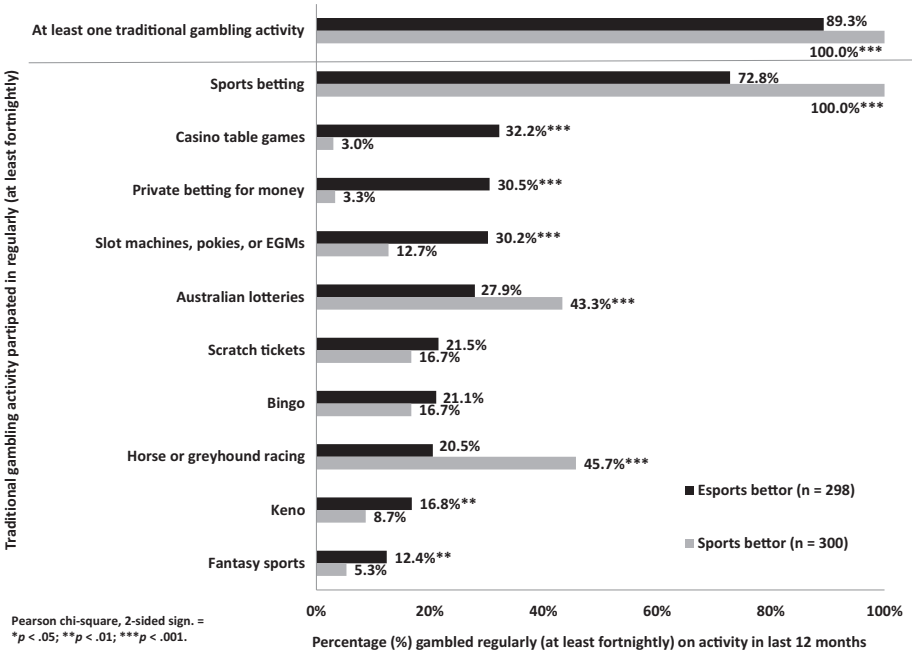


Fig. 2. Comparison of regular (at least fortnightly) participation in traditional gambling activities between esports bettors ($N = 298$) and sports bettors ($N = 300$)

4.91), $t(539.14) = 13.29$, $P < 0.001$. Table 4 shows problem gambling severity by group, with a greater proportion of esports bettors meeting criteria as a problem gambler (64.8%) than sports bettors (17.3%).

When controlling for age and gender in a linear regression, being an esports bettor presented as a significant predictor for greater problem gambling severity, accounting for 15.3% of the variance in PGSI score (see Table 2).

Gambling-related harm

As measured by the SGHS, the percentage of esports bettors (81.9%) being identifiably harmed (1+ harms) was significantly greater than harmed sports bettors (45.3%), $\chi^2(1, 597) = 86.19$, $P < 0.001$, $\Phi = -0.380$. In addition, the average number of harms experienced was greater for esports bettors ($M = 4.30$, $SD = 3.20$) than sports bettors ($M = 1.93$, $SD = 2.90$), $t(589.53) = 9.47$, $P < 0.001$. In line with the results for problem gambling (PGSI), after controlling for *age* and *gender* in a linear regression, being an esports bettor (versus sports bettor) was a significant predictor of greater SGHS score and accounted for 9.60% of the variance in SGHS score (see Table 2).

Attributable gambling problems and harm to specific gambling activities

Given esports bettors gambled on multiple activities, and the patterns of gambling participation were related to each other, we sought to identify whether (and if so, to what degree) video game-related gambling activities contributed to problem gambling and gambling-related harm, separate to traditional gambling activities. Two multiple linear regressions were conducted with *age, gender*, and *gambling frequency* variables to predict PGSI and SGHS. Table 5 shows that, for esports bettors, greater frequency of esports skin betting (ESB) and skin gambling on games of chance (SG), as well as less frequent buying of lottery tickets, were significant predictors of PGSI scores.

DISCUSSION

This study compared the profiles of regular adult esports bettors to sports bettors on demographics, gambling behaviours, level of gambling problems, and gambling-related harm. Demographically, esports bettors were significantly younger (early 30s) than sports bettors (mid 40s). Esports betting was found to attract a higher proportion of female bettors, compared to traditional sports betting, although consumers of both types of betting were more likely to be male. Esports bettors were more likely than sports bettors to speak a language other-than-English at home, to be university educated, and be employed. These findings are consistent with previous Australian research that also compared adult regular esports bettors to sports bettors (Gainsbury et al., 2017a), but only sub-sampled the former from the latter group and only included people who bet on esports with cash or credit, specifically excluding those who bet on esports with skins. The current research adds to these findings by sampling esports bettors who use in-game items (skins), as well as monetary forms of betting. It is important to note that demographics, such as high education and being employed, to some degree may be attributable to being younger and not necessarily being an esports bettor. The higher degree of non-English speaking esports bettors than sports bettors may be reflective of an ethnic origin and/or

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Table 3. Spearman's rho correlation coefficient between frequency of participation in traditional gambling activities, video-game related gambling activities, problem gambling severity, and gambling-related harm (Base: esports bettors, $n = 298$)

Variables	PGSI	SGHS	1	2	3	4	5	6	7	8	9	10	11	12
PGSI	1													
SGHS	0.557***	1												
1. ECB freq	−0.079	−0.053	1											
2. ESB freq	0.316***	0.166**	−0.279***	1										
3. SG freq	0.266***	0.128*	−0.009	0.534***	1									
4. Sports freq	0.070	−0.067	0.256***	0.058	0.261***	1								
5. Casino freq	0.108	0.110	0.139*	0.086	0.101	0.151**	1							
6. Private freq	0.194**	0.109	0.012	0.297***	0.296***	0.158**	0.106	1						
7. EGM freq	−0.070	0.038	0.016	−0.005	0.047	0.130*	0.171**	0.132*	1					
8. Lotto freq	−0.187**	−0.016	0.045	−0.076	−0.088	0.028	0.212***	0.121*	0.089	1				
9. Scratch freq	−0.055	0.065	−0.073	−0.091	−0.120*	0.023	0.198**	0.205***	0.098	0.375***	1			
10. Bingo freq	−0.046	0.066	−0.053	−0.097	−0.116*	0.039	0.205***	0.213***	0.105	0.371***	0.991***	1		
11. Race freq	−0.039	0.017	0.041	−0.014	0.012	0.146*	0.249***	0.177**	0.081	0.300***	0.242***	0.249***	1	
12. Keno freq	−0.048	0.009	0.061	0.045	0.084	0.091	0.130*	0.170***	0.021	0.239***	0.235***	0.246***	0.241***	1
13. Fantasy freq	0.112	0.026	0.062	0.131*	0.149*	0.095	0.034	0.095	0.240***	0.021	0.096	0.007	−0.021	0.099

*Relationships are significant at the $P < 0.05$ level. ** $P < 0.01$ level, *** $P < 0.001$ level. Freq = gambling frequency last 12 months; ECB = Esports Cash Betting; ESB = Esports Skin Betting; SG = Skin Gambling (games of chance); Sports = sports betting; Casino = casino table games; Private = private betting for money; EGM = electronic gaming machine; Lotto = Australian lotteries; Scratch = Scratch tickets; Race = horse/dog race wagering; Fantasy = fantasy sports betting.

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Table 4. Problem gambling severity (PGSI) and gambling-related harm (SGHS) between esports bettors ($N = 298$) and sports bettors ($N = 300$)

Problem gambling severity status (PGSI)	Esports bettor ($N = 298$) *n* (%)	Sports bettor ($N = 300$) *n* (%)	Statistic	*P* (sign.)
Non problem gambler (0)	25 (8.4)	100 (33.3)	$\chi^2(3, 595) = 147.64$,	<.001
Low-risk gambler (1–2)	32 (10.7)	71 (23.7)	$P < 0.001$, $\Phi = 0.497$	<.001
Moderate-risk gambler (3–7)	48 (16.1)	77 (25.7)		0.004
Problem gambler (8+)	193 (64.8)	52 (17.3)		<0.001

non-Australian country of birth, where esports is culturally more popular, such as in many Asian countries (Gainsbury et al., 2017a; YouGov, 2020).

Esports bettors were found to be highly involved in other video game-related gambling activities (i.e., skin gambling) and traditional forms of gambling – most frequently sports betting (around 70%), followed by casino table games, private betting for money, EGMs, and Australian lotteries. These findings add to the growing evidence from previous studies which compared adult esports bettors to sports bettors (Gainsbury et al., 2017b) and youth sample (16–24 years) esports bettors versus those betting on other sports (Wardle et al., 2020). Compared to sports bettors, esports bettors more frequently gambled on 'riskier' traditional gambling activities (i.e., where large amounts of money can be spent in short periods of time – namely casino table games, EGMs, and private betting for money). This too, is consistent with previous research showing esports bettors' gambling intensity is greater than sports bettors (Gainsbury et al., 2017b; Wardle et al., 2020), although there are only very few who gamble exclusively on esports.

This study provides evidence that, even after controlling for age and gender, esports bettors experience significantly higher levels of gambling problems and gambling-related harms compared to those who only gamble on traditional gambling activities (i.e., their sports bettor counterparts). The fact that esports bettors are highly engaged in esports betting, skin gambling, *as well as* traditional forms of gambling could account for this finding. Theoretically, there are two main direct pathways which could explain this high level of engagement among these relatively young esports bettors, who, consequently, experience high levels of gambling problems and harm. The first pathway is that esports bettors were already involved in other gambling activities and experiencing gambling problems and harms as a result before becoming involved in esports betting; thus, they were already more vulnerable to take up esports betting when they became available to them (especially over the course of the last decade). This explanation appears to be supported by research which found being an esports bettor was predicted by greater gambling consumption (Macey et al., 2020). While this study did not examine problem gambling and harm amongst esports bettors, empirical evidence is emerging that esports betting is associated with greater gambling problems and harm (Browne, Rockloff, et al., 2019; Gainsbury et al., 2017b, 2019; Macey & Hamari, 2018a; Rockloff et al., 2020; Russell et al., 2020; Wardle et al., 2020; Zendle, 2020).

The *second pathway* is that esports viewers may try esports betting with money or skins to 'immerse' themselves further into the pastimes they love (watching esports, obtaining skins). In turn their experience with video game-related gambling could have led to involvement in traditional gambling, which, as they gambled more on multiple activities, adversely impacted them. The decision to try traditional forms of gambling could occur via their actual gambling experiences (e.g., making profit, experiencing excitement) and/or exposure to gambling (e.g., advertising and marketing via esports, promotions via esports betting or skin gambling operators), and is, perhaps, facilitated by easy access to traditional gambling forms in Australia. A study by Macey and Hamari (2018b) with young video gamers found support for this theory. Using a path model, they showed significant positive relationships between esports viewing with both online gambling and video game gambling, then these two gambling activities with PGSI (Macey & Hamari, 2018b). Further research is needed to ascertain the extent to which participation in esports betting, or other video game-related gambling activities, places these gamblers (particularly those underage) at risk for involvement in traditional gambling and the development of gambling problems and/or experiences of gambling-related harm, and vice versa.

Amongst esports bettors greater frequency of esports skin betting and skin gambling on other games of chance were the strongest predictors of problem gambling. Participation in all other traditional gambling activities each accounted for less than one percent of gambling problems and harms. These findings are very interesting, considering gambling with skins remains unregulated, and is highly popular and easily accessible to children and adolescents (King, 2018; Greer et al., 2019). To our knowledge, this is the first study to examine esports cash betting, esports skin betting, and skin gambling on games of chance together, amongst a range of other traditional gambling activities, and to partition out how harmful each product is to the gambler. Other similar studies have examined these video game-related activities separately, finding that, while esports betting was associated with greater degrees of problem gambling amongst Australian adult gamblers (Browne, Rockloff, et al., 2019), last-month adult Australian online gamblers (Gainsbury, Angus, & Blaszczynski, 2019), and adolescent British at-risk/problem gamblers skin gamblers

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Table 5. Linear regressions of gambling activity predictors of problem gambling (PGSI) and gambling-related harm (SGHS) (Base: Esports bettors, $n = 298$)

	PGSI					SGHS				
	B	SE	Beta	t	sr^2	B	SE	Beta	t	sr^2
Age (years)	0.026	0.037	0.041	0.708	0.15%	0.008	0.019	0.027	0.430	0.06%
Gender (M,F)	−0.427	0.740	−0.032	−0.577	0.10%	0.282	0.384	0.044	0.734	0.18%
ECB freq.	−0.309	0.561	−0.033	−0.550	0.09%	0.027	0.292	0.006	0.091	0.00%
ESB freq.	**0.748**	**0.377**	**0.151**	**1.985***	**1.15%**	0.161	0.196	0.067	0.821	0.23%
SG freq.	**0.724**	**0.357**	**0.153**	**2.027***	**1.20%**	0.254	0.185	0.111	1.372	0.63%
Sports freq.	0.514	0.470	0.066	1.094	0.35%	−0.331	0.244	−0.087	−1.355	0.61%
Private freq.	0.399	0.215	0.110	1.857	1.01%	0.085	0.112	0.048	0.761	0.19%
EGM freq.	−0.240	0.206	−0.066	−1.161	0.39%	0.026	0.107	0.015	0.247	0.02%
Casino freq.	0.353	0.208	0.098	1.698	0.84%	0.190	0.108	0.109	1.760	1.04%
Race freq.	0.037	0.233	0.009	0.159	0.01%	0.048	0.121	0.025	0.399	0.05%
Fantasy freq.	0.187	0.270	0.039	0.691	0.14%	−0.045	0.140	−0.019	−0.317	0.03%
Keno freq.	−0.245	0.244	−0.059	−1.005	0.30%	−0.051	0.127	−0.025	−0.400	0.05%
Lotto freq.	**−0.542**	**0.221**	**−0.150**	**−2.452***	**1.76%**	−0.021	0.115	−0.012	−0.182	0.01%
Obs.			298					298		
SUM					7.48%					3.12%
R^2			17.0%					5.0%		
Adj. R^2			13.2%					0.6%		
Resid. SE			6.142					3.191		
F Statistic (df = 13; 284)			4.481***					1.139, ns		

Note: * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; B = unstandardized coefficient; SE = standard error; Beta = standardized coefficient; t = independent t-test statistic; sr^2 = squared semi-partial correlation coefficient; freq = gambling frequency last 12 months; ECB = Esports Cash Betting; ESB = Esports Skin Betting; SG = Skin Gambling (games of chance); Sports = sports betting; Private = private betting for money; EGM = electronic gaming machine; Casino = casino table games; Race = horse/dog race wagering; Fantasy = fantasy sports betting; Lotto = Australian lotteries. Bold signifies significant results.

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(Wardle, 2019), these video game-related gambling activities did not independently predict problem gambling when factoring in participation in traditional gambling activities (Browne, Rockloff, et al., 2019; Gainsbury et al., 2019; Wardle, 2019). This discrepancy between these and the current findings is likely due to the fact that the influence of skin betting was not separately explored in previous research. However, due to the associative nature of this research, we recommend that future research is conducted to replicate the current findings and confirm if this specific gambling activity is, indeed the most harmful and problematic.

Implications

The results of this study have important practical implications. First, they highlight that frequent using skins to bet on esports and games of chance are associated with greater gambling problems among adults. This is of potential concern, especially from a youth-protection perspective, because websites offering skin gambling are easily accessible to consumers under legal gambling age (Greer et al., 2019; King, 2018) and are increasingly offering unregulated monetary and Blockchain-based technology betting options (Abarbanel & Macey, 2018; Greer et al., 2019).

In addition, the current findings add to a growing research base that emerging video game-related gambling products, such as esports betting and skin gambling, are attracting young consumers who may be more vulnerable to experience issues related to their gambling than older/traditional gambling cohorts. Education programs and awareness campaigns should be directed key stakeholders on the convergence of gambling with video gaming and esports and governments should be mindful of the need to appropriately regulate skin gambling in the online environment.

Limitations and future directions

One limitation of this study is that the groups sampled as esports bettors and sports bettors gambled regularly on their namesake activities, meaning they are only representative of more-involved gamblers, who are, in turn, likely experiencing higher levels of gambling problems and harms. Second, our study was limited to an adult sample and future research should replicate this study with children and adolescents who may be more exposed to esports betting via video games and esports. Third, data were collected cross-sectionally and only shows correlational (not causal) evidence of the association of esports betting with traditional gambling activities, and gambling problems and harm. A longitudinal study would best capture whether participation in esports betting typically occurs prior to, or after, traditional gambling. Longitudinal research would also help determine whether esports betting during youth places one at risk for involvement in commercial forms of gambling later in adult life, as well as subsequent development of gambling problems and experiences of gambling-related harm. Fourth, the sample was recruited via online panels, introducing a potentially biased sample of participants more familiar with the online landscape and more likely to have internet-based addictions, such as online gambling - this may possibly explain the high level of gambling problems and harm amongst esports bettors. Fifth, we acknowledge that the measures of gambling problems and harm are not strictly reflective of gambling solely for esports or sports bettors. It is difficult sample exclusive esports bettors, as virtually all bet on sports. The comparison of PGSI and SGHS scores between esports bettors to sports bettors should therefore be viewed as comparing the *added* risk from additional betting on esports, not the absolute difference between the two forms of betting. Likewise, sports bettors in the study could also bet on other forms of gambling, and thus their PGSI and SGHS scores may not be due to sports betting specifically. Further, there may be components of esports betting that are not captured by the PGSI or SGHS, since neither scale has been validated for this population. Future work may be required to determine if instruments used to measure problems or harm due to traditional gambling forms also apply to newer forms like esports betting. Sixth, some of the effect sizes reported here are relatively small, and statistical significance should not be confused with practical significance and replication is required to determine if the effect sizes reported here are stable. Seventh, this study did not consider the broader psychological, environmental, or comorbid factors that may explain why esports bettors participate in other forms of gambling and experience high levels of gambling problems and harm, for example impulsivity, gambling motivations, mental health issues, and substance use (cf. Browne, Hing, et al., 2019; Dowling et al., 2017; Miller, 2015; Williams et al., 2015). Eighth, the current study does not examine different structural features or contextual factors between esports betting and sports betting, such as speed of betting, whether they bet alone or in groups, bet types, or other characteristics that might appeal more to a particular segment of the population, such as young people. This was beyond the scope of this study, but it is an important topic for future research.

CONCLUSIONS

This is one of the few studies to explore video game-related gambling in the Australian context. It found that esports betting mainly attracts a young, male demographic, who are engaged in many traditional forms of video game-related and traditional gambling activities, more frequently on 'harmful' forms, and experience higher levels of gambling problems and harm than traditional gamblers (i.e., sports bettors). In addition, this study provides preliminary evidence that for adult esports bettors greater frequency of esports skin betting and skin gambling on games of chance is associated with current gambling problems. This research could be utilised to inform the regulation of appropriate action to safeguard consumers of these products, alongside the development of education and awareness programs, and to help reduce gambling harm. Future research will be

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needed to identify other factors which explain why esports bettors are more at risk for gambling involvement and harm than other types of bettors.

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