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ORIGINAL ARTICLE

Associations between playing free-to-play sports gambling predictor games and online sports betting frequency for men in the United Kingdom

Charley Wilson[1] · Nadia Butler[1] · Zara Quigg[1]

Abstract

Aim This study aimed to describe associations between playing predictor games and online sports betting behaviours, and problem gambling.

Methods An online survey using a convenience sample was completed by males aged 18 + years, living in the United Kingdom, and having participated in any gambling activity in the past year (n = 384). The survey asked questions about sociodemographics, gambling behaviours and predictor game playing behaviours. The Problem Gambling Severity Index (PGSI) tool was used to determine existence of at-risk and problem gambling. Bivariate analyses using X^2, and multivariate analyses using binary logistic regressions were carried out.

Results Predictor games were played by 45.8% of all participants. In bivariate analyses, there was an association between predictor game playing and age ($p = 0.019$), with predictor game playing most prevalent in the age group 18–24 years 51.8%. In bivariate analysis, there was a significant graded relationship between playing predictor games and PGSI group ($p < 0.001$), with predictor game playing most prevalent among those with problem gambling 76.9%. In multivariate analysis, after controlling for sociodemographics and PGSI group, those who played predictor games were 2.80 (1.65–4.74 $p < 0.001$) times more likely to engage in high frequency online sports gambling than those who did not play predictor games.

Conclusions This study suggests there may be links between playing predictor games and gambling harms through increased frequency of online sports gambling, particularly amongst already vulnerable groups. Policy options placing restrictions on the most harmful inducements – one of which being predictor games – must be considered to protect against gambling harms.

Keywords Gambling · Problem gambling · Inducements · Predictor games

Background

Globally, gambling is increasingly considered a significant public health concern. Across different regions, research has illustrated that gambling harm can occur at different levels, from the individual, to relationships, to harms at the community and societal levels (Langham et al. 2015; Orford 2020). Individual harms can range from low-level financial harm up to crisis points, including crime, homelessness, violence, and suicide (Langham et al. 2015; Butler et al. 2019; Orford 2020; Wardle et al. 2020). Alongside this are harms

to significant others characterised by inter-personal conflicts and the breakdown of relationships (Langham et al. 2015; Goodwin et al. 2017). At community and societal levels, gambling contributes to inequalities, with harms most heavily concentrated amongst those with the least resources to tackle them (Wardle 2015; Evans and Cross 2021). While gambling harms have previously been considered as isolated to those experiencing problem gambling, research has shown that the majority of overall harms associated with gambling fall on those who are below the threshold for problem gambling, with even low-risk gamblers having poorer wellbeing than people who do not gamble (Canale et al 2016; Browne et al. 2017; Butler et al. 2019; Browne 2020).

Online sports gambling is one branch of the gambling industry that has seen rapid expansion in recent years, with gross gambling yield (the amount of money retained by the operators from customer stakes after winnings are

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paid out) increasing by 33.6% to £2.33 billion from 2015 to 2020 in the UK (The Gambling Commission 2020). In the UK in 2016, 8% of all adults gambled online with a bookmaker, 13% of men compared to 2% of women, with a review of betting account data showing that 94% of online betting revenue came from men (Connolly et al. 2018; Forrest and McHale 2021). The Health Survey for England (NHS Digital 2018) found that 3.7% of those who engaged with online betting with a bookmaker were considered to have problem gambling, compared to 0.5% of those who gambled on any activity. Unlike sports gambling of the past, featuring football pools with long outcome times and limited opportunities to bet, today's landscape is vastly different. With 24-h instant availability, opportunities to gamble on a variety of markets, shorter outcome times through in-play betting and micro-markets – promoting more impulsive betting, and accumulator and multiplier bets, these features make online sports betting increasingly popular, however, progressively more convergent with more harmful forms of gambling (Lopez-Gonzalez et al. 2018; Winters and Derevensky 2019; Orford 2020; Newall et al. 2021).

Online sports gambling has become increasingly normalised, with betting becoming, for many young men, an integral part of their enjoyment of sports, reinforced by interactions with peer groups (Deans et al. 2016; McGee 2020). A key factor in this normalisation is the role of marketing, advertising and inducements, which are pervasive across UK sports (McGee 2020; Purves et al. 2020; Torrance et al. 2021). While media campaigns, and 'responsible gambling' adverts have attempted to reduce riskier gambling behaviours, these are often run alongside a barrage of betting advertisements and are limited in protecting people from gambling harm (Newall et al. 2019a, b; Purves et al. 2020). Inducements (such as free-bets and bonuses) can be defined as 'gambling sales promotions offering incentives to bet additional to what is normally received as the core wagering product, the incentive to bet is offered in conjunction with a specified betting-related activity and/or redeemed in a form that encourages betting' (Hing et al. 2015a p. 15). Inducements have the aim of increasing betting consumption by increasing uptake, continuation, and intensification of gambling (Hing et al. 2015a).

Another inducement development of many gambling companies is the availability of free-to-play sports gambling predictor games (referred to as predictor games from here onwards), whereby real money or free-bets can be won by answering questions or making predictions on sports games. Usually after playing the predictor game, offers for real money bets are given. These offers for betting are based on predictions made by the player in the predictor game – further personalising offers for betting, which could make the real money gambling market more attractive.

Predictor games are an interactive and engaging form of inducement. They could also be another incentive drawing new players into gambling, particularly as new players may want to first simulate gambling without ever having the negative impacts of losing, which could erroneously give perceptions of reduced risks and increased control – leading to increased risk-taking behaviours (Frahn et al. 2014; McGee 2020). Research has shown gambling practice games are a potential gateway into monetary gambling, particularly for younger males, allowing people to increase their skills, knowledge, and familiarity with gambling activities (Gainsbury et al. 2016; Armstrong et al. 2018). Further, practice gambling games increase the likelihood of future problem gambling (Gainsbury et al. 2016). Predictor games could be seen as a sports gambling practice game. More recent developments within predictor games have seen some betting companies offering monthly or seasonal leaderboards adding a further competitive element. Betting companies have used predictor games in communications via texts, emails, and social media, encouraging consumers to play, updating them on their performance, and using predictor games to give out further inducements such as free-bets across social media.

Inducements are particularly attractive to people who gamble, as they are perceived to reduce risk, increase control and increase the profitability of bets (Deans et al. 2017; Lopez-Gonzalez et al. 2017a). However, studies show that inducements increase betting expenditure, often beyond what was intended, and are associated with decreased control, encouraging riskier and more impulsive betting behaviours, often causing and exacerbating gambling harms, and limit the ability of those harmed by gambling to reduce their consumption (Hing et al. 2014, 2016, 2018a; Browne et al. 2019). Predictor games, as an interactive form of inducement, could cause harm by encouraging the continuation and intensification of gambling behaviour, increasing players' gambling consumption, further normalising gambling, as well as increasing the number of gambling 'near-misses'. Further, heavy advertisement of predictor games, and their use in personalising direct gambling messages could similarly lead to riskier gambling behaviours.

Previous research has been carried out on sports betting and inducements, this has mostly looked at inducements as a broader topic including multiple types, focused on the structural features of gambling products and advertisements, and around gambling harms. A lot of this research has been conducted outside of the UK, mostly in Australia (Hing et al. 2014, 2015a, 2016, 2018a; Browne et al. 2019), and to the authors knowledge, no prior research has been conducted explicitly investigating predictor games and their links to gambling behaviours and harms.

Aims

The current study aims to determine whether there is an association between playing predictor games and: (1) online sports gambling behaviour; and (2) gambling problem severity, in a sample of men from the UK.

Methods

Study design and participants

A cross-sectional online survey using convenience sampling was conducted. The survey was promoted through social media, and gambling forums, charities and support-groups were approached to promote the survey. The topics of online sports gambling and predictor games were pointed out in the survey title and adverts. Participants were eligible to take part in the study if they met the following inclusion criteria: male, living in the UK, aged 18 years or over, and having gambled within the past 12-months. Male gender was chosen as an inclusion criterion as males are more likely to engage in online sports gambling, and more likely to experience harms associated with sports gambling than females, this is particularly the case for younger males, with marketing also often targeted towards males (Deans et al. 2017; Lopez-Gonzalez et al. 2017b; Winters and Derevensky 2019; Forrest and McHale 2021). In total 473 individuals completed the survey; however, 89 were removed due to not meeting the eligibility criteria. Therefore, the overall sample size was n = 384.

Measures

Sociodemographic factors Measured sociodemographic factors included: age (18–24; 25–34; 35 +), annual income level (rounded to the nearest thousand) (< £20,000; £20,000-£40,000; > £40,000), education level (less than university level education; university level education), and ethnicity (any white background; all other non-white backgrounds).

Predictor game playing behaviours Participants were asked about some of their predictor game playing behaviours, including their frequency of playing predictor games (never; 1–5 times a year; 6–11 times a year; about once a month; 2–3 days a month; about once a week; 2–3 days a week; 4–5 days a week; every day). Frequency of predictor game playing was dichotomised into a yes/no measure for analysis, with any frequency of predictor game playing other than 'never' constituting yes. While lower frequency of playing predictor games are likely to have a more limited effect on gambling behaviours, any predictor game playing was chosen as the measure in this instance to take account of all of those who played predictor games and to demonstrate whether they are associated with gambling behaviours broadly across the range of frequencies of those who play predictor games. Further, participants were asked whether they had ever won money from playing predictor games (no; yes—£1 or less; yes—£1.01-£5; yes—£5.01-£10; yes – more than £10).

Online sports gambling frequency Participants were asked about their online sports and horse racing gambling frequency over the past 12-months (never; 1–5 times a year; 6–11 times a year; about once a month; 2–3 days a month; about once a week; 2–3 days a week; 4–5 days a week; every day); the question and responses were based on those in the 2010 British Gambling Prevalence Survey (Wardle et al., 2011). Frequency of online sports gambling was categorised as low: 1 time per year – 2–3 days per month; and high: once per week – every day.

Problem Gambling Severity Index (PGSI) The PGSI is a self-report, validated instrument designed for measuring the presence and severity of gambling problems in general populations (Ferris and Wynne 2001; Holtgraves 2008). The PGSI tool consists of nine questions – four of these measure difficulties in controlling gambling behaviours, while the other five are concerned with the negative impacts of gambling. The PGSI questions are measured on a four-point scale (0 = never, 1 = sometimes, 2 = most of the time, 3 = almost always) (The Gambling Commission 2021). Scores for each question are summed, giving a total overall score ranging from 0 to 27, higher scores indicate a greater severity of gambling risk. PGSI score can be divided into the following four distinct categories: 0 = non-problem gambling; 1–2 = low-risk gambling; 3–7 = moderate risk gambling; 8 + = problem gambling (Raisamo et al. 2014; Canale et al. 2016).

Statistical analysis

All analysis was performed using SPSS v.27. Bivariate analyses were used to examine the association between playing predictor games and sociodemographics, PGSI group, and online sports gambling frequency. Descriptive statistics were used to examine whether participants had won money from playing predictor games. Binary logistic regression (enter method) models were used to estimate the association between predictor game playing and online sports gambling frequency (with online sports gambling frequency as the dependent variable), while controlling for sociodemographics and PGSI group.

Ethics approval

Ethical approval was given by the Liverpool John Moores University Public Health Institute Research Ethics Committee (reference number: PHIPGT2019).

Results

Nature and prevalence of playing predictor games and association with sociodemographics

Predictor games were played by 45.8% of all participants (Table 1). Of those who played predictor games, the proportion of those doing so 1–5 times a year was 27.4%; 6–11 times a year, 6.3%; about once a month, 14.9%; 2–3 days a month, 9.7%; about once a week, 22.3%; 2–3 days a week, 11.4%; 4–5 days a week, 4.6%; and every day, 3.4%.

In bivariate analysis, there was a significant association between playing predictor games and age ($p = 0.019$), with the prevalence of playing predictor games highest amongst those aged 18–24 (51.8%), with a declining percentage of individuals playing predictor games with increasing age (Table 1). There were no significant associations between playing predictor games and ethnicity, income, or education (Table 1).

Of those playing predictor games, 40.6% had ever won money (including in the form of free-bets) from playing predictor games, including 25% of those with non-problem gambling, 35.2% of those with low-risk gambling, 57.5% of those with moderate-risk gambling, and 65% of those with problem gambling ever having won money from playing predictor games.

Associations between playing predictor games and problem gambling

The overall prevalence of non-problem gambling in the sample was 40.9%, low-risk gambling 31.5%, moderate-risk gambling 20.8%, and problem gambling 6.8% (Table 1). In bivariate analysis, there was a significant graded relationship between playing predictor games and PGSI group ($p < 0.001$; Table 1), with 36.3% of those with non-problem gambling, 48.8% with low-risk gambling, 50.0% of those with moderate-risk gambling, and 76.9% of those with problem gambling playing predictor games (Table 1).

Table 1 Bivariate sample sociodemographics and gambling behaviours by predictor game involvement

Sociodemographics and gambling behaviours	All % (n)	Plays predictor games % (n)	X2	p
All	100 (384)	45.8 (176)		
Age group (years)				
18–24	36.7 (141)	51.8 (73)		
25–34	45.0 (173)	46.8 (81)		
35+	18.2 (70)	31.4 (22)	7.92	0.019
Income				
<£20,000	36.8 (141)	46.1 (65)		
£20,000-£40,000	47.0 (180)	49.4 (89)		
>£40,000	16.2 (62)	35.5 (22)	3.62	0.164
Education				
Less than university level	36.0 (136)	41.9 (57)		
University level	64.0 (242)	48.3 (117)	1.45	0.228
Ethnicity				
Any white background	87.8 (337)	46.0 (155)		
All other non-white backgrounds	12.2 (47)	44.7 (21)	0.03	0.866
PGSI group				
Non-problem gambling	40.9 (157)	36.3 (57)		
Low-risk gambling	31.5 (121)	48.8 (59)		
Moderate-risk gambling	20.8 (80)	50.0 (40)		
Problem gambling	6.8 (26)	76.9 (20)	16.84	<0.001
Online sports gambling frequency				
Low	57.8 (177)	45.2 (80)		
High	42.2 (129)	68.2 (88)	15.97	<0.001

Playing predictor games and online sports gambling frequency

Of those who engaged in online sports or horse race gambling, the proportion of those doing so 1–5 times a year was 23.2%; 6–11 times a year, 11.4%; about once a month, 10.8%; 2–3 days a month, 12.4%; about once a week, 18.3%; 2–3 days a week, 10.8%; 4–5 days a week, 8.5%; and every day, 4.6%.

In bivariate analysis, there was a significant association between playing predictor games and online sports and horse racing gambling frequency ($p < 0.001$; Table 1). In multivariate analysis, after controlling for sociodemographics and PGSI group, those who played predictor games were 2.80 (1.65–4.74 $p < 0.001$) times more likely to engage in high frequency online sports gambling than those who did not play predictor games (Table 2).

Discussion

Key findings

This study adds to the current evidence around inducements and is, to the knowledge of the authors, the first study to explore associations between playing predictor

Table 2 Multivariate relationships between playing predictor games and high frequency of online sports gambling

Age group (years)	AOR (95% CI)	p
35 + (ref)		0.137
25–34	0.48 (0.22–1.07)	0.072
18–24	0.42 (0.17–1.02)	0.056
Income		
< £20,000 (ref)		0.758
£20,001–£40,000	0.82 (0.45–1.51)	0.533
> £40,001	0.73 (0.29–1.85)	0.512
Education		
Less than university level (ref)		
University level	0.76 (0.44–1.32)	0.330
Ethnicity		
Any white background (ref)		
All other non-white background	0.53 (0.22–1.29)	0.161
PGSI group		
Non-problem gambling (ref)		< 0.001
Low-risk gambling	2.09 (1.12–3.87)	0.020
Moderate-risk gambling	5.43 (2.71–10.92)	< 0.001
Problem gambling	5.93 (2.06–17.11)	0.001
Predictor game playing		
Does not play predictor games (ref)		
Plays predictor games	2.80 (1.65–4.74)	< 0.001

games and self-reported online sports gambling frequency. This study takes place from a UK perspective, whereas most other research on inducements has been performed in Australia. The key findings within this study were that there was a significant association between playing predictor games and age, with the highest prevalence of playing predictor games amongst those aged 18–24 followed by those aged 25–34, and lowest amongst those aged 35 + years. There was an incremental increase in the prevalence of playing predictor games as problem gambling severity increased, with non-problem gambling having the lowest prevalence, and problem gambling the highest. Playing predictor games was significantly associated with higher frequency of online sports gambling while controlling for sociodemographics and PGSI group.

Associations between playing predictor games and sociodemographics

The only statistically significant finding for engagement with predictor games by sociodemographics was an association between playing predictor games and age. With younger males having an increased engagement with predictor games, with engagement decreasing incrementally with increasing age. An explanation for this could be that younger males are more likely than older males to engage with online sports gambling (Winters and Derevensky 2019; Forrest and McHale 2021). With this increased engagement with online sports gambling sites and a greater deal of exposure to their digital marketing (often direct and targeted towards younger males), this brings about increased opportunities, awareness and motivations to engage with predictor games (Sproston et al. 2015; Deans et al. 2017; Hing et al. 2017). This could therefore be a good illustration of the effectiveness of digital gambling marketing in influencing gambling behaviours and wider engagement with gambling products. This may be particularly effective to a younger demographic in terms of sports gambling marketing (Sproston et al. 2015; Guillou-Landreat et al. 2021).

The increased level of predictor game playing among younger males could also illustrate a greater level of gambling normalisation among younger people, and particularly an overexposure of young people to gambling advertising and media (Sproston et al. 2015; McGee 2020; Guillou-Landreat et al. 2021). This may be demonstrated in younger people who are new to online sports gambling having awareness of the inducements on offer and may want to sample gambling products in a risk-free manner by engaging with predictor games to 'test their skills' whilst also having the chance of gaining free-bets (Armstrong et al. 2018; McGee 2020; Orford 2020).

Associations between playing predictor games and PGSI group

The prevalence of predictor game playing increases incrementally across the spectrum of gambling risk levels, from those with non-problem gambling having the lowest prevalence to those with problem gambling the highest. This finding is concurrent with some past research, which had highlighted that those with problem gambling are at increased exposure to inducements (Hing et al. 2014, 2015a; Sproston et al. 2015). However, more current research looking at both impacts of and exposure to inducements could not find significant differences, or patterns suggesting significant differences, across PGSI groups (Hing et al. 2019; Rockloff et al. 2019). In the study by Hing et al. (2019) when looking at exposure to inducements, it was noted that due to a large proportion of the sample having been exposed to inducements that comparisons across PGSI groups could not be undertaken. The extent of the increased prevalence of playing predictor games in riskier PGSI groups in the current study may be overstated due to the nature of self-report data, and that those with problem gambling are more likely to overestimate their exposure to gambling marketing (Hanss et al. 2015; Rockloff et al. 2019). While the effect size could be overstated, when considering the studies by Hing et al. (2019) and Rockloff et al. (2019) looked at a broader range of inducements, this finding overall may still be accurate in the case of predictor games, given that predictor games are a uniquely interactive type of inducement. More research may be required, particularly that which is not overly reliant on self-report data, to determine whether there are differences across the PGSI groups with regard to engagement with predictor games and inducements more generally.

Predictor games could bring about a range of harms, particularly in those groups with greater levels of engagement (younger males and those with problem gambling), who are already at increased susceptibility to gambling harms – and appear to be the target of much gambling advertising and marketing as shown by previous research (Sproston et al. 2015; Newall et al. 2019a; Guillou-Landreat et al. 2021). Previous research has depicted some potential harms related to inducements (including free-bets) which may be particularly concerning from the perspective of those with problem gambling. This includes that engagement with inducements may increase gambling spending, frequency and time, limits the ability of those with problem gambling to reduce their gambling, and may act as a potential trigger for gambling activities, including for those who have stopped gambling (Hing et al. 2014, 2015a). These harms may be factors for consideration in terms of predictor games, in light of the current research showing that younger males and those with problem gambling have increased engagement with predictor games.

If an individual wins the predictor game, this further encourages the continuation and intensification of gambling through free-bets. Furthermore, by winning free-bets from predictor games, this could act as a trigger or a reminder for betting, also bringing about erroneous perceptions about gambling as a risk-free activity (Hing et al. 2014, 2018a; Lopez-Gonzalez et al. 2017b). This is concerning given that those with problem and at-risk gambling in the current study had a higher prevalence of winning money, including free-bets, from playing predictor games. Playing predictor games also exposes individuals to encouragements and opportunities to place bets, both immediately after the predictor game is played and through direct messaging (Hing et al. 2018b). These may be particularly influential as they are based upon predictions that have already been made through the predictor game – making these advertisements personalised and unique to the individual. Further research may be useful in determining whether the impacts of predictor games are limited to those winning predictor games (and so receiving free-bets), and determining whether advertising of bets based on predictions made in predictor games is more effective than usual advertising and direct messaging.

Associations between playing predictor games and frequency of online sports gambling

Higher frequency of online sports and horse race gambling was more likely among those who played predictor games compared to those who did not. This relationship was significant while controlling for sociodemographics and PGSI group. Increased frequency of gambling has been shown to have clear links to both problem gambling and gambling harms (Orford et al. 2013; Raisamo et al. 2014; Hing et al. 2017). Arguments have been made that gambling advertisements and promotions do not increase overall consumption, rather they increase the market share for an individual provider (Hing et al. 2014). However, a finding of increased frequency of online sports gambling in those that play predictor games compared to those that do not play predictor games would provide evidence to counter this point at the level of one specific type of inducement.

The association between playing predictor games and increased frequency of online sports and horse race gambling could demonstrate a mechanism through which playing predictor games may lead to increases in PGSI scores. This would help to characterise predictor games in the same way that previous research has characterised other inducements – as encouraging the intensification and continuation of gambling behaviours (Hing et al. 2015a, 2016). However, it must be stated that this is purely speculation, and such conclusions can not be derived from the current dataset given that it is cross sectional in nature.

The association between playing predictor games and increased frequency of online sports and horse race gambling is concerning at the population level, given that playing predictor games is not isolated to one gambling risk group – therefore consisting of a greater number of gamblers than those with problem gambling alone. This may therefore push people towards experiencing gambling harms. This would be consistent with prior research demonstrating that the majority of gambling harms fall at the sub-problem-gambling level (Canale et al. 2016; Browne 2020). A public health approach to gambling related harm is accordingly justified to prevent harms caused by gambling and inducements (including predictor games). This would require moving beyond ineffective, individualised, 'responsible gambling' approaches, which are promoted by the gambling industry in contradiction to the simultaneous encouragement of gambling through advertisements and inducements (Butler et al. 2019; Sulkunen et al. 2019; Wardle et al. 2019).

Policy implications

This study has helped to illustrate that predictor games as a product promoted by the gambling industry are associated with groups vulnerable to, and behaviours linked with, greater degrees of gambling harms. This brings further evidence that the current self-regulatory model, focused on individual responsible gambling efforts, is ineffective to protect players from gambling harms, especially when set against a backdrop of aggressive advertising and promotions while pushing products which are designed to encourage the intensification and continuation of harmful gambling behaviours (Orford 2020). The actions and products of the gambling industry must therefore come under a greater degree of scrutiny in future, as even products which could be perceived as harmless (such as predictor games) can promote gambling harms. Consequently, restrictions on gambling advertising and marketing have been suggested by different stakeholder groups, with Sulkunen et al. (2019 p. 124) suggesting that the gambling industry 'should be mandated to prove that a product, or an advertisement is safe before it is launched to players'. Newall et al. (2020 p. 152) seconds this point in relation to custom sports betting products stating that 'the unique features of any new gambling product should be considered for potential impacts on harmful or problematic gambling before the product has been released'. These remain viable regulatory options in the UK. The current Gambling Act is outdated and inadequate to capture the full range of modern online gambling products. Therefore, a greater level of independent regulation is required in order to prevent gambling harms, and should include monitoring of all products and inducements on offer. Effective regulation of online gambling advertising and marketing has been shown to be connected to lower levels of gambling problems (Sulkunen et al. 2019). The upcoming gambling review led

by the Department for Culture, Media and Sport provides the grounding to be able to make such regulatory changes.

Limitations

The findings in the current study must be considered in light of the following limitations:

This study did not include all sociodemographic factors which have been found to be linked, even if not conclusively, to problem gambling including employment and marital status (Hing et al. 2015b; Russell et al. 2018; Winters and Derevensky 2019).

A wider context around participants' engagement with inducements more generally was not considered as part of the study. This study cannot exclude that those who engage more with predictor games may also engage more with a range of other inducements, it may therefore be this wider interaction with inducements which brings about the observed findings within this study. Further, this study did not consider any differences between individual predictor games.

As this research is cross-sectional, the direction of causality across the associations drawn cannot be assessed. There may also be cyclical relationships between playing predictor games, online sports gambling frequency, and PGSI scores. Underlying confounding factors also must be considered. However, as suggested by Binde (2014), longitudinal research which may be able to demonstrate causality, while logical, still may have methodological challenges in controlling for confounding factors. This considered, the methodology chosen in this study remains a good choice for a first study looking to highlight associations between playing predictor games and key gambling risk factors.

When comparing the current study to previous nationally representative studies, the rates of at-risk and problem gambling were increased in the current sample (Wardle et al. 2011; Sturgis 2020). This is likely due to the convenience sampling approach used. However, due to these factors the generalisability of the findings may be limited.

It should be noted that the proportion of individuals who in the past 12-months ever engaged in both online sports gambling (79.7%) and playing predictor games (45.8%), is high in this sample, further limiting the generalisability of findings. This is likely due to the topics of online sports gambling and predictor games being pointed out in the survey title and adverts, encouraging those who are more interested in these to take part.

Conclusions

Given the associations between playing predictor games, increased frequency of online sports and horse race gambling, and increased prevalence of predictor game playing

amongst groups vulnerable to gambling harms (younger males, and those with problem gambling), it is likely that predictor games are linked to gambling harms. Therefore, policy action placing restrictions on access to, or harmful features of, inducements (including predictor games) or places a burden of responsibility on the industry to prove their safety, may be required to effectively reduce harm. However, further evidence is needed on predictor games and inducements overall, particularly research which controls for a number of confounding factors, establishes harmful features, and can establish the direction of causality between increased frequency of online sports gambling and playing predictor games. Future research may include determining whether the impacts of predictor games are limited to those winning predictor games (and so receiving free-bets) and determining whether advertising of bets based on predictions made in predictor games is more effective than usual advertising and direct messaging.

Authors' contributions CW designed and directed the study, analysed the data and drafted the manuscript. NB and ZQ supported and supervised study design and implementation, and manuscript drafting. All authors have read and approved the manuscript.

Availability of data and materials The study materials and data are available from the corresponding author upon reasonable request.

Code availability Not applicable.

Declarations

Ethics approval Liverpool John Moores University provided ethical approval for the study and the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Consent to participate All participants were provided with a participant information sheet prior to taking part, and all gave informed consent to take part in the research.

Consent for publication Not applicable.

Conflicts of interest The authors have no conflicts of interest to declare that are relevant to the content of this article.

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