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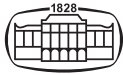
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AKADÉMIAI KIADÓ

Situational features of smartphone betting are linked to sports betting harm: An ecological momentary assessment study

Journal of Behavioral Addictions

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FULL-LENGTH REPORT



ABSTRACT

Background and aims: Smartphones extend the situational characteristics of sports betting beyond those available with land-based and computer platforms. This study examined 1) the role of situational features and betting platforms in harmful betting behaviours and short-term betting harm, and 2) whether people with more gambling problems have preferred situational features, engage more in harmful betting behaviours, and experience more severe short-term betting harm. *Methods:* An ecological momentary assessment analysed 1,378 betting sessions on sports, esports or daily fantasy sports, reported by 267 respondents (18–29 years; 50.9% male) over 10 weeks. *Results:* Factor analysis revealed five situational features of betting sessions: 1) quick, easy access from home, 2) ability to bet anywhere anytime, 3) privacy while betting, 4) greater access to promotions and betting options, and 5) ability to use electronic financial transactions. Regression models underpinned the analyses. Greater short-term betting harm was significantly associated with the ability to bet anywhere anytime, privacy when betting, and greater access to promotions and betting options. Betting sessions when these features were prioritised were more likely to involve impulsive betting, use of betting inducements, and betting with more operators. Respondents with more gambling problems were more likely to prioritise privacy and the ability to bet anywhere anytime; and to bet on in-game events, use promotional inducements, bet with more operators, and report greater betting harm. *Discussion and conclusions:* Certain situational features of sports betting are empirically associated with engagement and subsequent harm. Only smartphone betting combines all three features associated with betting harm.

KEYWORDS

sports betting, smartphones, mobile gambling, gambling harm, problem gambling, situational characteristics

INTRODUCTION

The structural features of gambling products and situational characteristics of gambling environments can elevate the risk of gambling harm, irrespective of biopsychosocial factors (Hilbrecht et al., 2020; Parke & Griffiths, 2006). The risk of harm posed by different gambling activities depends on the extent to which their structural and situational characteristics facilitate initiation, engagement and extended play (e.g., Lopez-Gonzalez, Estévez, & Griffiths, 2019; McCormack & Griffiths, 2013). Structural characteristics are the features of the gambling product itself that reinforce engagement by fostering regular, persistent or excessive gambling (McCormack & Griffiths, 2013; Meyer & Hayer, 2005). Examples include event frequency, continuity of play, pay-out ratios, and audio-visual effects (Griffiths, 1993, 1999;

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Meyer, Fiebig, Häfeli, & Mörsen, 2011; Parke & Griffiths, 2006). Situational characteristics are the contextual features that enable or encourage uptake and engagement in the gambling activity, including features of the macro environment and those of the gambling venue, Website or app itself (McCormack & Griffiths, 2013). Examples include accessibility, social facilitation, privacy and marketing (Hing et al., 2015; Lopez-Gonzalez, Estévez, & Griffiths, 2017; Meyer et al., 2011).

While changes to a gambling product alter its structural characteristics, changes to a betting platform, such as on-track betting, a website or app, affect its situational features. For example, compared to land-based gambling, using an online platform such as a computer increases accessibility, the ease and speed of payments, opportunities to bet with multiple operators, access to promotions, and privacy while gambling (Gainsbury, 2012; Griffiths, Parke, Wood, & Parke, 2005; Hing, Smith, et al., 2022; McCormack & Griffiths, 2013). A more recently introduced gambling platform, smartphones, further enhance the geo-temporal accessibility of gambling, its convenience, privacy, instant availability, and integration into daily activities (Drakeford & Hudson-Smith, 2015; Hing et al., 2023; Parke & Parke, 2019; Raymen & Smith, 2020).

Smartphone gambling has grown exponentially, particularly for sports betting, including on traditional sports, esports and daily fantasy sports (DFS). Smartphones are now the predominant platform used for these activities (Hing et al., 2021; Lopez-Gonzalez & Griffiths, 2018; Winters & Derevensky, 2020). While participation in most gambling forms has stabilised or declined, sports betting, in all its forms, has attracted a new generation of young adult gamblers, predominantly men, and continues to grow (Browne et al., 2020; Hing et al., 2021; Rockloff, Browne, Hing, et al., 2019). The convenience of betting using smartphone apps is valued by this generation (Hing, Russell, et al., 2022), but smartphone betting may also present situational features that increase the risk of gambling harm. Few studies have directly examined the relationship between these situational features and gambling harm, even though elevated rates of problem gambling have been found amongst smartphone bettors (Lopez-Gonzalez et al., 2019).

Prior research into smartphone betting

In a theoretical paper, James, O'Malley, and Tunney (2017) argued that smartphone gambling is likely to accelerate the acquisition of harmful gambling behaviours. This is because it combines the structural schedules of reinforcement present in a gambling activity with the situational interactions that characterise smartphone use, such as habitual and constant checking, integration into daily activities, and portable use in numerous contexts. Qualitative findings are largely consistent with these expectations. In one study (Drakeford & Hudson-Smith, 2015), participants discussed how the proximity, social accessibility, privacy and instant availability of smartphone betting results in more frequent and impulsive gambling, and a seamless integration of

gambling into their everyday lives. Other qualitative studies report that this convenient access has integrated smartphone betting into participants' home, work, leisure and social activities (Gordon, Gurreri, & Chapman, 2015; Lamont & Hing, 2019, 2020; Raymen & Smith, 2020). Based on interviews with frequent sports bettors, Hing et al. (2023) developed a grounded theory model linking situational features of smartphone betting - such as physical, financial and social accessibility, privacy and wagering marketing - with instant access to betting. In turn, this instant access was reported to foster harmful betting patterns, such as more frequent and larger bets, impulsive betting, placing riskier bets, and loss-chasing.

Focusing on sports bettors with a gambling problem, a mixed-methods study (Parke & Parke, 2019) concluded that immediate access to unlimited betting, in-play betting, cash-out options, instant deposits and wagering inducements on smartphones, hinder self-control. This can then facilitate continuous betting, prolonged betting sessions, high spending, impulsive betting, and chasing losses. A focus group investigation with sports bettors receiving gambling treatment (Lopez-Gonzalez, Jiménez-Murcia, & Griffiths, 2021) found that smartphone betting exploits the usage patterns of constant checking and immediate response to push notifications. Smartphone betting can transform gambling into a continuous activity that permeates daily life, accelerates disordered gambling and debts, and impedes treatment due to the presence of gambling stimuli at both home and work.

Beyond qualitative studies, Hing, Russell, et al. (2022) conducted a discrete choice experiment with 616 young adult sports bettors to examine their preferred features of sports betting platforms (smartphones, computers, land-based venues). Smartphones are the only platform with all their preferred betting features. The most crucial feature is the ability to place bets instantly, 24/7, from anywhere, followed by the feature of being able to make electronic financial transactions. Features of less, but still significant, importance include online access to betting information and the ability to bet with multiple operators. Social and privacy features, and access to promotions, did not significantly influence platform choice. Participants with more severe gambling problems attached greater importance to the ability to place in-play bets, bet with both cash and credit cards, view frequent promotions, and bet with multiple operators.

In summary, previous research provides insights into the situational features of smartphone betting that are valued by bettors and reportedly facilitate harmful betting behaviours. However, no research has statistically examined relationships between situational features of smartphone betting during betting sessions and subsequent gambling harm. To address this gap, this study's principal aim is to examine the role of situational features and betting platforms in harmful betting behaviours and short-term betting harm. A secondary aim is to examine whether people with more gambling problems have preferred situational features, engage more in harmful betting behaviours, and experience more severe short-term betting harm.



METHODS

Design

An ecological momentary assessment (EMA) collected detailed data on 1,378 betting sessions on traditional sports, esports and daily fantasy sports (DFS). EMA studies are suited to episodic behaviours such as gambling because they administer multiple short surveys to measure participants' behaviours in close to real-time serving to reduce recall bias, and in naturalistic settings to optimise ecological validity (Shiffman, Stone, & Hufford, 2008). The lead author's organisational ethics committee approved the study (#23030).

Recruitment and survey administration

Respondents were aged between 18 and 29 years, resided in New South Wales (NSW) in Australia, and bet on sports, esports or DFS at-least fortnightly. Qualtrics, a cloud-based software services company, recruited the respondents through several panel providers and removed any duplicate responses across panels. Respondents were reimbursed for each survey in line with the regular practices of their panel provider.

The study was conducted from June to September 2021. A baseline survey ($N = 267$) was followed by 10 EMA surveys, each administered one week apart. The retention rate was 55% at the 10th EMA survey. Appendix A describes the survey dates, number of responses, exclusions, and processes used to ensure data quality.

Participants' characteristics

Appendix B summarises the sample's characteristics. The mean participant age was 24.8 years (Median 25, Min. 18, Max. 29). Gender was evenly split (50.9% male). Most respondents had a university or college qualification (58.8%), were single/never married (46.1%) or in a de facto relationship (32.6%), and in full-time employment (54.7%). The median annual income category was AU\$50,000–\$59,999. Reflecting the inclusion criteria of frequent betting, the sample was skewed towards higher gambling severity: problem gambling (38.6%), moderate risk gambling (13.5%), low risk gambling (18.4%) and non-problem gambling (11.2%). During the EMA, participants engaged in 2,335 betting sessions: 50.9% on sports, 27.3% on esports and 21.8% on DFS. Most betting sessions were conducted using a smartphone (82.9%), 14.3% using a computer/laptop/tablet, 2.0% using a gaming console, 0.8% in a land-based venue, and none by telephone.

Measures

Questions on demographics, betting over the last 12 months, and the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001) were asked only in the baseline survey. All other measures were asked in both the baseline survey and all EMA surveys.

Demographics. Please see Table A2 in Appendix B.

Betting over the last 12 months. Respondents were asked how often they had bet on sports, esports and DFS. For each form, they were asked their typical monthly expenditure, and the percentage spent on bets placed via smartphone, computer/laptop/tablet, gaming console, at land-based venues and using telephone calls.

Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001). Respondents completed the 9-item PGSI in relation to the past 12 months. Response options were never (0), sometimes (1), most of the time (2) and almost always (3). Total scores categorise respondents into non-problem (0), low risk (1–2), moderate risk (3–7) and problem gambling (8–27) groups. Cronbach's alpha and McDonald's omega were both 0.92.

Betting during the last 7 days. Respondents were asked whether they had bet on sports, esports, and DFS during the last 7 days (no, yes).

Betting during their most recent betting session. To optimise recall, respondents were asked detailed questions only about their most recent betting session ($n = 1,378$): which channel (platform) they mainly used (smartphone, computer/laptop/tablet, gaming console, land-based venue, telephone call); how the number of bets placed, expenditure, and time they spent betting compared to how much they had planned (much less, a bit less, about the same, a bit more, much more); the percentage of their bets that were researched and planned in advance of the match, placed on the spur of the moment before the start of the match, or placed on the spur of the moment during the match; the percentage of their bets placed on the final outcome of the match, key events within the match, and micro events within the match; how many promotions (i.e., special offers or inducements) they used, specifically composed of bonus bets, odds boosts, or money-back offers; and how many operators they placed bets with.

Situational features of their most recent betting session. Respondents responded 'true' or 'false' to 25 statements to reflect the situational features of their most recent betting session (e.g., 'You wanted to bet with cash', 'You wanted to bet from home'; see Table 1). These features were derived from qualitative interviews with young adult sports bettors (Hing et al., 2023), and operationalised as 24 features in Hing, Russell, et al. (2022). Slight adjustments were made to refine these original 24 features to a slightly larger set of 25 features for the current study.

Short-term betting harm. Respondents completed an adapted version of the Short Gambling Harms Screen (SGHS; Browne, Goodwin, & Rockloff, 2018) in relation to their betting on sports, esports or DFS in the past 7 days. Reliability at baseline was 0.87 for both Cronbach's alpha and McDonald's omega.

Analysis

Pre-processing. Data were analysed using R (Core Team, 2020). Situational features were coded as binary variables (false/true), as were relationship and employment status: 'in relationship' (married or de facto) or not, and full-time employment or not. The number of operators bet with (free



Table 1. Results of a factor analysis of the important situational features of a betting session

Item	Situational Features	Privacy when betting	Ability to bet anywhere anytime	Quick easy access from home	Greater access to promotions and betting options	Use of electronic financial transactions	Communality
You wanted to...							
22	avoid other people when you were betting	0.89					1.0
23	keep your betting private, without anyone else knowing	0.79					1.2
21	bet alone, without other people around	0.78					1.2
24	bet anonymously so there is no record of your betting	0.68					1.2
25	access responsible gambling tools (E)	0.45					2.0
20	bet in a social setting		0.85				1.2
5	bet in a gaming venue or betting agency		0.66				1.4
4	bet away from home, but not at a betting agency		0.66				1.1
6	bet when land-based betting venues were closed		0.52				1.1
16	use a credit card for betting		0.50				1.7
12	place in-play bets (E)		0.43		0.41		2.8
7	bet without having to travel somewhere			0.69			1.0
9	bet while doing other things			0.66			1.0
2	instantly place bets without waiting			0.66			1.1
1	place bets easily without too much effort			0.64			1.1
3	bet from home			0.54			1.6
8	easily research betting information			0.44			2.0
15	quickly access and transfer money for betting			0.42			2.3
18	access betting promotions instantly				0.80		1.2
19	link directly to betting promotions from your betting device				0.70		1.1
17	access a wide range of betting promotions				0.56		1.4
11	access a wide range of bets				0.52		1.6
10	bet with more than one operator		0.31		0.38		3.2
13	to bet with electronic money					0.58	1.4
14	bet with cash (R)		0.50			-0.50	2.2

Notes: The extraction method was factor analysis using minimum residual solution method. Factor loadings above .30 are shown. Reverse-scored items are denoted with (R). Items excluded from final factors extracted are denoted with (E). Highlighted cells indicated corresponding factors selected for subsequent analyses.

entry) were thresholded at 5, so the few observations with large counts above 5 did not unduly affect the results. The large set of 25 situational features were explored using oblique rotation factor analysis before aggregation. Because these were all binary variables, the correlation matrix for the factor analysis was calculated using tetrachoric correlations. Education and income were ordinal categories and treated as a numeric integer score for analyses.

Before analysis, impulse betting and type of bet were each originally captured with three categories. For impulse betting, however, the two options relating to bets placed on the spur of the moment were combined. That is, the percentage of their bets that were placed on the spur of the moment before the start of the match, and the percentage of their bets that were placed on the spur of the moment during the match were added together for analysis. For type of bet, the two options for in-game events (key events and micro-events) were also combined. That is, the percentage of their bets placed on key events within the match, and the percentage of their bets placed on micro events within the match were added together for analysis. The betting platform for each session was originally recorded via five options: Smartphone (1), Computer/laptop/tablet (2), Gaming console (3), At land-based venues (4), and Using telephone calls (5). However, less than 30 cases were recorded for options 3–5. Unexpected COVID-19 lockdowns during data collection limited access to land-based venues. No cases were recorded for telephone calls. The 11 instances of land-based betting sessions were excluded for analyses that focused on

platform. For other analyses, gaming console and land-based levels were retained as factor levels. However, caution should be exercised in interpreting effects for these levels due to the small number of cases in these cells.

Regressions. The study design is an exploratory and descriptive EMA on the 1,378 most recent betting sessions reported by participants. The analyses principally focus on associations between 1) *Situational features of betting sessions* (e.g., wanting to keep one's betting private) and 2) *Betting behaviours and outcomes* (e.g., making more bets than planned, or scores on the short-term SGHS measure). Secondary analyses are presented on differences in both 1) and 2) by *Platform* (smartphone, computer/laptop/tablet, gaming console or at land-based venues) and *Demographics and individual differences* (e.g., gender or 12-month PGSI).

Betting behaviours "Number of bets vs planned", "Expenditure vs planned" and "Time spent vs planned" were approximately normally distributed. However, "Bet impulsively", "Bet on in-game events", "Use special offers - odds boost", "Use special offers - bonus bets" and "Use special offers - money-back offers" showed an approximately uniform distribution, with lower scores being somewhat more prevalent. Finally, "Number of operators used" and "SGHS Score" had a strong bias towards lower scores (positive skew).

Here it is important to note the distinction between the SGHS and the PGSI in the present study. Problem gambling severity was assessed for the past 12 months (individual-level variable), whilst gambling harms were assessed on the



given week of assessment (week-level variable). This means that PGSI (i.e., problem-gambling status) is properly grouped with other individual differences measures, since it reflects a relatively stable within-person characteristic, whereas SGHS is treated as an outcome that is potentially affected by the type of betting behaviour engaged in during the given period (i.e., the last 7 days).

The regression tables below are organised with respect to a given class of measures as independent variables (IVs), and one or more variables with a different class as the dependent variable(s) (DVs). Whilst causal plausibility governed our choice of which classes featured as IVs or DVs, we caution that the design is not an experimental manipulation with clearly defined instrumental, control and outcome variables. Although the EMA design provides for control of individual differences, and the ability to assess within-subject variation over the time frame, it does not provide for unambiguous attribution of causality.

We employed generalised linear mixed effects (GLME) models to account for within-subjects differences using the lme4 package (Bates, Mächler, Bolker, & Walker, 2015). A simple random intercept was included for participants, but no other random effects were modelled. For all regressions, both DVs and IVs were scaled, except for binary (0,1) outcomes. Thus, all regression tables provide standardised regression coefficients, comparable in terms of effect size. Assumptions for modelling were checked and deemed to have been met.

In order to provide a more comprehensive understanding of the variance explained by our mixed-effects models, we computed two forms of R² values for each regression. The marginal R² describes the variance explained by the fixed factors alone, offering insight into the contribution of our independent variables at the data point (week) level. Meanwhile, the conditional R² takes into account both the fixed and random factors, thereby providing the proportion of total variance explained by the entire model, considering both data points and the clustering effect of participants. These calculations were conducted following Nakagawa and Schielzeth's (2013) method using the r.squaredGLMM function from the 'MuMIn' package in R.

Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The Institutional Review Board of Central Queensland University approved the study. All subjects were informed about the study, and all provided informed consent.

RESULTS

Factor analysis of situational features

A factor analysis on the situational features of betting sessions collapsed them to a smaller and more reliable set of constructs. Five factors were identified with eigenvalues above 1 and a parallel analysis suggested 4 components and 6 factors. Models involving fewer factors did not display a clear factor structure. The five-factor solution yielded a

reasonably clear factor structure (Table 1). Two situational feature items, *access to responsible gambling tools* and *placing in-play bets*, did not have congruent content and/or had split loadings with factors, and accordingly were excluded from subsequent analyses. Only two items loaded on *use of electronic financial transactions*, and one item cross-loaded with another factor. We retained this "transactions" factor for analysis so as not to force the items onto other factors in a four-factor solution, but associations with this factor should be interpreted with caution since it is measured by only two items. Scores on factors were created by simple summation of the number of positive responses.

Relationships between situational features and betting platforms, and harmful betting behaviours and short-term betting harm

Table 2 summarises the results of regression models that were run to test the relationship between the IVs of situational features and platform on the DVs of betting behaviours and outcomes. *Quick easy access from home* was significantly associated with placing more bets and spending more time and money on betting than planned, but also with less uptake of betting promotions, betting with fewer operators, and lower short-term betting harm. *Ability to bet anywhere anytime* was significantly associated with more impulse betting, greater uptake of promotional inducements, betting with more operators, and greater short-term betting harm. *Privacy when betting* was significantly associated with greater uptake of promotional inducements, and higher short-term betting harm, but less likelihood of placing more bets than planned. *Greater access to promotions and betting options* was significantly associated with greater uptake of promotional inducements, betting with more operators, and greater short-term betting harm, but less likelihood of impulse betting. *Use of electronic financial transactions* was significantly associated with spending more time and money on betting than planned, and less uptake of some types of promotional inducements.

When controlling for these situational features, the different betting platforms still had some residual effects on the outcome variables, although most effects were small. *Betting with a smartphone* was significantly associated with a greater likelihood of betting impulsively, compared to when betting using a computer/laptop/tablet. *Betting using a computer/laptop/tablet* was significantly associated with higher betting expenditure than planned, and betting with more betting operators, compared to when betting with a smartphone. *Betting using a gaming console* was significantly associated with betting with more betting operators, compared to when betting with a smartphone. *Betting in a land-based venue* was not associated with any of the outcome variables. However, the small number of betting sessions conducted in land-based venues may have been insufficient to detect any effects.

Associations between situational features and demographics and PGSI

Table 3 indicates that females were more likely to prioritise the situational features of *quick and easy access from home*.

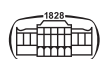


Table 2. Regression coefficients of factors of situational features and betting platform on betting behaviours and outcomes

Betting behaviours (DV)	Factors of situational features					Betting platform (ref. = smartphone)			Constant	Obs	RE	Marg	Cond
	Quick and easy access from home	Ability to bet anywhere anytime	Privacy when betting	Greater access to promotions and betting options	Electronic financial transactions	Computer/laptop/tablet	Gaming console	At land-based venues					
	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)		N			
Number of bets vs planned	0.145*** (0.033)	-0.016 (0.031)	-0.077** (0.030)	0.005 (0.033)	0.053 (0.028)	0.080 (0.080)	0.337 (0.189)	0.338 (0.288)	-0.008 (0.039)	1,378	0.42	0.03	0.21
Expenditure vs planned	0.120*** (0.033)	0.017 (0.031)	-0.030 (0.030)	0.018 (0.033)	0.073** (0.028)	0.202* (0.080)	0.023 (0.190)	0.159 (0.290)	-0.034 (0.038)	1,378	0.39	0.03	0.19
Time spent vs planned	0.076* (0.033)	0.017 (0.031)	-0.030 (0.030)	0.043 (0.033)	0.059* (0.028)	0.151 (0.081)	0.021 (0.190)	0.236 (0.290)	-0.024 (0.040)	1,378	0.43	0.02	0.20
Bet impulsively	-0.052 (0.031)	0.071* (0.030)	-0.032 (0.028)	-0.069* (0.031)	0.024 (0.026)	-0.165* (0.076)	-0.200 (0.172)	0.069 (0.267)	0.051 (0.047)	1,378	0.62	0.02	0.40
Bet on in-game events	-0.009 (0.039)	-0.034 (0.037)	-0.055 (0.033)	0.019 (0.036)	-0.027 (0.032)	-0.095 (0.100)	0.362 (0.340)	0.318 (0.382)	0.022 (0.056)	868*	0.67	0.01	0.48
Use special offers - odds boost	-0.146*** (0.029)	0.194*** (0.028)	0.021 (0.027)	0.146*** (0.029)	-0.052* (0.025)	-0.028 (0.072)	0.128 (0.164)	-0.373 (0.254)	-0.030 (0.044)	1,378	0.57	0.09	0.42
Use special offers - bonus bets	-0.228*** (0.043)	0.283*** (0.042)	0.088* (0.040)	0.219*** (0.044)	-0.069 (0.036)	0.067 (0.106)	-0.007 (0.242)	-0.230 (0.375)	1.739*** (0.064)	1,378	0.82	0.09	0.42
Use special offers - money-back offers	-0.212*** (0.045)	0.300*** (0.044)	0.124** (0.042)	0.158*** (0.045)	-0.140*** (0.038)	0.110 (0.111)	0.438 (0.253)	-0.111 (0.392)	1.599*** (0.067)	1,378	0.87	0.10	0.43
Number of operators used	-0.181*** (0.028)	0.110*** (0.027)	0.032 (0.026)	0.116*** (0.028)	-0.030 (0.024)	0.218** (0.070)	0.318* (0.157)	-0.252 (0.245)	-0.063 (0.045)	1,378	0.60	0.06	0.45
SGHS Score	-0.152*** (0.027)	0.186*** (0.026)	0.255*** (0.025)	0.057* (0.027)	-0.044 (0.023)	0.102 (0.066)	0.266 (0.150)	0.314 (0.234)	0.152*** (0.045)	1,378	0.61	0.16	0.53

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; + Betting on in-game events was not applicable to DFS bettors which accounts for the lower N. Effects significant at the .05 level highlighted: green (positive), red (negative). Each row summarises standardised beta coefficients for a separate multiple regression for a given dependent variable. RE = Standard deviation of random effect (intercept) per participant.

Gamblers with higher PGSI scores were more likely to prioritise *ability to bet anywhere anytime*, and *privacy when betting*, but were less likely to prioritise *use of electronic financial transactions*.

Associations between betting behaviours and outcomes, and demographics and PGSI

Females were more likely to bet impulsively, and bet on in-game events (Table 4). Gamblers in a relationship were more likely to bet on in-game events. Gamblers with a lower educational level were more likely to bet impulsively. Those who were not born in Australia were less likely to place more bets than planned, and less likely to spend more time and money on betting than planned. The analysis found no significant differences for betting behaviours and outcomes by age, employment and income. Gamblers with higher PGSI scores had a greater tendency to bet on in-game events, take up all three types of promotional offers, bet with more operators, and have higher short-term SGHS scores.

Associations between betting platform and PGSI

Finally, we examined whether participants with higher problem gambling severity tended to gamble using a particular platform. Due to low numbers, betting using land-based venues and gaming consoles were excluded from this analysis. Accordingly, platform was treated as a percentage of weeks that a participant gambled using a smartphone, rather than a computer/laptop/tablet. Each case was

weighted based on the number of observations available for that participant. The resultant weighted simple regression of percentage use of smartphones on PGSI was non-significant, $t = -1.27$, $p = 0.203$, $B(\ln(\text{PGSI})) = -0.0003$, $SE = 0.002$, indicating that people with gambling problems, when compared to others, were no more likely to bet using a smartphone compared to a computer/laptop/tablet.

DISCUSSION

This study analysed data on 1,378 betting sessions on sports, esports or DFS. Five situationally important features were extracted using factor analysis from 25 items (questions) derived from past interviews with young sport bettors (Hing et al., 2023). The study further assessed these five situational features, and the main platform used during these sessions, in relation to several outcome variables, including potentially harmful betting behaviours and short-term betting harm.

The role of situational features and betting platforms in harmful betting behaviours and short-term betting harm

Across the betting forms combined, the five situational features were differentially associated with more harmful betting behaviours and harmful outcomes. This finding empirically supports theoretical expectations that situational features of sports betting impact on engagement and subsequent harm (Lopez-Gonzalez et al., 2017). Structural characteristics of sports betting (Lopez-Gonzalez et al., 2019;



Table 3. Regression coefficients of situational features on gambler characteristics

<i>Gambler Characteristics</i>	<i>Situational gambling motivations (DV)</i>				
	Quick and easy access from home	Ability to bet anywhere anytime	Privacy when betting	Greater access to promotions and betting options	Use of electronic financial transactions
	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)
Age	0.053 (0.053)	-0.086 (0.055)	-0.058 (0.053)	-0.070 (0.054)	-0.003 (0.048)
Gender	0.194* (0.096)	0.019 (0.099)	0.040 (0.096)	0.158 (0.098)	0.043 (0.087)
In a relationship	0.088 (0.098)	-0.093 (0.101)	0.004 (0.097)	0.130 (0.100)	0.171 (0.088)
Education	-0.029 (0.052)	0.043 (0.054)	-0.033 (0.052)	0.004 (0.054)	0.018 (0.047)
Full-time employed	0.027 (0.102)	0.087 (0.106)	0.079 (0.102)	-0.035 (0.104)	-0.009 (0.092)
Country of Birth	-0.006 (0.149)	0.003 (0.154)	0.237 (0.149)	0.112 (0.152)	-0.119 (0.136)
Income	0.017 (0.052)	0.025 (0.053)	0.027 (0.052)	0.060 (0.053)	-0.013 (0.047)
PGSI	-0.037 (0.049)	0.171*** (0.050)	0.148** (0.049)	0.072 (0.050)	-0.104* (0.044)
Constant	-0.129 (0.099)	-0.061 (0.102)	-0.113 (0.099)	-0.183 (0.101)	-0.087 (0.089)
Observations	1,378	1,378	1,378	1,378	1,378
R2 (Marginal)	0.02	0.06	0.06	0.02	0.01
R2 (Conditional)	0.41	0.46	0.40	0.41	0.27

Notes: *p<0.05; **p<0.01; ***p<0.001; Note: Gender (Male 0, Female 1), Country of Birth (Aust 0, Other 1), Income (annual personal income before tax). Each column summarises standardised beta coefficients for a separate multiple regression for a given dependent variable. Effects significant at the .05 level highlighted: green (positive) and red (negative) effects.

Newall, Russell, & Hing, 2021) and individual differences (Hing, Russell, Vitartas, & Lamont, 2016, 2017; Russell, Hing, & Browne, 2019) also contribute to harmful behaviours and outcomes. However, this study provides the first statistical analysis of the role of situational factors in sports betting.

Table 2 summarised the interactions between each situational feature and each potentially harmful betting behaviour. While these betting behaviours generally increase the risk of gambling harm, the more important outcome variable is actual harm from betting, as measured by short-term betting harm. Greater short-term betting harm was significantly associated with three of the five situational features: 1) *privacy when betting*, 2) *ability to bet anywhere anytime*, and 3) *greater access to promotions and betting options*. Mechanisms by which these situational features can contribute to subsequent betting harm are discussed below.

Betting online increases *privacy when betting*, which may increase the risk of harm because it lacks the social pressure that helps to regulate gambling (Hing et al., 2015, 2021; McCormack & Griffiths, 2013). Smartphone betting can be especially private due to the normalisation of frequent smartphone use, making it less apparent to others that a person is betting on their phone (Drakeford & Hudson-Smith, 2015; Hing et al., 2023). Conversely, experiencing gambling harm may increase the desire for privacy to conceal one's betting (Fulton, 2019; Hing & Russell, 2017). The only potentially harmful betting behaviour in this study linked to a preference for privacy while betting was greater uptake of promotional inducements. While inducements can undermine self-control and increase the appeal of betting offers (Browne, Hing, Russell, Thomas, & Jenkinson, 2019; Parke & Parke, 2019; Rockloff, Browne, Russell, Hing, & Greer, 2019), bettors already experiencing gambling harm

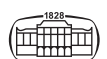


Table 4. Summary of regressions of betting behaviours and outcomes on demographics and PGSI

Betting behaviours (DV)	Individual differences										R2	
	Age	Gender	In a relationship	Education	Full-time employed	Country of Birth	Income	PGSI	Constant	Obs	Marg.	Cond.
	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	N	0.02	0.21
Number of bets vs planned	-0.027 (0.044)	-0.054 (0.080)	0.051 (0.082)	0.026 (0.044)	0.025 (0.085)	-0.395** (0.127)	0.033 (0.043)	0.021 (0.041)	0.052 (0.083)	1,378	0.02	0.19
Expenditure vs planned	-0.016 (0.043)	0.039 (0.078)	0.103 (0.080)	0.038 (0.043)	0.045 (0.083)	-0.314* (0.124)	-0.024 (0.042)	0.057 (0.040)	-0.065 (0.081)	1,378	0.02	0.21
Time spent vs planned	-0.084 (0.044)	0.048 (0.080)	0.115 (0.082)	0.060 (0.044)	0.081 (0.085)	-0.304* (0.126)	-0.030 (0.043)	0.013 (0.041)	-0.093 (0.082)	1,378	0.05	0.40
Bet impulsively	-0.043 (0.052)	0.298** (0.095)	0.112 (0.096)	-0.112* (0.052)	0.080 (0.100)	-0.008 (0.147)	-0.023 (0.051)	-0.029 (0.048)	-0.225* (0.097)	1,378	0.07	0.49
Bet on in-game events	-0.058 (0.058)	0.306** (0.107)	0.298** (0.110)	-0.074 (0.058)	-0.139 (0.116)	-0.041 (0.171)	0.006 (0.056)	0.118* (0.054)	-0.197 (0.109)	868	0.05	0.42
Use special offers - odds boost	-0.053 (0.053)	-0.059 (0.095)	0.188 (0.097)	0.044 (0.052)	0.031 (0.101)	-0.165 (0.148)	-0.007 (0.051)	0.173*** (0.048)	-0.127 (0.098)	1,378	0.05	0.43
Use special offers - bonus bets	-0.035 (0.078)	0.166 (0.142)	0.082 (0.144)	0.088 (0.077)	0.062 (0.151)	-0.195 (0.220)	-0.132 (0.076)	0.307*** (0.072)	1.569*** (0.146)	1,378	0.06	0.45
Use special offers - money-back offers	-0.008 (0.084)	0.028 (0.152)	0.136 (0.155)	0.020 (0.083)	0.182 (0.162)	0.111 (0.236)	-0.092 (0.082)	0.349*** (0.077)	1.380*** (0.157)	1,378	0.04	0.46
Number of operators used	-0.041 (0.053)	0.113 (0.096)	0.144 (0.098)	0.072 (0.053)	-0.034 (0.102)	-0.053 (0.149)	0.016 (0.052)	0.179*** (0.049)	-0.157 (0.099)	1,378	0.13	0.53
SGHS Score	-0.077 (0.054)	0.117 (0.098)	-0.021 (0.100)	-0.008 (0.054)	0.048 (0.104)	-0.134 (0.152)	-0.002 (0.053)	0.365*** (0.050)	0.091 (0.101)	1,378	0.02	0.21

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; Gender (Male 1, Female 2), Country of Birth (Aust 1, Other 2), Income (annual personal income before tax). Each row summarises standardised beta coefficients for a separate multiple regression for a given dependent variable. Effects significant at the .05 level highlighted: green (positive) and red (negative) effects.

may seek bonuses and money-back offers to sustain a betting session (Hing, Smith, et al., 2022).

The ability to bet anywhere anytime was also associated with short-term betting harm. This feature is exclusive to smartphones because their portability and online connectivity allow instant access to betting at any time and location (Drakeford & Hudson-Smith, 2015; Hing et al., 2021; James, O'Malley, & Tunney, 2019). A preference for being able to bet anywhere anytime was associated with impulsive betting during the betting session, which reflects impaired control and is consistently linked to gambling problems among sports bettors (Hing, Russell, Li, & Vitartas, 2018; Hing, Li, Vitartas, & Russell, 2018; Parke & Parke, 2019). While research has found impulse bettors to have higher trait impulsivity (Hing, Li, Vitartas, & Russell, 2018), the current study observed a relationship between impulsive betting and immediate geo-temporal access to betting. A preference for being able to bet anywhere anytime was also related to increased engagement with promotional inducements and betting across multiple operators. Instant access to betting enables an immediate response to gambling incentives, and this increased betting activity may contribute to subsequent harm. Sports bettors describe how the constant availability of betting facilitates more frequent and impulsive betting, especially when triggered by the push notifications and betting opportunities they see while browsing on their phone (Hing et al., 2023; Lopez-Gonzalez et al., 2021; Parke & Parke, 2019).

The third situational feature associated with increased short-term betting harm was prioritising greater access to promotions and betting options. Betting operators frequently

send customers promotional inducements with a direct link to the advertised offer (Hing, Russell, et al., 2018; Rawat, Hing, & Russell, 2019). Smartphones provide instant access to these promotions in the betting app. Respondents who preferred greater access to promotions and betting options were more likely to take up promotional offers and engage with multiple betting operators. Having accounts with multiple operators increases the inducements received and allows bettors to shop around for the best offers (Jenkinson, de Lacey-Vawdon, & Carroll, 2018). Experimental and longitudinal studies demonstrate that increased exposure to and uptake of betting promotions result in higher betting expenditure and a tendency to place riskier bets with longer odds (Browne et al., 2019; Rockloff, Browne, Russell, et al., 2019). Increased betting expenditure and placing long-shot bets, which tend to result in losses (Newall & Cortis, 2021), are likely to contribute to betting harm.

Overall, the situational features were more important than the betting platform *per se* in explaining the outcome variables. When controlling for the situational features, the platform used had only some small unique effects. Betting with a smartphone significantly increased the likelihood of betting impulsively. Betting using a computer/laptop/tablet was associated with higher betting expenditure than planned and betting with more operators. Betting using a gaming console was linked to betting with more operators. Despite these small effects, platform choice is still important in driving betting behaviour and harm by virtue of the situational features each platform offers. Importantly, only smartphones combine all three features significantly associated with short-term betting harm.



Whether preferred situational features, harmful betting behaviours, and short-term betting harm varies with problem gambling severity

Bettors with higher PGSI scores were significantly more likely to prioritise two situational features associated with short-term betting harm: *ability to bet anywhere anytime* and *privacy when betting*. Experiencing urges to gamble is a symptom of gambling disorder (APA, 2013), and instant accessibility to betting enables an immediate response to this urge. As discussed earlier, privacy when betting is also often sought by people with a gambling problem and enables continued betting without scrutiny (Fulton, 2019; Hing & Russell, 2017). In this study, higher-risk bettors were more likely to report greater betting harm during the past 7 days, indicating that bettors with an existing gambling problem are the most likely to report continuing harm from their betting. They were also more likely to report some potentially harmful betting behaviours during their most recent betting session. Consistent with previous research (Hing et al., 2021; Russell, Hing, & Browne, 2019; Russell, Hing, Browne, Li, & Vitartas, 2019), these behaviours were taking up promotional inducements, betting with more wagering operators, and betting on in-game events. While some previous studies have found that bettors with a gambling problem are more likely to use a mobile device to bet (Gainsbury, Liu, Russell, & Teichert, 2016; Lopez-Gonzalez et al., 2019), the current study found no significant difference by PGSI score in use of a smartphone or computer/laptop/tablet to bet on sports.

Limitations

The sample was not necessarily representative of young frequent sports bettors, but purposive sampling facilitated collecting data on a large number of betting sessions to support rigorous analysis. The study relied on self-report data, which may be subject to social desirability and other biases. However, the surveys asked about past-week betting which should have reduced recall bias. To limit the analyses presented in the current paper, we did not examine differences by betting form, but this could be a useful focus of future research. Unfortunately, COVID-19 lockdowns affected the study. The NSW capital city, Sydney, was in lockdown for nearly the entire EMA period and some other areas of NSW for much shorter periods. During these lockdowns, land-based betting venues were closed, so respondents reported few betting sessions in land-based venues, reducing the associated analytical power. However, the analysis was still able to detect important differences in the situational features facilitated by the different betting platforms and their relationship to betting behaviours and harm. The data were analysed cross-sectionally and appropriately controlled using a random intercept. Even though the data are longitudinal, we did not model how these situational factors may change over time, or whether they are fairly stable. If some of those indicators are susceptible to systematic changes over time, this was not accounted for in the analysis. We made this decision because little change was expected during the short period (10 weeks) over which the EMA was

conducted. The study cannot demonstrate causation; however, the findings are consistent with theoretical propositions that certain situational characteristics of gambling activities contribute to uptake, engagement and increased gambling harm (Lopez-Gonzalez et al., 2017; Meyer et al., 2011; Thomas, Sullivan, & Allen, 2009), especially amongst online gamblers where access and availability are strong behavioural drivers (Hubert & Griffiths, 2018; McCormack & Griffiths, 2013).

CONCLUSIONS

Regulators are unlikely to restrict the 24/7 online availability of sports betting, even though this would reduce gambling harm. Of the situational features of smartphone betting linked to betting harm, there is the greatest potential to modify betting inducements. Betting inducements contribute to risky betting behaviours and gambling harm, and there is significant community opposition to their marketing (Browne et al., 2019, 2021; Rockloff, Browne, Russell, et al., 2019; Ungeod-Thomas et al., 2023). Reducing or banning inducements would help to reduce gambling harm and better align their regulation with community expectations. Community education could raise awareness of red flag behaviours associated with betting harm, as indicated by this study. These include betting in secrecy, betting multiple times during the day or night, integrating betting into other activities across locations, and extensive use of betting inducements. Guidelines for protective behaviours could include not concealing one's betting activities from others, setting specific times and locations for betting, limiting uptake of betting inducements, and limiting the number of betting accounts. Bettors can also be encouraged to use consumer protection tools, such as setting expenditure limits and opting out of receiving wagering marketing.

This study has expanded our understanding of smartphone betting, since previous research has mainly involved small interview studies. However, numerous research questions remain unanswered about the prevalence of smartphone-related gambling harm, who are most at-risk, protective and risk factors, and the aetiology of smartphone gambling behaviour and harm.

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Appendix A: Survey dates, responses, exclusions and processes used to ensure data quality

Table A1. Dates of the baseline and EMA surveys

Wave	Open date	Close date	Number of completed responses
0 (Baseline)	19th June 2021	29th June 2021	267
1	29th June 2021	5th July 2021	198
2	6th July 2021	12th July 2021	196
3	13th July 2021	19th July 2021	192
4	20th July 2021	26th July 2021	172
5	27th July 2021	2nd August 2021	172
6	3rd August 2021	9th August 2021	161
7	10th August 2021	16th August 2021	164
8	17th August 2021	23rd August 2021	162
9	24th August 2021	30th August 2021	153
10	31st August 2021	6th September 2021	147

Note: The completed responses refer to the number of responses in each wave after exclusions and data quality checks.

The baseline survey served as a screening tool. Only those who were deemed eligible in the baseline survey were invited to the subsequent EMA surveys. A total of 567 potential respondents were invited to the baseline survey. Of those, three did not consent to take part in the survey; 22 were outside of the required age range; 19 did not live in NSW; 179 were deemed ineligible because they did not bet on sports, esports or DFS at the required frequency, and 36 started the survey after the required sample size had been met but before the survey was closed. Four respondents were screened out by an attention check question. Subsequent data scrubs excluded a further 23 because their IP address indicated they were not in Australia ($n = 14$), their IP addresses and other information indicated duplicate responses ($n = 7$), and because they sped through the survey ($n = 2$). Of the remaining 282 respondents, 15 started but did not complete the baseline survey, for a completion rate amongst eligible

respondents of 94.7% ($N = 267$). Due to the different procedures of the different panels, it is unclear how many respondents were invited into the survey so a response rate cannot be calculated.

Each EMA wave was also screened for data quality. Because the respondents were pre-screened in the baseline survey, very few data quality issues were observed during the EMA surveys, and only seven responses were removed as probable duplicate responses. Importantly, these duplicate responses did not have implications for other waves of the study; that is, while these duplicates were found in two waves, this did not necessarily mean that there were also duplicate responses from the same respondents in other waves of the study. Each EMA survey opened on a Tuesday, and respondents were sent up to three SMS reminders per week if they had not completed the survey.



Appendix B: Sample characteristics

Table A2. Descriptive statistics for the sample

Between subject measures (N = 267)					
	%	N		%	N
Education					
Year 10 or equivalent	3.4	9			
Year 12 or equivalent	19.1	51			
Trade, technical cert. or diploma	18.7	50			
A university or college degree	45.7	122			
Postgraduate qualification	13.1	35			
Employment					
Full time	54.7	55			
Part time or casual	30.7	31			
Self-employed	2.2	2			
Unemployed	1.5	1			
Full time student	6.4	6			
Full time home duties	3.7	4			
Sick or disability pension	0.7	1			
Country of birth					
Australia	87.2	233			
Other	12.7	34			
Language					
English	88.0	235			
LOTE	12.0	32			
			Gender		
			Female	49.1	131
			Male	50.9	136
			Marital status		
			Single/Never married	46.1	123
			De Facto	32.6	87
			Married	20.6	55
			Divorced/Separated/Widowed	0.6	2
			Household		
			Single person	22.5	60
			Single parent with children	5.2	14
			Couple with children	26.6	71
			Couple with no children	26.2	70
			Group household	18.0	48
			Other	1.5	4
			PGSI		
			Non-problem gambling (0)	11.2	30
			Low risk gambling (1–2)	18.4	49
			Moderate risk gambling (3–7)	13.5	36
			Problem gambling (8+)	38.6	103

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