

THE PREVALENCE AND DETERMINANTS OF PROBLEM GAMBLING IN AUSTRALIA: ASSESSING THE IMPACT OF INTERACTIVE GAMBLING AND NEW TECHNOLOGIES

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The prevalence and determinants of problem gambling in Australia: Assessing the impact of interactive gambling and new technologies

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ABSTRACT

New technology is changing the nature of gambling with interactive modes of gambling becoming putatively associated with higher rates of problem gambling. This paper presents the first nationally representative data on the prevalence and correlates of problem gambling among Australian adults since 1999 and focuses on the impact of interactive gambling. A telephone survey of 15,006 adults was conducted. Of these, 2,010 gamblers (all interactive gamblers and a randomly selected sub-sample of those reporting land-based gambling in the past 12 months) also completed more detailed measures of problem gambling, substance use, psychological distress and help-seeking. Problem gambling rates among interactive gamblers were three times higher than for non-interactive gamblers. However, problem and moderate risk gamblers were most likely to attribute problems to electronic gaming machines and land-based gambling, suggesting that although interactive forms of gambling are associated with substantial problems, interactive gamblers experience significant harms from land-based gambling. The findings demonstrate that problem gambling remains a significant public health issue that is changing in response to new technologies, and it is important to develop strategies that minimize harms amongst interactive gamblers.

Keywords: prevalence, problem gambling, internet gambling, addiction, public health policy, risk factors

INTRODUCTION

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Problem and disordered gambling have been recognised as significant public health concern (Gainsbury, Blankers et al., in press). Numerous responsible gambling and problem prevention programs strategies have been introduced by governments and industry operators in an attempt to minimise gambling-related harm, however, gambling remains a significant cause of harm at individual and societal levels (Monaghan & Blaszczynski, 2010). Disordered gambling is a recognised mental health condition that is characterised by difficulty limiting gambling expenditure, chasing losses, lying about gambling and severe negative consequences of excessive gambling (APA, 2013). Problem gambling is a more general term that incorporates sub-clinical conditions where an individual experiences significant negative consequences as a result of gambling, and as such this is an appropriate term to use in relation to harm minimisation policies (Neal, Delfabbro, & O'Neil, 2005). This term is generally used in research where screening measures are used to identify problem gamblers without confirmation through clinical interviews, and as such typically includes disordered gamblers.

Internationally, problem gambling prevalence rates range from 0.2% to 2.3% (Fong, Fong, & Li, 2011; Petry, 2005; Productivity Commission, 2010; Shaffer, LaBrie, LaPlante, Nelson, & Stanton, 2004; Wardle et al., 2007). In Australia, the most recent national prevalence survey in 1999 estimated that about 1% of adults experience severe levels and 1.1% experience moderate levels of problems with their gambling (Productivity Commission, 1999). The prevalence of disordered and problem gambling has remained relatively stable over the last twenty years; however the introduction of new technology has changed the nature of many forms of gambling and provides new interactive modes of gambling. The term interactive gambling is often used interchangeably with Internet, online, and remote gambling and refers to all forms of gambling (including wagering) via the Internet through varied media including computers, mobile phones, wireless devices (e.g., tablets), and interactive televisions (Gainsbury et al., 2012).

Researchers have argued that there is little value to continue general population epidemiological studies that focus on the prevalence of pathological gambling (Shaffer et al., 2004; Young, 2013). Conceptual models of disordered gambling are complex and multidimensional and the recent movement of disordered gambling within the latest version of the DSM demonstrates the lack of clear conceptual understanding of this disorder (Hodgins, Stea, & Grant, 2011). Research that produces nationally representative samples remain relevant, but epidemiological research now needs to focus on the incidence of disordered gambling so that prevention efforts are informed (Shaffer & LaPlante, 2013). Given the myriad of factors that are associated with gambling problems, research is needed to identify the areas where researchers and policy makers should concentrate their efforts. This paper aims to identify the specific forms and modes of gambling, associated mental health issues and characteristics and behaviours that are most likely to be associated with gambling problems. Specific consideration is given to the impact of the relatively recently introduced opportunities for interactive gambling.

Risk factors for problem gambling

It is widely accepted that different gambling activities pose variable risks, with factors such as bet continuity, rapidly determined outcomes, high stake size, betting with credits, high accessibility and availability, perception of skill, captivating lights and sounds, and gambling environments with few distractions, contributing in various measures to the 'addictive' potential of gambling activities (Aurer & Griffiths, 2012; Breen & Zimmerman, 2002; Delfabbro & King, 2012; Dowling, Smith, & Thomas, 2005). Research shows that electronic gaming machines (EGMs) appear to be particularly related to gambling problems with approximately 80% of people presenting for gambling treatment reporting problems with this form of gambling, while 15% of regular EGM players are estimated to be problem gamblers (Productivity Commission, 2010). Consequently, a large proportion of public health strategies have focused on this gambling activity. However, the introduction of interactive gambling has changed the nature of many traditional gambling activities, indicating that new investigations are required to ensure that policies and practices are current.

Interactive gambling differs primarily from land-based gambling in terms of its constant availability, easy access and ability to bet for uninterrupted periods in private, facilitated by the interactive and immersive Internet environment (Monaghan, 2009). Evidence suggests that there is a clear, albeit complex, relationship between increasing availability of gambling opportunities and increased levels of related problems (Adams, Sullivan, Horton, Menna, & Guilmette, 2007; LaPlante & Shaffer, 2007; Reith, 2012; Sevigny, Ladouceur, Jacques, & Cantinotti, 2008; Storer, Abbott, & Stubbs, 2009; Welte, Wieczorek, Barnes, Tidwell, & Hoffman, 2004). Consequently, it has been asserted that interactive modes of gambling may lead to the development or exacerbation of gambling problems due to the greater accessibility to gambling opportunities that these modes provide (Gainsbury & Wood, 2011; Griffiths, Wardle, Orford, Sproston, & Erens, 2009).

Numerous studies support this purported relationship with findings of greater levels of problem gambling severity amongst samples of interactive as compared to non-interactive gamblers (Gainsbury Russell, Hing, Wood, & Blaszczynski, in press; Griffiths et al., 2009; Wood & Williams, 2011). However, the higher rates of gambling problems experienced by interactive gamblers is likely to be related to the tendency for this group to have greater overall gambling participation, including gambling on a greater number of activities and spending more time and money on gambling (Gainsbury et al., in press; Philander & MacKay, 2013; Wardle et al., 2011; Wood & Williams, 2011). Research has yet to investigate whether problems reported by gamblers who engage in interactive modes of gambling are caused by this mode of access and what specific gambling activities are related to interactive and land-based gambling problems.

Problem gamblers experience high levels of comorbid mental health problems, including depression, anxiety and substance use disorders (Hodgins, Stea, & Grant, 2011; Lorains, Cowlshaw & Thomas, 2011). Despite the severe negative consequences of gambling and comorbid health and mental health issues, few problem gamblers (less than 10%) seek help from professional sources (Evans & Delfabbro, 2005; Gainsbury, Hing, & Suhonen, in press; Suurvali, Hodgins, Toneatto, & Cunningham, 2008). Studies have also found higher rates of smoking and alcohol consumption, as well as substance abuse or

dependence, among interactive as compared to non-interactive gamblers (Gainsbury, Wood, Russell, Hing, & Blaszczynski, 2012; Griffiths et al., 2009; Wood & Williams, 2010). However, the relationships between interactive gambling, gambling problems and other mental health issues are still unclear. Similarly, various socio-demographic characteristics have been associated with gambling problems, but the relationship between these variables and overall gambling participation has not been investigated in detail.

Technological advancements have changed the nature of and accessibility of various forms of gambling in Australia, which is predicted to have significant impacts in terms of gambling problems and related health and mental health concerns. Therefore, data on patterns and characteristics of use in relation to gambling problems must be understood to enable appropriate prevention and treatment initiatives to be developed, targeted and implemented. The primary aim of this study was to investigate the determinants of problem and disordered gambling; in particular what forms and mediums of gamblers are most likely to be associated with gambling problems. Additionally, the study aimed to investigate substance use, mental health and help-seeking amongst gamblers and identify characteristics and behaviours that are predictive of greater problem gambling severity. The overarching objective of this study was to further the understanding of the impact of interactive modes of gambling on gambling problems to aid in the theoretical understanding of disordered gambling and enable the creation of more effective prevention, harm minimisation and treatment strategies.

METHOD

A random digit dial computer-assisted telephone survey of a nationally representative sample of registered telephone numbers (excluding non-registered mobiles) was conducted in November and December 2011. The household interviewee was randomly selected by requesting the interview be conducted with the person aged 18 or older who was having the next birthday. Maximal effort was made to complete each interview with the randomly designated person. This included multiple call backs and phone calls on evenings and weekends. Interviewers' work received periodic visual and audio monitoring for quality control by a supervisor.

The survey was introduced as an important national study concerning popular pastimes and leisure habits of Australians conducted through two Australian universities. This introduction was used to minimise oversampling of gamblers who are more likely to agree to be involved in gambling-specific surveys (Williams & Volberg, 2009). The sampling process to guide the interviewers through the relevant pathways of the survey is illustrated in Figure 1. In total 15,006 Australian adults participated in the survey (47.5% male, aged 18-100 years of age), which represented a 26.4% response rate that is similar to Australian telephone surveys for other public health issues, including smoking (Dunlop, Perez, & Cotter, 2011).

All participants completed the screening questions and those who had not gambled in the past 12 months (N=5,408) were not asked any further questions. All interactive gamblers and a randomly selected sub-sample reporting land-based gambling in the last 12 months completed the full survey (N = 2,010; see Figure 1). The study obtained ethical approval

from the relevant institutional review boards of the two universities directly involved in data collection.

Measures

The telephone survey questionnaire included 10 main sections, although only the seven measures relevant to the current paper are described here. Surveys usually took up to 25 minutes to complete, primarily depending on the participant's extent of gambling involvement. The survey instrument was created specifically for this research, but was based on a previous survey conducted by Wood and Williams (2010).

Gambling behaviour and attitudes: Participants were asked how often they had participated (times per week, month or year) in 10 different gambling activities in the past 12 months. Those who had participated at least once were asked whether they had used an interactive mode for each activity. Gambling activities asked about included lottery tickets, instant scratch tickets, horse or dog race betting, EGMs, sports betting, keno, casino table games, poker, bingo and betting on skill games. For each gambling activity used, participants were asked whether they had gambled using interactive modes and their typical monthly expenditure. Gamblers were also asked whether they thought that the benefits of gambling outweighed the harms with five response options available, where higher scores indicating that the respondent believed the benefits outweighed the harms.

Problem Gambling Severity Index (PGSI): Nine questions that comprise the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001) were administered. Questions assessed the extent of gambling-related harm experienced over the previous 12 months with response options of 'never', 'sometimes', 'most of the time', and 'almost always'. Total scores range from 0 to 27 and indicate the risk level of gambling problems for each participant (zero=no problems, 1-2=low-risk; 3-7=moderate risk; 8-27=problem gambler).

The PGSI has been independently validated and results indicate that it has excellent reliability, dimensionality, external/criterion validation, item variability, practicality, applicability, and comparability (McMillen & Wenzel, 2006; Neal et al., 2004). In this survey, the PGSI was not administered to those who only reported playing bingo and lottery less than once per week and did not participate in any other forms of gambling, as these participants were considered to be highly unlikely to experience gambling problems. This procedure was implemented based on the best practice recommendations for gambling prevalence surveys to avoid participant fatigue amongst low-frequency gamblers and to reduce false positive rates (Williams & Volberg, 2012). The internal consistency of the PGSI for this study was good with a Cronbach's α of 0.84.

Gambling consequences: Five questions asked which gambling activities and modes of access contributed to gambling problems as well as perceptions of the connection between interactive gambling and gambling problems. Another five questions probed the nature and extent of any help seeking for gambling problems. These questions could refer to problems and help seeking at any time; that is, they did not need to occur within the

last 12 months. This section was only completed by participants who scored three or higher on the PGSI.

Alcohol, tobacco, substance use and mental health: Seven questions created for this survey requested information about the frequency of cigarette smoking, drinking alcohol and illegal drug use and substance use while gambling. The Kessler Psychological Distress Scale (K6; Kessler et al., 2002) asked the frequency of symptoms of psychological distress from “None of the time” (=0) to “All of the time” (=5) over 6 questions. The total score was the sum of the numeric values of the answers with scores over 13 indicating clinically high levels of psychological distress.

Demographics: Demographic variables were measured to match the most recent Census data and included gender, year of birth, household size and current living arrangement, availability of Internet access at home and work, locality and postcode, marital status, educational level, employment, county of birth, language spoken at home, and whether participants were of Australian Aboriginal or Torres Strait Islander descent (Indigenous).

Analysis

Two weights were applied to the data: a design weight to correct for sampling one adult per household and a post-stratification weight to correct for age x gender cell size against the 2011 Australian census. The aim of the combination of these weights was to increase the national representativeness of the sample. This was critical to accomplish the research goal of understanding the prevalence of problem gambling and related influences. All interactive gamblers were retained, whereas an approximately equal number of non-interactive gamblers were surveyed after the screening questions. As 100% of interactive gamblers and 13.3% of non-interactive gamblers were selected for the majority of questions in the survey, these proportions were accounted for in population prevalence calculations. Weights were also normed so that the weighted N for each analysis was equal to the unweighted N.

Those participants who were not administered the PGSI as they only played lottery and bingo less than once a week and did not participate in any other forms of gambling were classified as non-problem gamblers in prevalence calculations as it was considered highly unlikely that they would have experienced negative consequences of gambling in the past 12 months (Williams & Volberg, 2012). For the remaining sub-groups, the proportions obtained from the sample that completed the PGSI were extrapolated to those who did not complete the PGSI. This was based on the assumption that those who completed the PGSI are a random subsample of the gamblers in the survey and that their results can thus be used to estimate the proportions in the overall screening sample (N = 15,006) and then in the population.

Pearson chi-square analyses or t-tests, using a significance criterion of $p < 0.05$, were carried out to test for statistically significant differences between proportions or between mean values of variables of interest. Follow up tests for the chi-square analyses were conducted using a Bonferroni-adjusted z-test. A multivariate analysis was conducted in order to determine which factors uniquely predict problem gambling severity. Due to the

extreme non-normal distribution of PGSI scores, the analysis was run as a Poisson regression.

A related paper has been published based on this research that presents the prevalence of gambling participation, the relationship between various gambling activities and interactive modes of access, and a comparison of interactive and non-interactive gamblers in terms of socio-demographic characteristics, attitudes and beliefs about gambling and gambling participation (reference blinded).

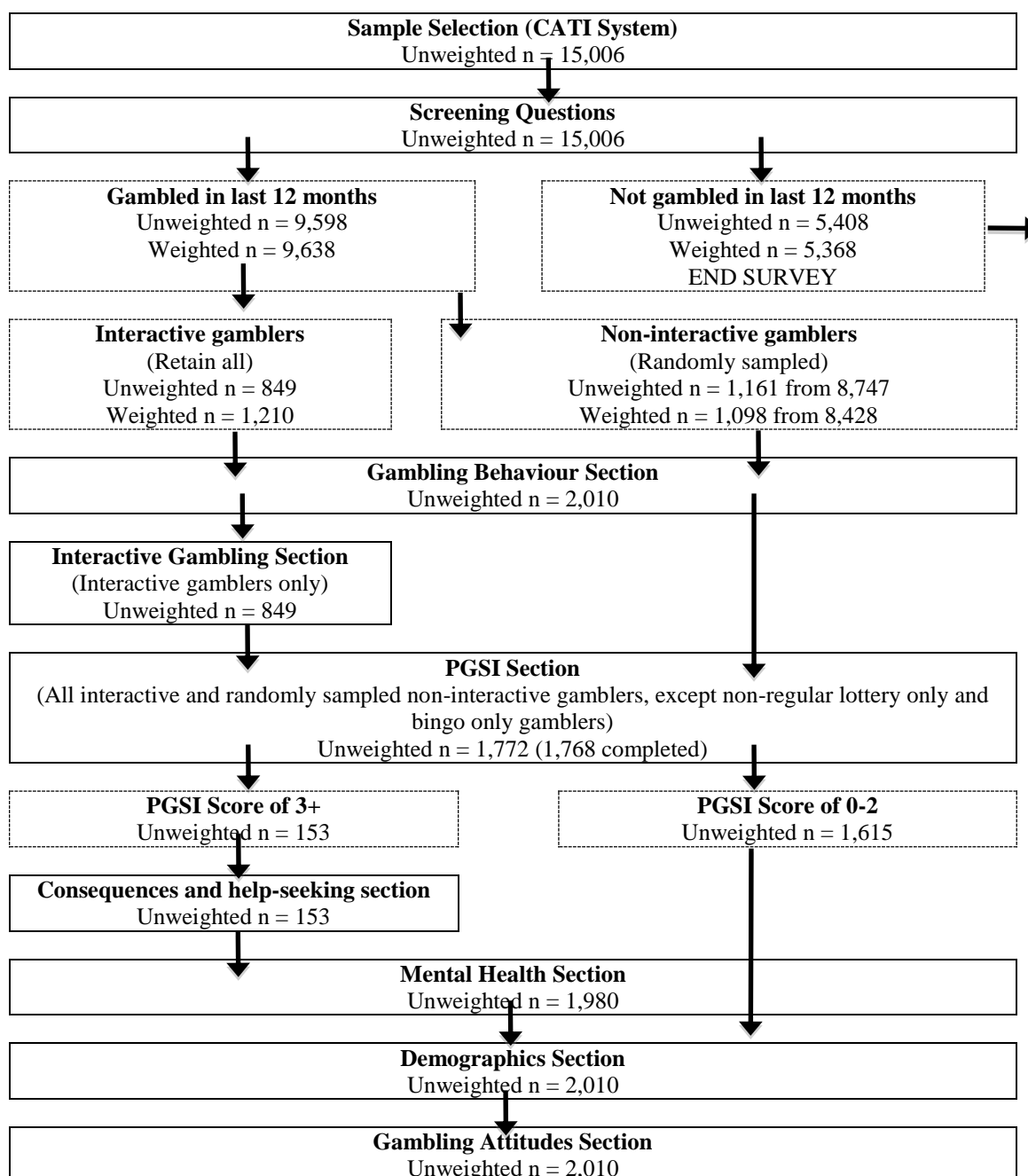


Figure 1 – Unweighted number of respondents who answered each section of the National Telephone Survey. Weighted numbers are weighted by age x gender and number of adults in the household.

RESULTS

In the present study, a non-gambler was defined as anyone not engaging in any of the surveyed forms of gambling at least once in the past 12 months, and an interactive gambler was defined as anyone who used an interactive mode of gambling at least once in the past 12 months. Non-interactive gamblers were defined as a participant who had gambled at least once in the past 12 months, but did not report using any interactive forms. Although these definitions are quite inclusive, they are consistent with previous studies (Griffiths et al., 2009; Olason et al., 2011; Productivity Commission, 1999; Wardle et al., 2011; Wood & Williams, 2011), enabling comparison of results.

Prevalence of gambling problems

As shown in Table 1, based on responses to the PGSI, the past year population prevalence rate of problem gambling among the Australian adult population was calculated to be 0.6%, with an additional 3.7% of adults experiencing moderate gambling-related harms. Amongst those who had gambled in the past 12 months, 1.0% were classified as problem gamblers and a further 5.8% gave responses indicating that they experienced moderate gambling-related harms.

Table 1 – Past year prevalence of gambling status amongst the Australian adult population in 2010/2011.

PGSI Category	Weighted % of population	Weighted % of gamblers
Non-gambler	35.7	NA
Non problem gambler (PGSI = 0)	52.3	81.4
Low risk gambler (PGSI = 1 to 2)	7.7	11.9
Moderate risk gambler (PGSI = 3 to 7)	3.7	5.8
Problem gambler (PGSI = 8 to 27)	0.6	1.0

Note: Weighted by product of design and post-stratification weights. Differential sampling of interactive and non-interactive gamblers also accounted for.

The relative prevalence of problem gambling among interactive and non-interactive gamblers is reported in Table 2. The overall problem gambling prevalence rate among Australian non-interactive gamblers was 0.9%. In comparison, the rate among interactive gamblers was three times higher at 2.7%. Less than 60% of interactive gamblers were classified as non-problem gamblers, whereas more than 80% of non-interactive gamblers were classified as non-problem gamblers, which was a significant difference $\chi^2(3, N = 1,767) = 103.62, p < 0.001, \Phi = 0.24$. Furthermore, the average PGSI score of interactive gamblers ($M = 1.3, SD = 2.6$) was significantly higher than that of non-interactive gamblers ($M = 0.51, SD = 1.87$), $t(1731.4) = 7.61, p < 0.001, d = 0.37$. For each PGSI question, a significantly higher proportion of non-interactive gamblers responded “never”.

Table 2 – Past year prevalence of problem gambling among interactive and non-interactive gamblers in 2010/2011 excluding non-regular bingo and lottery gamblers (N = 1,767)

PGSI Category	Interactive gamblers N (%)	Non-interactive gamblers N (%)
Non problem gambler (PGSI = 0)	564 (58.9%)	657 (81.2%)*
Low risk gambler (PGSI = 1-2)	238 (24.8%)*	99 (12.2%)
Moderate risk gambler (PGSI = 3- 7)	130 (13.6%)*	46 (5.7%)
Problem gambler (PGSI = 8 +)	26 (2.7%)*	7 (0.9%)
$\chi^2 (3, N = 1,767) = 103.62, p < 0.001, \Phi = 0.24$		

Note: Weighted by product of design and post-stratification weights.

Gambling participation among problem gamblers

Respondents with different levels of problem gambling severity were compared in terms of the gambling activities they engaged in. As there were relatively small numbers of problem gamblers in the sample, they were merged with moderate risk gamblers (i.e., those who scored 3 or more on the PGSI) for these analyses. As shown in Table 3, a significantly higher proportion of moderate risk or problem gamblers engaged in keno and betting on skill games compared to non-problem and low risk gamblers. Moderate risk and problem gamblers were also more likely to use EGMs and bet on sports, casino table games, and poker compared to non-problem gamblers. No significant differences were found based on problem gambling severity in gambling on lottery, instant scratch tickets, or betting on horse/dog races.

Table 3 – Percentage of respondents from each level of problem gambling reporting engagement in each gambling activity.

Gamblers apart from non-weekly bingo and lottery gamblers				
Form	Non-problem	Low risk	Moderate or problem	
Lottery tickets	64.1	62.1	66.1	$\chi^2(2, N = 1,766) = 0.47, p = 0.789$
Instant scratch tickets	56.3	58.2	46.6	$\chi^2(2, N = 1,766) = 3.92, p = 0.141$
Horse/dog race betting	40.5	31.1	41.5	$\chi^2(2, N = 1,766) = 5.03, p = 0.081$
EGMs	28.6 _a	53.2 _b	63.5 _b	$\chi^2(2, N = 1,766) = 113.09, p < 0.001, \Phi = 0.25$
Sports betting	21.6 _a	26.7 _b	28.6 _b	$\chi^2(2, N = 1,767) = 20.94, p < 0.001, \Phi = 0.11$
Keno	13.6 _a	19.4 _a	33.1 _b	$\chi^2(2, N = 1,769) = 37.46, p < 0.001, \Phi = 0.15$
Casino table games	10.9 _a	34.3 _b	28.0	$\chi^2(2, N = 1,770) = 120.43, p < 0.001, \Phi = 0.26$
Poker	7.6 _a	20.7 _b	18.5 _b	$\chi^2(2, N = 1,766) = 61.13, p < 0.001, \Phi = 0.19$
Bingo	4.8	2.6	5.0	$\chi^2(2, N = 1,768) = 1.66, p = 0.437$

Betting on skill games	2.3 _a	0.5 _a	13.0 _b	$\chi^2(2, N = 1,769) = 52.18,$ $p < 0.001, \Phi = 0.17$
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Note: Weighted by product of design and post-stratification weights. Due to the relatively small number of problem gamblers, their results are merged with moderate risk gamblers. Percentages with the same subscripts do not differ significantly from other percentages in the same line.

Similar results were found when analysing interactive and non-interactive gamblers based on gambling problem severity; higher rates of problem gambling severity were associated with greater use of EGMs, keno, casino table games, poker and betting on other games of skill (Table 4). For interactive gamblers, a significantly higher proportion of low risk, moderate risk or problem gamblers engaged in sports betting compared to non-problem gamblers, and moderate risk or problem gamblers were significantly more likely to gamble on EGMs, casino table games, and poker compared to both low risk and non-problem gamblers.

Table 4 – Percentage of respondents from each level of problem gambling reporting engagement in each gambling activity, split by non-interactive and interactive gamblers, as well as the total sample.

Form	Interactive gamblers			Non-interactive gamblers			
	Non-problem	Low risk	Moderate or problem		Non-problem	Low risk	Moderate or problem
Lottery tickets	65.9	68.9	65.9	$\chi^2(2, N = 776) = 0.61$, p = 0.739	63.8	61.2	66.2 $\chi^2(2, N = 991) = 0.52$, p = 0.773
Instant scratch tickets	54.1	57.8	60.3	$\chi^2(2, N = 775) = 1.92$, p = 0.384	56.7	58.2	44.6 $\chi^2(2, N = 992) = 3.79$, p = 0.150
Horse/dog race betting	67.0	68.9	77.2	$\chi^2(2, N = 777) = 4.86$, p = 0.088	36.	25.6	36.4 $\chi^2(2, N = 991) = 5.68$, p = 0.059
EGMs	39.5 _a	49.5 _a	66.1 _b	$\chi^2(2, N = 777) = 29.36$, p < 0.001, $\Phi = 0.19$	27.1 _a	53.7 _b	63.1 _b $\chi^2(2, N = 991) = 63.10$, p < 0.001, $\Phi = 0.25$
Sports betting	51.2 _a	68.9 _b	66.9 _b	$\chi^2(2, N = 777) = 22.27$, p < 0.001, $\Phi = 0.17$	17.4	20.7	23.1 $\chi^2(2, N = 991) = 1.89$, p = 0.389
Keno	17.1 _a	17.7 _a	31.5 _b	$\chi^2(2, N = 776) = 13.71$, p = 0.001, $\Phi = 0.13$	13.04 _a	19.7 _{a,b}	33.3 _b $\chi^2(2, N = 993) = 21.63$, p < 0.001, $\Phi = 0.15$
Casino table games	23.4 _a	33.2 _b	54.0 _c	$\chi^2(2, N = 776) = 43.94$, p < 0.001, $\Phi = 0.24$	9.1 _a	34.4 _b	24.2 _b $\chi^2(2, N = 993) = 67.03$, p < 0.001, $\Phi = 0.26$
Poker	14.0 _a	26.6 _b	40.5 _c	$\chi^2(2, N = 775) = 45.13$, p < 0.001, $\Phi = 0.24$	6.7 _a	19.8 _b	15.4 _b $\chi^2(2, N = 991) = 26.04$, p < 0.001, $\Phi = 0.16$
Bingo	6.4	8.8	7.9	$\chi^2(2, N = 776) = 1.35$, p = 0.510	4.6	1.7	4.6 $\chi^2(2, N = 992) = 2.27$, p = 0.322
Betting on skill games	3.5 _a	3.6 _a	8.7 _b	$\chi^2(2, N = 776) = 6.80$, p = 0.033, $\Phi = 0.09$	2.1 _a	0.0 _a	13.6 _b $\chi^2(2, N = 992) = 35.45$, p < 0.001, $\Phi = 0.19$

Note: Weighted by product of design and post-stratification weights. Interactive gambler figures weighted so that total N = 776 and non-interactive figures weighted so that N = 996, the number of each who responded to the PGSI. Subscripts are presented where significant differences exist. Percentages with the same subscripts do not differ from other percentages in the same gambling form from the same type of gambler, i.e., non-interactive and interactive gamblers were analysed separately

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Contribution to gambling problems and help seeking

Approximately half of the 153 participants categorised as moderate risk or problem gamblers indicated that EGMs had made the largest contribution to their gambling problems (43.2% interactive gamblers; 50.0% non-interactive gamblers). Of the interactive gamblers, 14.8% attributed problems to casino table games, 13.9% to sports betting, and 12% each to race wagering and poker. Among non-interactive gamblers, 14.7% indicated their problems were mostly related to keno, 11.8% to casino table games, 8.8% to lottery tickets, 5.9% to poker, and 2.9% to sports betting.

Of the interactive moderate risk or problem gamblers, 58.3% identified land-based gambling as the primary gambling medium responsible for their gambling problems, compared to 84.9% of moderate risk or problem non-interactive gamblers. Just over one-quarter, (26.2%) of moderate risk and problem gamblers identified interactive gambling via computers as contributing the most to their gambling problems, while a further 11.7% identified interactive gambling via mobile phones as the medium most responsible for their issues.

Just over half of the interactive moderate risk or problem gamblers indicated that their problems had emerged before they first gambled interactively (53.5%), and of these only one in five (21.0%) agreed that interactive gambling had exacerbated their problems, while over half (52.6%) disagreed with this statement. Of the 46.5% who reported their problems had started after they first gambled interactively, this trend was reversed with 87.9% reporting that interactive gambling had contributed to problems, compared with 9.1% who disagreed.

Only 15.4% and 25.9% of non-interactive and interactive moderate risk or problem gamblers respectively had considered seeking help for their gambling problems. However, when specific types of help, including forms of informal support and self-help were listed, approximately 60% of both interactive and non-interactive moderate risk or problem gamblers reported that they had sought some form of assistance. Of those who had obtained help, more than half of both interactive and non-interactive moderate risk or problem gamblers had attempted self-help strategies (57.5%; 55.0%).

The next most common form of help-seeking was family and friends for interactive gamblers (18.42%) and self-exclusion from land-based gambling venues for non-interactive gamblers (30.0%), which was also used by 15.8% of interactive gamblers. When asked where they would like to seek help in the future, a face-to-face service was the preferred location for help for 69.2% of non-interactive gamblers compared to 36.8% of interactive gamblers; a significant difference (χ^2 (3, N = 145) = 13.48, p = 0.009, Φ = 0.31). The next most popular option was a telephone service (25.5% of interactive and; 12.8% of non-interactive gamblers), followed by an online service (12.3%; 2.6%). A minority (21.7%; 15.4%) said that they would not seek help from a professional service.

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Substance use and mental health

The majority of participants had consumed alcohol in the past 12 months although non-interactive gamblers were more likely to have not drunk any alcohol in the previous year than interactive gamblers (7.6% vs. 5.3%), $\chi^2 (7, N = 1,979) = 29.53, p < 0.001, \Phi = 0.12$. A greater proportion of interactive gamblers drank alcohol at least once weekly (64.2%) compared to non-interactive gamblers (53.7%). A significantly higher proportion of non-interactive gamblers were non-smokers (74.3% vs. 65.1%), while a significantly higher proportion of interactive gamblers smoked daily (22.3% vs. 13.2% of non-interactive gamblers), $\chi^2 (5, N = 1,980) = 42.09, p < 0.001, \Phi = 0.15$. In terms of illegal drug use, 14.3% of interactive gamblers reported use in the last 12 months compared to 7.9% of non-interactive gamblers.

The majority of interactive gamblers reported never smoking (90.1%) or drinking (78.0%) while gambling online or in land-based venues (85.2% never smoked; 51.1% never drank). However, a significantly higher proportion of interactive gamblers reported at least sometimes drinking ($\chi^2 (3, N = 1,975) = 155.84, p < 0.001, \Phi = 0.28$) and smoking ($\chi^2 (3, N = 1,977) = 51.04, p < 0.001, \Phi = 0.16$) while engaging in land-based gambling compared to non-interactive gamblers. Furthermore, a higher proportion of interactive gamblers reported drinking or smoking whilst engaging in land-based gambling as compared to interactive gambling.

There were no significant differences between interactive and non-interactive gamblers in terms of the proportion identified as having high psychological distress that would be indicative of a mental disorder. However, those in the interactive gambling group ($M = 3.3, SD = 4.0$) did have significantly higher scores indicating some psychological distress as compared to non-interactive gamblers ($M = 2.9, SD = 3.4$), $t(1968.8) = 2.27, p = 0.023, d = 0.10$.

Predictors of problem gambling severity

A Poisson regression was run to determine which variables predicted problem gambling levels. The dependent variable, score on the PGSI, was treated as a continuous variable. The following predictors were included in the model: gender, country of birth (recoded into Australia and not Australia), primary language spoken at home (recoded into English and not English), Indigenous status (recoded into Indigenous and non-Indigenous), tobacco use, alcohol use and illicit drug use (all recoded into none and at least some), home and/or work Internet access (recoded into no and yes), age (in years), psychological distress (scored by the Kessler 6), number of forms of gambling engaged in, gambling expenditure and the views about the benefits or harms of gambling (higher scores indicate that the respondent feel that the benefits outweigh the harms). Reference groups for categorical variables are indicated in Table 5. The following variables were excluded due to issues with the assumptions of the analysis: marital status, living arrangements, highest level of education, work status, and state of residence.

The regression model suggested that males had PGSI scores 111% higher than females, English speakers had PGSI scores about 62.5% of those of non-English speakers and illicit drug users had scores about 91.6% higher than those of non-illicit drug users. For

every unit increase in Kessler 6 score, PGSI scores were predicted to increase by approximately 7.3%. Every extra form of gambling engaged in predicted an increase in PGSI scores of 22.1%, while those who reported making AUD\$1,000 in winnings in the past 12 months predicted PGSI scores that were 63.8% of those of people who reported breaking even (Table 5). The interactive gambler variable was not significant, although it was close ($p = 0.051$).

Table 5 – Poisson regression of characteristics predicting a higher problem gambling score in Australian gamblers (N = 745)

Poisson	b	Std. Error b	95% CI Lower	95% CI Upper	Wald	p
Interactive gambler (ref no)	-.21	.11	.43	<-.01	3.80	.051
Gender (ref female)	.75	.11	.54	.96	47.11	<.001
Country of birth (ref not Australia)	.08	.12	-.15	.32	.48	.488
Language at home (ref not English)	-.47	.11	-.69	.24	16.58	<.001
Indigenous Status (ref non-Indigenous)	.41	.23	-.03	.85	3.31	.069
Tobacco use (ref none)	.26	.10	.05	.46	6.13	.013
Alcohol use (ref none)	-.02	.16	-.32	.29	.01	.912
Illicit drug use (ref none)	.65	.13	.40	.91	24.82	<.001
Home internet access (ref no)	-.39	.19	-.77	-.02	4.30	.038
Work internet access (ref no)	-.08	.11	-.29	.14	.49	.482
Age (in years)	-.01	<0.01	-.02	<-.01	8.01	.005
Psychological Distress (Kessler 6)	.07	.01	.05	.09	52.62	<.001
Number of forms of gambling engaged in	.20	.02	.15	.25	66.84	<.001
Gambling expenditure (\$000's)	-.45	.03	-.51	-.38	170.45	<.001
Views about benefits or harms of gambling	-.06	.05	-.15	.03	1.50	.221

Note: Bold font designates statistically significant results.

DISCUSSION

This is the first national problem gambling prevalence study conducted in Australia since 1999 (Productivity Commission, 1999) and the first to specifically investigate the use of interactive gambling. The results showed that, similar to previous prevalence estimates and international surveys, the overall prevalence of problem gambling appears to be relatively stable. The proportion of Australian adults experiencing moderate levels of harm was greater than in previous surveys; however, as different measurement instruments were used in the two surveys it is difficult to draw firm conclusions about

these changes (Productivity Commission, 1999). Among those who had gambled in the past year, over one-fifth reported at least some negative consequences from their gambling. These findings confirm the importance of addressing this public health issue, particularly given previous findings that up to ten additional people are impacted by an individual's gambling problems (Productivity Commission, 1999).

Similarly to earlier reports (Productivity Commission, 1999), use of EGMs and casino table games was associated with greater problem gambling severity as was poker, keno and betting on skill games. This suggests that these games may have structural characteristics that represent greater risk for problems among gamblers. Notably, among interactive gamblers, sport betting was used by a significantly greater proportion of those with at least some level of gambling problems, a finding not replicated among land-based only gamblers. This is consistent with previous Australian research finding that problem interactive gamblers were more likely to gamble on sports than problem land-based gamblers (Gainsbury, Russell et al., in press). Gambling on poker and casino table games was also related to more severe problems amongst interactive than land-based gamblers in the current study.

Although causation cannot be determined from these results, these findings indicate that these forms of interactive gambling, may be more attractive to those with gambling problems, or possibly that in their interactive form they represent greater risk for the development of gambling problems. Internet technology enables fast paced bets, rapidly determined outcomes, and easily accessible games. For example, an analysis of interactive poker found that on average about 70 hands are played per table per hour, simultaneous play at more than one table occurs in 40% of all sessions, with 3.2% of sessions involving an individual playing at 12 or more tables at the same time (Fiedler, 2012). In comparison, at a land-based casino, players will play about 30 hands per hour (Fiedler & Rock, 2009). As regulations differ between land-based and interactive modes of gambling, and offshore gambling sites may have few responsible gambling measures, the interactive gambling environment may pose significantly greater risks to players, with fewer safeguards to prevent them gambling excessively and developing problems (Monaghan, 2009; Gainsbury & Wood, 2011; Smeaton & Griffiths, 2004).

Although participation in interactive gambling did not significantly predict greater problem severity, problem gambling rates were three times higher and rates of moderate and low level problems were more than twice as high among interactive gamblers as compared to non-interactive gamblers. This confirms previous findings that interactive gambler are at greater risk of experiencing gambling-related problems (Gainsbury, Russell et al., 2012; Griffiths et al., 2009; Wood & Williams, 2011). Nonetheless, as over half of the interactive gamblers surveyed indicated that their problems were related to land-based forms of gambling and just over half had problems before they ever gambled interactively, the contribution of interactive gambling to problems is clearly mixed. As greater engagement in various gambling activities was predictive of greater problem severity, these results may reflect the tendency for interactive gamblers to be highly involved gamblers. As these results are based on a cross-sectional survey they do not imply causality, and as only a small number of participants were classified as moderate

risk or problem gamblers the figures must be interpreted with caution. Nonetheless, the results are consistent with previous studies (Gainsbury, Russell et al., in press; Wood & Williams, 2011).

Unsurprisingly, greater gambling involvement and expenditure were predictive of gambling problems, which is consistent with previous findings that involvement in gambling overall accounts for a large proportion of gambling problems and may explain the link between interactive gambling and gambling problems (Gainsbury, Russell et al., in press; Holtgraves, 2009; LaPlante, Nelson, LaBrie, & Shaffer, 2009; Philander & MacKay, 2013). Previous studies of interactive gamblers have found that this population is highly involved in multiple forms of gambling and problem interactive gamblers tend to play more types of gambling than land-based problem gamblers (Gainsbury, Russell et al., in press).

Similar to previous studies (Gainsbury et al., 2012; Griffiths et al., 2009; Wood & Williams, 2011), interactive gamblers had higher rates of tobacco, alcohol and illicit drug use than non-interactive gamblers. However, interactive gamblers were less likely to drink alcohol and smoke when they were gambling interactively than when gambling in land-based venues, indicating they were unlikely to be using interactive modes to avoid smoking restrictions. Higher rates of drinking alcohol when gambling in venues may indicate that the supply of alcohol at these venues or social norms may increase alcohol intake during gambling, despite the lack of restrictions on consuming alcohol when gambling interactively in private settings. As illicit drug use was a significant predictor of having greater levels of gambling problems, this may indicate that problem gamblers are also more likely to use illegal drugs and develop substance use problems, as well as having a greater propensity for risky behaviour. Conversely, those who are at risk for gambling problems may engage in a range of risk-taking behaviours, for example due to high levels of impulsivity (Leeman & Potenza, 2012).

Greater psychological distress also predicted gambling problems, which may reflect greater psychological comorbidities, or distress caused by experiencing gambling problems. Interactive gamblers had higher rates of psychological distress than non-interactive gamblers, although these did not reach clinically significant levels indicating that, on average, people in this group were not experiencing significant comorbid mental health issues at the time of the survey. Problem and moderate risk gamblers appeared to have some insight into their problems as the majority reported having sought help, although they were most likely to use self-help or informal sources such as family and friends. This is consistent with findings from a recent study of Australian gamblers (Gainsbury, Hing et al., in press; Hing, Nuske, & Gainsbury, 2012) which found that problem gamblers were reluctant to seek help due to a desire to solve the problem on their own and experienced significant barriers related to denial of problem severity. The rates of help-seeking reported are much higher than those found in an international sample of interactive and non-interactive gamblers (Wood & Williams, 2011). However, the international study did not specifically include self-help options and informal support, which are the most popular help-seeking strategies used by Australian gamblers surveyed.

Limitations

Comparisons with previous surveys, including the 1999 Productivity Commission findings, must be made with caution as different measures of problem gambling were used. Although 15,006 Australians were asked about their gambling participation, only 2,010 completed the entire survey, with results from this sub-sample extrapolated to the wider population. Given the low proportion of interactive gambling in the population, a large number of people had to be included to ensure a sufficient sample of interactive gamblers. The number of interactive problem gamblers included was insufficient to enable detailed investigation of this subgroup. Furthermore, by oversampling a particular population, this may have biased the total sample included, although weighting was used to make the sample as representative as possible. Only landline telephones were included in the survey. Comparison of telephone survey methodologies indicates that although participants recruited through landlines do not significantly differ from those recruited via mobile phones in past year gambling behaviour, mobile phone users who did not have landlines were less likely to have gambled in the past year but were more likely to endorse some lifetime gambling problems (Jackson, Pennay, Dowling, Coles-Janess, & Christensen, in press). However, this previous study did not find any significant differences between the populations of landline, mobile and mobile phone only users on levels of interactive gambling (Jackson et al., in press). Nonetheless, even if the problem gambler rates are several times higher among the mobile phone only users not represented in these results, the very small number of people in these groups relative to the general population means that only small adjustments would be needed to account for these. Future research should include measures of informal gambling activities and examine subgroups of interactive gamblers to further explore the relationship between types of gambling and problems.

Conclusions

Taken together, the results of the current study suggest that gambling problems are related to overall gambling involvement and intensity in terms of the number of gambling activities pursued. For some interactive gamblers, this medium appears to significantly contribute to their difficulties, but importantly, existing problem gamblers also appear likely to gamble interactively, which, even if it does not cause problems, is likely to exacerbate them. Combined with low rates of professional help seeking, the high rates of gambling problems experienced by interactive gamblers is of concern given that participation in this mode of gambling is increasing.

Population prevalence studies are useful for assessing what proportion of people are at risk for or appear to have significant gambling problems at a given time, which can be compared to previous time points and other populations (Shaffer et al., 2004). In addition, studies such as this one provide important insights into particular subgroups, permit exploration of which groups are most vulnerable to developing gambling-related problems, and identify which forms and modes of gambling should be targeted to have the greatest impact on reducing gambling harms. This study demonstrates that disordered gambling remains a major public health issue for Australia. It is argued that it is important to focus on the forms of gambling that are most likely to be associated with harms, such as EGMs, and interactive poker, casino games, and sports betting.

Regulation and public health measures have focused on EGMs over the past years leaving interactive gambling with fewer requirements and harm minimization policies. Further efforts are required to prevent these forms of gambling from causing significant problems and to assist those who do have problems to seek appropriate help. This study informs our understanding of the impact of new technologies on gambling problems and provides key data for future research in terms of testing causality. It also assists policymakers in considering the effectiveness of potential strategies that prevent gambling problems and assist those who are experiencing harms.

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