

Journal of Gambling Issues
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Editorial

Welcoming Sherry Stewart as the Journal of Gambling Issues' Editor-in-chief

It is with great pleasure that the Editorial Board of the *Journal of Gambling Issues* announces the appointment of Dr. Sherry Stewart as Editor-in-chief.

Dr. Stewart is internationally respected for her research on psychological factors contributing to addictive disorders, and the co-morbidity of mental illness and addictions. Her research on problem gambling is wide-ranging – in the past 10 years, she has been awarded grants and published on problem gambling-related topics that include (but are not limited to) motivations, cognitions, reward mechanisms, video lottery terminals (VLTs), cross-addictions, and psychometrics.

Currently, Dr. Stewart is a Killam Research Professor in the Departments of Psychiatry and Psychology at Dalhousie University in Halifax, Nova Scotia. Both a practicing clinician and researcher, she has previously served as Director of Training of the Doctoral Clinical Psychology Program, and today holds a Governor-in-Council appointment with the Canadian Centre on Substance Abuse.

We look forward to having Dr. Stewart uphold the tradition of trusted scholarly editorship that has, since our inception, been a hallmark of our Journal. At the same time, we welcome the personal mark that Dr. Stewart's special qualities will undoubtedly bring to our publication.

Journal of Gambling Issues Editorial Board

Editorial

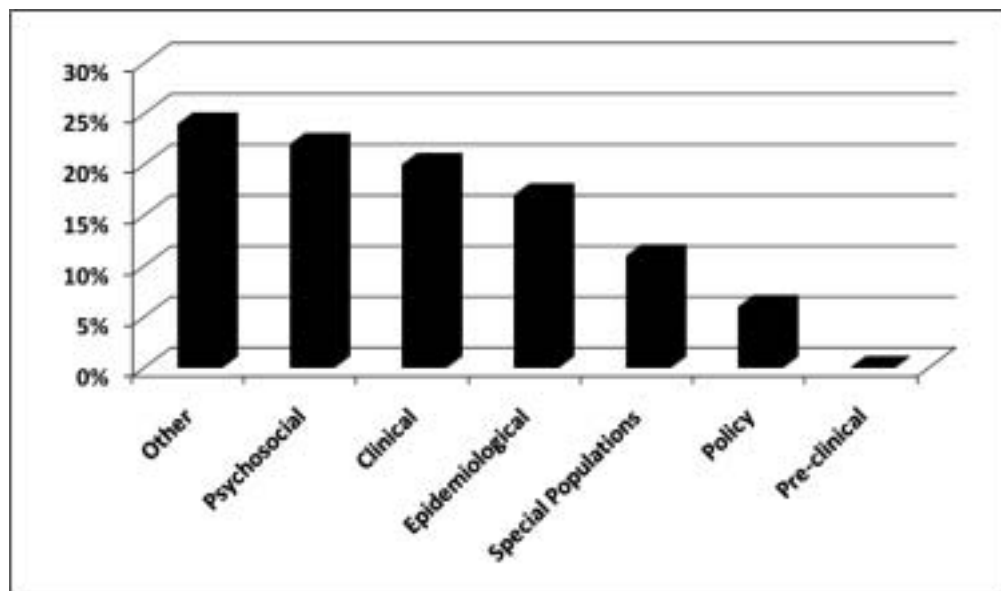
Journal of Gambling Issues: The First Decade and Onward

This 24th issue represents the 10th anniversary of the *JGI* (formerly *e-Gambling: The Electronic Journal of Gambling Issues*). Anniversaries are times to reflect on the past, to celebrate accomplishments, and to look ahead toward the future. This 10th anniversary of the journal coincides with the launching of the Problem Gambling Institute of Ontario at the Centre for Addiction and Mental Health (PGIO, 2010). I am very enthusiastic about assuming the role of editor-in-chief of the *JGI* at this exciting time in the journal's history. I feel very privileged to inherit this role from two outstanding predecessors – Phil Lange, founding editor-in-chief, who established the *JGI*'s very high standard of ethical publishing in the gambling field, and Daryl Boshart, who maintained this high standard since assuming the role of editor in 2008. I also feel extremely fortunate to have Daryl continuing at my side in the role of managing editor as I assume the challenges of my new position.

JGI was originally developed to provide a forum for clinicians, researchers, gamblers, the gambling industry, and the public to carry on dialogue about such important issues as what constitutes responsible gambling, gambling as a social phenomenon, and evidence-based treatments for problem gamblers (Garfinkel, 2000). Guided by a highly-dedicated core Editorial Board, and later an additional international advisory panel, the journal has been committed to disseminating knowledge about gambling to as wide a public as possible; from the outset, the journal ensured accessibility through electronic publishing on the internet. Like the other gambling journals, the *JGI* has published feature articles and research papers on a wide variety of topics in the area of gambling studies, as well as letters to the editor and policy pieces. Many of the feature articles have been written by world-renowned experts in the gambling field – Blaszczynski, Derevensky, Peele, Korn, Griffiths, and Volberg, to name a few. What makes the *JGI* unique is the combined focus on high quality scientific contributions balanced against contributions from other perspectives such as the *clinic* section (offering up-to-date treatment information), the *first person accounts* (providing the opportunity to learn from the stories of those whose lives have been impacted by gambling), *reviews* (critical reviews of books on various gambling-related topics), and *service profiles* (where gambling programs describe the distinguishing attributes of the services they provide). A survey of the *JGI* readership (Lange, 2002) indicated that the audience was particularly appreciative of the range of articles in the journal written both by experts and by “everyday people”, the high quality of the articles, as well as the journal's ready accessibility. We plan to maintain these strengths of the *JGI* as we move forward into our second decade.

We have recently completed a survey of the types of articles published in the journal over the last 12 issues. We utilized seven broad categories in classifying the published articles: psychosocial, clinical, epidemiological, special populations, policy, pre-clinical, and “other”. The latter category was reserved for articles not readily classifiable into any

Figure 1. Proportion of articles published over last 12 issues of *JGI* that fall into each of seven topic categories.



of the other categories and included topics such as advertising, religion, organized crime, and film. The results are displayed in Figure 1. These results were presented to the Editorial Board at our last meeting in January, 2010, for discussion and planning. The board felt that these statistics demonstrate that the *JGI* has developed a solid niche in publishing in the psychosocial, clinical, and epidemiological fields, given that over half of the published articles fall in these three domains (see Figure 1). We will continue to solicit high quality articles in these areas in order to maintain our established publishing niche. The Editorial Board also felt that these statistics reveal two areas we could focus on building in future issues. First, given that only 5% of our publications over the last 12 issues were in the policy realm (see Figure 1), and since a 2002 e-survey of our readership identified ‘public policy discussions on gambling’ as an area about which they would like to see more coverage (Lange, 2002), we will attempt to increase our focus on this topic in future issues. Second, given that we did not publish any articles that could be classified as pre-clinical studies in this time period, the Editorial Board discussed ways to increase the recruitment of articles on such topics as affective neuroscience, genetics, and other biological perspectives on gambling behavior and gambling problems, that would have relevance for our wide readership of researchers, clinicians, affected individuals and their significant others, and policy makers alike.

A notable new development with the *JGI* is our plan to incorporate a French language section within the journal. This section will be edited by Serge Sévigny from the Université Laval. We feel that this addition should increase the relevance of the journal to French-language scientists and practitioners by providing a publishing venue for French-speaking Canadians with interests and expertise in gambling research and treatment, as well as for

those from other French-speaking countries around the world. This immediate development fits extremely well with my longer-term goal as editor-in-chief to increase the *JGI*'s visibility and impact by fostering a more national, and even international, scope for the journal. I thank the Editorial Bboard for placing their confidence in me and for providing me with this exciting new opportunity.

-Sherry Stewart, Incoming Editor-in-Chief

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The association of at-risk, problem, and pathological gambling with substance use, depression, and arrest history

Sandra L. Momper,¹ Jorge Delva,² Andrew Grogan-Kaylor,¹ Ninive Sanchez,¹
& Rachel A. Volberg³

¹School of Social Work, University of Michigan, Ann Arbor, MI, USA

E-mail: smomper@umich.edu

²Curtis Research Center and School of Social Work, University of Michigan, Ann Arbor, MI, USA

³Gemini Research Ltd., Northampton, MA, USA

Abstract

We examined at-risk, problem, or pathological gambling co-occurrence with frequency of past-year alcohol, tobacco, and marijuana use; depressive symptoms; and arrest history. Data included the responses of over 3,000 individuals who participated in a 2006 telephone survey designed to understand the extent of at-risk, problem, and pathological gambling; comorbidity levels with substance use; mental health; and social problems among Southwestern U.S. residents. Data were analyzed with multinomial and bivariate logistic regression. Respondents at risk for problem gambling were more likely to use alcohol, tobacco, and marijuana than those respondents not at risk. Pathological gamblers were no more or less likely to consume alcohol or tobacco than were non-gamblers or those not at risk. A dose-response relationship existed between degree of gambling problems and depressive symptoms and arrest history. Interventions for at-risk or problem gamblers need to include substance use treatment, and the phenomenon of low levels of substance use among pathological gamblers needs further exploration.

Keywords: problem gambling, substance use, depression, arrest history

Introduction

Gambling, at the recreational, at risk, problem, and pathological level, is on the rise in the United States and internationally (Gerstein et al., 1999; National Gambling Impact Study Commission, 1999; Stucki & Rihs-Middel, 2007). Additionally, problem or pathological gamblers tend to have higher rates of alcohol abuse (Sellman, Adamson, Robertson, Sullivan, & Coverdale, 2005; Welte, Barnes, Wieczorek, Tidwell, & Parker, 2001), tobacco dependence (Petry & Oncken, 2002; Rodda, Brown, & Phillips, 2004), marijuana use (Engwall, Hunter, & Steinberg, 2004; Kausch, 2003), depressive symptoms (Goodyear-Smith et al., 2006), and arrest history (Gerstein et al., 1999; Thompson & Schwer, 2005).

In general, gambling disorders and substance use disorders are commonly comorbid conditions. Crockford and el-Guebaly (1998) found in a review of clinical and community gambling studies conducted between 1966 and 1999 that 25% to 63% of pathological gamblers had a lifetime substance abuse disorder. Cunningham-Williams, Cottler, Compton, and Spitznagel (1998) found in the St. Louis Epidemiologic Catchment Area Study that among problem gamblers with alcohol abuse or dependence, gambling problems developed within 2 years of the onset of alcoholism in 65% of the cases and problem gambling occurred after the onset of nicotine dependence in 67% of the cases. In a 2000–2001 study of 960 callers to the Connecticut Council on Problem Gambling Helpline, Potenza, Steinberg, and Wu (2005) reported that 173 callers to the helpline reported alcohol use problems; compared with those callers without an alcohol use problem ($N = 787$), they were more likely to acknowledge problems with more forms of gambling. Petry, Stinson, and Grant (2005) analyzed the National Epidemiologic Survey on Alcohol and Related Conditions (2001–2002) and found that 73% of the 192 pathological gamblers in this large, nationally representative sample had lifetime alcohol use disorders and that 60.4% reported lifetime nicotine dependence. Associations between problem gambling and marijuana use are less well-known. In a chart review of 113 pathological gamblers in treatment at a Veterans Administration Center, those reporting a history of drug abuse or dependence reported the highest lifetime rates of marijuana use (72.7%; Kausch, 2003). Petry and Tawfik (2001) reported that 20% of youth seeking treatment for marijuana had a gambling problem.

Both general population and gambling treatment studies of gamblers have shown elevated depression scores and higher frequencies of major depressive disorders among those with gambling problems (Bland, Newman, Orn, & Stebelsky, 1993; Cunningham-Williams et al., 1998; Lynch, Macejewski, & Potenza, 2004; Petry et al., 2005). Kausch (2003) found in chart reviews of gamblers in treatment that 43% ($N = 113$) had a clinical diagnosis of depressive disorder. In a Scottish study, pathological gamblers had significantly higher rates of depression than did problem gamblers, non-problem gamblers, and non-gamblers (Moodie & Finnigan, 2006). Although data on problem gamblers and arrest history are limited, Potenza et al. (2005) found that, compared with general population samples, problem and pathological gamblers are more likely to report legal issues, including crimes, arrest, and incarceration. Adult male pathological gamblers, for instance, are more likely to be involved in illegal activities (Abbott & Volberg, 1999), and a study of incarcerated women who scored high on a measure of problem gambling found that preincarceration levels of gambling involvement and expenditures on gambling were higher than in general population samples (Abbott & McKenna, 2005).

The literature clearly delineates the associations between problem and pathological gambling and substance use disorders. However, most of this literature focuses on people who meet diagnostic criteria for substance use disorders. Such an approach examines whether or not people are above a clinical cutoff for substance disorders rather than examining their position in the full range of the distribution of substance use behaviors. Also, rates of these disorders are generally compared between individuals who meet some type of gambling problem criteria versus no gambling problem or between individuals who meet pathological gambling criteria versus non-gamblers or those who do not meet pathological gambling criteria. Statistically, using dichotomous outcomes in measuring associations

between independent and dependent variables makes less use of the available information on the relationship between gambling and substance use behaviors than would be achieved with more finely graded measures of both constructs. That is, the focus has for the most part been on individuals whose substance use has progressed over the years to become extremely deleterious such that they meet diagnostic criteria for abuse and dependence. Far less is known about the associations between various degrees of gambling problems and substance use among people who consume substances in smaller amounts and who may not meet diagnostic criteria. Given that most people who consume substances do not progress to abuse and dependence, an important gap in knowledge concerning comorbid gambling and substance use exists. Further, multivariate examinations of these relationships with large survey data sets are rare.

Equally important, relationships between gambling and substance use may be nonlinear in nature, suggesting that examinations of these relationships with standard ordinary least squares regression techniques may be inappropriate. The present study contributes to a better understanding of the relationship between comorbid gambling problems and substance use consumption by using binomial and multinomial logistic regression to examine associations between lifetime gambling (not a gambler or not at risk, at risk, problem, and pathological) and frequency of past-year substance use. We also examine associations between lifetime gambling, number of lifetime depressive symptoms, and lifetime arrest history. The overarching goal is to add to the literature on these discrete associations by using a large sample of adult individuals living in a large southwestern state to better understand the connections between distinct levels of gambling and levels of substance use, depression, and history of arrests.

Methods

Sample

Data are from the 2006 Study of Gambling and Problem Gambling in New Mexico (Volberg & Bernhard, 2006), where a 15- to 20-min phone interview survey was conducted between September of 2005 and January 2006. The main sample for this survey included 3,007 residents of New Mexico aged 18 years and over. These participants were selected through random-digit dialing to ensure that each telephone-owning household in New Mexico had an equal probability of selection into the sample. Nearly 15,000 telephone numbers were initially called. Of these numbers, about 11,000 were potentially eligible numbers. Of the remaining 6,376 households with which contact was made, 3,007 individuals completed the telephone interview, resulting in a completion rate of 47%. Of note is that the Pew Research Center found that rigorously conducted telephone polls obtain representative samples of the public and provide accurate data about the views and experiences of Americans even though response rates have declined from 61% to 51% since 1997 (Pew Research Center for the People & the Press, 2004).

The study also included an additional sample of 589 Native American New Mexico residents aged 18 years and over. These respondents were selected from a random sample of telephone numbers likely to belong to a Native American household. Native American ethnicity was confirmed for all respondents in this subsample before conducting the interview.

Procedurally, the subsample included approximately 3,600 telephone numbers, of which 2,253 were determined to be potentially eligible. Approximately 1,800 of these 3,600 numbers could not be contacted; of the remaining 1,792 households with which contact was made, 1,376 were eligible and 589 individuals completed the telephone interview, resulting in a completion rate of 43%. The overall sample for the present study therefore included 3,596 residents of New Mexico aged 18 years and over.

Measures

Demographic characteristics. Respondents were asked their gender (male vs. female); their date of birth, which was then converted into the participant's age (a continuous variable); their annual family income (eight categories: $\leq \$15,000$ to $\geq \$80,000$); and their marital status, which included the following response categories: married, common-law, living as married, widowed, divorced, separated, and never married. In this study, individuals who were married, had a common-law arrangement, or had been living as married were combined into one category. Individuals who were widowed, divorced, separated, and never married were combined into a separate category.

Finally, individuals were asked which of the following racial or ethnic groups describe them best: Native American, Asian or Pacific Islander, Black or African American, White or Caucasian, or something else. Participants were also asked if they were Hispanic or Latino. Because of the relatively small sample sizes of Asian or Pacific Islanders, Blacks or African Americans, and those of Other backgrounds, for this study, we created the following four response categories: non-Hispanic/Latino Whites, non-Hispanic/Latino Native Americans, Hispanic/Latino, and non-Hispanic/Latino Other.

Lifetime problem gambling. In problem gambling prevalence surveys, individuals are classified as at-risk, problem, or pathological gamblers on the basis of their number of positive responses on a valid and reliable problem gambling screen. The National Opinion Research Center DSM-IV Screen for Gambling Problems (NODS), lifetime measure, was used to provide a measure of problem gambling (Gerstein et al., 1999). The NODS is a reliable and valid screening measure that is based on the most recent psychiatric criteria for pathological gambling (American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders*, 1994 [*DSM-IV*]) and is appropriate for use in population-based telephone surveys (Abbott & Volberg, 2006; Gerstein et al., 1999; Hodgins, 2004). Individuals who meet five or more of the DSM-IV criteria for pathological gambling exhibit "persistent and recurrent maladaptive gambling behavior", are unable to resist impulses to gamble, and gamble in such a way that "disrupts personal, family, or vocational pursuits" (*DSM-IV*, 1994, p. 615). "Problem gamblers" who meet three or four of the *DSM-IV* criteria can be preoccupied with gambling, gamble for emotional escape, and may lie repeatedly about gambling (Toce-Gerstein, Gerstein, & Volberg, 2003). "At-risk gamblers" meet one or two *DSM-IV* criteria, the most common of which is *chasing*, followed by preoccupation and escape (Toce-Gerstein et al., 2003). The NODS consists of two 17-item measures, one that assesses lifetime problem gambling and the other past-year gambling. In this study, we used the lifetime measure of gambling. Examples of questions include the following: "Have you ever gambled to relieve uncomfortable feelings such as guilt, anxiety, helplessness, or

depression?” “Have you ever lied to family members, friends, or others about how much you gamble or how much you lost on gambling?” “Has there ever been a period when, if you lost money gambling one day, you would return another day to get even?” Each criterion item is scored 0 or 1, to produce a maximum score of 10. Several items are administered only if a preliminary screening question is endorsed. Scores of 0 are interpreted as indicating low risk. In this study, individuals who were non-gamblers or who scored 0 were coded as “non-gamblers or not at risk.” Individuals who scored 1 or 2 were coded as being “at risk of problem gambling.” Individuals who scored 3 to 4 were coded as “problem gamblers” and those who scored 5 or more were coded as “pathological gamblers.”

Frequency of alcohol, tobacco, and marijuana use in the past year. To assess alcohol, tobacco, and marijuana use in the past year, we asked respondents whether they had consumed alcoholic beverages; used cigarettes, chewing tobacco, or snuff; or used marijuana or hashish during the past 12 months. Response options for all three questions included daily (30 or more times/month), several times a week (6–29 times/month), several times a month (3–5 times/month), once a month or less (6–12 times/year), only a few days all year (1–5 times/year), or never during the past 12 months.

Lifetime depression symptoms and history of arrest. Although numerous screening measures have been developed to detect depression, there is good evidence that even very short screens can be as effective as longer screening measures. A recent meta-analysis demonstrated that a two-item screen is effective in identifying clinical depression among adults in primary care settings (U.S. Preventive Services Task Force, 2002). These items query whether a person has “felt down, depressed or helpless” or “felt little interest or pleasure in doing things” over the past 2 weeks.

For the purpose of obtaining a lifetime measure of depression symptoms, answers to the following two questions were included in the analysis: “In your lifetime, have you ever had a period of 2 weeks or longer when nearly every day you felt sad, empty, or depressed for most of the day?” and “In your lifetime, have you ever had a period of 2 weeks or longer when you lost interest in most things like work, hobbies, and other things you usually enjoyed?” Responses to these questions were dichotomous (Yes-No) and scores on this small depression scale could range from 0 to 2, depending on whether respondents endorsed none, one, or both items (Cronbach’s $\alpha = 0.76$). History of arrest was assessed by the question, “Have you ever been arrested for any reason?” with a dichotomous (Yes-No) response format.

Data analysis

Our independent variables included the demographic characteristics of the respondents and their gambling status. One of our dependent variables (arrest history) was dichotomous. In this case, logistic regression was clearly an appropriate analytic strategy. As described in the Measures subsection, other dependent variables were measured on Likert scales. Modeling these data with standard ordinary least squares (OLS) regression techniques would assume a linear relationship between a unit change in the independent and dependent variables. Further, OLS regression makes the assumption that the outcome variable is continuous and

that each unit change on the dependent variable is equivalent. For example, the change from 0 to 1 is conceptualized as representing an equivalent amount of change as the change from 1 to 2. Because of the scaled nature of most of our dependent variables, we did not believe it was appropriate to assume that each unit change on the dependent variable was equivalent to the next.

Therefore, we first considered the use of an ordinal logistic regression model, which does not require this latter assumption. However, such models test the assumption of a proportional relationship of the independent and dependent variables. A Brant test indicated that a proportional odds assumption for an ordinal logistic regression was not met (Long & Freese, 2005). Therefore, we used bivariate and multivariate multinomial logistic regression to examine the association of the demographic characteristics and problem gambling, with the variables assessing frequency of alcohol, tobacco, and marijuana use, as well as depression symptoms. Our models were estimated with and without statistically adjusting for the demographic controls.

All analyses presented in this paper were conducted with STATA 10.0 (StataCorp, 2008). Coefficients from a multinomial or binomial logistic regression may be difficult to interpret. Therefore, we report odds ratios (ORs), which provide an intuitively meaningful metric of the relationship of different independent variables with the dependent variable of interest. Numerically, ORs are the exponentiated value (e^{β}) of the parameters from the logistic regression models. ORs of 1.0 indicate no relationship between the independent variable and dependent variable. ORs greater than 1.0 indicate that increases in the independent variable are associated with *increases* in the dependent variable, whereas ORs below 1.0 indicate that increases in the independent variable are associated with *decreases* in the dependent variable.

Results

The sample consisted of 3,596 individuals, 60% of whom were women and 40% men. The average age was 51 years ($SD = 17.0$). Most respondents were identified as White/non-Hispanic (51.5%), followed by Latinos (23.3%), Native Americans (18.5%), and Other backgrounds (6.7%). About two thirds were married or living together, 9% widowed, 12% divorced, 1.6% separated, and 16.1% never married. The median total household income in the year prior to the interview fell within the range of \$35,000 to \$50,000. Most respondents were not gamblers or did not meet the criteria for being at risk (91.3%). Approximately 6.5% were at risk of problem gambling, 1.2% were problem gamblers, and 1.0% were pathological gamblers. The percentages of individuals who had consumed alcohol, tobacco, and marijuana in the past year were 54%, 24%, and 3%, respectively. About 33% had experienced at least a depressive symptom and 13% had been arrested in their lives.

Demographic characteristics, problem gambling, and substance use

The results of the multinomial logistic regression analyses of the associations of demographic characteristics and lifetime problem gambling with past-year alcohol, tobacco, and marijuana use are shown in Table 1. To facilitate the interpretation of the results of the

multinomial logistic regression analyses, we discuss the results for each of the levels of the dependent variables as compared with the reference category. The reference category for all these comparisons is “never consumed alcohol, tobacco, and marijuana in the past year.” The five categories of substance use that are compared with this reference category are as follows: 1 = only a few days per year (1–5 times/year), 2 = once per month or less (6–12 times/year), 3 = several times per month (3–5 times/month), 4 = several times per week (6–29 times/month), and 5 = daily (30 or more times/month).

Substance use only a few days (1–5 times/year). People who infrequently use alcohol, tobacco, and marijuana (only a few days all year or 1–5 times/year) are more likely to be older when compared to those people who never consume these substances. Higher income was positively associated with alcohol use in the bivariate and multivariate models. Individuals who were married or living together had lower ORs associated with tobacco in the bivariate and multivariate analyses and lower ORs associated with marijuana use in the bivariate analyses only. Native Americans were less likely to consume alcohol when compared with Whites in the bivariate and multivariate models. Although Native Americans were considerably more likely to use tobacco and marijuana than were Whites, this association was not significant in the multivariate model.

Being at risk of problem gambling was positively associated with alcohol use but not with tobacco and marijuana use. The magnitude of this association increased and remained significant when demographic controls were entered in the model. Being a problem gambler was significantly associated with the use of marijuana a few days during the year (OR = 5.18), though the association became non-significant when the demographic controls were entered in the model.

Substance use about once per month (6–12 times/year). The consumption of alcohol and marijuana about once per month (6–12 times/year) was less likely to occur among females than males and the consumption of alcohol, tobacco, and marijuana was less likely to occur among older individuals compared with those who never consumed these substances in the past year. Alcohol use was more likely to occur among those with higher incomes in the bivariate and multivariate models. Individuals who were married or living together were less likely to consume alcohol about once per month in the multivariate model. Native Americans were about half as likely as Whites to consume alcohol (adjusted OR [aOR] = 0.42) but were substantially more likely than Whites to use tobacco, even after including the demographic controls (aOR = 3.48).

Individuals at risk of problem gambling were significantly more likely to use tobacco (aOR = 2.72) and marijuana (aOR = 5.36) about once a month or less when compared with individuals who are not gamblers nor at risk of problem gambling. Pathological gamblers were also substantially more likely to use tobacco (aOR = 6.64).

Substance use several times per month (3–5 times/month). The consumption of alcohol, tobacco, and marijuana several times per month (3–5 times/month) was significantly less likely to occur among females and among older individuals compared with those who never consumed these substances in the past year. Alcohol use several times per month was

Table 1
Association of demographic characteristics and lifetime problem gambling with alcohol, tobacco, and marijuana use in the past 12 months: Results of bivariate and multivariate multinomial regression analysis

Frequency of substance use by demographics and problem gambling	Alcohol use			Tobacco use			Marijuana use		
	Bivariate		Multivariate	Bivariate		Multivariate	Bivariate		Multivariate
	OR	SE	aOR	OR	SE	aOR	OR	SE	aOR
Only a few days all year (1–5 times/year)									
Female (Ref = Male)	1.05	0.11	1.14	0.59*	0.14	0.69	0.85	0.28	1.15
Age	0.98***	0.003	0.98***	0.96***	0.007	0.97***	0.95***	0.01	0.96**
Income	1.19***	0.04	1.19***	1.00	0.07	1.09	0.90	0.09	0.95
Married or living together (Ref = Other)	1.09	0.11	0.80	0.51**	0.12	0.50*	0.46*	0.16	0.70
Race/ethnicity (Ref = White)									
American Indian	0.57***	0.07	0.49***	2.75***	0.66	1.78	2.45**	0.85	1.22
Latino	1.17	0.13	0.81	0.81	0.23	0.97	0.89	0.36	1.09
Other race	0.62*	0.14	0.82	0.82	0.43	0.72	0.41	0.42	1.15
Problem gambling (Ref = Not a gambler or at risk)									
At risk	1.67**	0.33	2.12**	0.79	0.47	0.30	0.91	0.67	0.98
Problem	1.09	0.48	0.75	2.81	2.10	1.18	5.18*	3.87	4.13
Pathological	0.74	0.37	0.38	1.68	1.73	1.60	—	—	—
Once/month or less (6–12 times/year)									
Female (Ref = Male)	0.70**	0.08	0.79	0.62	0.19	0.94	0.24**	0.12	0.33*
Age	0.98***	0.003	0.97***	0.96***	0.01	0.97***	0.97*	0.01	0.97*
Income	1.26***	0.05	1.26***	0.90	0.08	0.95	0.87	0.12	0.90
Married or living together (Ref = Other)	1.14	0.13	0.70*	0.57	0.17	1.08	0.55	0.24	0.42

Table 1, *Continued*

Frequency of substance use by demographics and problem gambling	Alcohol use			Tobacco use			Marijuana use		
	Bivariate		Multivariate	Bivariate		Multivariate	Bivariate		Multivariate
	OR	SE		OR	SE		OR	SE	
Race/ethnicity (Ref = White)									
American Indian	0.54***	0.08	0.42***	3.71***	1.13	3.48**	1.70	0.82	0.81
Latino	1.06	0.14	0.91	1.27	0.42	2.40	0.72	0.40	0.64
Other race	0.83	0.19	0.10	1.08	0.65	1.97	0.71	0.73	1.81
Problem gambling (Ref = Not a gambler or at risk)									
At risk	1.18	0.30	1.31	3.68**	1.55	2.72*	11.24***	5.02	5.36**
Problem	1.79	0.76	1.41	—	—	—	7.12	7.51	—
Pathological	0.43	0.32	0.49	6.70*	5.09	6.64*	—	—	—
Several times/month (3–5 times/month)									
Female (Ref = Male)	0.54***	0.06	0.58***	0.55***	0.02	0.82	0.26*	0.15	0.18*
Age	0.98***	0.003	0.97***	0.95***	0.01	0.96**	0.95*	0.02	0.96
Income	1.38***	0.05	1.38***	0.93	0.08	0.98	0.90	0.15	0.71
Married or living together (Ref = Other)	1.11	0.12	0.59***	0.63	0.17	1.66	0.81	0.44	2.17
Race/ethnicity (Ref = White)									
American Indian	0.37***	0.06	0.26***	4.64***	1.24	4.97***	2.51	1.41	0.77
Latino	0.94	0.11	0.71*	0.73	0.25	1.8	0.54	0.41	0.28
Other race	0.62*	0.15	0.51	0.54	0.39	—	—	—	—
Problem gambling (Ref = Not a gambler or at risk)									
At risk	1.58*	0.33	1.59	4.11***	1.48	2.36	2.73	2.10	—

Table 1, *Continued*

Frequency of substance use by demographics and problem gambling	Alcohol use				Tobacco use				Marijuana use			
	Bivariate		Multivariate		Bivariate		Multivariate		Bivariate		Multivariate	
	OR	SE	aOR	SE	OR	SE	aOR	SE	OR	SE	aOR	SE
Problem	0.54	0.34	0.55	0.37	2.20	2.27	1.38	1.46	7.77	8.22	4.96	5.63
Pathological	1.03	0.48	0.89	0.52	2.62	2.71	3.07	3.12	—	—	—	—
Several times/week (6–29 times/month)												
Female (Ref = Male)	0.40***	0.05	0.47***	0.08	0.73	0.16	0.92	0.27	0.12**	0.09	0.24	0.20
Age	1.00	0.004	0.99*	0.005	0.94***	0.01	0.95***	0.01	0.91***	0.02	0.93*	0.03
Income	1.50***	0.06	1.50***	0.07	0.87*	0.06	0.94	0.08	0.71	0.15	0.74	0.16
Married or living together (Ref = Other)	1.16	0.15	0.50***	0.09	0.52**	0.12	0.55	0.17	0.27*	0.16	0.57	0.45
Race/ethnicity (Ref = White)												
American Indian	0.33***	0.07	0.20***	0.06	3.01***	0.67	1.61	0.55	2.83	1.62	0.74	0.70
Latino	0.53***	0.09	0.53**	0.12	0.69	0.19	0.67	0.28	0.97	0.64	1.11	0.96
Other race	0.67	0.18	0.54	0.26	2.14*	0.71	—	—	1.24	1.29	0.00	0.00
Problem Gambling (Ref = Not a gambler or at risk)												
At risk	2.48***	0.54	2.21**	0.67	2.02	0.77	1.26	0.68	4.50*	2.98	3.16	2.7
Problem	1.17	0.65	0.76	0.59	5.40**	2.98	3.35	2.28	—	—	—	—
Pathological	0.56	0.41	0.71	0.58	3.22	2.41	3.25	2.62	—	—	—	—
Daily (≥30 times/month)												
Female (Ref = Male)	0.42***	0.07	0.48***	0.10	0.63***	0.06	0.73**	0.09	0.26***	0.11	0.29*	0.16
Age	1.02***	0.005	1.01	0.007	0.98***	0.003	0.98***	0.004	0.93***	0.01	0.92***	0.02
Income	1.46***	0.08	1.44***	0.09	0.93*	0.03	0.89***	0.30	0.93	0.11	0.95	0.12
Married or living together (Ref = Other)	1.18	0.20	0.63	0.15	0.71***	0.07	0.81	0.10	0.18***	0.08	0.17**	0.10

Table 1, *Continued*

Frequency of substance use by demographics and problem gambling	Alcohol use			Tobacco use			Marijuana use		
	Bivariate		Multivariate	Bivariate		Multivariate	Bivariate		Multivariate
	OR	SE		OR	SE		OR	SE	
Race/ethnicity (Ref = White)									
American Indian	0.11***	0.05	0.13***	0.06	0.62***	0.09	0.36	0.11**	0.09
Latino	0.40***	0.10	0.41**	0.13	0.80*	0.09	0.35	0.17*	0.14
Other race	0.47	0.20	0.18	0.19	0.97	0.19	0.97	2.01	1.64
Problem gambling (Ref = Not a gambler or at risk)									
At risk	3.87***	0.95	4.42***	1.47	2.83***	0.43	2.86	2.68	1.83
Problem	1.79	1.12	2.10	1.66	2.49*	0.88	12.21***	3.20	3.68
Pathological	0.57	0.58	1.11	1.19	1.98	0.83	13.69***	14.04**	11.7

Note. Dashes indicate insufficient data available for these analyses. In the multinomial regression analyses, "never having consumed the substance in the past year" is the reference category for the frequency of alcohol, tobacco, and marijuana use variables. OR = odds ratio; aOR = adjusted OR.

* $p < .05$; ** $p < .01$; *** $p < .001$.

more likely to occur among individuals with higher incomes and less likely among those who were married or living together. Native Americans were less likely to drink alcohol but more likely to use tobacco several times per month. From the multivariate analysis, Latinos were less likely than Whites to drink alcohol.

Individuals who were at risk of problem gambling were more likely to drink alcohol and use tobacco several times per month than were non-gamblers or those not at risk, but these associations became non-significant when demographic controls were entered.

Substance use several times per week (6–29 times/month). The consumption of alcohol several times per week (6–29 times/month) was less likely to occur among women in both the bivariate and multivariate analyses, compared with those who never consumed alcohol in the past year. For marijuana, for the same contrast, only the bivariate analysis was significant. The use of these substances was less likely to occur among older individuals and among those married or living together, though only the coefficients pertaining to the alcohol variable remained significant in the multivariate models. Higher incomes were positively associated with this level of alcohol use in the bivariate and multivariate analyses.

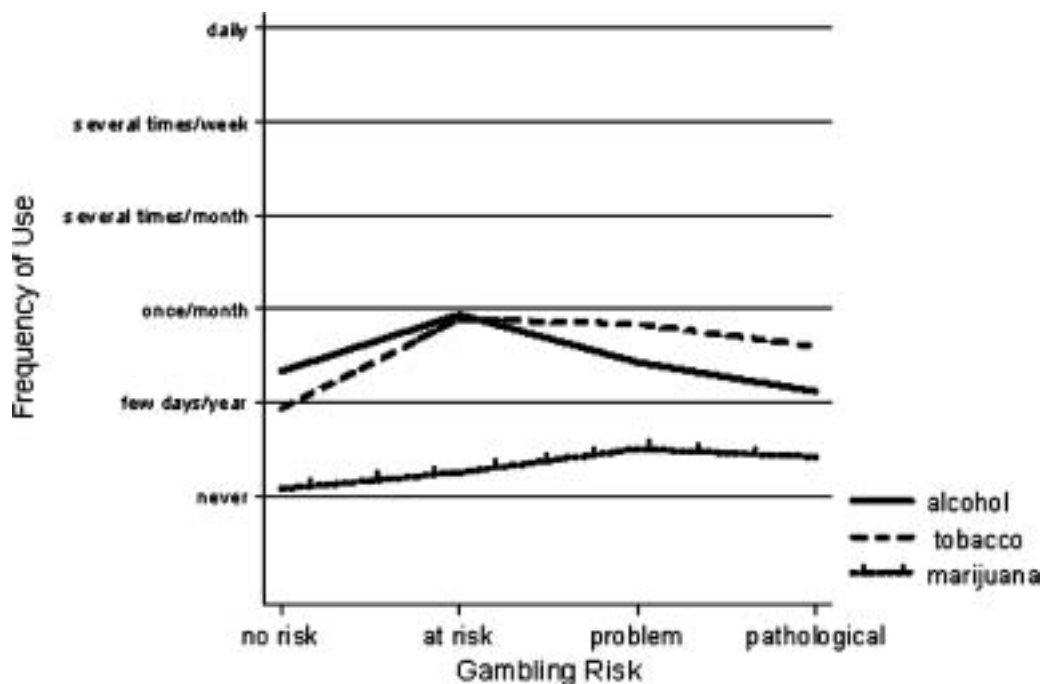
Individuals at risk of problem gambling were more likely to drink alcohol (aOR = 2.21) and use marijuana (OR = 4.50) several times per week, but the association with marijuana was not significant when demographic controls were entered, though the magnitude remained considerably large (aOR = 3.16). Individuals with problem gambling were more likely to use tobacco (OR = 5.40) several times per week, but this association became non-significant when demographic controls were entered in the model (aOR = 3.35).

Daily substance use (30 or more times/month). Finally, the consumption of tobacco and marijuana on at least a daily basis (30 or more times/month) was more likely to occur among males and younger individuals in both the bivariate and multivariate models and alcohol use on at least a daily basis was more likely to occur among older individuals in only the bivariate analysis when compared with those who never consumed alcohol, tobacco, and marijuana in the past year. Individuals with higher incomes were more likely to consume alcohol but were less likely to use tobacco. Individuals who were married or living together were significantly less likely to consume tobacco and marijuana at this frequency. Native Americans and Latinos were substantially less likely than Whites to consume these substances on a daily basis.

Being at risk for problem gambling was significantly associated with alcohol (OR = 3.87) and tobacco (OR = 2.83) use. The magnitude of the association with marijuana use was large (aOR = 2.68), but it was not a statistically significant association at the conventional level of .05 because of its large standard error ($SE = 1.83$). Problem gambling was significantly associated with tobacco (OR = 2.49) and marijuana (OR = 12.21) use in the bivariate but not the multivariate models. Finally, pathological gambling was also strongly and significantly associated with marijuana use (aOR = 14.04).

Consistent with these findings, Figure 1 shows that the average frequency of alcohol consumption is highest among participants at risk for problem gambling and lowest among

Figure 1. Mean frequency of alcohol, tobacco, and marijuana use by degree of gambling problem.



those with pathological gambling. The average frequency of tobacco use is also highest among those at risk of gambling problems, with a decline in the frequency observed among those with problem and pathological gambling. We find it interesting that – consistent with the results of the multinomial regression analyses – the average frequency of marijuana use is highest among problem and pathological gamblers.

Demographic characteristics, problem gambling, and lifetime depression symptoms

The results of the multinomial analyses of the associations of demographic characteristics and lifetime problem gambling with lifetime depression symptoms are shown in Table 2. To facilitate the interpretation of the results of the multinomial regression analyses, we discuss the results for each of the two levels of the dependent variable as compared with the reference category. The reference category is “never having experienced either of the two depression symptoms.” The two categories of depression symptoms that are compared with this reference category are as follows: 1 = any one depression symptom and 2 = two depression symptoms.

One depression symptom. Compared with individuals who never experienced either of the two depression symptoms, individuals who experienced one depression symptom were more likely to have lower incomes, but this association lost its significance in the multivariate analyses. Individuals who were married or living together were about half as likely to experience one symptom of depression in both the bivariate and multivariate analyses. We

Table 2

Association of demographic characteristics and lifetime problem gambling with lifetime depression symptoms: Results of bivariate and multivariate multinomial regression analysis

Frequency of depression symptoms by demographics and problem gambling	Depression			
	Bivariate		Multivariate	
	OR	SE	aOR	SE
One depression symptom				
Female (Ref = Male)	1.14	0.11	1.25	0.15
Age	1.00	0.003	1.00	0.004
Income	0.90***	0.03	0.94	0.03
Married or living together (Ref = Other)	0.58***	0.06	0.62***	0.08
Race/ethnicity (Ref = White)				
American Indian	0.94	0.12	0.74	0.13
Latino	1.11	0.12	1.03	0.15
Other race	0.70	0.15	1.02	0.36
Problem gambling (Ref = Not a gambler or at risk)				
At risk	1.58*	0.29	1.35	0.32
Problem	3.69**	1.50	4.01**	2.00
Pathological	3.29*	0.01	2.47	1.43
Two depression symptoms				
Female (Ref = Male)	1.72***	0.16	1.96***	0.23
Age	0.99**	0.003	0.99**	0.004
Income	0.91***	0.03	0.94*	0.03
Married or living together (Ref = Other)	0.59***	0.05	0.62***	0.08
Race/ethnicity (Ref = White)				
American Indian	0.68**	0.08	0.47***	0.08
Latino	0.91	0.10	0.56***	0.08
Other race	0.55**	0.12	0.96	0.30
Problem gambling (Ref = Not a gambler or at risk)				
At risk	2.13***	0.34	2.11***	0.42
Problem	5.18***	1.86	7.54***	3.31
Pathological	7.25***	2.88	5.32***	2.52

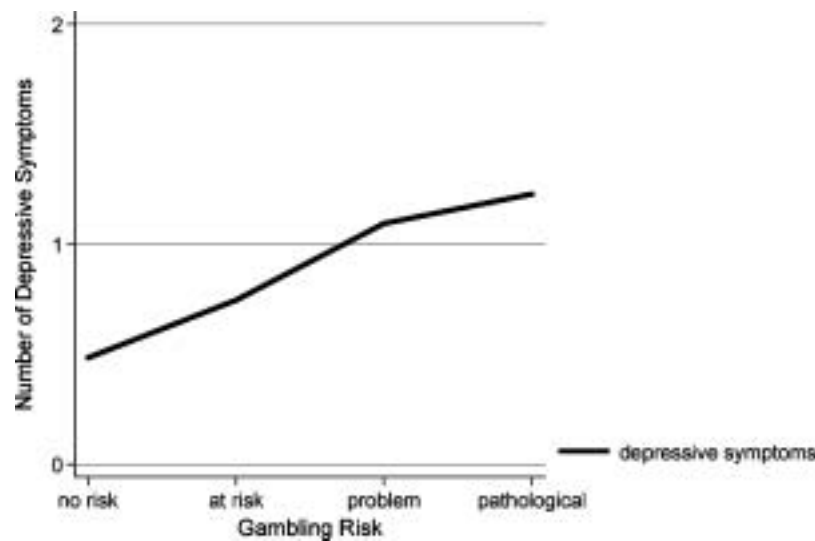
Note. In the multinomial regression analyses, “not having experienced any depression symptoms in their lives” is the reference category for the depressive symptoms variable. OR = odds ratio; aOR = adjusted OR.

* $p < .05$; ** $p < .01$; *** $p < .001$.

find it interesting that there were no racial or ethnic differences in the experience of one symptom of depression.

Individuals at risk of problem gambling were more likely to experience a symptom of depression (OR = 1.58), but this association became attenuated and not significant when demographic controls were added to the model. Problem gamblers also had a substantially higher risk of experiencing a depression symptom (OR = 3.69). When the demographic

Figure 2. Mean number of depressive symptoms by level of gambling problem.



controls were added, the magnitude of the ORs increased and remained significant (aOR = 4.01). On the other hand, pathological gambling was associated with an increased risk of one depression symptom in the bivariate but not the multivariate model.

Two depression symptoms. Compared with individuals who never experienced either of the two depression symptoms, individuals who experienced both symptoms in their lives were more likely to be females, younger, have lower incomes, and not be married or living with someone. Native Americans and Latinos also were less likely than Whites to experience two symptoms of depression. Individuals of Other racial or ethnic backgrounds were also less likely than Whites to experience two symptoms of depression, but only in the bivariate analysis.

Being at risk of problem gambling (aOR = 2.13), being a problem gambler (aOR = 7.54), and being a pathological gambler (aOR = 5.32) were all significantly associated with experiencing two symptoms of depression.

Figure 2 displays the dose-response relationship between gambling problems and depressive symptoms estimated with the multinomial logistic regression analyses described earlier. The average number of depressive symptoms increases with the level of gambling problem, though some leveling off occurs once the person has developed problem gambling.

Demographic characteristics, problem gambling, and history of arrest

The results of the associations of demographic characteristics and problem gambling with a history of arrest are shown in Table 3. Women, older individuals, and those with higher incomes were significantly less likely to have been arrested. Native Americans were more likely to have been arrested, but this association became non-significant in the multivariate model.

Table 3

Association of demographic characteristics and lifetime problem gambling with history of arrests: Results of bivariate and multivariate logistic regression analysis

History of arrests by demographics and problem gambling	Arrests			
	Bivariate		Multivariate	
	OR	SE	aOR	SE
Female (Ref = Male)	0.21***	0.02	0.21***	0.03
Age	0.97***	0.003	0.97***	0.004
Income	0.91**	0.03	0.87***	0.03
Married or living together (Ref = Other)	0.60***	0.06	0.74*	0.10
Race/ethnicity (Ref = White)				
American Indian	1.50***	0.18	0.81	0.14
Latino	1.16	0.13	1.03	0.17
Other race	0.94	0.23	0.99	0.36
Problem gambling (Ref = Not a gambler or at risk)				
At risk	2.47***	0.40	1.56*	0.34
Problem	3.08**	1.07	1.59	0.67
Pathological	3.85***	1.38	3.12*	1.43

Note. OR = odds ratio; aOR = adjusted OR.

* $p < .05$; ** $p < .01$; *** $p < .001$.

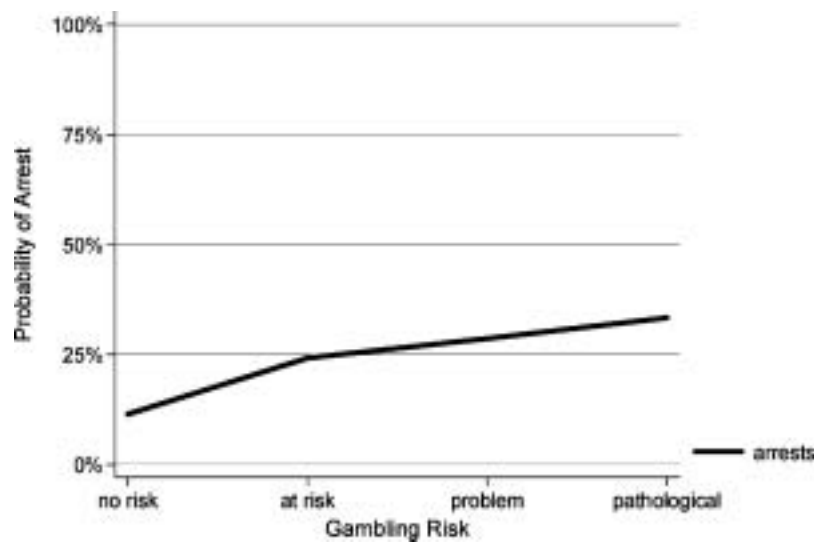
A history of arrest was more likely to be reported among individuals at risk of problem gambling (OR = 2.47), those with problem gambling (OR = 3.08), and those categorized as pathological gamblers (OR = 3.85). When demographic controls were included in the model, the magnitude of the associations decreased for all three but remained significant for those at risk of problem gambling (aOR = 1.56) and those categorized as pathological gamblers (aOR = 3.12).

Figure 3 depicts how the probability of having ever been arrested increases with the level of gambling problem. This is consistent with the earlier findings that showed increased likelihood of an arrest history with an increased degree of gambling problem.

Discussion

In this study of over 3,000 adults who participated in a telephone survey about gambling and other behaviors, we found that those at risk for problem gambling were more likely to consume alcohol at each of the drinking levels, from relatively infrequent drinking to daily drinking, when compared with individuals who do not gamble or who were not classified as being at risk. A similar finding was observed for tobacco use. These significant findings remained even after controlling for demographic characteristics. These findings suggest that the consumption of alcohol and the use of tobacco are common behaviors among

Figure 3. Percentage of individuals with an arrest history by degree of gambling problem.



individuals at risk of problem gambling. Comorbid substance use is a common factor among gamblers, suggesting that cross-addictive behavior may be occurring (National Research Council, 1999). Substance users might be turning to gambling as another form of addictive behavior and their “at-risk” status is an initial gambling phase that may lead to problem or pathological gambling. This is consistent with the findings of Cunningham-Williams et al. (1998), which suggest that among problem gamblers with alcohol abuse or dependence, their gambling problems developed within 2 years of the onset of alcoholism in 65% of the cases, and problem gambling occurred after the onset of nicotine dependence in 67% of the cases. More longitudinal studies are needed to further investigate the directionality of these associations.

Compared with non-gamblers or those not at risk, individuals at risk of problem gambling had an increased likelihood of using marijuana when the consumption was more frequent, in this case beginning with individuals who use marijuana once per month. This finding is consistent with prior research on frequent marijuana users in treatment who also report increased levels of gambling behaviors (Petry & Tawfik, 2001).

Interestingly, individuals who met criteria for problem gambling were no more or less likely to consume alcohol at the various levels when compared with non-gamblers or those not at risk. These findings are somewhat similar to the 2005 gambling helpline study by Potenza et al., which reported that only a small percentage of individuals with current gambling problems and past alcohol problems reported drinking while gambling. The findings of both studies contradict previous research that shows that problem gamblers report higher levels of drinking while gambling (Baron & Dickerson, 1999; Smart & Ferris, 1996; Welte et al., 2001; Zack, Stewart, Klein, Loba, & Fragopoulos, 2005). Of note is that Sjoberg (1969), in an experimental study, found that participants were less willing to gamble their money when given a high dose of alcohol, but their gambling increased with a low dose of alcohol.

Our results also indicate that problem gamblers were more likely to consume tobacco but only at the higher frequency of consumption (beginning with several times per week). Petry and Oncken (2002) reported that smoking status was associated with more severe gambling, with gamblers who smoke on a daily basis gambling on more days and spending more money per month gambling compared with gamblers who do not smoke on a daily basis. The ORs associated with marijuana use were elevated among problem gamblers when compared with non-gamblers or those not at risk, but at the higher frequencies, these ORs were not statistically significant despite their large magnitudes (i.e., 7.12, 7.77). The lack of statistical significance at conventional levels of alpha is likely due to lack of power resulting from the low prevalence of marijuana use in this study. Finally, pathological gamblers were no more or less likely to consume alcohol and tobacco than were non-gamblers or those not at risk. Unfortunately, there was insufficient data to conduct detailed analysis of the distribution of marijuana use among pathological gamblers. It may be that in this general population sample, the use of substances is not part of the behavioral repertoire of pathological gamblers, who may already be focused on their gambling involvement to the exclusion of drug use. In a study of problem gambling and marijuana use, Kausch (2003) found that among pathological gamblers in treatment who reported a substance abuse problem, marijuana was the second most commonly abused substance after alcohol. Certainly, further research is needed to better understand the association between marijuana use and different levels of gambling problems.

In the case of depression symptoms, problem gamblers were more likely to experience one symptom of depression when compared with non-gamblers or those not at risk. Interestingly, there was a dose-response association between the degree of gambling problem and the likelihood of having experienced two depression symptoms. It might be that depression is a result of increased levels of gambling, which can lead to, for instance, financial losses and serious family problems. However, because gambling can be a positive social event or reinforcing activity (Desai, Desai, & Potenza, 2007), people suffering from depressive symptoms may be more prone to gamble to escape from or cope with, albeit inappropriately, the symptoms of depression. This idea is consistent with prior research that found that pathological gambling was linked to depression (Cunningham-Williams et al., 1998; Maccallum & Blaszczynski, 2003), although the directionality of the association is unknown and merits further investigation.

Consistent with prior research (Potenza et al., 2000), the study findings suggest a dose-response relationship between the likelihood of having a history of arrest and the degree of gambling problem. As gambling problems increase, legal and criminal issues, such as theft and embezzlement to support gambling, can occur and can possibly lead to arrest. Whether or not gambling occurs prior to, or after, being arrested is unknown. However, a New Zealand study (Abbott & McKenna, 2005) reported very high levels of pre-arrest or incarceration gambling involvement, as well as expenditure on continuous forms of gambling (i.e., types of gambling characterized by rapid cycles of stake, play, and determination; Dickerson, 1993) in both women and men in the general adult New Zealand population (Abbott & Volberg, 1999, 2000).

The study findings need to be interpreted with the following limitations in mind. First, the study design was cross-sectional, limiting our ability to examine temporal and causal associations. To mitigate some of the concerns attendant with the use of cross-sectional data, we used a lifetime measure for problem gambling (because this was treated as an independent variable in our analyses) and past-year measures of substance use. Nonetheless, longitudinal studies with appropriately sophisticated analytical methods are needed to establish a temporal and potentially a causal association among the studied variables. Another limitation is the use of self-report data collected via telephone surveys, whereby sensitive questions, especially those reporting on illegal behaviors such as marijuana use, are commonly misreported (Abbot & Volberg, 2000; Galesic, Tourangeau, & Couper, 2006). We believe that this resulted in the underreporting of alcohol, tobacco, and marijuana use. Publicly available data for the particular age group in our sample were not available for the state of New Mexico; hence, we compared the estimates with national data. Compared with 2005 national estimates (Office of Applied Studies, Substance Abuse and Mental Health Services Administration, 2005), the year most of the individuals participated in the survey, a smaller percentage of individuals in our study reported past-year consumption of alcohol, tobacco, and marijuana.

However, even as underreporting occurred, the associations identified, even those that were not statistically significant at the conventional alpha levels of .05, show that problem gambling is associated with substance use, mental health, and social problems. Third, the completion rate of 47% is low but is still comparable to five recent Canadian gambling prevalence surveys whose response rates ranged from 37% to 64% (Miller & Currie, 2008) and a Scandinavian gambling prevalence survey whose response rate was 47% (Bondolfi, Jermann, Ferrero, Zullino, & Osiek, 2008). Participation rates in telephone surveys in the general population have declined precipitously in recent years as individuals in the general population become increasingly reluctant to participate in this type of research and as technological barriers proliferate (e.g., answering machines, caller ID; Jarvis, 2002; Tourangeau & Yan, 2007). Despite the low completion rate, the findings are indicative of the extent to which alcohol, tobacco, and marijuana; depression symptoms; and arrest occur among individuals who are at risk of problem gambling. The study findings also suggest that for individuals with the most severe gambling problems, alcohol and tobacco use are less prevalent than they are among individuals with less severe problems, those without problems, and those who do not gamble. Finally, the study sample included a larger percentage of women, individuals 35 years and older, and racial and ethnic minorities when compared with the characteristics of the population of New Mexico. In light of these demographic differences, and of the underreporting of substance use, it becomes even more critical that additional research be conducted on the comorbidity of gambling disorders with substance use, mental health, and social and legal problems with distinct population groups. We posit that prevention and treatment interventions will be considerably better informed if more is known about the extent of gambling experiences and problems in distinct populations (i.e., men, women, younger and older, minority and non-minority, individuals with and without substance abuse and/or mental health problems).

In conclusion, the study findings suggest that individuals at risk of gambling problems and those with a gambling problem consume alcohol and tobacco more frequently than do

other individuals. Interventions aimed at helping at-risk and problem gamblers to decrease or discontinue their gambling activities may also benefit these individuals by including treatment aimed at reducing their alcohol and tobacco use. Individuals who are pathological gamblers may be too consumed with their gambling activities to seek out and use alcohol and tobacco.

On the other hand, the number of depressive symptoms and the likelihood of arrest increased with the level of gambling problems. These findings suggest that interventions aimed at helping gamblers also need to involve careful attention to the depressive symptoms that gamblers experience and to the likelihood that these individuals have had a history of arrest. This history, which may be gambling related, is likely to require more effort to help problem and pathological gamblers overcome the stigma of being arrested when being reintegrated into their families and society.

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For correspondence: Sandra L. Momper, PhD, Assistant Professor, School of Social Work, University of Michigan, 1080 South University Avenue, Ann Arbor, MI, 48109-1106, USA. Tel: 001-734-763-6578, Fax: 001-734-763-3372, E-mail: smomper@umich.edu

Contributors: Dr. Momper wrote the literature review and collaborated with Drs. Delva, Grogan-Kaylor, and Volberg on the Methods, Results, and Discussion sections. Drs. Delva and Grogan-Kaylor conducted the data analyses. Dr. Volberg conducted the study. All authors collaborated on the final report.

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Sandra Momper, MSW, PhD, is an Assistant Professor of Social Work at the University of Michigan. She has conducted several studies with American Indian populations. Her NIMH-funded research focused on gambling and was entitled “Maternal Gambling, Parenting in the Home Environment, and Child Outcomes in Native American Families” (Momper, & Jackson, 2007). She recently completed a NIDA-funded post-doctoral fellowship at the University of Michigan Substance Abuse Research Center (UMSARC), where she studied substance abuse from a multidisciplinary perspective and garnered support for studying gambling as addictive behavior. Her research interests include exploring the relationships among gambling and the use of alcohol and other drugs in minority populations. She is funded by NIDA and NIMH through a Diversity Award mechanism under the parent grant entitled “Ecologic stressors, PTSD, and drug abuse in Detroit” (RO1-DA 022720).

Jorge Delva, MSW, PhD, is Co-Director of the Vivian A. and James L. Curtis School of Social Work Research and Training Center and a Professor of Social Work at the University of Michigan. The main aim of the Curtis Center is to create a multidisciplinary environment that will facilitate collaboration among investigators to increase their competitiveness in securing funding and advancing their research agendas. With funding from NIH, RWJF, and other sources, his research has focused on studying trends and effects of individual risk and protective factors on substance use and childhood obesity while taking into account neighborhood and other contextual level factors. He is particularly interested in how these factors manifest themselves among racial and ethnic minority populations and between cultures in the United States and internationally.

Andrew Grogan-Kaylor, PhD, is an Associate Professor of Social Work at the University of Michigan. His current research focuses on neighborhoods, parenting, children and families, and substance use, as well as the use of advanced statistical methods.

Ninive Sanchez, MSW, is a doctoral student in Social Work and Social Science at the University of Michigan. Her research interests include youth development and neighborhood conditions, and community-based prevention research. Ms. Sanchez is the project coordinator for the Santiago Longitudinal Study, a NIDA-funded longitudinal study of drug use among adolescents and their families in Santiago, Chile.

Rachel A. Volberg, PhD, has been involved in research on gambling and problem gambling since 1985 and is widely regarded as the most experienced problem gambling epidemiologist in the world. Dr. Volberg has directed or consulted on numerous studies throughout the world, including national prevalence surveys in the United States, Australia, New Zealand, Great Britain, and Sweden. She is presently involved in several projects funded by government agencies in Australia, Canada, and Sweden to improve methods for measuring problem and pathological gambling in clinical and community

studies. She is also involved in three longitudinal studies being carried out in Australia, Scotland, and Sweden. In addition to her own consulting business, Dr. Volberg holds appointments at the University of Massachusetts, Amherst; the National Opinion Research Center at the University of Chicago; and the Auckland University of Technology in New Zealand.

Time and money spent gambling and the relationship with quality-of-life measures: A national study of New Zealanders

En-Yi Judy Lin, Sally Casswell, Brian Easton, Taisia Huckle, Lanuola Asiasiga, & Ru Quan You

Centre for Social and Health Outcomes Research and Evaluation, Massey University, Auckland, New Zealand

E-mail: j.lin@massey.ac.nz

Abstract

This study provides quantitative measures of the impacts of gambling from a general population sample exposed to a range of gambling opportunities. New tools to assess the level of gambling participation and quality-of-life measures were used in a telephone survey with 7,010 adults in New Zealand. The findings show that people with higher gambling loss reported significantly poorer physical health, mental health, relationships, feelings about self, quality of life, satisfaction with life, living standards, and study performance. When respondents' reports of quality of life in the various domains were analysed in relation to the time spent gambling in different modes, it was clear that time spent on electronic gaming machines provided the greatest risk for people's quality of life. This study estimated that 2.4% of the population had an inferior state of reported mental well-being as a result of gambling. The main contribution came from the playing of electronic gaming machines.

Keywords: gambling, telephone surveys, quality of life, New Zealand

Introduction

Research on the impacts of gambling on individuals has shown impairment of physical and mental health; reduction in study performance and work efficiency; commitment of crime to support gambling; financial hardship via debts and asset/money losses; and psychological disturbance such as depression, guilt, anxiety, suicide attempts, and drug and alcohol addiction (Abbott, 2001a, 2001b; Australian Institute for Gambling Research, 2001; Barnes, Welte, Hoffman, & Dintcheff, 1999; Dickerson et al., 1996; National Gambling Impact Study Commission, 1999; Productivity Commission, 1999; Shaffer & Korn, 2002). Interpersonal problems between gamblers and their significant others include relationship breakdown, neglect of family, domestic violence, and negative impacts on the physical and mental health of family members (Dickson-Swift, James, & Kippen, 2005; Lorenz & Yaffee, 1988, 1989; Patford, 2007). The provision of health, counselling, and other gambling treatment services was recorded as a further financial cost imposed by gamblers on

society (Productivity Commission, 1999). In New Zealand, analyses of users of treatment services have provided information about the primary mode of gambling associated with problems, that is, electronic gaming machines (EGMs) (Ministry of Health, 2007).

Research on the impacts of gambling has also provided discussion on the potential beneficial effects of gambling for individuals, particularly in terms of social interaction. The mental health benefits include a sense of social connectedness and a rest from daily stresses. Furthermore, in addition to fun and excitement, gambling may also contribute coping strategies by enhancing memory, problem-solving ability, concentration, and hand-eye coordination (Shaffer & Korn, 2002). These beneficial aspects of gambling tend to be identified as gambling mode and/or venue specific. For example, in New Zealand, *housie* (i.e., bingo) is considered a safe social outlet for women, as well as a good fundraiser and form of social cohesion for Maori and Pacific community groups. Racing provides an important social focus in rural communities and casino facilities provide a venue for social interactions for new migrants (Department of Internal Affairs, 1995; Li & Chan, 2006).

New Zealand provides a number of gambling opportunities: it has six casinos and approximately 20,000 non-casino gaming machines (Department of Internal Affairs, 2009). There are also several racing and sports betting opportunities and lottery products. The 2006/07 survey on Gaming and Betting Activities (Health Sponsorship Council, 2007) found that over four fifths (83%) of New Zealanders had taken part in at least one gambling activity during the last 12 months. The majority of people had engaged with lottery products (67%), just under one fifth had bet on horse or dog races or on sports events (18%), and just under one fifth had played a gaming machine at a pub or club (18%). Fewer people had played gaming machines at one of the six casinos (8%), played *housie* (bingo) for money (3%), played table games at one of the six casinos (3%), or played text (2%) or Internet games (<1%) for money.

Within the New Zealand context, there has been limited research assessing the full range of social impacts of gambling. In part, this has been due to the lack of reliable and complete data available for this analysis (Australian Institute for Gambling Research, 2001). Although previous studies have provided important information about the prevalence and the extent of gambling behaviours, these studies gave only a few indications of the impacts of gambling. Other studies have provided information on impacts for problem gamblers only, not for the full range of gamblers. In an attempt to address this limitation, the current study was undertaken to collect some of the missing information necessary for the further understanding of the impact of gambling in New Zealand via a general population survey. The survey, by sampling from the general population, avoided the limitations of researching exclusively- clinical populations and provided data complementary to that provided about people in treatment for gambling problems.

Also, the measures utilised in this study to assess participation in gambling have been developed to avoid some of the methodological problems identified in the literature (Abbott & Volberg, 1999; Collins & Lapsley, 2003; Duvarci, Azmi, Coskunol, & Ersoy, 1997; Hayward & Colman, 2004; National Gambling Impact Study Commission, 1999). The data collected allowed analysis of different ways of defining gambling participation, did

not conflate subjective response to gambling with participation measures, and allowed disaggregation by mode and venue of gambling, as well as by the measure having the potential to add new modes and venues to the measurement instrument if they enter the gambling environment.

In terms of impacts, the current study focuses primarily on measures of intangible impacts, including a wide range of potential impacts (both negative and positive) within the same measurement frame. The current study also utilises some of the data from the survey in a preliminary analysis of the social costs by using two counterfactual scenarios.

Methodology

Sample size

The total sample size of the survey was 7,010 (2,915 males and 4,095 females), composed of (a) a general population sample of 4,650 respondents, (b) a Maori oversample of 533 respondents, (c) a Pacific oversample of 858 respondents, and (d) a Chinese/Korean oversample of 969 respondents. The survey population consisted of New Zealand residents living in permanent private households who were 15 to 80 years of age and had lived in New Zealand for at least 12 months. The mean age of the participants was 43.13 years ($SD = 16.32$).

Data collection

Data collection took place from May 2007 to November 2007 using a computer-assisted telephone interview (CATI) system. A stratified sample design was used to reflect the New Zealand population on the basis of geographic regions and level of urbanisation. The strata, when combined, covered the whole of New Zealand. The level of urbanisation was divided into a metropolitan area (Auckland urban area) and large cities such as Hamilton, Christchurch, and Wellington; and smaller main urban areas, large towns, small towns, and rural areas. The strata had been derived from local calling areas but were adjusted to match main urban areas where possible.

Telephone numbers were randomly generated. The use of randomly generated phone numbers has the advantage of including both published and unpublished phone numbers and therefore greater coverage of the sampling frame than does the use of non-randomly generated, listed telephone numbers. Telephone numbers were screened against the Yellow Pages (to remove business numbers). Phone numbers were distributed in proportion to the usually resident population aged 15 to 80 years with a landline telephone across 33 area strata.

Each number was called at least 10 times at different times and days of the week until contact was made. The final stage of sampling involved the random selection of one respondent from among those eligible in each household. The number of eligible people living in each household was established and listed so that the data collection software could select one respondent at random (no decimation took place and the data were weighted

appropriately prior to analysis to take account of interviews being conducted with one person per household).

The sampling for the Maori sample utilised the Maori electoral roll, and the sampling for the Pacific and Chinese/Korean samples included the use of a lexicon approach. This lexicon sample was essentially a list-based frame of electoral households where there were published telephone numbers and people with Pacific or Chinese/Korean-seeming names. A list of words that could trigger a possible Pacific or Chinese/Korean name was matched against all the names (not just surnames) on the electoral roll to look for households where there might be Pacific or Chinese/Korean people.

Survey instrument

The survey was developed from the existing survey instrument produced from the pilot qualitative study previously conducted by SHORE and Whariki (2006). This pilot study included three components: (a) a review of the available literature about methodologies and approaches used for measuring the social and economic impacts of gambling; (b) data collection with various stakeholders from the gambling industry and qualitative interviewing of people from different ethnic groups who participated in gambling, as well as with those affected by the gambling of others, to provide insights into the nature and range of gambling impacts within New Zealand; and (c) development and piloting of a quantitative data collection instrument to assess the social and economic impacts of gambling in New Zealand (SHORE and Whariki, 2006). The survey instrument was piloted thoroughly and found to be largely successful in its aims. The current study builds on the survey designed as part of this pilot project. The survey covers the following areas:

Participation in gambling. We first ascertained whether respondents had gambled in the previous 12 months. This was established by asking respondents if they had gambled using nine specified (and mutually exclusive) modes/venues of gambling plus any additional types of gambling they participated in. These modes/venues were playing EGMs in a bar, playing EGMs in a club, playing EGMs in a casino, gambling at a casino's table games, playing poker or other card games for money, betting at a race track, betting at the TAB, playing housie for money, and gambling on the Internet for money.

For each mode/venue in which a respondent reported gambling, they were asked how often they gambled using that mode/venue in the last 12 months, how much time they would spend gambling on a typical occasion for that particular mode/venue, and the longest amount of time they had spent on any one occasion in the last 12 months.

Gambling losses. Respondents were asked how much money they had lost in the past 12 months due to gambling ("Overall, how much do you think you have lost in the last 12 months? By this I mean your total net loss."). It was explained to respondents, where necessary, that this is the total amount they have lost after winnings have been taken into account.

Loss-to-income ratio. A ratio of losses to personal income was calculated. Respondents who reported earning less than \$1,000 a year were excluded from the analysis to avoid a high loss-to-income ratio resulting from low loss by a low income earner. This resulted in the exclusion of 462 people, the majority of whom were parenting or doing unpaid work at home (44.3%) or were students (36.4%). A small proportion of them were retired (10.8%) or unemployed (6.1%).

Quality of life. Respondents rated themselves on a 5-point scale (from very poor to very good) on a number of domains of life, including physical health, mental well-being, relationships with family and friends, feelings about oneself, overall quality of life, financial situation, material standard of living, performance in study or employment-related training, performance at work, ability to take care of children, and ability to take care of the elderly. Each domain reported was measured with a single question, such as “In general, in the last 12 months would you say your physical health has been very good, good, adequate, poor, or very poor?” and “Thinking about your relationships with people that are close to you, in the last 12 months how would you rate your relationships with family and friends? (very good, good, adequate, poor, or very poor)” Respondents also rated themselves (from very dissatisfied to very satisfied) on how satisfied or dissatisfied they were with their lives in general (“Taking everything into account, how satisfied or dissatisfied would you have been with your life in general these days?”).

Illegal activities. Respondents were asked if they had engaged in theft, fraud, or any other illegal activity in the last 12 months.

Results

Weighting and income imputation

Before examining the impact of gambling on the domains of life, the data were weighted in three stages. The first stage was to correct for dwelling unit or household selection probabilities (i.e., individuals in a household with many people have a lower chance of being selected; thus, they were under-represented and were weighted more). The weight for each individual was obtained by the number of eligible people in a household divided by the average number of individuals per household. The second stage was to match the survey weights to New Zealand 2006 Census population distributions by using post-stratification for groups based on gender, age, and ethnicity. The final stage involved a standardisation to match the weighted sample size to the initial survey size.

About 17% of income information was missing from this survey. Therefore, income was imputed by a mathematical formula obtained from a linear regression model, which used demographic variables as predictors. These variables included age, gender, ethnicity, education, marriage status, and current occupational status. This imputation decreased the median income of the sample from \$35,000 to \$24,000, which brings it into alignment with the national median income reported in the 2006 census (i.e., \$24,400). The majority (84%) of the respondents who did not give their personal income information were either non-gamblers or gamblers who reported no gambling loss. Further analysis of the data

revealed that the exclusion of the 17% missing-income respondents from the regression analysis did not alter the findings of the current study.

Response rate

The response rate for the current study was 62% for the general population sample, 74% for the Maori sample, 64% for the Pacific sample, and 62% for the Chinese/Korean sample.

The response rate was calculated as follows:

Response rate =

$$\frac{\text{number of eligible responding}}{\left(\text{number of eligible responding} \right) + \left(\text{number of eligible non-responding} \right) + \left(\text{estimated number of eligibles from the unknowns} \right)} \times 100$$

The response rate reflects that a proportion of the unknowns were likely to be eligible if contact had been made. As we were not able to make contact with all who were eligible, they were classified as non-respondents. An assumption is made that the proportion of eligibles from the list of unknowns is the same proportion as eligibles from the set of known eligibility.

$$\left[\begin{array}{c} \text{Estimated number} \\ \text{of eligibles from the} \\ \text{unknown} \end{array} \right] = \left[\begin{array}{c} \text{number} \\ \text{of} \\ \text{unknown} \end{array} \right] \times \frac{\left(\text{number of eligible responding} \right) + \left(\text{number of eligible non-responding} \right)}{\left(\text{number of eligible responding} \right) + \left(\text{number of eligible non-responding} \right) + \left(\text{number of ineligible} \right)}$$

For the general population sample, the estimated number of eligible dwellings from the no answers was based on a previous study in which Telecom identified the proportion of residential telephone numbers in this category. This proportion of the no answers was added to the gatekeeper refusals (eligibility unknown) and the proportion of eligibles from the unknowns was estimated using the formula given.

Impacts of gambling on domains of life

Multinomial logistic regression was used to assess the relationship between gambling and people's quality of life. The mathematical formula for this model is as follows:

$$\Pr(y_i = j) = \frac{\exp(X_i \beta_j)}{1 + \sum_{j=1}^J \exp(X_i \beta_j)}, \quad J = 1, 2, 3, \dots$$

Table 1

Impact of money lost (as a ratio of income) on domains of life

Domain of life	Log odds	Odds ratio	Standard error	p-Value
Physical health	-0.21	0.81	0.068	< .001
Mental well-being	-0.39	0.67	0.079	< .001
Relationships with family/friends	-0.45	0.63	0.072	< .001
Feelings about self	-0.30	0.74	0.060	< .001
Overall quality of life	-0.30	0.74	0.070	< .001
Overall satisfaction with life	-0.21	0.81	0.059	< .001
Financial situation	0.08	1.09	0.066	0.196
Material standard of living	-0.17	0.84	0.062	0.006
Work performance	-0.09	0.91	0.075	0.227
Study/training performance	-0.21	0.81	0.075	0.006
Care giving – children	0.06	1.06	0.117	0.617
Care giving – elderly	-0.25	0.78	0.165	0.127

where for the i th individual, y_i is the observed outcome and X_i is a vector of explanatory variables. The unknown parameters β_j are typically estimated by maximum likelihood.

Two measures of participation in gambling (i.e., independent variables) are reported in this analysis: first, the ratio of losses to income, and second, time spent gambling in different modes. These analyses controlled for the effects of the following demographic variables to isolate an independent impact of gambling: age, gender, ethnicity, marital status, educational qualification, occupational status, income (with log transformation), and prevalence of other heavy gamblers in one's life.

Loss-to-income ratio

Results of the logistic regression assessing the impact of loss-to-income ratio on the domains of life are shown in Table 1. In summary, respondents with higher loss-to-income ratio reported experiencing significantly poorer physical health, poorer mental well-being, worse relationships with family/friends, worse feelings about self, lower overall quality of life, lower satisfaction with life, and poorer study-related performance.

There was no association between loss-to-income ratio and self-rated financial situation, but there was a poorer standard of living reported. Further analysis of the data (by dividing participants into different gambling levels for loss-to-income ratio) revealed that there were differences found in the reports of actual income relative to respondents' ratings of their financial situation. Gamblers in the high gambling-loss group¹ who rated themselves as good or very good in terms of their financial situation had an average annual income of \$38,000, which was much lower than the average annual income of people who rated themselves as good or very good but who reported low gambling losses (\$65,900).

Time spent gambling in different modes

Results of the logistic regression assessing the impact of time spent gambling in different modes² on the domains of life are shown in Table 2. The time spent on each gambling mode was analysed separately because of the high correlation in time spent between different modes.

In summary, playing EGMs in any setting (bar, club, or casino) was associated with self-reported poorer physical health. Playing EGMs in both bars and casinos affected participants' perceptions of their mental well-being, relationships with family/friends, feelings about self, overall quality of life, and overall satisfaction with life. Playing EGMs in a bar was also associated with poorer child rearing; on the other hand, playing EGMs in a casino was associated with better self-rated material standard of living.

Other results specific to the gambling mode were that a longer time spent playing on casino tables was negatively associated with participants' perceptions of their physical health, mental well-being, and work performance and was marginally associated with overall quality of life.

Betting at the TAB gave a mixed picture, with worse self-reported mental well-being but a better self-rated financial situation. Playing poker at home or with friends also gave a mixed picture, with worse self-rated study/training performance but better overall quality of life.

In contrast with the case in other forms of gambling, some positive associations emerged between time spent at the race track and participants' self-ratings of their physical health, feelings about self, satisfaction with life, financial situation, and material standard of living. A closer examination of the profile of people engaged in different gambling modes revealed that people who spent more time betting at the race track, playing housie, or playing EGMs in a club were older (mean age = 45.8, 46.2, and 48.6 years, respectively) and they included a higher proportion of retired people (14.9%, 24.8%, and 22.9%) compared with other forms of gambling. However, among these three groups, those who bet on the race track had the highest average annual income (\$49,400) compared with people who played EGMs in a club (\$35,600) or played housie (\$27,500). In fact, people who bet at the race track had a higher average annual income than did people who were engaged in other forms of gambling, with the only exception being people who gambled at casino table games whose average annual income was \$63,300.³ In other words, people who spent more time betting at the race track were people who were senior in age (with about 15% of them retired) yet had a higher income; thus, it is not hard to understand why they perceived their quality of life and financial situation at levels higher than other gamblers.

Playing housie (in community centres, clubs, or bars) was also associated with a better material standard of living.

Impacts of gambling on illegal activities

Approximately 1.3% of people admitted they had engaged in illegal activities (mainly stealing and fraud) during the last 12 months. Logistic regression was used to assess the

Table 2
Impact of gambling modes on domains of life (showing log odds)

Domain of life	Gambling mode							
	EGMs in bar	EGMs in club	EGMs in casino	Casino tables	Poker	Race track	TAB	Housie (Bingo)
Physical health	-0.14***	-0.12*	-0.14**	-0.13*	-0.01	0.08*	-0.06	0.01
Mental well-being	-0.30***	-0.09	-0.21***	-0.15*	-0.07	-0.01	-0.15***	-0.04
Relationships with family/friends	-0.18***	-0.02	-0.12*	-0.14	-0.01	0.00	-0.04	0.09
Feelings about self	-0.14***	-0.02	-0.10*	-0.03	0.01	0.09*	0.07	0.01
Overall quality of life	-0.14***	-0.09	-0.10*	-0.14 ⁺	0.08*	0.07	0.02	0.03
Overall satisfaction with life	-0.13**	-0.08	-0.20***	-0.02	-0.02	0.12**	0.03	0.02
Financial situation	-0.05	0.05	0.01	0.01	0.00	0.10**	0.13*	0.06
Material standard of living	0.00	0.10	0.10*	0.08	0.03	0.10**	0.08	0.12*
Work performance	-0.04	0.05	-0.05	-0.16*	0.00	0.06	0.08	0.09
Study/training performance	-0.02	-0.11	0.08	-0.03	-0.13**	-0.02	-0.01	0.11
Care giving – children	-0.15*	0.08	-0.08	-0.16	0.08	0.08	0.09	0.18
Care giving – elderly	0.02	0.06	0.14	0.08	0.18	0.18	0.16	-0.15

Note. EGMs = electronic gaming machines.
 *** $p < .001$. ** $p < .01$. * $p < .05$. + $p < .06$.

impact of gambling on individuals' involvement in illegal activities. The results show that people who played EGMs in a bar or played poker/card games at their own or someone else's house were significantly more likely to be involved in illegal activities compared with people who had never gambled in the last 12 months ($p = .011$ and $.008$).

For those who were involved in illegal activities, 25% said they would not have committed such a crime if they had not been gambling in the last 12 months.

Estimating the social cost of gambling

The results from the current study were utilised in an econometric analysis of the social cost of gambling (for references to the methodology used here, see Anielski & Braaten, 2006; Collins & Lapsley, 2003; Single et al., 2003).

The relationship between the measure of the domain of life (y) and the individual's gambling status (z characterised by 1 if they gamble, 0 if they do not) is given by the following:

$$y = \alpha + \beta x + \gamma z + u$$

where x is (a vector of) the individual's other social characteristics; u is a random term that covers variables not included in x ; and α , the vector β , and γ are (estimated) parameters. A person who gambles will have a value of y given by:

$$y = \alpha + \beta x + \gamma + u$$

and a person with the same characteristics who does not gamble will have a value of y (say y^*) given by:

$$y^* = \alpha + \beta x + u.$$

Therefore y^*-y , the change from being a gambler to not being one, is given by γ .

The counterfactual is equivalent to recalculating the value of each if they switch from being a gambler (or a particular type of gambler) (i.e., $z = 1$) to being a non-gambler (i.e., $z = 0$).

In the current study, two counterfactuals were considered and reported on: (a) No Gambling: this assumes that all gambling (in every mode) does not occur; the purpose of this counterfactual is to give a sense of the general significance of gambling; and (b) No EGMs: this assumes that there is no gambling on EGMs (whether they are in bars, casinos, or clubs) and there is no displacement to other gambling activities. The aim of the second counterfactual was to assess the contribution of one particular gambling mode to overall social costs. The mode used to illustrate the principle was chosen because both the literature and the current study suggested that EGMs are the most socially costly of all modes. This may seem to be

Table 3
Mental well-being by reported state

State of mental well-being	Actual situation	Counterfactual	
		No gambling	No EGMs
Very good	1,722,000	1,767,000	1,767,000
Good	1,112,000	1,089,000	1,085,000
Adequate	273,000	255,000	257,000
Poor	46,000	42,000	43,000
Very poor	8,200	7,300	7,500
Total	3,160,000	3,160,000	3,160,000
Net improvement		74,000	69,500

Note. EGMs = electronic gaming machines.

the most policy-realistic scenario, but it crucially assumes that no EGM gambler switches to another mode or to any other socially costly activity (e.g., heavy drinking).

In this study, two life domains were chosen to give an overall estimate of the size of gambling: (a) mental well-being and (b) satisfaction with life. For each domain, an econometric equation was estimated across the 7,010 individuals and used to predict the outcome for each survey respondent based on their demographic characteristics and their gambling behaviour. The equation is a *probit*, which predicts the probability of an individual being in each of the five categories (i.e., very good, good, adequate, poor, and very poor) associated with the domains of life. The equations are summarised elsewhere (SHORE and Whariki, 2006). The particular advantage of this econometric approach is that the predictions from the equations (which are needed for the counterfactuals) are best linear unbiased estimates, even if the individual parameters are not precisely estimated.

The econometric equation can be used to predict what individuals will report if they have different gambling behaviour consistent with each counterfactual (i.e., no gambling and no EGMs). Aggregating across all individuals (in the age range from 15 to 80 years) gives the proportions of the population in each category.

Mental well-being

The relevant population responses from the sample are given in the “actual situation” column of Table 3, with the estimated responses from the counterfactuals shown in the following two columns.

To summarise the myriad changes in the impact of gambling on the mental well-being of all those involved in gambling, we proposed measuring the change by the number of people who would upgrade their category (e.g., from “good” to “very good”). The summary indicator is measured net, so that a person who downgrades their mental well-being state is offset by a person who upgrades their state.

The general conclusion is that under each of the counterfactuals, there would be mental well-being gains. If there were no gambling at all, 74,000 (2.4%) of the population would expect to have a better state of mental well-being. Moreover, of those 74,000 whose mental well-being would benefit from stopping gambling altogether, 69,500 would benefit from stopping gambling on all forms of EGM (assuming they did not displace their gambling to another mode), including those who report being associated with others who gamble on the EGMs. This number represents 94% of the net number who would benefit if all gambling were stopped.

Satisfaction with life

The relevant population responses from the sample are given in the “actual situation” column of Table 4, with the estimated responses from the counterfactuals shown in the following two columns.

Table 4

Satisfaction with life by reported state

State of satisfaction with life	Actual situation	Counterfactual	
		No gambling	No EGMs
Very satisfied	1,245,000	1,240,000	1,259,000
Satisfied	1,666,000	1,676,000	1,658,000
Neither satisfied nor dissatisfied	174,000	172,000	171,000
Dissatisfied	52,000	51,000	51,000
Very dissatisfied	22,000	21,000	21,000
Total	3,160,000	3,160,000	3,160,000
Net improvement		1,000	22,000

Note. EGMs = electronic gaming machines.

The counterfactual outcomes for satisfaction with life are quite different from the mental well-being outcomes. The total net improvement is only 1,000. Although there are small reductions in the lowest three categories, there is also a reduction in the top (very satisfied) category with the increase in the satisfied category. Thus, some people who are currently very satisfied would be less satisfied if there were no gambling. For them, some gambling must add to their satisfaction with their life.

The No EGMs counterfactual shows that there would be a net 22,000 who would report a more satisfying life if there were no EGMs. By comparison with the No Gambling counterfactual, we may conclude that there would be a net 21,000 (i.e., 22,000 to 1,000) who would be less satisfied with life if all forms of gambling, other than EGMs, were prohibited.

Discussion

The present study is an attempt to broaden the current understanding of the impact of gambling by using a less conventional approach. For example, instead of using a problem gambling screen, other ways of examining the impact of heavier gambling were investigated, including first, the individual's loss of money as a proportion of income (excluding those who reported earning less than \$1,000 a year), and second, the time spent in different modes of gambling. Furthermore, new measures of quality of life derived from extensive qualitative questionnaire work were used to measure the impact of gambling.

The loss-to-income ratio proved to be a sensitive measure in relation to the domains of life; this measure showed an association with poorer physical health, mental well-being, relationships with family/friends, feelings about self, quality of life, satisfaction with life, and study/training performance. These findings are in accordance with previous research that showed that gambling has a negative impact on people's physical health, emotional well-being (including the quality of relationships and feelings about self), and study performance (Abbott, 2001a, 2001b; Ministry of Health, 2004; SHORE and Whariki, 2006). Past research has shown that New Zealanders tend to under-estimate their gambling expenditures (Abbott & Volberg, 2000); thus, it is expected that if actual gambling loss data were obtained, even stronger associations would be found between gambling loss and people's domains of life.

The finding that the loss-to-income ratio did not show any association with participants' ratings of their financial situation but is associated with a poorer standard of living is somewhat counterintuitive. It may be that participants were less uncomfortable in rating their material standard of living but found it more intrusive to report and rate their financial situation. In other words, participants' own perception of their financial situation may be prone to denial and wishful thinking. Further analysis of the data (by dividing participants into different gambling levels in terms of loss-to-income ratio) revealed that there were indeed differences found in the reports of actual income relative to respondents' ratings of their financial situation. Among those who rated themselves as good or very good financially, people with higher gambling losses had the lowest actual income. This finding illustrates the complexity of measuring the impact of gambling on financial well-being, while appearing to support previous findings of a negative impact of heavier gambling.

Regarding participants' ability to take care of children and the elderly and their self-rated work performance, the loss-to-income ratio failed to have a significant impact. This finding contrasts with previous research (e.g., Abbott, 2001a, 2001b; Productivity Commission, 1999), including the qualitative research that formed the first phase of this study (SHORE and Whariki, 2006). It may be that other aspects of gambling (such as time spent in gambling) are more influential on participants' self-perception of their care-giving ability and their work efficiency. This area warrants further research.

When respondents' reports of quality of life in the various domains were analysed in relation to the time spent gambling in various modes and venues, there was a clear picture, supported

by previous findings (e.g., Abbott & Volberg, 2000; Ministry of Health, 2006), that time spent on EGMs (especially EGMs in bars) was a risk for people's quality of life and also for criminal behaviour. This association held true even after controlling for participants' age, gender, ethnicity, marital status, educational qualifications, occupational status, and income.

Time spent playing EGMs in various settings, however, had differing impacts on participants' domains of life. Although playing EGMs in bars was associated with poorer self-ratings regarding several life domains, playing EGMs in clubs showed only one negative association with a quality-of-life domain (namely, physical health). Furthermore, in contrast with playing EGMs in bars and clubs, which showed only negative associations with participants' domains of life, playing EGMs in a casino showed some positive associations with participants' self-ratings regarding their material standard of living. More research (ideally with a longitudinal design) would allow us to further understand these relationships.

Other results specific to the gambling mode were that time spent playing on casino table games was associated with a poorer quality of life in a number of domains and playing poker/card games was associated with criminal behaviour and worse self-rated study performance. The race track, in contrast, provided a picture of a better quality of life and financial situation, and playing housie was associated with a better self-reported material standard of living.

In summary, the evidence from the current study that time spent gambling disaggregated into different modes of gambling is very informative. Although playing EGMs in bars was the greatest risk for people's quality of life, some forms of gambling proved to have beneficial impacts on the gamblers.

In addition, this study has contributed to the measurement of the social costs of gambling in New Zealand. With a no gambling counterfactual scenario, analysis has suggested that as much as a net 2.4% of the population had an inferior state of reported mental well-being as a result of gambling. The main contribution came from those who played EGMs. Analysis suggests that for respondents classified as having severe mental health problems or disorders, between 4.3% and 7.6% of them may have been caused by gambling. The study also showed that many people were worse off, as measured by the satisfaction with life question, as a result of their gambling, especially those who were involved with EGMs. However, some people would lead less satisfactory lives if there were no opportunities for them to gamble.

Limitations

One limitation of the current study is the use of the CATI system in recruiting survey participants. A disadvantage of CATI is that it does not allow for access to people without a landline phone. Although New Zealand telephone coverage is high by international standards (an estimate from the 2004 Household Economic Survey [Statistics New Zealand,

2004) indicated that 93% of households in New Zealand had a landline telephone), telephone coverage is lower among particular population sub-groups such as low-income households (86%), Maori peoples (89%), and Pacific peoples (87%). As Maori and Pacific peoples are at-risk groups for gambling in New Zealand, this bias may result in some under-estimation of the impacts of gambling.

There is also the issue of under-representation of heavy gamblers who are unable to access a landline telephone. Results from a New Zealand survey found that the proportion of respondents that had gone into debt or borrowed to gamble was very similar for respondents with and without access to a landline: 2.65% for respondents with a landline and 2.74% for respondents who did not have a landline (Pacific Research & Development Services & SHORE/Whariki, 2004). A pilot study found that problem gambling gave the same prevalence estimates when administered in a postal or telephone interview (Rönnberg et al., 1999). However, in the 1999 National Prevalence Survey, pathological gambling prevalence rates were approximately three times higher for the respondents who could not be contacted by telephone and who completed the postal questionnaire than they were for respondents who completed the questionnaire by telephone (Abbott & Volberg, 2000). It is possible, therefore, that the relationships found with reduced quality of life may be stronger if more of the heavier gamblers were included in the analysis.

Another limitation of the current study is the use of self-reported gambling loss data. Past research has documented the inconsistencies in how survey respondents calculate gambling expenditure and the mismatch between self-reported expenditures and actual gambling revenue (Blaszczynski, Dumlao, & Lange, 1997; Volberg, Gerstein, Christiansen, & Baldridge, 2001; Williams & Wood, 2007; Wood & Williams, 2007). In the New Zealand context, this is likely to result in under-estimation of actual gambling losses (Abbott & Volberg, 2000). Therefore, the relationships found between loss-to-income ratio and reduced quality of life may be stronger if actual gambling loss data were used in the analysis.

Finally, it is recommended that future studies follow participants over time to gain additional information and to further understand the extent to which gambling has an impact on people's lives.

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For correspondence: En-Yi Judy Lin, PhD, Centre for Social and Health Outcomes Research and Evaluation, Massey University, PO Box 6137, Wellesley St, Auckland, New Zealand, +64 9 366 6136, +64 9 366 5149, Website: www.shore.ac.nz; Email: j.lin@massey.ac.nz

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Author biographies:

En-Yi J Lin is a researcher at the Centre for Social and Health Outcomes Research and Evaluation and holds a PhD in Psychology from Victoria University of Wellington. Her research interest is in Asian people’s well-being, especially their adaptation and transition to a foreign land. Dr. Lin’s PhD thesis “Developmental, Social and Cultural Influences on Identity Conflict in Overseas Chinese” won the 2007 Outstanding Dissertation Award conferred by the International Academy for Intercultural Research.

Professor Sally Casswell is a social scientist and is the Director of the Centre for Social and Health Outcomes Research and Evaluation at Massey University. Professor Casswell has an international reputation in the area of alcohol research and is a member of the World Health Organization’s Expert Panel on Drug Dependence and Alcohol Problems.

Her research interests are in social and public health policy, particularly in relation to alcohol, gambling, and other drugs. She has extensive experience in instrument design, survey methodologies, and study implementation. Professor Casswell also served as a member of the Health Sponsorship Council's Public Health Advisory Committee for Problem Gambling, which provided input to assist the Health Sponsorship Council with its development of advice to the Ministry of Health on social marketing approaches to prevent and minimise gambling-related harm in New Zealand.

Brian Easton is an independent scholar who works as a consultant and teaches in economic, social statistics, public policy, and New Zealand Studies. He holds degrees in mathematics and economics from the University of Canterbury and in economics from Victoria University of Wellington. He is a Fellow of the Royal Statistical Society, a Chartered Statistician, a Member of the Royal Society of New Zealand, a Distinguished Fellow of the New Zealand Economic Association, and an Honorary fellow of the Centre for Social and Health Outcomes Research and Evaluation. He was appointed to the Prime Minister's Growth and Innovation Advisory Board during its entire existence from 2002 to 2009, and in 2009 he was made NZIER Economist of the year.

Taisia Huckle is the quantitative team leader at the Centre for Social and Health Outcomes Research and Evaluation. She has considerable experience in study design, implementation, and analysis. She has taken a lead role in many research projects and is currently studying towards a PhD in public health. The topic for her PhD is the assessment of the impact of a liberalised alcohol environment in New Zealand.

Lanuola Asiasiga is a senior Pacific researcher at the Centre for Social and Health Outcomes Research and Evaluation. She has carried out research in a number of large studies including many projects focused on the health and well-being of Pacific people and others where she has played an important advisory role with projects involving multiple ethnicities.

Ru-Quan You is a statistician at the Centre for Social and Health Outcomes Research and Evaluation. He holds an MSc degree in Statistics from the University of Auckland. He has worked on a number of social and health-related surveys and is experienced at planning and carrying out data analysis and statistical modelling and reporting on the findings.

¹This group consists of people with a loss-to-income ratio in the top 20% of the sample.

²Internet gambling was not included in this analysis because the number of people in the sample that participated in Internet gambling was too low (0.6%, $n = 42$).

³The mean age of people who spent a longer time on casino table games was 39.2 years and only 8.5% of them were retired.

Online crime and internet gambling

John L. McMullan¹ & Aunshul Rege²

¹Department of Sociology and Criminology, Saint Mary's University, Halifax, N.S.

Email: john.mcmullan@smu.ca

²School of Criminal Justice, Rutgers University, Newark, New Jersey, U.S.A.

Abstract

The spread of Internet gambling has raised several issues concerning motivations to gamble, consumer behaviour online, problem gambling, security of Web sites, and fairness and integrity of the games. Rather surprisingly, however, there has been little in the way of research regarding online crime and Internet gambling even though it is an urgent priority. This article addresses this absence by investigating the types, techniques, and organizational dynamics of online crime at the portals of Internet gambling sites. Our approach is qualitative in nature and explores, using document analysis, the activities of cybernomads, *dot.com* teams, and criminal networks. We demonstrate that there are different levels of criminal organization, distinguished by their complexity of division of labour; coordination of roles; purposefulness of association between criminals; and ability to avoid, evade, or neutralize security systems and law enforcement. We conclude by arguing that conventional understandings of real-world gambling-related criminal relationships have been altered by the digital environment of the Internet.

Keywords: crime, Internet, gambling

Introduction

Over the past 14 years there has been a global explosion in online gambling, allowing customers to play 24 hours a day, seven days a week, from the comfort of home, work, and public places. The online industry now offers an assortment of services, such as sports betting, casino games, bingo, lotteries, blackjack, and poker. Over 400 different companies in 48 jurisdictions provide online gambling at approximately 2100 registered sites, producing an estimated \$20 billion in known revenues. Most of these jurisdictions are located in the Dutch Antilles, Malta, the Kahnawake Mohawk reserve in Canada, Gibraltar, the United Kingdom, and Australia (Williams & Wood, 2007, 2009). Possible precipitating factors for this expansion include easy access, convenience and comfort of online play, legalization and cultural approval, perceived financial value to consumers, widespread advertising, celebrity endorsements and corporate sponsorships, aversion to land-based gambling clienteles and environments, preference for player-to-player competition rather than fixed-odds wagering, and likeability of the structural characteristics of online games (Williams & Wood, 2009; Wood, Williams, & Lawton, 2007; Griffiths, Parke, Wood, & Parke, 2006).

At the same time, the spread of Internet gambling has raised several issues concerning problem gambling, consumer confidence, the fairness and integrity of the games, and the security of Web sites (Zangeneh, Griffiths, & Parke, 2008; McMullan & Perrier, 2007). In one study of online poker players, Wood & Griffiths (2008) found that cheating was a major concern for consumers. Players believed that *poker bots* operated by gambling sites were cheating them and that computer viruses were enabling some players to see other players' hands during play. In a second survey of Internet gamblers in 105 countries, Wood & Williams (2009) discovered that verifying the fairness of the games and identifying illegalities at gambling venues were major player concerns. Similarly, the American Gaming Association (2006) reported that about 50% of online casino players believed that Internet providers cheated them and 46% insisted that players cheated at play as well. Indeed, an international survey of over 10,000 Internet players found that about one third of them had had disputes with gambling providers and were dissatisfied with the complaint processes (Parke et al., 2007). McMullan & Rege (2007) discovered that gambling providers were also the victims of crimes such as cyberextortion, and Computer Emergency Response Team — Laboratoire d'Expertise en Sécurité Informatique (CERT-LEXSI) (2006), a French forensic firm, has reported that gambling companies were often the perpetrators and victims of international phishing schemes, identity theft scams, and money-laundering operations. Most recently, Giacomassi and Pitts (2009) have argued that Internet gambling is the latest victimless crime in the United States, and Ferentzy and Turner (2009) have outlined the many connections between gambling and organized crime. Rather surprisingly, however, there has been little in the way of a review or examination of online crime and Internet gambling even though it is an urgent research priority.

This study seeks to redress this absence by investigating the types, techniques, and organizational dynamics of virtual villainy at the portals of online gambling sites. It does not, however, examine the frequency of crime. We do not have reliable cybercrime statistics to calculate rates since "many cybercrimes go undetected and many detected cybercrimes go unreported" (Brenner 2007, p. 17). Our aim, therefore, is necessarily exploratory and qualitative in character. We ask the following questions: What types of cheats and crimes occur at online gambling sites? Who are the offenders? Who are the victims? How organized are cheating and cybercrime? Is there an organized-crime involvement in Internet gambling? How effective is legal governance in detecting, apprehending, and prosecuting cybercrime? Are conventional understandings of real-world gambling-related criminal behaviours and relationships altered by the digital environment of the Internet? Our purpose in writing this article, in part, was to stimulate debate and further research and help rectify a shortcoming that the research community acknowledges is pivotal but has so far failed to document and understand.

Method and approach

The World Wide Web is akin to a massive library. Yet despite the staggering volume of material, it has received only cursory attention from researchers interested in studying both criminal activity and gambling. Typical of the research to date have been studies of satellite hacking, telemarketing fraud, software piracy, sex crimes, pornography, stolen identity, cyberhomicide and cybersuicide, and the benefits and deficits of online gambling,

including illegal business and player practices and gambling and organized crime (Mann & Sutton, 1998; McMillen & Grabosky, 1998; Shover, Coffey, & Hobbs, 2003; Taylor, Holland, & Quayle, 2001; Goodson, McCormick, & Evans, 2001; Jewkes, 2003, 2007; McMullan & Rege, 2007; Griffiths, Parke, Wood, & Parke, 2006; Griffiths & Parke, 2004; Schmallegger & Pittaro, 2009; Woods & Coats, 2008; Ferentzy and Turner, 2009; Williams & Wood, 2007, 2009). Research has tended to focus on readily available newsgroup sources and sites, player focus groups, interviews, and surveys and has ignored Web site features, chatrooms, blogs, and Internet interaction. We tried to be comprehensive in our approach and engaged a wide assortment of materials — video clips; media stories; online interviews; cheating kits and manuals; forensic, police, and security reports; and sociolegal documents — published between 2000 and 2008.

We used the Google search engine to retrieve our data. It coded more pages, created larger indices, and presented the most up-to-date data when compared to other search engines. We coded for 48 combinations of keywords, such as “cyberextortion and organized crime,” “player collusion and gambling,” “betting sites and fraud,” and so on. We sorted the data around four intersecting themes: online gambling; criminal techniques; the organization of cybercriminal practices; and legal control practices such as the efficacy of private cybersecurity, the quality of transborder policing, and the effectiveness of existing laws. The combination of keywords produced enormous quantities of page rankings, and we used a 10-page 100-article return process as a cut-off to obtain sample materials for each searched keyword. This criterion was a consistent means of retrieving data, and it ensured that each category was given equal weight and consideration. We retrieved 4800 documents, but the number of articles per keyword was repetitive after the first five or six pages. This in the end narrowed our materials to about 500 documents.

Because data about cybercrimes at gambling sites were not readily available from case law or field studies, we relied on document analysis as our research method. Document analysis may be defined as a way of analyzing texts in a systematic and qualitative manner for the purposes of exploring the classic questions of who said what, to whom, why, how, and with what effects (Mason, 2002; Maxfield & Babbie, 2001). While Internet documents were easy to access, use, and link and were sometimes presented in dynamic ways through threads, forums, and animations, there were some issues with quality control, accuracy of discovery, and consistency of documents over time. We dealt with these matters by relying primarily on authenticated Web sites such as news sites (e.g., MSNBC), security sites (e.g., McAfee), and law enforcement sites (e.g., FBI); by indexing every relevant article’s uniform resource locator (URL) to create a registry of all document sources that could be checked and reexamined; and by triangulating multiple sources to verify information and look for missing data (Neuman, 2003).

There were, of course, many differences in the online crimes we studied. However, they all had one thing in common. They were acts where computers and information communication technologies were the agents, instruments, or targets of deviant or criminal events. We thus focused on the technical character of the illegal acts, the digital contexts that they occurred in, and the novel virtual socio-legal problems confronted therein. This approach stressed that at a given point in time certain illegal acts presented technical and social obstacles that

had to be overcome for their successful completion, that we could identify and analyze the most efficient types of organization for managing these problems, and that the existence of different types of organization may be explained in terms of their technical efficiency in managing the online opportunities at hand (Best & Luckenbill, 1982; Grabosky, 2001; Brenner, 2002; Jewkes, 2003, 2007; Wall, 2007). Treating the rationality of an organizational entity as a potential explanation of its existence led us to ask the following questions: Was it possible for criminals working alone to plan and execute online cheats and crimes and manage the exigencies of online security? How did this nomadic form of cybercrime differ from the teams of digital *dot.cons* (i.e., Internet-based scams) that seemed able to develop collective attacks on diverse targets or from those even larger groupings that were able to establish enduring criminal networks?

Cybernomads

Toolkit cheats

We discovered that cybernomads were almost always solo criminal actors who stole or modified data, compromised computer systems, manipulated software for illegal purposes, or executed cyberattacks at online gambling sites. As one gambling consultant put it, “there are a number of groups trying to make money by hacking Where would you go? I’d go to dodgy online casinos” (cited in Warner, 2001, p. 2). Cybernomads varied with respect to their skills and motivations, but their strength was in their software and programming expertise and in their ability to exploit sites that offered businesses or players little protection (Penenberg, 1998; Keller, 1999; Kish, 1999; Zacharias, 2004; Brenner, 2002, p. 27). Toolkit cheats, for example, purchased prepackaged equipment such as scanners, sniffers, and snoopers; malware packages; password crackers; denial of service botnets; logic bombs; and algorithms that reduced their reliance on other organizational members to hack and crack gambling portals (Rogers, 2005; Gu, Liu, & Chu, 2004). Smoke Poker, for example, was an artificial intelligence program that gave cheaters the upper hand over honest players and providers in poker tournaments (International Game Developers Association, 2004). It was advertised as follows:

It’s a hands-free, robotic poker player that’s been deviously programmed to play a level of professional poker that you, yourself, could only dream of. It makes all of the right moves, always at the right time, to suck up consistent profits from the weakest and strongest players alike. (SmokePoker.com, 2008, p. 2)

It included a sophisticated decision engine; advanced neural network technology; and an opponent-modelling system that monitored the poker tables, memorized opponents’ game styles and betting patterns, calculated the pot and hand odds of winning, and then played the cards “in the best possible way, on auto-pilot!” (Brunker, 2004, p. 2; SmokePoker.com, 2008, p. 3; Yan & Randell, 2005, p. 3). One satisfied user claimed, “my earnings have soared from \$2000 a month to well over \$8000!” Another stated that he “cleared a massive bonus in two days, netting an amazing profit of \$550!” A third insisted that in “just 4 short weeks” he increased his “poker bankroll by 1000%” (cited at SmokePoker.com, 2008, p. 1). Consider as well the HoldemGenius toolkit, which compiled advanced mathematical algorithms and allowed cheats to see their pot-drawing-out odds and odds of winning at over 100 online

poker rooms, including PokerStars, Full Tilt Poker, BoDog, Party Poker, Titan Poker, and Absolute Poker. The algorithms were available from a fully functional Web site that also offered tutorials, customer support, and regular software upgrades to cybernomads. The latest update reviewed at the end of 2008 offered “bug fixes” at Party Poker, Full Tilt Poker, and Absolute Poker sites; “auto-resizing” at Titan Poker and Carbon Poker; and “upgrade support” at two- and nine-player games at BoDog.com (HoldemGenius, 2008b, pp. 2–3). Win HoldEm, another toolkit, promoted a “team edition” that allowed players to see one another’s cards, in violation of rules against collusion. According to a company spokesperson, poker bots increased corporate profits by “35 percent in a five-day test in January [2004] in which it was used to play 7,000 hands” (cited in Brunker, 2004, p. 4).

Hackers

Other cybernomads were more advanced hackers. They manufactured malware, technical intelligence, and personal information or merchandised it to others via the underground economy. For example, one hacker offered computer spyware for \$800, guaranteed it for six months, and accompanied it with a package of support upgrades (Jellenc & Zenz, 2007; Brothersoft.com, 2008, p. 1). Others created bot-networks using malicious codes that were covertly installed on personal or industry computers (McAfee, 2005; Symantec, 2007). These “zombies” were then activated for simple forms of intrusive trespass or herded into armies for more adventurous criminal projects such as cyberextortion (Skoudis, 2007; Morgan, 2005; McMullan & Rege, 2007). Botnet battalions were sold at various prices; 10 bots for a 24-hour “test-drive” sold for \$5 US, small-scale attacks went for about \$40 US, and 500 bots for one month cost \$220 US (Biever, 2004, p. 1; Jellenc & Zenz, 2007, p. 43; McAfee, 2005, p. 13; O’Brien, 2000; Payton, 2005). Shadowcrew.com, CardersMarket.com, and CarderPlanet.com were the “Walmarts” of the cyberunderground, where digital loot such as credit card numbers and social security data were bought and sold in bulk packages and where cybernomads schooled each other on how to upgrade malicious activities for online gambling attacks (Arkin et al., 1999; Acohido, Swartz, & Ward, 2006, p. 1; McAfee, 2007, p. 10; McMillen & Grabosky, 1998; Payton, 2005; Symantec, 2007, p. 12).

Finally, cybernomads with the highest degree of technical acumen were akin to professional criminals. They executed prolonged attacks on their own and were more likely to have subcontracted their services to larger crime networks on a project-by-project basis (Rogers, 2005). One hacker, for example, targeted nine different sites for eight days, eventually closing down FullTiltPoker for 48 hours and disrupting Titan Poker so that it only loaded for a few hours on several of the eight days (Adair, 2008; Online-Casinos.com, 2008, p. 1; Jellenc & Zenz, 2007). Others lived off the data flow between gambling sites and players. They stole financial information from providers and conducted clandestine transactions in the customers’ names by assuming their legal identities. Other hackers were able to play both ends against the middle. They intercepted \$100 wagers, credited \$90 to their own accounts, and sent the remaining \$10 to site operators. Then they intercepted the returning transmissions from the site operators. If the customer won, the hackers credited the customer’s “phantom” account with \$100. If the player lost, neither the player nor the operator realized that \$90 had been diverted. The gambler assumed he or she lost \$100, while the operator assumed the gambler lost \$10 (Cabot, 2001). Still others, like Josh

“JJProdigy” Field, used several accounts concurrently to cheat gambling providers and players. He won a \$500,000 tournament but then deliberately lost the next tournament worth \$140,000 to another player named ABlackCar. Party Poker discovered that JJProdigy had operated both accounts, cheating them and their customers of nearly \$200,000 (Angerman, 2008). JJProdigy described his *modus operandi* as follows: “Sites can detect two things: IP [computer] addresses and the computer used. As long as you have different IP addresses and different computers, it is an easy stunt to pull off. For the different IP addresses, I simply used Verizon Wireless cards” (Ulick, 2007).

Characteristics of cybernomads

Cybernomads tended to operate alone partly because of the physical distance separating them online and partly because they competed with each other for digital loot. While they networked with people in digital stores and Web sites in order to obtain supplies, gain knowledge, plan strategies, and perfect attacks, they seem to have seldom needed partners or to have come into much contact with their victims. They emerged safely from online encounters by making use of superior technical force, secrecy impersonation, and quick attacks. They lived in the digital shadows and were prepared to take flight if necessary to evade industry, avoid victims, and escape legal agents with whom they seldom developed any stable *modus vivendi*. Cybernomads lived ubiquitous online lives and constantly shifted from one Internet venue or adventure to another. They combined skill with bravado to cheat and steal and to frustrate detection and capture. They often exaggerated their own qualities, especially when they were attacking or avenging gambling providers, which they often thought were beneath them. There was no leader-gang relationship among cybernomads, although they sometimes consulted with others or occasionally engaged in subcontracting practices. They shared a subculture but they did not usually hack with others. Digital loot did not have to be shared because the profits were almost always consumed by the principal actors or fixed at set commissions for services when merchandising arrangements were in force.

Dot.cons

Outside colluders

Cybercriminals also worked in dot.con teams that united for criminal projects that could be both occasional and ongoing. Players teamed up with other players, consultants, or Web site owners or managers to commit fraud, theft, and money laundering (Smed, Knuutila, & Hakonen, 2006; Yan, 2003). Most notable was the case at FullTiltPoker.com, where Chris “BluffMagCV” Vaughn was denied the \$1 million prize he thought he had won at poker because he engaged in “seat-stealing”: selling his seat deep in the tournament to a more experienced associate, Sorel “Imperlum” Mizzi, for a percentage of Mizzi’s prize. As Vaughn put it, “we were on instant messenger and I sent him [Mizzi] a message and it pretty quickly led to a discussion about selling the account” (cited in World Poker Rules, 2007, p. 1). Mizzi then logged on to Vaughn’s account from home, and other players “faced a completely different BluffMagCV competitor, one with a different playing style and an incredible amount of online MTT [multiple-table tournament–Ed.] experience,”

that opponents did not recognize and could not beat (Angerman, 2008, p. 2). While the gambling provider eventually tracked the account swap to Mizzi's home IP address, banned both players from the site, and deprived them of their potential winnings, one security expert noted that "if Sorel and Vaughn lived together, nobody would have known this happened." He added, "this [seat stealing] isn't going to stop, because it's unenforceable" (cited in WPR, 2007, p. 1; Angerman, 2008). Indeed, Zie Justin and TheVoid are just two of the better-known cheating teams who played in large and small tournaments and surreptitiously deployed multiple accounts at the same cash game tables in order to purloin winnings from honest players (Woods & Coats, 2008; Moses, 2008).

Dot.cons also exploited gambling site data packets by inserting, deleting, or modifying game events or commands (Yan & Randell, 2005, p. 3; Yan, 2003, p. 3). The CheckRaised Rakeback calculator application that players placed on their computers to help track commission fees taken by gambling operators was a case in point. When the program was run it silently installed "Backdoor.Win32.Small.la" and other malware. This concealed the registry launch point from users, initiated keylogger scripts that retrieved users' login details, and spied on consumer interface connections to other poker applications. Customers' usernames, passwords, and account information were exposed and sent back to teams of hackers, which used the information for blackmail and identity fraud (Naraine, 2006; Sturgeon, 2005; Turkulainen, 2006).

Criminal insiders

Dot.con teams sometimes included gambling insiders, who provided and/or used privileged information for illegal purposes (Smed et al., 2006). The Absolute and Ultimate Bet scandals involving Tokwiro Enterprises and the Kahnawake Gaming Commission were exemplary. Suspecting unfair play, a player at Absolute Poker requested a history of the cards he was dealt during a high-stakes poker tournament. He received a detailed log of every player's hand history and IP address by mistake and discovered that at each table at which "Potripper" played, another account, "#363," was a "spectator." Indeed, once #363 entered the tournament, Potripper did not "fold a single hand before the flop for the next 20 minutes, and then folded his hand pre-flop when another player had a pair of kings as hole cards!" (Levitt, 2007, p. 1). Investigations eventually linked #363's IP address to an employee of the company and the Potripper account to a former executive of the company. According to the Gaming Commission, the perpetrator was a "high ranking trusted consultant with access to its security systems" (Kahnawake Gaming Commission (KGC), 2008a, p. 2). The insider consultant had real-time access to all the hole cards on all the hands and had relayed this information to his associate, Potripper. Between them, Potripper and #363 stole between \$500,000 and \$1 million from players over at least six weeks of undetected illegal play (Goldman, 2007; Levitt, 2007). In addition, six other "superuser accounts" — GrayCat, PayUp, SteamRoller, XXCashMoneyXX, DoubleDrag, and RonFaldoXXB — discarded "hands on flops despite raising preflop," suggesting that they too were aware of their opponents' hole cards and were part of a larger web of account deception and inside corporate collusion that was taking money from consumers without much fear of detection or prosecution from either the company or the regulator (Casinomeister, 2007, p. 7; KGC, 2008a; Moses, 2008).

In the case of Ultimate Bet, two players, “Tramboplaine” and “dipnyc21,” reviewed their hand histories in several tournaments and found that one account, “NioNio,” had won 13 of the 14 sessions and banked \$300,000 in profit in just 3000 hands. This win rate was 10 standard deviations above the mean, or “approximately equal to winning a one million dollar lottery on six consecutive occasions” (Moses, 2008, p. 2). NioNio, in fact, was at the centre of several dot.con teams that changed usernames repeatedly to cheat players and evade detection (KGC, 2009, p. 6). Eventually it was discovered that NioNio had obtained an unfair advantage through “unauthorized software code that allowed the perpetrators to obtain hole card information during live play” (KGC, 2008b, p. 2). The code was written by individuals who worked for Excapsa Software, which had a corporate relationship with E World Holdings, a previous partner of Ultimate Bet, which then used the software to cheat the new owner (Tokwiro Enterprises) and thousands of customers of about \$22 million. A total of 23 “super user accounts” involving 117 virtual personas were deployed by 31 industry insiders and associates to cheat consumers over 55 months of play from June 2003 to December 2007. The vast majority of the computer devices, IP addresses, and player accounts used to cheat and transfer money had ties to the E World Holdings Group and/or Russell Hamilton, a former world series of poker champion. Excapsa, which sold the faulty software to Blast Off Ltd., a company controlled by Tokwiro Enterprises, has paid out a \$15 million lawsuit settlement that has been used to compensate some players for the losses that occurred before and during Tokwiro’s ownership of Ultimate Bet (KGC, 2009; Hintze, 2008; KGC, 2008b; Swoboda, 2008; Polson, 2008).

Not only were corporate insiders involved in fraud, some engaged in theft by withholding winning revenues or by creating phantom sites and malware to steal from potential customers (Andrle, 2006; CERT-LEXSI, 2006; Games and Casino, 2006; Kvarnstrom, Lundin, & Jonsson, 2000; Zacharias, 2004). Several gambling sites, for example, were set up as fly-by-night businesses. Site operators simply transferred potential customers’ funds from their business accounts to their personal accounts and then disappeared into the ether of the Internet (Cabot, 2001; CERT-LEXSI, 2006; Heinrichs, 2001; Penenberg, 1998; Zacharias, 2004). Others designed fake Web sites with fancy graphics, fraudulent licences, and phoney company phone numbers and e-mail addresses and stole consumers’ identity data under false pretences. Still others, such as GlobalSportsNet, defrauded customers by not mailing them their winnings, while others, such as “Fallons” and “Bingo World,” shorted their customers on their returns (Arthur, 1997, p. 1; Kelley, 1997; Shaw, 2004). As Finch (2007) rightly observes, “the key value of the Internet in connection with identity theft and fraud is the way in which it shields the true identity of the fraudster from those with whom they interact online” (p. 10).

Employees of gambling sites also teamed up with dot.con teams in crimes against their employers (Rogers, 2005). Employees, for example, sold company secrets, including account information, gaming software, and sophisticated algorithmic programs for deciphering random number generators, to hackers who then cracked into gaming servers, altered their programs, and ensured that “every roll of the dice in craps turned up doubles, and every spin on the slots generated a perfect match; . . . cherries across the board” (cited in Reuters, 2001, p. 1; Warner, 2001; McMullan & Perrier, 2003, 2007). Perhaps the best-known reported case of employee-generated crime involved Starnet Communications, where highly placed

employees cheated its licensees of 85% of net sales. Employees created “fake” winner accounts with modified betting histories. They changed a \$20 win for a \$20,000 win and deprived the licensee of \$19,980. Starnet’s accounting unit then paid the supposed winners out and tampered with company records to cover up their workplace crime (Gambling Magazine, 1999).

Botnet herders and small-scale organized crime

Digital teams sometimes used bots to launder money through gambling sites. One team, for example, swamped poker rooms with inferior poker bots. Dot.con members then played against and defeated the weaker staged bots, allowing money to change hands, with team members dividing the take and cleaning the capital before botnet hunters could find them (OnlinePoker-News.com, 2007). In other instances, botnet battalions programmed to wager, pick cards, and fold were used to flood casino gaming rooms with illegal capital. Bot-herders took the last seats in the games, easily beat the zombie armies they had mustered, and cashed out the winnings as “clean” money from the casino or poker room accounts (Sullivan 2007). As one security officer observed, “phishers set up online gambling accounts using stolen credit card numbers and victim’s identities . . . and launder dirty money by exchanging funds through the pots of games they set up amongst themselves” (Leyden, 2008, p. 1). Still other dot.con teams engaged in “chip dumping”. Proceeds from crime were deposited into fake customer accounts and deliberately “lost” to associates at gaming tables who then cashed the dumped winnings into a network of accounts, further smoothing the cybertrail from criminality to legality (RSe Consulting, 2006). Finally, some teams used offshore gambling sites to launder funds. From 1998 to 2005, for example, www.BetWWTs.com illegally enticed US gamblers to place wagers on sports events. The owners sequestered the bets, moved their illegal capital to shell corporations, and transferred the money to clandestine accounts in foreign banks in the Caribbean (Ames, 2006; Department of Justice (DOJ), 2006).

Lotteries were also associated with fraud involving teams of dot.cons, and MaxLotto was a case in point. Licensed in the Dominican Republic in 2001, it advertised that 10% of its worldwide \$100 million lottery revenues would be donated to charities (Kelley, Todosichuk, & Azmier, 2001; PRNewsWire, 2001). By 2002, however, MaxLotto.com had disappeared from the net with its customers’ capital. No prizes had been paid out and few of its listed benefactors knew of the company or had received donations from it (Bortz, 2008). Or consider the lottery fraud that occurred in India in 2007, organized by a three-handed team. The leader, Albaika, recruited Acharya online to serve as the broker for Sagwekar and other teams of agents he had commissioned to set up bogus bank accounts in Mumbai. Then Albaika sent a mass email across India congratulating many players on winning a lottery worth millions of rupees and instructed them to deposit funds for service charges into bank accounts as a condition of receiving their jackpots. Once the money was deposited, however, Albaika used his network of agents to usurp the clients’ funds, estimated to be about \$8 million (Times of India, 2008).

Characteristics of dot.cons

Dot.cons approached cybercrime as a working trade and developed established routines for taking money from a large number of victims. Three circumstances favoured the

establishment of this form of illegal activity. First, the dramatic expansion of Internet gambling over the last decade meant that people from near and far carried large quantities of personal e-cash in online gambling accounts or in the form of large tournament prizes. Cheats travelled from one gambling site to another following sport-betting opportunities, card competitions, casino games, lotteries, and other events that attracted online crowds. Hackers fleeced novice operators as they set up their businesses on the net, and commercial insiders who designed software and administered gambling venues conned and stole from the virtual strangers and partners who passed through their Internet portals. Dot.cons thrived by targeting many consumers simultaneously, by not taking too much from any one victim at any one time, and by harvesting many online personas so that consumers did not know that they were cheated or defrauded until long afterward or not at all. In such circumstances attempts at player and property protection and security and law enforcement were not especially energetic or effective, either because the crimes were automatic and difficult to detect or because they were mostly minor in their personal and economic consequences and not likely to result in many formal complaints or legal actions. Second, in the digital world of multiple make-believe names and easily given trust, cybercheats, cybercons, and cyberthieves were fairly safe if they could evade detection and avoid confrontations with virtual victims while they were online. Once away from cyberspace they could melt into their own social worlds, assume their offline identities, live like other citizens, and return later to the Internet with new proxy identities (Finch, 2007). Finally, the scale and density of Internet gambling sites, activities, and users as well as other commercial venues meant that there were enough criminals on the net to form hacker undergrounds, within which techniques of crime could be developed, innovated, and passed on over time. As Cere (2007, p. 148) puts it, hacking has become the “veritable ethic” of the information age. It ranges from benign thrill-seekers to net-dedicated hackers to more criminally oriented digital teams and networks.

The result of these circumstances is that dot.con teams have been able to establish a *modus vivendi* with industry and law enforcement such that overt conflict has so far been minimal. Punishments to date have not been very severe, and detection and arrest seem to have followed only a small fraction of the crimes committed, as evidenced by comparing the outcomes of the Absolute and Ultimate Bet poker scandals. To date no offenders have been arrested or charged, and most have been protected from public exposure and granted *de facto* immunity from legal action by both gambling companies and regulators. The trick of the dot.con trade has been to reduce the likelihood that their crimes can be detected, reported, and acted upon so as to limit public tips and complaints and minimize police involvement. This has not been that difficult because crime control in virtualized worlds remains relatively underfunded, poorly resourced and organized, and especially difficult to apply in shifting, borderless contexts (Aas, 2007; Brenner, 2007; Jewkes & Andrews, 2007; McMullan & Rege, 2007). The typical form of organization for dot.con teams has been a flexible group consisting of two to six associates that participated in particular criminal events in which each person had specialized roles to play in the crimes that they conducted, such as programming attack tools, creating malware, herding bots, and manipulating player accounts. Unlike with cybernomads, however, there was an elementary leadership feature as well as a principle for dividing profits. The most common rule appeared to be that novices followed the lead of more experienced dot.cons and that payouts were negotiated

in advance of jobs and mostly honoured once a criminal event was completed. As Holt (2009) observes of the hackers he studied, those who formed “teams” tended to be more sophisticated, lasted for longer periods of time on the Internet, and had a more developed stratification structure when compared to hackers who performed alone.

Assemblages

Cyberextortion rings

Crime assemblages constituted a third type of organization related to Internet gambling and are best exemplified by the cyberextortion attacks of online sites between 2000 and 2006. The distributed denial of service (DDoS) attack is the typical technique, and it usually began with bots that were herded into an army weeks or months before attacks were scheduled (Paulson & Weber, 2006; Ratliff, 2005; Golubev, 2005). Bots then swamped gambling providers with bogus requests that consumed all available disk space and CPU time, bandwidth capability, or physical network components and denied services to legitimate customers (McMullan & Rege, 2007; Paulson & Weber, 2006, Murphy, Pender, Reilly, & Connel, 2005). Once the sites were slowed or shut down, ransoms in return for protection from further attacks were demanded. “Dear wvts, as you can see your site is under attack. We have found a problem with your network,” stated one e-mail. The attackers then insisted that gambling sites wire cash (\$40,000 to \$50,000 US) to offshore bank accounts in multiple \$10,000 packets: “You will lose more than \$40,000 in the next couple of hours if you do not resolve this problem,” one attacker warned (cited in Karshmer, 2005, p. 1). If the operators did not pay up, the attacks continued and the sites suffered further disruptions and demands for tribute (Warner, 2001; Cassavoy, 2005; Germain, 2003, 2005).

Hundreds of gambling sites were subjected to DDoS attacks, and cyberextortionists inflicted over \$70 million in reported overall damages to British bookmakers alone in 2004 (Nutall, 2004). Canbet Sports Bookmakers, for example, suffered a DDoS attack during the Breeders’ Cup that cost them more than £100,000 in revenue every day the site was shut down. In 2003, BetCris was warned via email, “if you choose not to pay for our help, then you will probably not be in business much longer, as you will be under attack each weekend for the next 20 weeks, or until you close your doors” (as cited in Ratliff, 2005, p. 4). BetCris did not comply and it took the cyberextortionists less than 20 minutes to take down the site. In 2004, Multibet also refused to pay tribute. That site was attacked four times and the business was interrupted for 20 days until a reluctant CEO wired the protection money to an eastern European bank account (Jellenc & Zenz, 2007; McMullan & Rege, 2007).

Cyberextortion networks had an elementary division of labour that included organizers, extenders, and executors (Lemieux, 2003). Organizers arranged plans to be conducted by other subnetwork members. They often shifted from legitimate activities to exploit new online opportunities in the gambling field (Gray, 2005). The mastermind in one cyberextortion ring, for example, was a 21-year-old mechanical engineering student who studied computer programming before starting to hack gambling sites for a living (Computer Crime Research Center (CCRC), 2005; McConnell International LLC, 2000). Other organizers

worked at the behest of international syndicates that provided the capital to finance attacks at online sites (Germain, 2004; Williams, 2002; Walker, 2004).

Extenders were mainly recruiters who screened new members and added to the skill sets of the networks. For example, one hacker was “contacted by a couple of different criminal organizations that offered him quite a bit of money,” and known associates of his had also been hired by “various organized crime groups” (cited in Public Broadcasting Service, 2001, p. 3). As one law enforcement agent observed, hackers know that if they are clever they can “use it to earn a living” with an international outfit (cited in ZDNet, 2005, p. 1). Executors were the front-line agents, who possessed practical knowledge of reverse engineering, virus installations, and architectural vulnerabilities. They banded together to implement DDoS attacks against gambling sites from around the world. For instance, one cyberextortion ring had members in Moscow, St. Petersburg, and Saratov who had never met face to face. As one police officer observed, this was “not a normal organization. Everyone sat at home, and everyone had their role” (cited in Bullough, 2004, p. 2). While subunits communicated with each other via organizers, the latter need not know other members. This separation of tasks and personnel resulted in a remote compartmentalization structure that guaranteed a fluid, flexible, and smooth-functioning network with regenerative characteristics. For example, three hacker rings running DDoS attacks against U.K. bookmakers also made 54 similar attacks in 30 other countries for six months worth an estimated \$4 million U.S. (Leyden, 2006). So these mafias of the minute have required fewer interpersonal contacts, fewer relationships based on sponsorship and discipline, and fewer hierarchical command systems to commit crimes when compared to conventional real-world organized-crime groups (Brenner, 2002; Council of Europe, 2004; McAfee, 2005; CCRC, 2005; Gray, 2005; Ferentzy & Turner, 2009).

Phishers and identity fraud

Cyberassemblages also used gambling sites to conduct identity scams, but on a grander scale than dot.cons. One criminal network, with the help of an insider, hacked into BetOnSports’ database and stole account names, addresses, phone numbers, social security numbers, and credit card and bank account numbers, which they then used for illegal purchases and identity fraud all around the world (DOJ, 2007a; Mark, 2007; Costigan, 2007; United States Attorney Southern District of New York (USASDNY), 2008; Caray, 2006). Another cyberassemblage combined confidence cheating with identity theft and deployed the real addresses of the lottery Euromillion Espana to swindle consumers of over \$200 million in France, Australia, Netherlands, Britain, Romania, and East Africa (elGordo.com, 2008, p. 1). Some network members were akin to forgers and created fake sites and administrative documents. Others, specializing in social engineering, posed as representatives of elGordo.com and sent convincing emails to consumers. They obtained confidential customer information through three phishing techniques: (i) the deceptive attack, where users were tricked by fraudulent messages into releasing their information through the lottery to crime groups; (ii) the malware attack, where malicious code placed on customers’ computers retrieved confidential user information without their consent; and (iii) the Domain Name System (DNS) attack, where the IP addresses of lottery sites were altered to send victims to fraudulent servers (Emigh, 2005; CERT-LEXSI, 2006; Barrett, 2004). While Spanish police eventually arrested some members, the crime network continued to function

despite international police investigations and court prosecutions (Queen, 2007, p. 1). A third example involved PartyPoker.com, where phishers working in an elaborate criminal enterprise designed a perfect replica of the gambling site and hosted it on their own illegal servers. PartyPoker's customers were sent e-mails warning of US legislation that would affect them and were told to take remedial action by clicking a link to the cloned site's login page. Those who complied were directed to a phantom venue, where they were prompted for personal information that was then used to (i) sell legal identities for criminal use, (ii) simulate real user accounts so that network members could impersonate players and gamble in their place, (iii) steal playing credits from online gambling accounts, and (iv) merchandise digital data to competing gambling sites (Chen et al., 2005; Emigh, 2005; Thompson, 2007).

Money-laundering enterprises

Criminal assemblages also operated or worked in tandem with Internet gambling sites to further other criminal pursuits. From 1997 to 2008, for example, US state and federal courts have charged and convicted gambling companies such as World Sports Exchange, World Interactive Gaming Corporation, Golden Chips Casino, Paradise Casino, Gold Medal Casino, Betcris, Dukesports, Betcorp, Betwwts, BetonSports, Bettheduck, Sportingbet, and Safedepositsports for crimes including conspiring to violate the Wire Wager Act, tax fraud, illegal gambling, money laundering, racketeering, and enterprise corruption. While many of these prosecutions were for engaging in or enabling illegal sports betting using phone lines and computers on the Internet, several had complex structures involving formal organized-crime elements.

The Giordano money-laundering enterprise is a good case in point. Members of this network were adept at moving unlawfully earned proceeds through online casinos, shell corporations, and bank accounts to Central America, the Caribbean, Switzerland, and Hong Kong. The executors involved front companies that developed the gambling Web site www.playwithal.com, which enabled approximately 40,000 customers to set up accounts and place bets on football, baseball, golf, and other sports events. Giordano, the organizer, ran the strategic operation of the network; his son-in-law, the controller, oversaw the everyday operations, managed bettor information, and handled Internet accounting matters and discrepancies; and his wife and daughter, the financial officers, laundered crime proceeds to several offshore banks. Five other individuals acted as street-level clerks, runners, and enforcers, collecting bets; distributing, delivering, and transferring illegal gambling proceeds between members; and maintaining network and bettor discipline when necessary (CERT-LEXSI, 2006; North Country Gazette, 2006; Venezia, Martinez, & Livingston, 2006).

The Uvari Bookmaking network also combined an illegal gambling business with money laundering and tax evasion. They had network members and clients in New York, New Jersey, Florida, Nevada, North Dakota, New Hampshire, and Oklahoma, as well as in offshore locations, such as the Euro Off-Track in the Isle of Man and the Elite Turf Club in Curacao. The Uvari Group operated as an intermediary between gamblers and sport-betting companies. They determined their "take" based on the volume of accounts they opened at offshore sites and always returned a portion of their commissions to bettors as

an incentive for them to continue using their bookmaking facilities. They created customer accounts for individual bettors, took their customers' personal information, and attached it to the social security numbers of group members, creating hundreds of dummy accounts in their own names. This permitted customers to remain anonymous and avoid paying taxes on winnings and, simultaneously, allowed the Uvari Group to launder money and claim income tax deductions by associating their customers' losses with their own accounts (CERT-LEXSI, 2006; USASDNY, 2005, pp. 1–6; DOJ, 2007b, pp. 1–6).

Finally, the Corozzo network engaged in an illegal gambling and loan-sharking enterprise that was based in the United States and Costa Rica. The network of at least 26 members relied on toll-free telephone numbers and four online betting Web sites to handle thousands of sport wagers each month from November 2005 to January 2008, amounting to an estimated take of \$10 million. A controller ran the operations, resolved bettor and accounting disputes, and managed account information, and three agents oversaw the offshore accounts, calibrated wins and losses, counted the weekly take, and advised the controller regarding economic matters. In addition, an onshore clerk accepted wagers over the telephone and recorded them on audiotape and on paper, six money collectors transferred gambling proceeds between members of the organization and financial institutions, and 13 runners managed bettors by accepting wagers and setting up login codes and passwords. Finally, two enforcers lent money at exorbitant interest rates to troubled bettors and instilled fear in all bettors not to miss their payments (District Attorney Queens County, 2008, pp. 1–5; North Country Gazette, 2008, pp. 1–3; Ginsberg, 2009).

These case studies suggest that Internet gambling sites are ideal for money laundering and other complex fraudulent and extortionist activities that, in turn, can finance yet other crimes. Despite the strict codes for reporting financial transactions, money launderers seem able to function by manipulating accounts, making smaller cash exchanges, putting players “on the take” on their payrolls, hiding transactions in a bewildering array of gambling and bank accounts, and mobilizing fear when necessary.

Characteristics of criminal assemblages

Criminal assemblages were structured as ongoing projects or businesses rather than as crafts or solo operations. Unlike the “short cons” of the dot.con teams, which were often intermittent events, the “big cons” of the criminal assemblages relied upon the time-honoured methods of long firm fraud: the willingness of a large number of victims to supply credit and information and to invest or agree to acquiesce to schemes that promised to pay well over the odds. This culminated in the establishment of clever illegal business premises on the net where victims were relieved of both identity and capital before bankruptcies were declared or corporations disappeared. This was especially apparent with the *modus operandi* of cyberextortion groups whose organizations were remotely controlled rather than directly and locally managed. Nodal subnetworks in extortion rings coexisted in a dispersed lateral field of global information flow. The virtual rings that brought down gambling sites were dynamic, international pods of loosely connected groups. The networks supplied contact points to assemble criminal endeavours and to develop counteractions against reluctant or resistant victims, competitors, or law enforcement agencies, after which they usually dispersed, only to resurface later (Brenner, 2002; McMullan & Rege, 2007).

However, because larger amounts of money were being appropriated in an increasingly visible way, gambling providers, regulators, police, and private security companies necessarily stepped up their efforts to prevent it. Criminal networks and public and private law enforcement agencies were more and more engaged in techno-wars, which had a tendency to escalate as each side improved their techniques to outwit and outflank the other. One consequence was that assemblages had to be prepared to take greater chances, including raising the risks involved in marketing their products and using direct confrontations with their victims while simultaneously upgrading their techniques and planning to minimize these higher risks. The danger of recognition in victim confrontations at virtual venues was reduced by upgrading the speed of operations and by deploying ingenious aliases, clones, and simulations. The danger that information might be leaked before or after the commission of crimes was reduced by remote planning, careful recruiting of members, secret meetings, and prudent online behaviour that aroused as little suspicion as possible. The danger of exposure was reduced by communicating via screen identities that were difficult to trace and by engineering trust in the act of crime. In short, speed, anonymity, synchronization, and coordination were arranged as much as possible in advance so that criminal acts appeared as “natural” as possible and aroused few suspicions.

A second consequence was that operations on this scale become known to corporate and government agencies, and their success depended on the ability of the industry and the state to suppress them. Certainly victims — *bona fide* lotteries, online betting shops, and Internet poker rooms — took more precautionary licensing and registration measures, developed better internal security measures, hired private cybersecurity firms, and tried to mobilize existing law enforcement agencies to help them combat criminal networks. Without a doubt, US authorities have cracked down on the sport-betting market and its software and payment-processing companies in an effort to restrict the reach of Internet gambling Web sites (Geiss, Brown, & Pontell, 2009). However, cybercrimes of an international sort are especially difficult to discover and limit by traditional law enforcement bodies, third-party multilateral policing partnerships, and victims using self-help market-based solutions. The laws governing cybercrimes occurring at Internet gambling sites were and remain imprecise and confounding as to where offences occurred (i.e., whether in the country where criminal networks were based or in the jurisdiction where the crimes happened), where evidence should be collected, what laws applied and in what jurisdiction, what courts prevailed, and what sanctions were appropriate.

This ambiguity surrounding legal guardianship was compounded by the fissured structure of law enforcement within and between nation-states, making the policing of cyberassemblages complicated, costly, and occasional. Many police forces simply did not have the reach, resources, or expertise to investigate crimes that were committed from remote places in multiple sovereign jurisdictions where the offenders were not even present. As the deputy director of SRI International put it, the botnet-hunting community “is two or three years behind in terms of response mechanisms” (cited in Naraine, 2006, p. 2). Cybercrimes committed from across the globe have played ducks and drakes with international law enforcement agencies, which lack enforceable international instruments, effective trans-border crime management measures, and up-to-date forensic tools, resulting in low public

visibility of gambling-related crimes, few successful prosecutions, and for the most part, paltry penalties (Nhan & Huey, 2008; Moore, 2007; McMullan & Rege, 2007; Jewkes & Andrews, 2007; Smith & Wynne, 1999).

The weakness of global legal governance has encouraged multilateral policing by private-sector providers and digital security firms and fostered self-help business solutions reliant upon authentication and encryption technologies. This has meant investing in business opportunity reduction remedies such as detection systems, enhanced firewall protection, and patch and configuration systems to limit malware infections and software compromises, and in intelligent web-based products such as parallel network intrusion prevention architectures and self-correcting software to identify, filter, and divert illegitimate traffic from gambling sites to improve security. But these reforms have not eliminated the problems. To start, the relations between private and public agencies have not always been workable. The case of Don Best Sports, which was extorted for \$200,000, is illustrative of this problem. A computer security company tracked the cyberattacks to a chat room in Kazakhstan, but when they notified the FBI and the Secret Service, the latter “threw up their arms because it was in Kazakhstan,” said the CEO of the private security company (cited in Ratliff, 2005, p. 3). Furthermore, resorting to multilateral policing and self-help solutions has been costly. Many gambling companies cannot afford the expensive investments in hardware, software, maintenance, and upgrading. The result is a global patchwork of private self-help fiefdoms that afforded security to some but created few industry-wide standards on safety and protection and little consensus about the best devices to stop cybercrimes early and at a distance from gambling venues. Finally, authentication and encryption technologies have created an underground cottage industry in devices and schemes to circumvent these security tools. As cybersecurity has evolved, the high-level plans of cyberthieves, cybercons, and cyberextortionists have disguised attacks, intrusions, and simulations at their point of ingress into gambling site networks; tested the guards, tech boxes, switches, and detectors for anomalies and weaknesses; and probed the new multilateral and commercial security systems for gaps, lapses, and intelligence. A never-ending cycle of enhanced detection and counterdetection measures has proliferated to rationally handle the technical problems of crime and negotiate the exigencies of legal control on the Internet, resulting in an online marketplace that remains replete with criminal potential (Jewkes, 2007; Nhan & Huey, 2008; McMullan & Rege, 2007).

In sum, crime assemblages were more formal and continuous in operation when compared to the two other kinds of online criminal organization. They were more sophisticated than dot.cons or cybernomads, had the most elaborate division of labour for engaging in criminal behaviour, and lasted for an extended duration across time and space. However, despite the more complex stratification system and apparent ability to neutralize formal law enforcement, there is no evidence that these crime networks coordinated their activities into cartels, purchased immunity from the state by bribery or influence peddling, or imposed a monopoly either by consent or coercion over cybernomads or dot.cons. There is no tendency toward a business enterprise type of organization where the former usurps or administers the latter. If anything the economy of online gambling-related crime is in a state of vertical malintegration. So there appears to be no managerial rationality, where one entity is capable of running other online crime groups. More likely there will be no sudden disappearance

of cybernomads, dot.cons, or crime assemblages from Internet gambling sites in the near future.

Cybercrime, real-world crime, and online gambling

Not all deviant or criminal activities occurred solely in cyberspace or solely in physical space, and these raise the relationship between offline and online realms in criminal relations and Internet gambling. To date, online aspects of crime and terrestrial counterparts tend to be studied as separate realms. Real-world crime is seen as (a) physically proximate, (b) one-to-one in scale, (c) limited by geographically and demographically demarcated areas and their risks, (d) patterned into predictable trends and rates, and (e) policed by law enforcement agencies that can concentrate their resources where they think these crimes are most likely to happen. Online crime is seen as (a) not constrained by physical proximity between victim and offender for the consummation of an offence; (b) automated so that an offender can commit thousands of crimes quickly, affecting many victims simultaneously; (c) located in electronic environments where information flow dematerializes space, crime scenes, physical evidence, and criminal identity so that it is difficult to determine where a crime occurs, uncover evidence about it, and identify credible suspects; (d) not recorded in discrete categories or patterned into reliable statistics; and (e) not easily policed by law enforcement agencies, which cannot easily identify offender-offence-victim patterns to deploy their resources to deal effectively with criminal events (Brenner, 2007; McMullan & Rege, 2007; Jewkes, 2003; Grabosky, 2001).

While these differences are no doubt important, our investigation suggests that there are also many contact points where the virtualization of the Internet is inscribed into real-life events and contexts and vice versa, resulting in the intermingling of online and offline worlds and the development of new hybrids around crime and Internet gambling (Brown, 2006). The first lesson from this study concerns the *space of crime*; cheating and cybercrimes at gambling sites were increasingly planned and executed in *hybrid space*, and neither cyberspace nor physical space was predominant in criminal conduct. Thus territory and distance were different from those conceptualized solely in cyberspace or solely in physical space. Hybrid territory at Internet gambling portals was both finite and infinite, sites were both remote and proximate, and distance existed and disappeared. Cybernomads, dot.cons, and cyberextortionists committed crimes by “jacking into” cyberspace and then disconnecting to return to physical space. They did not leave either world behind in the consummation of their crimes but rather followed a process of weaving online communications, identities, and activities into their existing offline lives and vice versa, for purposes of criminal behaviour.

The second hybrid concerns criminal identity when actors, teams, and networks blur the boundaries between real-life experiences and personas and virtual experiences and screen identities. The terms “criminals” and “cybercriminals” as *sui generis* categories emphasize the boundaries between the embodied real and the virtual and fail to appreciate the ways in which the virtual is inscribed into the real world of crime and vice versa, creating *hybriminals*, who experienced and interacted in an infinite space when they attacked gambling sites remotely through anonymous, combinatorial, and repetitive techniques and

then returned to physical zones where interaction, distance, and space were finite. This flow of space and blending of worlds (finite/infinite, remote/proximate) increased the *scope* of criminal organizations at gambling sites. So while sites of victimization were located in cyberspace (poker rooms, casinos, lotteries), sites of planning, coordination, and implementation occurred in several physical and digital territories simultaneously. Hybriminals met face-to-face in physical space and then logged into cyberspace under countless identities to attack customers and providers all over the world. Alternatively, they consummated crimes online using stolen or fabricated identities and, fearing exposure, retreated into physical zones to avoid, evade, or neutralize detection. This ability to move, turn, and return gave hybriminals substantial control over their criminal techniques and movements; expanded the nature of criminal agency and the scope of criminal events; limited the potential for detection, apprehension, and arrest; and kept crime organizations relatively anonymous, flexible, and regenerative.

The third hybrid concerns the blending of the virtual and the physical and how it impacts the speed of criminal events, resulting in a new notion of time for crime. On the one hand, real-world elements of criminal events at gambling sites certainly entailed planning and execution that extended over linear time-frames (e.g., bookmaking schemes, money laundering). On the other hand, online elements tended to form and dissolve almost in an instant, only to reappear in circular repetitive cycles of time (e.g., hacking, DDoS attacks, digital ransoms). So hybriminals crossed over and engaged with various notions of time and combined the fast-forwarding of virtual spaces with the slow-motioning of terrestrial spaces to consummate crimes at gambling sites continuously/intermittently, concurrently/chronologically, in real time/in chosen time, and for short/long durations. They operated at the portals of Internet gambling in *hybrid time* according to a series of information breaks and flows where offenders could literally “time” their crimes, record and repeat them, delay and divert them, or even cancel them while they were occurring. Thus crimes at online gambling sites combined recursive and linear time elements that afforded perpetrators even greater control over the planning of their criminal activities and the speed of their execution (Bogard, 1996; Brown, 2006; Wall, 2007).

The fourth form of hybrid concerns the character of assemblages. Crime networks operating primarily in cyberspace (e.g., cyberextortion rings) tended to be lateral in structure, with fleeting memberships and weakly developed horizontal divisions of authority, while those more rooted in real-world environments (e.g., bookmaking schemes) tended to be stable formal organizations with vertical authority structures. *Hybrid assemblages*, however, exhibited the characteristics of both land-based and digital criminal organizations. They recruited confederates in both physical and digital spaces. Technological skills were discovered and deployed in online environments, while skills such as meeting with partners and picking up ransoms were used in physical space. Hybriminal assemblages had access to a wider set of criminal expertise, which when directed at gambling targets fashioned new alliances between hackers and organized-crime groups and unconventional divisions of labour involving the subcontracting of specialist services. Hybrid assemblages were a mix of old and new features, combining digital techniques such as DDoS attacks, virus and malware manipulations, and phishing with traditional techniques such as confidence cheating, embezzlement, and forgery.

The final hybrid form concerns governance in the borderless world of online gambling. Effectively governing crime in fluid contexts requires a more flexible form of technopolicing that can function in the spaces of connectivity between the virtual and the real. Defensible Internet spaces now necessitate inventive online architectural solutions and better offline law enforcement, but they especially require more proactive digital security networks that are responsive to both virtual attacks and real-world harms. Forward-looking systems of crime control will need to mobilize and integrate political nodes, law enforcement nodes, industry nodes, and citizen nodes into a comprehensive system capable of pooling technical resources, expert knowledge, and trained personnel to form new security regimes for gambling habitats. This means that online players will have to take greater responsibility for the security of their computers to limit hacking and botnet herding. Suppliers of devices, software, hardware, and critical infrastructure will have to be more accountable in law for ensuring that the technologies gambling consumers are provided with on the Internet are reliable and can prevent cheating and fraud. Law enforcement agencies will have to be organized to participate fully in multilateral policing that increases the internodal bandwidth for discovery and detection of wrongdoing and strengthens the density of nodal relationships in the security of online gambling environments to divert and repel cyberattacks, identify identity fraud, and restrict money laundering (Johnston & Shearing, 2003; Williams, 2006; Wall & Williams, 2007).

In sum, users, providers, and architects of online gambling sites have good reason to express concern about the protection of private information, the integrity of the games, and the security of Web sites because Internet gambling has been a source of crime, a vehicle for crime, and a support for crime. Like other forms of Internet commerce, it has not been immune to criminal exploitation, and like other forms of Internet commerce, what is beyond doubt is that the cases that come to the attention of the industry, regulatory authorities, consumers, and academic researchers are likely to represent the tip of the iceberg.

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For correspondence: Dr. John L. McMullan, Saint Mary's University, McNally Building, South Wing, Fourth Floor, 923 Robie Street, Halifax, Nova Scotia, B3H 3C3, Canada. Tel: 902-420-5885, Fax: 902-420-5121. E-mail: john.mcmullan@smu.ca

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John L. McMullan, PhD, is a professor of sociology and criminology at Saint Mary's University in Halifax, Nova Scotia, Canada. Professor McMullan is the author of eight books, seven government reports, and over 60 academic articles on business crime; criminal organization; law enforcement; media; crime and justice; gambling and advertising; and gambling, crime, and social policy. He is a commissioner of the Law Reform Commission of Nova Scotia and a member of the executive board of the Nova Scotia Criminal Justice Association.

Aunshul Rege, MA, is currently a PhD student at the Rutgers School of Criminal Justice in Newark, New Jersey, USA. Her interests include Internet gambling and crime, online fraud and identity theft, cybercriminal organization, and cyberoffender rationality. Her PhD research examines cybercrime and critical infrastructure.

Experienced poker players differ from inexperienced poker players in estimation bias and decision bias

Jakob Linnet,^{1,2} Line Gebauer,^{1,2} Howard Shaffer,³ Kim Mouridsen,¹ & Arne Møller^{1,2}

¹Center of Functionally Integrative Neuroscience, Aarhus University Hospital, Aarhus University, Denmark

²Pathophysiology and Experimental Tomography Center, Aarhus University Hospital, Aarhus University, Denmark

³Division on Addictions at the Cambridge Health Alliance, Harvard Medical School, Boston, Massachusetts, USA

Abstract

This paper investigates the similarity or difference in cognitive bias on a poker task between experienced poker players (EPPs) and inexperienced poker players (IPPs). EPPs were compared with IPPs on probability estimation (estimation bias) and choice (decision bias). It was hypothesized that EPPs would have lower estimation bias and lower decision bias compared with IPPs, and that a player's level of experience could be identified from gambling behavior. Results indicate that EPPs significantly overestimated accepted gambles, but had significantly smaller estimation bias and decision bias compared with IPPs. All players could accurately be classified as "experienced" or "inexperienced" based on their estimation bias and decision bias. It is concluded that EPPs have significantly lower estimation bias and decision bias than do IPPs on the poker task presented in this research study. Despite significantly higher overestimation, EPPs make better decisions than IPPs. These findings are posited to have implications for the study of cognitive bias in pathological gambling and addiction.

Keywords: poker, cognitive bias, Texas Hold'em

Introduction

Poker has gained tremendous popularity in recent years, as evidenced by widely popular Internet poker Web sites and televised poker tournaments. As popularity and availability for playing poker increase, so does the risk for some individuals to develop problem or pathological gambling. Pathological gambling is characterized by maladaptive gambling behavior (American Psychological Association, *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition [DSM-IV], 1994), in which the individual continues gambling despite negative consequences such as incurred losses or jeopardized social relations. Cognitive biases, that is, distorted perceptions of probability and outcome, play a central role in problem gambling and are manifested in diverse ways,

including overestimation or overconfidence of winning, selective attention toward gains, erroneous perceptions, superstitions, rituals, and illusion of control (Delfabbro, 2004; Delfabbro & Winefield, 2000; Floyd, Whelan, & Meyers, 2006; Goodie, 2003, 2005; Ladouceur, 2004a; Ladouceur, Tourigny, & Mayrand, 1986; Lakey, Goodie, & Campbell, 2006; Lakey, Goodie, Lance, Stinchfield, & Winters, 2007; Linnet, Rojskjaer, Nygaard, & Maher, 2006; Raylu & Oei, 2002; Toneatto, Blitz-Miller, Calderwood, Dragonetti, & Tsanos, 1997).

Cognitive biases influence most forms of decision making, and the context of decision making can influence these biases. For instance, Kahneman and Tversky (1979, 1984) showed that people are often loss averse when faced with the possibility of losing a gain. These researchers found that most individuals prefer a certain gain of \$800 rather than an 85% chance of gaining \$1,000, even though the latter choice is more profitable in the long run. They also showed that people often are more willing to take risks when faced with the uncertain possibility of incurring a loss; for example, most individuals prefer an 85% chance of losing \$1,000 rather than a certain loss of \$800, even though the former choice leads to more losses in the long run. The question of cognitive bias is therefore one of *degree* — not presence or absence — as everyone holds cognitive biases to a certain extent. In relation to gambling, particularly skill games such as poker, the central question of cognitive bias is whether the degree of cognitive bias differs among gamblers, for instance, between experienced and inexperienced gamblers or between experienced and pathological gamblers.

Cognitive biases are involved in all forms of gambling and are associated with different gambling activities, including lotteries, slot machines, sports betting, racetrack betting, and casino games (Benhsain, Taillefer, & Ladouceur, 2004; Brownstein, Read, & Simon, 2004; Cantinotti, Ladouceur, & Jacques, 2004; Caron & Ladouceur, 2003; Cote, Caron, Aubert, Desrochers, & Ladouceur, 2003; Delfabbro, 2004; Delfabbro, Lahn, & Grabosky, 2006; Delfabbro & Winefield, 2000; Gibson & Sanbonmatsu, 2004; Gilovich, 1983; Gilovich & Douglas, 1986; Joukhador, Blaszczynski, & Maccallum, 2004; Joukhador, Maccallum, & Blaszczynski, 2003; Ladouceur, 2004b; Ladouceur, Tourigny, & Mayrand, 1986; Larsen, McGraw, Mellers, & Cacioppo, 2004; Rogers, 1998; Rogers & Webley, 2001). Biases are not specific to problem or pathological gambling, but are crucial in understanding how people are addicted to gambling and how the disorder can be treated. For instance, treatment of *erroneous perceptions*, a subset of cognitive biases, is an efficient treatment for pathological gambling (Ladouceur et al., 2001, 2003; Ladouceur, Sylvain, Letarte, Giroux, & Jacques, 1998).

Cognitive biases influence decision making, resulting in increased risk willingness when winning probabilities are seen as high and in risk aversion when winning probabilities are seen as low. In a series of studies, Goodie and Lakey (Goodie, 2003, 2005; Lakey et al., 2006, 2007) found that problem and pathological gamblers were more confident in their decisions about a general knowledge task, even though they had no greater competence or performance level than non-gambling controls. Problem and pathological gamblers were also more likely to accept lower probability gambles, which suggests a higher degree of cognitive bias.

At present, very little is known about the role of cognitive bias in poker. Our long-term goal is therefore to develop a method to study bias in pathological gamblers. As a first step toward this goal, we developed a method to measure bias in gamblers. In the present study, we compared experienced poker players (EPPs) with novice poker players to determine whether the method could successfully differentiate novice and experienced players. If successful, the method could be applied to future studies of pathological gambling. We designed a poker task simulating an on-line gambling environment. In this task (described at length in the Materials and Method section), players estimated the winning probability of different hands and determined whether they would play the hand (i.e., accept the gamble) or not play the hand (i.e., reject the gamble). From this information, it was possible to determine the estimation bias (i.e., the difference between the estimated probability and the “real” probability of winning the hand), as well as the decision bias (i.e., the extent to which gamblers played high or low probability hands).

We hypothesized that EPPs would have lower estimation bias, smaller decision bias, and stronger association between estimation bias and decision bias compared with inexperienced poker players (IPPs). Specifically, we hypothesized that: (1) EPPs would have smaller estimation bias and decision bias than would inexperienced players; (2) EPPs would show a more differentiated estimation bias on accepted versus rejected gambles compared with IPPs; and (3) experienced and IPPs could be accurately classified on the basis of their estimation bias and decision bias.

Materials and Methods

Participants

Participants were recruited at Aarhus University, Denmark, through an internal advertisement at the Center of Functionally Integrative Neuroscience at Aarhus University. We defined EPPs as individuals who had prior extensive knowledge with playing poker (i.e., had played for at least 1 year) and who played on a regular basis (i.e., at least once a week) either on-line, in casinos, or in poker clubs. The preferred form of poker among participants was on-line poker. IPPs were defined as individuals who were familiar with the rules of poker, but otherwise had little or no experience with playing poker. These inexperienced players were comparable to poker beginners (i.e., individuals starting to learn poker). Participants volunteered their participation; they did not receive compensation for their time, and they did not wager money or otherwise risk losing money while participating in this study. No monetary incentives or risks were associated with participation. Investigators interviewed participants about their poker history and conducted a clinical assessment to ensure that there were no gambling problems, either past or present. Using the cohort selection criteria described below, we recruited five EPPs and four IPPs. All EPPs were male and all IPPs were female. In Denmark, the present data did not require formal approval from the Science Ethics Committee, because they only involved questionnaire-based ratings of probability and the decision to play or fold, and did not include human biological material (see also “Ethics approval” section that follows References).

Poker task

As Figure 1 illustrates, we used a poker task simulating real-life Texas Hold'em poker (see e.g., Dennis, 2005), with a *flop* (i.e., three cards face up, which are common cards shared by all players), two *pocket cards* (i.e., two cards face up, which are visible to the player), and one opponent with two pocket cards face down. The player's objective is to determine the winning probability of the hand against the opponent and to determine whether to accept the gamble (i.e., play the hand) or reject the gamble (i.e., *fold* the hand). In real-life poker playing, the hand would involve wagering money (i.e., betting and/or raising), as well as revealing up to two more common cards (i.e., the *turn* and *river* cards). To reduce the number of variables, the poker task did not involve any of these additional features.

Participants were informed that they played against an optimal player, who could accurately determine the probability of winning and would play accordingly. Participants were instructed to accept or reject gambles to maximize the likelihood of winning based on probability, not as they might play the hand in a real poker game (e.g., by bluffing). Participants were first asked to estimate the probability of winning ("What is the probability of winning this hand?") by choosing one of 10 probability intervals (0–10%, 11–20%, 21–30%, 31–40%, 41–50%, 51–60%, 61–70%, 71–80%, 81–90%, and 91–100%). Next, participants were asked to decide whether they wanted to play the hand or not ("Do you want to play this hand?"). After deciding to play or fold the hand, the next hand was presented, participants were asked to estimate the probability, and so forth.

The task consisted of 50 trials with no feedback between trials. The probability of outcome was calculated for each hand with a computer program simulating 10 million gambles. The task involved no betting, and did not include turn or river cards.

Estimation bias, decision bias, and cognitive bias model

Estimation bias was defined as the difference between estimated probability and true winning probability:

$$\text{Estimation bias} = (EP - P) \quad (1)$$

where EP is the estimated probability of winning and P is the probability of winning. We also calculated the *absolute* estimation bias, as the deviation of estimated probability (positive or negative) from the true probability, to determine the total degree of estimation bias:

$$\text{Absolute estimation bias} = \sqrt{(EP - P)^2} \quad (2)$$

where the square root of the product of EP – P expresses the absolute deviation of estimated probability from the true probability.

Figure 1. The poker task simulates a real-life on-line poker task in which the participant has to estimate the probability of outcome and choose to accept or reject gambles. The task uses a Texas Hold'em setup, with one opponent indicated by cards face down at the top of the figure. The player's pocket cards are shown at the bottom of the figure, with the shared cards (the flop) in the middle. The opponent's pocket cards (face down) are shown at the top. No feedback is provided in the task. After each gamble (hand), the task continues to the next hand.



From the probability estimates, four types of decisions and two types of *decision bias* can be made on the poker task: (1) *incurred losses*, that is, acceptance of low probability gambles ($p < .5$); (2) *foregone gains*, that is, rejection of high probability gambles ($p \geq .5$); (3) *avoided losses*, that is, rejection of low probability gambles; and (4) *gains*, that is, acceptance of high probability gambles. The first two decisions are disadvantageous decisions because they lead to losses or missed gains over time; the latter two are advantageous decisions because they lead to avoided losses or gains over time. The overall *skill* level was calculated as the number of advantageous minus disadvantageous decisions:

$$\text{Skill} = (\text{AL} + \text{G}) - (\text{IL} + \text{FG}) \quad (3)$$

where AL is avoided losses, G is gains, IL is incurred losses, and FG is foregone gains. Incurred losses and avoided losses are two different ways of expressing decision making in relation to loss behavior, whereas gains and foregone gains are two different ways of expressing decision making in relation to winning behavior. Therefore, one or the other set of measures can be used to calculate decision bias in relation to estimation bias. We used estimation bias ($\text{EP} - \text{P}$), incurred losses, and foregone gains to determine the probability that an individual belonged either to the experienced or to the inexperienced

Table 1
Decision bias and estimation bias between experienced and inexperienced poker players

	Experienced players (<i>n</i> = 5)		Inexperienced players (<i>n</i> = 4)		
	Mean	<i>SD</i>	Mean	<i>SD</i>	<i>F</i>
Absolute estimation bias $\sqrt{(EP - P)^2}$					
All gambles	0.091	0.011	0.136	0.032	9.09**
Accepted gambles	0.087	0.008	0.135	0.035	9.06**
Rejected gambles	0.094	0.022	0.111	0.075	0.22
Estimation bias (EP – P)					
All gambles	0.024	0.035	–0.064	0.093	3.88*
Accepted gambles	0.066	0.015	–0.065	0.095	9.49**
Rejected gambles	–0.023	0.068	–0.052	0.107	0.25
Decision bias					
Skill	31.20	2.280	17.00	17.166	3.47*
Avoided losses	20.60	1.517	13.00	10.424	2.68
Losses	7.40	1.517	15.00	10.424	2.68
Gains	20.00	1.732	20.50	2.380	0.13
Foregone gains	2.00	1.732	1.50	2.380	0.13

Note. EP = estimated probability of winning; P = probability of winning.

p* ≤ .05, one-tailed. *p* ≤ .025, two-tailed.

group. Mathematically, the model was expressed as follows:

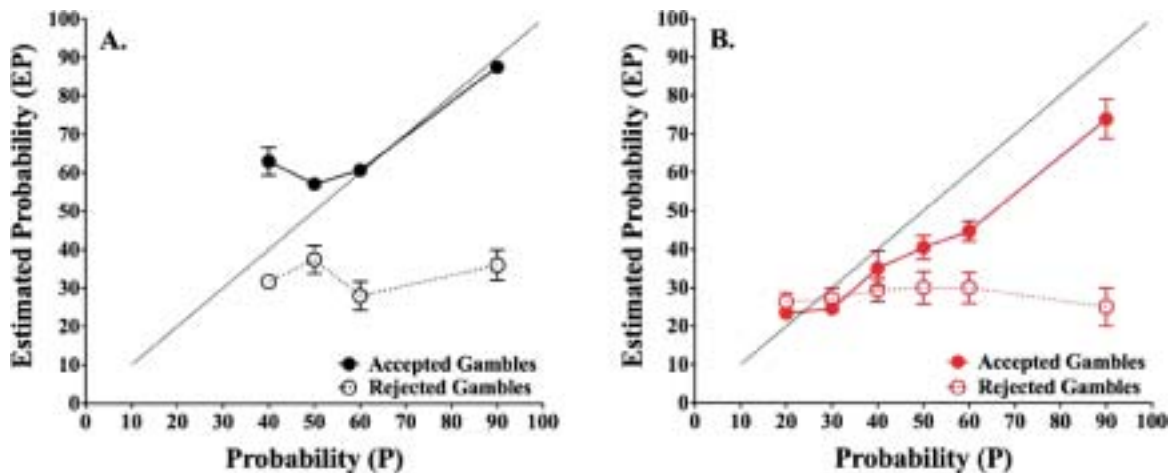
$$P(G|EB, IL, FG) = \frac{1}{1 + \exp \{ -(\alpha_1 EB + \alpha_2 IL + \alpha_3 FG) \}} \quad (4)$$

where G represents group and EB, IL, and FG denote estimation bias, incurred losses, and foregone gains. The coefficients (alpha 1, 2, and 3) were estimated from the experiment.

Table 1 shows that EPPs had significantly smaller absolute estimation bias ($\sqrt{(EP - P)^2}$) than did IPPs, $F(1, 7) = 9.09$, $p < .025$. This finding suggests that EPPs had more accurate probability estimation than did IPPs. EPPs also had significantly smaller absolute estimation bias in accepted gambles, $F(1, 7) = 9.06$, $p < .025$, whereas no differences were found in rejected gambles.

EPPs differed significantly from IPPs in estimation bias (EP – P), $F(1, 7) = 3.88$, $p < .05$ (one-tailed). On average, EPPs overestimated the probability of winning by 2.4%, whereas IPPs underestimated the winning probability by –6.4%. The largest differences were found in accepted gambles, $F(1, 7) = 9.49$, $p < .025$, where EPPs overestimated the winning probability by 6.6% and IPPs underestimated the probability by –6.5%. We found no differences in estimation bias of rejected gambles. For within group differences in estimation bias, EPPs significantly overestimated accepted gambles relative to rejected gambles, $F(1, 8) = 8.13$, $p < .025$, whereas IPPs did not differ in estimation bias between

Figure 2. Estimated probability of accepted and rejected gambles across probability intervals. (A) Experienced poker players estimate the probability of winning as significantly higher for accepted gambles (filled circles) than for rejected gambles (open circles). Only intervals with both accepted and rejected gambles are included. (B) Inexperienced poker players do not differ in estimated probability between accepted gambles (filled circles) and rejected gambles (open circles), except for the 90% to 100% probability interval.



accepted and rejected gambles. A comparison of estimation bias across probability intervals (Figure 2A) showed that EPPs had the largest overestimation of gambles in the 41% to 60% interval, whereas IPPs underestimated probabilities throughout the probability intervals, with the exception of very low probabilities (Figure 2B).

For decision bias, EPPs had a significant higher skill level than did IPPs. The differences, however, reached only a one-tailed significance level, $F(1, 7) = 3.88$, $p < .05$. EPPs and IPPs did not differ in the number of choices resulting in incurred losses or gains or in avoided losses or foregone gains.

A correlation analysis between estimation bias and decision bias showed significant correlations between skill level and estimation bias, $r(9) = 0.67$, $p = .05$ (one-tailed), and absolute estimation bias, $r(9) = -0.78$, $p < .025$. The results are illustrated in Figure 3. Absolute estimation bias was also significantly correlated with avoided losses, $r(9) = -0.73$, $p < .05$, and incurred losses, $r(9) = 0.73$, $p < .05$. The correlation analysis is summarized in Table 2.

Finally, we determined the ability of estimation bias and decision bias to correctly classify players as EPPs or IPPs. We used estimation bias, incurred losses, and foregone gains as predictive variables. We assigned probability weights to each of the measures and summed them in a combined cognitive bias probability weight (see Figure 4). On the basis of these cognitive bias weights, we tested whether we could identify EPPs and IPPs from their cognitive biases. Figure 4A shows that estimation bias accurately classified seven of nine players. Any arbitrary horizontal line would mistakenly classify at least two players as

Table 2
Correlations between estimation bias and decision bias

	Skill	Avoided losses	Incurred losses	Gains	Foregone gains
Absolute estimation bias $\sqrt{(EP - P)^2}$	-0.78***	-0.73**	0.73**	0.24	-0.24
Estimation bias (EP - P)	0.67*	0.55	-0.55	0.08	-0.08

Note. EP = estimated probability of winning; P = probability of winning.

* $p \leq .05$, one-tailed. ** $p \leq .05$, two-tailed. *** $p \leq .025$, two-tailed.

EPPs or IPPs. Similarly, incurred losses (Figure 4B) and foregone gains (see Figure 4C) each classified seven of nine participants accurately as either EPPs or IPPs. Each of these measures, however, accurately classified different individuals such that the combined model accurately classified all nine individuals as either EPPs or IPPs. Figure 4D shows the total model with a horizontal dashed line indicating the discrimination level between experienced and inexperienced players.

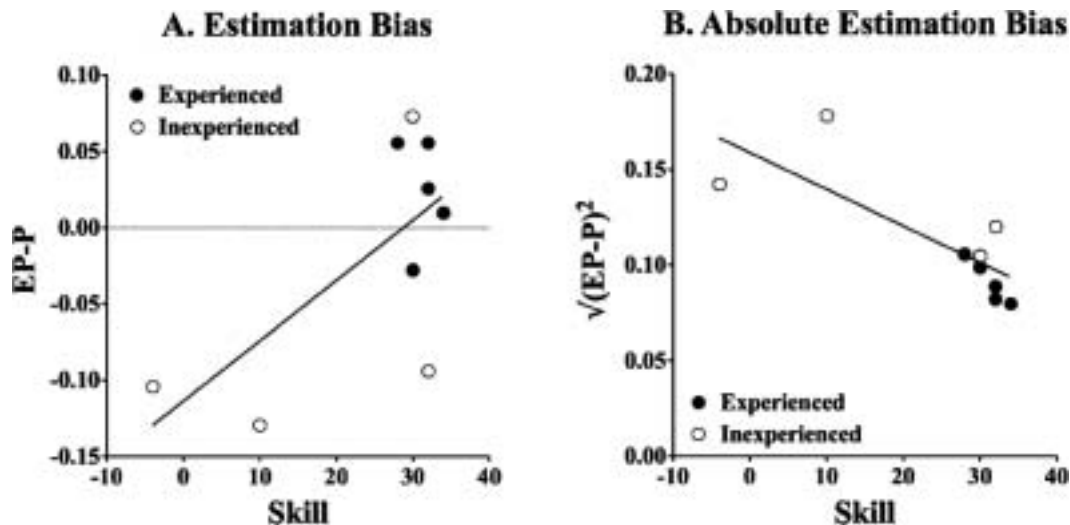
Discussion

In this study, EPPs had significantly lower estimation bias and decision bias than did IPPs, and EPPs showed significant differences in estimation bias of accepted and rejected gambles. EPPs overestimated accepted gambles predominantly in the 41% to 60% winning probability range. It was possible to accurately classify all players as EPPs or IPPs from statistical modeling of their estimation bias and decision bias.

EPPs had significantly lower absolute estimation bias and significantly higher skill level, although the latter reached only a one-tailed significance level. The data show that the poker task can accurately differentiate estimation bias and decision bias in EPPs and IPPs, and further research should therefore replicate our results in a larger sample size. In particular, a larger sample size is needed to reliably determine the tasks' ability to detect differences in skill level between EPPs and IPPs.

Although EPPs significantly differed in estimation bias between accepted and rejected gambles, we found no differences in IPPs. This finding suggests a poorer integration between estimation and choice in IPPs and may indicate that estimation bias and decision bias are independent or partly independent variables. The correlation between estimation bias and skill level is consistent with this notion: As the absolute estimation bias decreased, the skill level increased. This observation suggests that more accurate estimation is associated with better performance and that the convergence of estimation and skill level is higher in EPPs. The correlation between absolute estimation bias and skill level suggests a learning effect in EPPs.

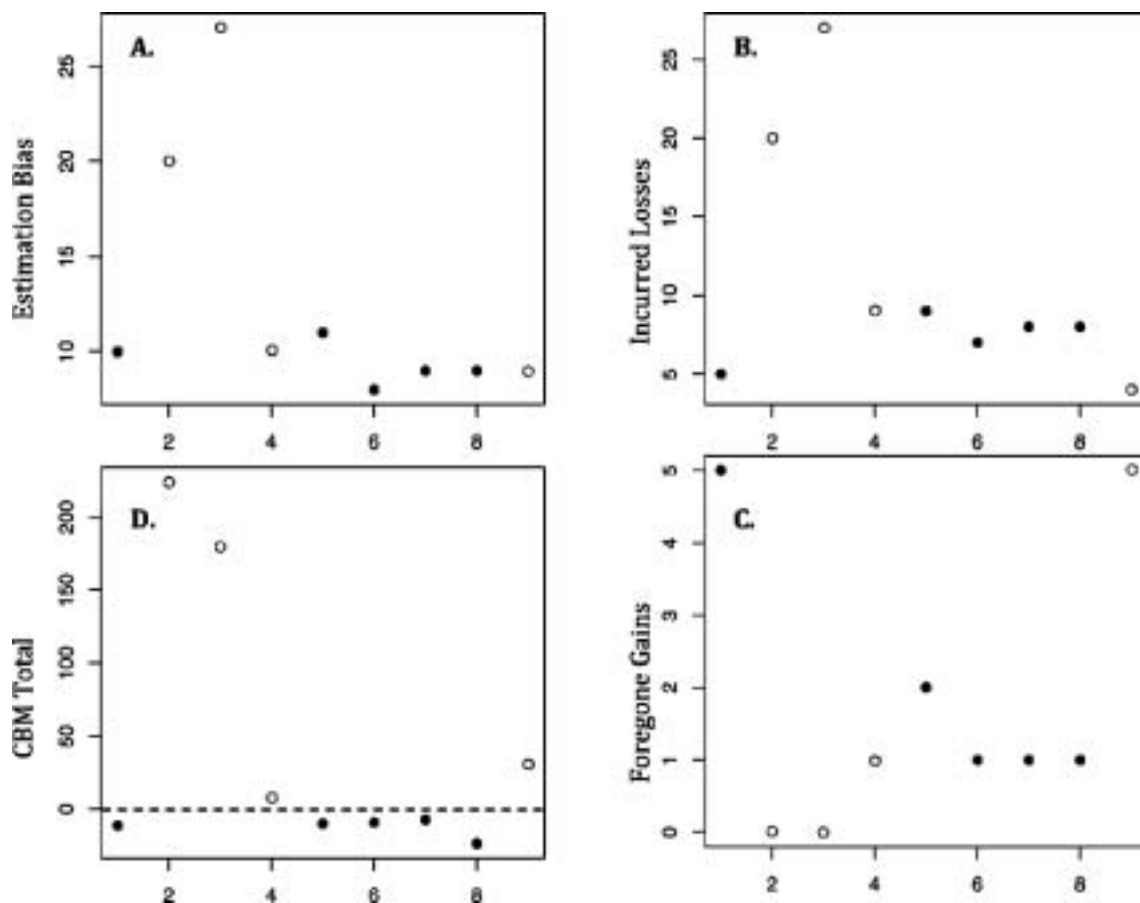
Figure 3. Correlation between skill and estimation bias and absolute estimation bias. (A) Estimation bias ($EP - P$) and skill level are significantly correlated, $r(9) = 0.67$, $p = .05$ (one-tailed). Experienced poker players are indicated with filled circles and inexperienced poker players are indicated with open circles. The line indicates the regression slope for the whole group. (B) Absolute estimation bias ($\sqrt{(EP - P)^2}$) and skill level are significantly correlated, $r(9) = -0.78$, $p < .025$.



Our data may have implications for pathological gambling in two ways: Pathological gamblers may have either (1) impaired estimation bias that contributes to impairments in skill level; or (2) intact estimation bias, but a poorer integration between estimation bias and decision bias, leading to poorer choices despite accurate estimation. An interaction of both variables, of course, is also possible. Further studies are needed to determine whether pathological gamblers have impaired estimation bias, impaired decision bias, or a combination of both. If pathological gamblers have these impairments, their performance level could fall between that of IPPs and EPPs. Over time, such a behavioral pattern will lead to losses against experienced poker players with better skill level. Uncorrected cognitive biases might lead to continued gambling despite losses, known as “chasing one’s losses” (Dickerson, Hinchey, & Fabre, 1987; American Psychiatric Association, 1994; Linnet et al., 2006; O’Connor & Dickerson, 2003).

EPPs significantly overestimated the winning probability compared with IPPs, especially with regard to accepted gambles; they predominantly overestimated gambles in the 41% to 60% winning probability range. EPPs may have overestimated mid-range probabilities for several reasons. First, they may have had less experience with playing hands in the 41% to 60% probability range, thus leading to a larger estimation bias in this range. Second, EPPs may have successfully played these hands in the past and won either by having opponents fold or by winning the hand despite lower odds. This could reinforce an estimation bias on that particular hand or on hands similar to it. Third, EPPs may have attributed value rather than probability to some of the low probability hands. Most EPPs will alternate between playing weaker hands and stronger hands to prevent appearing too predictable. Some hands

Figure 4. Differentiation between experienced and inexperienced poker players on the cognitive bias model. Experienced and inexperienced poker players are differentiated on the basis of (A) estimation bias, (B) incurred losses, and (C) foregone gains. Each variable accurately classifies seven of nine participants as either experienced (closed circles) or inexperienced (open circles) poker players. Different individuals are accurately classified by the three variables. The combination of variables in the cognitive bias model (CBM) (D) shows perfect discrimination, with inexperienced poker players all scoring above threshold (dashed line) and experienced poker players all scoring below threshold. Numbers on the abscissa refer to participants, whereas numbers on the ordinate refer to probability weights of the individual variables.



may therefore have a higher value to EPPs even though the winning probability of the hand is lower. This explanation would particularly make sense in the 41% to 50% range, which is where we saw the largest overestimation of experienced players. Although there was nothing to suggest problem or pathological gambling behavior in our EPPs, the mid-range probabilities may constitute a probability spectrum in which pathological gamblers are particularly at risk for overestimation or overinclusion of low-probability hands.

EPPs and IPPs did not differ in estimation bias on rejected gambles. On the one hand, this finding may suggest that neither group had much experience with these hands because

unplayed hands hold little information. On the other hand, it may suggest that EPPs do not pay much attention to long-shot gambles. Knowing whether a hand has a 24% or 34% chance of winning is not as useful as knowing whether it has a 64% or 74% chance of winning.

All players were accurately classified as EPPs or IPPs from statistical modeling of estimation bias, incurred losses, and foregone gains. This finding supports the validity of the poker task and may have implications for the study of cognitive biases in problem and pathological gambling. Problem and pathological gamblers are known to take larger risks and to be overconfident in their decision making (Goodie, 2003, 2005; Lakey et al., 2006, 2007). It is therefore possible that the poker task could differentiate between EPPs and pathological gambling poker players. However, further studies are needed to support this hypothesis.

Our study holds several limitations, which warrants replication by independent research. First, the study needs to be replicated in a problem gambling cohort to test the hypothesis that cognitive biases impair problem and pathological gamblers. Second, the study needs to be replicated with a larger sample size. Third, including ratings of confidence levels could provide important information about the role of confidence in relation to estimation bias and decision bias. Fourth, although we found a clear interaction between estimation bias and decision bias, our study could not determine the causality of factors, that is, whether overestimation led to acceptance of gambles, or whether accepted gambles were overestimated. Fifth, the poker task addresses only a limited number of poker-related variables (i.e., probability estimation and choice). Poker is a very complex game, which heavily involves social interaction (e.g., in betting and bluffing). The poker task in this study did not address these variables and cannot determine the degree to which they might have been present in the cognitive biases examined here. Finally, we note that all EPPs were male and all IPPs were female. Although we found significant differences between EPPs and IPPs, we cannot exclude the possibility that gender influenced some of these differences. Consequently, our findings should be reproduced in a sample that controls for gender differences.

In conclusion, this study showed that EPPs have significantly lower estimation bias and decision bias than do IPPs. Despite having significantly higher overestimation, EPPs make better decisions than IPPs. Additional research is necessary to determine whether these differences hold implications for the study of cognitive biases in pathological gambling and addiction.

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For correspondence: Jakob Linnet, Ph.D., aut. Cand. Psych, CFIN/PET, Aarhus University Hospital, Aarhus Sygehus, Nørrebrogade 44, Building 10G, DK-8000 Aarhus C, Denmark, Web site: <http://www.cfin.au.dk/menu374-en>, E-mail: linnet@pet.auh.dk

Contributors: Jakob Linnet designed the study, received funding, conducted the analysis, and wrote the final report. Line Gebauer assisted with the design and administered the

data collection. Howard Shaffer assisted with editing and revising the manuscript. Kim Mouridsen assisted with the data analysis. Arne Møller was a consultant.

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Jakob Linnet is an Associate Professor at CFIN/PET, Aarhus University. His research focuses on behavioral and neurobiological aspects of pathological gambling. He has published on dopaminergic dysfunctions in pathological gambling, pathological gambling slot machine behavior, and cognitive biases in poker. He is a co-leader of the pathological gambling group at Aarhus University.

Line Gebauer is a former research assistant in the pathological gambling group. She is currently a Ph.D. student at CFIN/PET. As a research assistant, she helped design the poker task and worked as an intern at the Division on Addictions, Harvard University.

Howard Shaffer is an Associate Professor of Psychiatry at Harvard Medical School; in addition, he is the Director of the Division on Addictions at The Cambridge Health Alliance, a Harvard Medical School teaching affiliate. Dr. Shaffer has written extensively about the treatment of addictive behaviors and the nature of addiction, including more than 200 chapters, journal articles, and reviews. He also has published more than 120 newspaper articles and six books.

Kim Mouridsen is an Assistant Professor in statistics at CFIN/PET, where he is the head of the neuroinformatics group. He is currently a visiting fellow at Harvard University.

Arne Møller is an Associate Professor at CFIN/PET and a co-leader of the pathological gambling group. His research interests in pathological gambling focus on individuals with Parkinson's disease who become pathological gamblers during agonist treatment.

A Qualitative Perspective on Physical, Social and Cognitive Accessibility to Gambling

Nerilee Hing & Sharen Nisbet

Southern Cross University, Lismore, NSW, Australia E-mail: nerilee.hing@scu.edu.au

Abstract

A possible relationship exists between heightened accessibility to gambling and the development and maintenance of gambling problems amongst employees at gambling venues. This paper takes an interpretive approach to exploring how working in a gambling venue influences accessibility to gambling. Semi-structured telephone interviews were conducted with 40 hotel and club employees in Victoria, Australia. Data were analysed along three key dimensions of accessibility to gambling. In terms of physical accessibility, respondents generally felt shiftwork and split shifts heavily influence the times staff are likely to access gambling facilities. Aspects of social accessibility, including familiarity and comfort of gambling in the workplace, encouragement by other staff, and workplace cultures that do not deter staff gambling, were considered encouraging influences. Cognitive accessibility (or knowledge and understanding about gambling) was heightened by enhanced knowledge of gambling products and processes, greater knowledge of jackpot levels, a desire to know what competing venues are offering, and cognitive distortions around winning.

Keywords: Gambling, accessibility, gambling venue staff

Introduction

Understanding the link between accessibility to gambling and the development and maintenance of gambling problems is of critical concern for prudent formulation of gambling policy at government, industry and venue levels, particularly in relation to harm minimisation and consumer protection. Despite the importance of developing this body of knowledge, previous research has been largely inconclusive. Indeed, the Productivity Commission (1999) cautioned that authoritatively proving a causal relationship between accessibility and problem gambling is necessarily difficult. This is because accessibility to gambling is a multi-dimensional construct (Productivity Commission, 1999), so isolating the impact of its different dimensions is challenging. Further, accessibility to gambling accompanies other factors that may influence the development and maintenance of gambling problems. Thus, accessibility may only be “the starting point for all people who develop gambling problems” (Abbott & Clarke, 2007, 127).

Persons employed in gambling venues have been postulated to be at heightened risk for developing gambling problems (Hing & Breen, 2006a; Hing, 2008; Hing & Nisbet, 2008).

This has been tenuously attributed to their enhanced accessibility to gambling venues and products. However, no empirical evidence has confirmed a causal link between accessibility to gambling and an increased prevalence of problem gambling amongst gambling venue employees. While the present study cannot claim to provide this, it contributes to knowledge by offering an interpretive perspective as to how working in a venue influences staff accessibility to gambling and their gambling behaviour, and presents an alternative perspective on a topic dominated by quantitative studies.

The aim of this paper is thus to explore, from the perspective of gambling venue employees, perceptions as to how working in a gambling venue influences one's accessibility to gambling products and venues, both inside and outside the workplace, and one's gambling behaviour.

Links Between Accessibility and Gambling Behaviour

It is generally accepted that accessibility to gambling is a multi-dimensional construct. In the first and only Australian national inquiry into gambling to date, the Productivity Commission (1999) devised a framework of nine such dimensions. This section briefly reviews previous studies pertaining to each of these.

Geographic Opportunities to Gamble. Geographic opportunities to gamble can be represented as either locational (place-based) or individual (Kwan, Murray, O'Kelly, & Tiefelsdorf, 2003). Measurable attributes can include the number of venues, number of opportunities to gamble per venue, and venue location relative to the gambler's place of work and/or residence (Abbott, 2007). Delfabbro and Le Couteur (2006) loosely refer to these as *geographical opportunities*. However, Kwan et al., (2003) dispute the assumption that people travel to their closest location to gamble, and note that locational preferences may change over time.

Machine Numbers. Several studies have focused on aggregate gaming machine numbers and compared these to problem gambling prevalence rates, with varying results (O'Neil & Whetton, 2002; O'Neil & Whetton, 2004; Responsible Gaming Council, 2006). Some authors speculate that this relationship is not linear (Shaffer, LaBrie, Nelson, & Stanton, 2004; Volberg & Abbott, 2005) and that "somewhere between seven and ten machines (per 1000 adults) the relationship breaks down" (Volberg & Abbott, 2005, p.10). This may be because the gambling problems of newly exposed populations recede over time through a process of adaptation (Shaffer et al., 2004; Abbott, 2006).

In Victoria, the South Australian Centre for Economic Studies (2005) concluded that regional caps on electronic gaming machine (EGM) numbers had little impact on accessibility to gambling opportunities. In contrast, a 30% reduction in gaming machine numbers in Nova Scotia was followed by a decrease in expenditure and time spent gambling by up to 12% of players surveyed (Corporate Research Associates, 2006).

Machine Density. The Productivity Commission (1999) found evidence of a statistically significant relationship between the number of machines per adult and problem

gambling rates in a population (Productivity Commission, 1999). Several studies have supported this notion (Ladouceur, Jacques, Ferland, & Giroux, 1999; Marshall, 1999; Marshall & Baker, 2002; Ladouceur, Jacques, Sevigny, & Cantinotti, 2005; Clarke, Tse, Abbott, Townsend, Kingi, & Manaia, 2006; McMillen & Doran, 2006). Other analyses have focused on the density of machines in low socio-economic areas (Marshall, 1999, 2005; Marshall & Baker, 2002). In Victoria, the Australian Institute for Primary Care (2004) found that disadvantaged areas are much more likely to have high EGM densities and expenditure. A later report (Department of Justice, 2005) compared several Victorian regions with similar areas in Western Australia, where there are no EGMs outside Burswood Casino. The Victorian problem gambling rates were three times that of Western Australia. The authors called for further research to determine whether gambling-related harm is caused more by the number of machines per venue or the convenience of their location.

Proximity. Several studies provide evidence linking distance travelled or proximity to a gambling venue and gambling behaviour (Shaffer et al., 2004; Hinch & Walker, 2005; Perese, Bellringer & Abbott, 2005; Walker & Hinch, 2006; Chhabra, 2007; Adams, Sullivan, Horton, & Menna, 2007; Rush, Veldhuizen, & Adlaf, 2007). However, the adequacy of proximity as a measure of accessibility has been questioned (Donato, 2003).

Nevertheless, spatial analysis in the Australian Capital Territory found the gambling expenditure of patrons living locally to a venue was likely to be higher than that of patrons who travelled more widely to gamble (Marshall et al., 2004). Further, a U.S. telephone survey found a positive link between proximity to a casino and problem gambling prevalence (Welte, Wieczorek, Barnes, Tidwell, & Hoffman, 2004). In an examination of spatial variance in problem gambling prevalence in Ontario, Rush, Veldhuizen and Adlaf (2007, p. 205) concluded that "...problem gambling appears to be modestly but significantly associated with proximity to casinos and racetracks with slot facilities" and that "...these forms of gambling might constitute an independent risk factor for problem gambling." Technology, such as the internet and mobile phones, has also transformed the convenience with which traditional forms of gambling, such as racing and sportsbetting, can be accessed (Delfabbro & Le Couteur, 2006).

Social Accessibility. Social accessibility to gambling has been defined as "the sense in which a venue provides a non-threatening and attractive environment to groups who might otherwise feel excluded" (Productivity Commission, 1999, 8; p. 6). For example, in the Northern Territory, casinos are perceived as a non-threatening environment for Aboriginal and Torres Strait Islanders, who are said to be tacitly discouraged from gambling in clubs and hotels (Productivity Commission, 1999). Similarly, the expansion of gaming machines in clubs and casinos has increased acceptability of participation by women (Abbott, 2001; Delfabbro & Le Couteur, 2006). The increasing incidence of women seeking help for problem gambling supports the positive correlation between this enhanced accessibility and problem gambling (Productivity Commission, 1999). A further feature of social accessibility is endorsement of gambling, tacit or explicit, by family and peers, with several clinical studies providing strong support linking family involvement in gambling to problem

gambling (Abbott, Cramer, & Sherrets, 1995; Australian Council of Social Services, 1997; Au, 2005).

Opening Hours. Many jurisdictions have restricted gaming machine operating hours to minimise harm to gamblers. However, little Australian evidence supports the efficacy of this in reducing problem gambling. Conversely, research in Nova Scotia showed “a disproportionate number of problem gamblers played video lottery terminals between midnight and closing” (Corporate Research Associates, 2006, p. 2). After the shutdown time was moved to midnight, problem gamblers reduced their spending by CAD \$75 and moderate risk gamblers by CAD \$140 per week (Corporate Research Associates, 2006).

Conditions of Entry. Accessibility to gambling can also be restricted via conditions on entry. The most common is for gamblers be 18 years of age or older. Others include restricting local residents from gambling, pre-registration of intent to gamble, entrance fees, and dress standards. Yet, it is not known whether these conditions impact on problem gambling. Self- and venue-exclusions can also restrict entry. However, an Australia-wide study documented inherent weaknesses and a general failure of self-exclusion programs to be effective (South Australian Centre for Economic Studies, 2003).

Ease of Use. Gaming machines require far less skill than many types of gambling, such as blackjack and betting on the races (Productivity Commission, 1999). The skill level required to gamble on an activity in turn influences its accessibility. Several authors have identified that male adolescent interest in skill-based games increases their access to these in early adulthood and have linked this with high adolescent problem gambling rates (Shaffer, Hall, & Vander Bilt, 1997; Delfabbro & Le Couteur, 2006). Gambling operators have also facilitated use of some products (e.g., auto-picks and mystery bets), presumably to enhance their accessibility.

Initial Outlay. Low outlay games are clearly more accessible to people on low incomes. Electronic gaming machines typically have a much lower initial cost than table games, making the former particularly appealing to people on low incomes (Productivity Commission, 1999). However, while affordability of initial outlay affects accessibility to gambling, the link between overall affordability and gambling behaviour is less clear. For example, population studies typically indicate that lower socio-economic groups gamble more than affluent groups. Thus, hope of winning may negate affordability for some people.

The preceding review of the literature indicated some evidence of a link between certain dimensions of accessibility to gambling and gambling behaviour and problem gambling. However, research results are largely inconclusive, being hampered by widely varying measures of accessibility, difficulties of isolating the influence of accessibility from other factors, and of distinguishing the influence of different dimensions of accessibility.

Gambling problems among gambling venue employees. Many of the multiple dimensions of accessibility are enhanced for gambling venue employees. For example, in

establishments that allow staff to gamble in their own place of employment, opportunities to gamble are in close proximity and easily taken up; their familiarity with gambling products facilitates their ease of use; and the normalisation of gambling through exposure may heighten social accessibility (Hing & Nisbet, 2008). This heightened accessibility suggests an amplified risk for gambling problems, which is borne out in empirical research.

For example, a study of the gambling behaviours of 34 employees at three large U.S. casinos (Collachi & Taber, 1987) found many behaviors to be consistent with problem gambling. Similarly, a sample of 3,841 U.S. casino employees was found to have a higher prevalence of past-year Level 3 (pathological) gambling (2.1%), but a lower prevalence of Level 2 (problem) gambling (1.4%), than the general adult population (Shaffer, Vander Bilt, & Hall, 1999). A longitudinal study that re-tested 1,176 U.S. casino employees at three intervals approximately 12 months apart found that gambling problems were generally more extensive when compared to the general population, although some respondents reduced their gambling problems over time (Shaffer & Hall, 2002). Duquette (2000) found a pathological gambling rate amongst 271 employees of one U.S. casino of 20.3%, compared to 1.1% for the general U.S. adult population, while Wu and Wong (2007) identified a pathological gambling rate of 7% among 119 dealers in Macau.

The gambling behaviour of venue staff has also been examined in Queensland, Australia (Hing & Breen, 2005, 2006a, 2006b, 2007, 2008a, 2008b, 2008c; Hing, 2008). One qualitative study revealed over 80 reasons why working in a venue may encourage staff gambling (Hing & Breen, 2006a), many of which related to dimensions of accessibility. A quantitative study (Hing, 2008) found that the proportion of problem gamblers among 511 Queensland gambling venue staff was 10 times higher than for the state population.

Clearly, the studies cited above have found widely varying rates of problem gambling among the venue staff surveyed. There are several possible explanations for this. One is jurisdictional differences, including how numerous and accessible gambling venues are, the legal minimum age for gambling, and legislation and policies that might restrict employees gambling in their own workplace. Cultural differences might also be relevant and may be reflected in the popularity of gambling and propensity to develop gambling problems. In addition, the studies have not been consistent in the types of employees included in their samples. For example, Wu and Wong's study (2007) included only table games dealers from any casino in Macau. Duquette's (2000) sample included both front and back of house employees from a casino where staff could gamble on most forms of gambling available in their workplace. Shaffer and Hall (2002) included only full-time casino employees, but did not specify whether these included both front and back of house staff and operational, supervisory and management staff. Hing's quantitative study (2008) included staff from hotels and clubs with gaming machines as well as casino staff, and included both front and back of house employees and those at all levels of employment. Nevertheless, where comparisons were possible, all the studies cited above all found higher rates of gambling problems amongst their samples than for the general population in the associated jurisdiction.

Methods

This research was undertaken as part of a larger study examining accessibility to gambling amongst gambling venue employees in Victoria. Semi-structured telephone interviews were undertaken with 40 club and hotel employees. Hotels are for-profit licensed premises which can be privately owned, while clubs are not-for-profit licensed premises which are owned by their members. In Victoria, hotels and clubs can each operate up to 105 gaming machines, as well as operate off-course betting outlets (TAB outlets) and keno. Two gaming operators, Tabcorp and Tattersall's, own all 27,279 gaming machines in these hotels and clubs and lease them to these venues. The only other provider of gaming machines in the jurisdiction is the Crown Casino. However, they declined to allow their staff to participate in the study.

The Interview Schedule

An original interview schedule was developed based on the literature review. The first section gathered information regarding respondents' experiences of working in gambling venues, such as their position, nature of their workplace, and staff gambling policies. Section Two was administered only to participants permitted to gamble (while off duty) in their workplace, whilst Section Three was administered to those not permitted to gamble in their workplace. Sections Two and Three asked participants whether and how certain aspects of working in a venue influenced staff gambling, both outside and, where applicable, inside the workplace. These aspects related to various dimensions of accessibility, sourced from the literature review, and included:

- Convenient access/proximity to gambling
- Familiarity with their own venue
- Safety and security
- Knowing other staff
- Knowing other patrons
- Shiftwork
- Knowledge and familiarity with gambling
- Normalisation of gambling
- Fellow employees
- Financial circumstances

Sample Selection

Interviewees were recruited via an earlier phase of the larger study. In November 2007, a survey had been distributed to a census of hotels and clubs operating EGMs in Victoria, requesting completion by three staff per venue and inviting respondents to participate in a telephone interview. A \$20 petrol voucher was offered for participation, and 189 respondents agreed.

A target number of interviews had been set at 40, because data redundancy would likely occur after this and due also to budgetary constraints. Interviewees were selected from the 189 volunteers using a process akin to quota sampling (Neuman, 2006).

Over a two-week period during December 2007, one telephone call was placed to each sampled interviewee to schedule a mutually convenient interview time. The interviews mostly took place the same day as the initial call. No message was left when an answering service was encountered, and the interviewer contacted the next person on the list. Interview duration was 15–30 minutes. All were recorded with permission and transcribed verbatim.

This sampling method has clear limitations, with quota sampling and a one-time telephone call possibly introducing bias. Nevertheless, while the intention was never to produce generalisable outcomes, the quota sampling used ensured a reasonably even balance of males (42.5%) and females (57.5%), although there was a higher proportion of respondents employed in clubs (72.5%) than hotels (27.5%). There was also reasonably balanced representation from staff working in venues with differently sized gaming machine installations (ranging from 10 to the maximum of 105) and those where Keno (58.1 per cent) and TAB (50%) were available.

Data Analysis

The raw data were analysed using thematic analysis, a method for identifying, analysing and reporting patterns within data, by organising and describing the data set in rich detail and by interpreting various aspects of the research topic (Braun & Clarke, 2006). It involves six distinct stages: (1) familiarisation with the data; (2) generating initial codes; (3) searching for themes; (4) reviewing the themes; (5) defining and naming themes via ongoing analysis; and (6) writing up the results (Braun & Clarke, 2006, p.87).

Results and Discussion

The paper now presents and discusses the results in terms of venue policies on staff gambling in the workplace and various dimensions of accessibility to gambling by staff. Please note that pseudonyms have been used in this discussion to protect staff identities.

Venue Policies on Staff Gambling in the Workplace

Victorian legislation prohibits hotel and club employees from gambling in their workplace while on duty. Individual venues have discretion on any other restrictions on staff gambling in the workplace.

Eighteen of the 40 respondents indicated they were permitted to gamble in their workplace, although there were several variations on this. Some had to wait a certain time period after a shift to commence gambling in their workplace (e.g., 15 minutes, 12 hours), others could only gamble for a limited time after a shift (e.g., 30 minutes, 45 minutes), others had to remove name tags or conceal or change from their work uniform, while others were barred just from playing linked jackpots.

Of the 21 respondents who indicated staff gambling was prohibited in their venue, most spoke of a total ban. One respondent (Will, club gaming manager) explained staff are not allowed to socialise on site (whether gambling or not), while another (Laura, club night duty manager) suggested the ban was to protect the venue from customer complaints. Practical considerations also limited some staff gambling. For example, Kathy (club bar attendant),

working in a small club, remarked “We can’t gamble here out of our working hours because . . . when we’re not working we’re closed.” Some respondents indicated they were unclear on their venue’s staff gambling policy. One respondent explained there was no policy at his venue, but “There really isn’t any need for any because the staff don’t gamble there anyway” (Rick, club bar and gaming manager). In contrast, Sally (club supervisor), a supervisor at a large club, indicated that not having a ban probably encouraged staff to gamble after work, some to excess, and that a ban would be preferable.

Accessibility to Gambling Among Staff

The interviews revealed numerous issues around staff accessibility to gambling, which are grouped below into three overarching dimensions of accessibility — physical, social and cognitive.

Physical Accessibility

Physical accessibility to gambling was discussed by the interviewees mainly in terms of convenience, proximity to work and home, and the influence of shiftwork and split shifts.

Convenient accessibility and proximity. Most respondents did not think convenient accessibility to gambling, in terms of its proximity at work, influences staff to gamble in the workplace. For example, Rhonda (hotel gaming supervisor) described “being with it all the time” as discouraging her from gambling while off duty. Amy (club gaming attendant) noted the unattractiveness of her venue as a place to socialise: “I don’t gamble a great deal but if I was gonna go to somewhere for dinner I definitely wouldn’t go to my work.” Some staff did not want to extend the time they spent in the workplace by also gambling there. However, it was readily acknowledged that staff, like the general public, have convenient access to venues in general.

However, some respondents described gambling as a convenient way to relax after work, particularly following night shifts. Some also gambled in the workplace when they came in to check rosters or return keys in their time off. Max (club duty manager) explained that “a lot of the staff that will play, will play because they’ve come in for something for work and the pokies are there, so yeah, convenience I suppose.” Other respondents, such as Patrick (hotel manager), explained their venue was “the only one in town.”

Where staff were required to change out of uniform to gamble in the workplace, employees who live some distance away appeared more likely to gamble closer to home. However, if there was no other similar venue there, then those workers may be more likely to gamble in their workplace. Even for staff not permitted to gamble at work, other venues in close proximity allow convenient gambling before or after work, or during meal breaks. For example, “convenient proximity” for Graham (club chef) meant a venue where staff “could walk down there on their break, spend 20 minutes down there and walk back again, you know half an hour break.”

Nearby venues were also considered good places to meet up with co-workers and friends who work at other venues. In Banjo’s (hotel gaming manager) case, she preferred to gamble at “the other hotel just a few metres up the road . . . [because] if you’ve had a stressful

day, you can relay it on to someone who understands.” Some respondents who were not permitted to gamble in their workplace indicated it may be more convenient to gamble closer to home, either on their way home from work or during time off, than to go to a venue near the workplace: “People will go to the closest place that they want to go to, or one that they’ve got to pass on the way home. That’s where they’ll drop off or they’ll go to, their local” (Noel, club manager).

Shiftwork. Shiftwork was a further worklife aspect that appeared to affect physical accessibility to gambling. Late night finishes meant some staff did not have the opportunity to gamble after work, thus staff gambling in the workplace was seen as confined to those working day shifts. For example, Sally (club supervisor) explained:

When I used to do day shift, I used to stay, have a drink and play . . . But now that I work nights, like I don’t go in there to play. And when I knock off, the machines are closed . . . all the ones that do day shift, the majority of them will stay and play the pokies afterward.

However, a number of staff who finished late explained they sometimes gamble at other venues after work. Further, many respondents had observed staff from other venues gambling at the respondents’ workplace before or after shifts and could “recognise the staff from other hotels . . . they weren’t in for a social drink. They were just more in to play pokies” (Noel, club manager).

Essentially, shiftwork was seen as encouraging staff to gamble at other venues, rather than in their workplace. This was due to workplace policies regarding staff gambling, opening hours, opportunities to meet up with fellow hospitality workers, wanting to experience the gambling facilities at other venues, and a desire for privacy in their own gambling. A lack of alternative leisure opportunities for night shift workers can also encourage staff gambling:

Only last week, well, our venue’s probably open the latest, but I’m not allowed to gamble, so I drove for half an hour to another venue that was open to the same time as us just to play for a couple of hours . . . I’d been home and I was bored so I thought I’d go to this venue (Dallas, hotel chef).

Split shifts. Both the workplace and non-workplace gambling groups spoke about split shifts. These are commonly worked by kitchen staff and appear to be a strong influence on their gambling behaviour. Several respondents acknowledged having seen kitchen staff gambling between shifts. These staff often find it easier to stay close to their workplace in between these shifts and gambling is one way to pass that time.

Social Accessibility

Social accessibility was discussed in relation to the familiarity and comfort of gambling in their workplace, safety and security, encouragement from other staff to gamble, the influence of patrons, the normalisation of gambling, limits on other social activities, and management and workplace culture.

Familiarity and comfort of gambling in the workplace. Most respondents who could gamble in their workplace believed that familiarity with their venue made it a comfortable, sometimes inviting place to gamble. Cheaper drinks for staff (where provided) and the non-judgemental attitude of others added to this comfort level. However, some who were able to gamble in their workplace felt staff preferred to gamble elsewhere, “to go in a different environment so they feel they’re actually away from work” (Jake, hotel junior manager).

In contrast, respondents who could not gamble in their workplace tended to disagree that familiarity with gambling environments encouraged staff to gamble. Some reasons were that this familiarity turned staff off gambling and they get sick of the environment. Others felt that individual factors such as boredom were more influential than social factors. However, Amy (club gaming attendant) described how her level of familiarity and comfort in a gambling environment grew over time: “Before I started working in venues I felt a bit more uncomfortable about going to them, but because I’m very aware of how they work and operate and stuff like that now, I’m more comfortable to go there.”

Safety and security. Respondents were fairly evenly divided on whether the added safety and security of gambling in your own venue, rather than going to another, encouraged staff to gamble in their workplace. Some commented that knowing other people in the workplace added to comfort levels and others that security is enhanced. As Lara (club cashier) commented, “Having been there for 10 years I know probably 80% of the patrons in there, I know the staff, I know the security, I know that if anybody came at me for any reason that I would be protected there.” However, others noted that alternative venues were just as safe.

Influence of fellow workers. The influence of other staff on social accessibility to gambling was a topic of much discussion. Most respondents who could gamble in their workplace believed that knowing other staff encouraged workplace gambling. The general collegiality was attractive, although this also applied for staff who gambled at other venues where they knew employees. For example, Amy (club gaming attendant) explained that, “[this town] is not a really big place so a lot of staff swap and change. So I’ve worked with quite a lot of people from around the area.” Consequently, she was more likely to visit their venues.

Finishing a shift at the same time as others, the social atmosphere of TABs for men, a drinking and gambling culture, and sharing of “hot tips” among staff were other encouraging factors noted. However, others felt that social factors had no influence on EGM gambling, as it is a mostly individual activity, while heavier gamblers might prefer to gamble elsewhere to retain privacy. Raina (club administration) for example, believed employees did not “enjoy other staff hovering around them and looking at what they do.” Respondents permitted to gamble in the workplace seemed more likely to encourage other staff to gamble with them, even outside the workplace. There were, however, some that did not want to socialise at all with fellow workers.

Influence of venue patrons. Knowing venue patrons seemed to discourage some respondents from gambling in their workplace (where permitted). They explained they sought

some respite from their patrons and sometimes felt uncomfortable if patrons commented on their gambling or any wins. For some, however, knowing patrons added to the social enjoyment.

Offering tips to TAB staff was prominent in venues where patrons involved in the racing industry gathered, and was facilitated by a welcoming social atmosphere. For example, these patrons might encourage staff to place bets on particular racehorses with comments such as “So and so’s got a ride today, it might do alright” or “I heard a tip” (Sky, club gaming supervisor).

Normalisation of gambling. Most interviewees recognised that gambling becomes very normalised for staff. However, whether this translates into heightened gambling activity depends on many other factors. Nevertheless, this normalisation can reduce any stigma around gambling. As one interviewee noted: “I think they [staff] feel it’s more acceptable” (Ben, hotel bar and gaming attendant); according to another, normalisation has an effect because it “sort of eases a bit on the perception that gambling is bad . . .” (Kaitlyn, club manager). Kaitlyn also illuminated the normalising effects of gambling that arise from noticing gambling’s positive effects, such as relief from loneliness and boredom amongst older patrons.

Among respondents who strongly agreed that the normalisation of gambling compelled staff to gamble themselves, a few believed this influenced their own gambling. Jill (club duty manager) spoke of how “whenever we go out as a group . . . we either meet in the pokies or meet in the bistro and end up in the pokies.”

Limits on other social opportunities. While previously postulated as influencing physical accessibility to gambling, elements of shiftwork were also described as influencing social accessibility. This related to the limit it imposed on social opportunities. Many respondents explained that family time and options for relaxing after work are very restricted, particularly when working late shifts, so they may socialise with fellow staff instead. Max (club duty manager) explained that the unusual hours associated with night-shift encouraged him to gamble after work, and discouraged him from going home as his family would most likely be asleep:

... sometimes we’ve finished work at say 12:30 here ... you might have worked from 3 o’clock. You’re a little bit, like awake and we tend to go to another venue for a drink because we know it’s open. And then obviously, if they go for a drink and there’s staff that do gamble here, well they tend to throw in 20 or 30 at another venue. And also, certainly if their partner’s also asleep at that time of night, they’re not likely to go home. So they’re wanting to go somewhere else.

Financial circumstances. The typical low wages of staff were also acknowledged as influencing the affordability of gambling for staff and thus the comfort level of spending limited disposable income on gambling. Most respondents felt venue employees would not consider gambling as a way to supplement their income. Matilda (hotel gaming attendant), for example, was typical in acknowledging her tight finances and said this limited her

gambling expenditure to \$2.00 – \$3.00 at most (in Australian currency, a relatively insignificant amount of money). However, some younger or newer staff members appeared more naïve in this regard. Max (club duty manager) noted that new employees “. . . can think wow, that’s so easy to do. So when money is low, maybe they do tend to look at pokies as an option of winning.”

Management attitudes to staff gambling. Social accessibility to gambling was also seen as dependent on management attitudes to staff gambling. Where a permissive policy applied, management can be seen as endorsing staff gambling. In some instances, staff gambling was recognised as keeping EGM turnover up. Sally (club supervisor) had approached her manager, seeking a ban on staff gambling. The manager responded: “our turnover would drop. I would sooner the staff play here, than go elsewhere and play.” This illustrates the strong leadership and mentoring role that managers can take, and the potentially strong message that a permissive staff gambling policy can send. Another respondent spoke of the liberating effect when the hotel owner/manager was absent, noting staff were then readily able to gamble in the workplace late at night.

Cognitive Accessibility

Several themes in the interviews related to cognitive accessibility to gambling, and those discussed below include perceived insider knowledge, enhanced product knowledge, better knowledge of jackpot levels, a desire to be aware of gambling products offered at competing venues, and cognitive distortions of some staff.

Perceived insider knowledge. It was widely acknowledged that gambling venue employees should have enhanced knowledge of the odds of winning at gambling and the extent of patrons’ losses, so this should discourage them from gambling. However, a perception of insider knowledge can override this. For example, Noel, a club manager with a long history of working in gambling, suggested staff can believe they have inside knowledge of gaming machines. He also clearly believed in the gambler’s fallacy:

I’d like to think we’ve got inside knowledge. Look, I can tell you, tell you now, when I do the morning shifts and I count the cash every morning for four or five days, on about day three or four I think, “gee we’re due for a couple of payouts.” And all of a sudden the machines will start paying out.

Enhanced product knowledge. The special knowledge required of staff working at TABs further added to their familiarity, comfort and knowledge of how to gamble on TAB activities. Others were genuinely interested in playing certain EGMs after watching patrons play them, and wanted to try the games themselves at their own, or another, venue. Reflecting a belief in the gambler’s fallacy, still other staff observed patrons winning on particular machines and were enticed to play them to see if they could also win. For example, Betty (club staff) spoke of how gaming floor personnel have time to observe patrons in play, develop a rapport and “hang around with them while they’re on the machine.” This can translate to gambling outside of work, as described by Banjo (hotel gaming manager),

who “used to go just up the road because there was a particular game I liked to play . . . and if I enjoy playing the game I enjoy watching [customers play] it too.”

Jackpots. The respondents generally felt they had a greater knowledge regarding jackpot levels than the general public. This led some respondents to again be subject to the gambler’s fallacy as they erroneously believe they know when jackpots are about to be won, with some reporting that they encourage fellow (off-duty) workers to pursue these jackpots. Max’s (club duty manager) “first memory of staff gambling” related to a staff jackpot win in the context previously described: “. . . we used to go around and say ‘go get on the Wild Cash machines, it’s about to go off.’ One of our staff had finished his shift, got on, won it.” The staff gambling policy at Max’s workplace was changed as a consequence of this incident.

Some respondents reported closely monitoring jackpot levels in their workplace, then playing these machines when off-duty or seeking out a linked machine at another venue. Amy (club gaming attendant) perceived this knowledge component as a consequence of the job, because “when you’re at work all day you keep an eye on those things.”

Competing offerings. Staff gambling was also encouraged by a desire to see what competing venues are offering, to try different machines and learn about alternative promotions and competitions. Some felt they gambled to enhance their product knowledge and work performance and to gain a better understanding of the patron experience. Andrew (club night supervisor), for instance, described “competition checks,” whereby gambling venue staff visit competing venues to “see what sort of operations the other venues are running.”

Cognitive distortions. In general, younger or newer staff were considered by respondents as being more vulnerable to cognitive distortions around gambling, seeing gambling as “easy money” after watching patrons win. However, the majority believed that staff were more influenced by player losses which, in turn, deterred them from gambling themselves. Betty’s (club staff) response was typical of many: “I probably gamble less [since I started working here], just because I’m sick of the place.” Responsible gambling awareness was also cited as a discouraging influence for some staff, but the limited training of newer or younger staff added to their vulnerability. Betty was sufficiently concerned with the propensity of newer staff to take up gambling, that she raised the matter with her hotel management. This vulnerability suggests a need for ongoing responsible gambling training so that newer staff are also trained.

Conclusions and Implications

This paper has presented an interpretive perspective from gambling venue employees as to how working in a venue influences their accessibility to gambling products and venues and their gambling behaviour. The results of 40 interviews with staff of hotels and clubs in Victoria, Australia were analysed and drawn together in relation to physical, social and cognitive accessibility to gambling.

Clearly, this study is subject to the usual limitations of qualitative research drawing on small and non-random samples, such that results cannot be generalised beyond the participant sample. Further, it cannot be claimed that the interview process did not introduce any bias. For example, interviewees may have been more or less honest and expansive due to the telephone administration of the interviews rather than if a face-to-face approach had been taken. Similarly, a longer interview time may have yielded additional insights. Also, while only one interviewer was used for consistency, it is possible that interviewer bias was present, although attempts were made to avoid this, particularly with the use of standardised questions. Further, the interviews did not ask about the interviewee's own gambling, as this was considered too personal. Therefore, it was not possible to distinguish amongst situational, regular and problem gamblers in the sample and whether their motivations for gambling differed. Nevertheless, an interpretive approach as utilised here is valuable in providing insights in two ways.

First, this study has shed further light on how working in a gambling venue can influence accessibility to gambling and, in turn, gambling behaviour, as the preceding data analysis has shown.

Second, this study has provided empirical support for the multi-dimensionality of accessibility as it pertains to gambling. While the Productivity Commission (1999) articulated nine dimensions of accessibility, their model has not been empirically tested. Indeed, most studies of accessibility to gambling have selected only one or a few dimensions of accessibility, usually in the physical domain. For example, proxy measures of gambling accessibility have included proximity or distance travelled, aggregate numbers of gaming machines in a jurisdiction, number of machines per head of population, and the spatial distribution of gambling facilities, as discussed earlier in this paper.

Yet, the staff interviews reported here highlight the importance of non-physical dimensions of accessibility on gambling behaviour. While it is accepted that physical access to gambling must be present for gambling to occur (even if that means only physical access to the Internet or telephone for some types of gambling), the staff interviews revealed the importance of non-physical dimensions of accessibility. In fact, where physical access is easy in terms of proximity, convenience and choice, it may be that the social and cognitive dimensions of accessibility are stronger determinants of where, when, how often and how much people gamble.

This contention has a number of implications. First, it suggests that research examining gambling accessibility would benefit from broadening how the construct is defined and then operationalised through related measurement tools. It may well be that a failure to do this in the past explains why research into the links between accessibility and gambling problems have been inconclusive and sometimes contradictory.

Second, most physical measures of accessibility to gambling have focused on population-level accessibility where, for example, numbers of gaming machines or casinos in a jurisdiction have been correlated against problem gambling prevalence rates in that population. Such efforts ignore additional factors that impact on individual-level accessibility. For an

individual who wishes to gamble on gaming machines, it may not matter whether the jurisdiction has 100 or 100,000 machines, or whether a venue has 10 or 100 machines. What enables gambling is if the person can get to at least one machine that they want to play, that they have spare time to do so when the venue is open, that they have the money to play, have sufficient know-how to do so, and that they personally feel that gambling on that machine is an acceptable thing to do. In addition to these enabling factors, there may well be a range of encouraging factors that then increase accessibility for that person. These might include, for example, encouragement from peers, a need to fill in time, enhanced knowledge about certain gambling products or a lack of other recreational opportunities.

Third, an expanded conceptualisation of accessibility to gambling might encourage policy-makers to rethink the efficacy of harm minimisation measures that limit only physical accessibility to gambling (e.g., caps on machine numbers, limits on opening hours). It may be that measures to limit the social accessibility of gambling (e.g., public education that denormalises heavy gambling) and the cognitive accessibility of gambling (e.g., consumer education aimed at lessening cognitive distortions around gambling) would be effective additions to accessibility-focused harm minimisation strategies.

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For correspondence: Professor Nerilee Hing PhD, Centre for Gambling Education and Research, Southern Cross University, P.O. Box 157, Lismore, NSW, Australia, 2480. Website: <http://cger.scu.edu.au>; Email: nerilee.hing@scu.edu.au.

Contributors: Nerilee Hing designed and gained funding for the study, administered the survey from which interviewees were recruited, co-wrote the literature review and compiled the paper. Sharen Nisbet conducted and analysed the interviews and co-wrote the literature review.

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Professor Nerilee Hing has a research focus on the management and strategic management of gambling venues, responsible provision of gambling, gambling policy and social impacts, particularly on population groups, including gaming venue staff, Indigenous people and women. She has conducted research projects for the New South Wales Casino Community Benefit Fund, Queensland Office of Gaming Regulation, Victorian Office of Gaming and Racing, Gambling Research Australia, the Australian Institute for Gambling Research, the SA Independent Gambling Authority, Australian Gaming Council, Clubs NSW, Club Managers' Association Australia, and various licensed clubs.

Sharen Nisbet is an Associate Lecturer in the School of Tourism and Hospitality Management. She has particular research interests in cashless gambling and gambling technologies. She has extensive practical experience in technology management, having worked in the information and communication technologies field for several years before joining the CGER as a research assistant in 2003. Her 1st Class Honours thesis focused on the advantages and disadvantages of cashless gaming technologies for a range of stakeholders. Sharen's research interests include gambling, new technologies, usability, management, organisational innovation and change management. She is currently studying for her PhD.

The attractions and risks of Internet gambling for women: A qualitative study

Roslyn Corney & Janette Davis

University of Greenwich, London, UK

Email: R.H.Corney@gre.ac.uk

Abstract

In this qualitative study, 25 females were interviewed who gambled frequently on the Internet. This paper describes the women's views about the Internet as a place to gamble and the associated risks. Volunteers were recruited from a wide range of sources in the UK and included 16 problem gamblers and 9 frequent gamblers. The women identified a number of features of the Internet that made it easy to gamble, such as its accessibility from home, its anonymity, and its privacy. The Internet was seen as less of a male domain and a place where women could learn to gamble. Frequent gamblers saw Internet gambling as a fun and social activity. All women recognised that they were at risk of excessive Internet gambling, and frequent gamblers had developed strategies to reduce these risks. The paper concludes with some measures that could identify and support those at risk.

Keywords: Internet gambling, women, United Kingdom

Introduction

Gambling has been traditionally seen as a predominately a male activity, but prevalence surveys suggest that in many countries, high proportions of women gamble (Abbott, Volberg, & Ronnberg, 2004; Productivity Commission, 1999; Welte, Barnes, Wieczorek, Tidwell, & Parker, 2002). The recent prevalence study of gambling in the UK (Wardle et al., 2007), with over 9,000 participants, indicated that 65% of women had gambled in the previous year (compared with 71% of men). This survey found that women were almost as likely as men to gamble on the National Lottery (59% men:56% women); equally likely to gamble on other lotteries (12% for both men and women), and more likely to use scratch cards (19% men:20% women) or play bingo (4% men:10% women). Although women were less likely than men to gamble on all other activities, 13% of women had gambled on horse racing and 10% on slot machines.

Studies on Internet gambling, however, suggest that male players still predominate (American Gaming Association, 2006; Griffiths & Barnes, 2008; Griffiths, Wardle, Orford, Sproston, & Erens, 2009). For example, the UK prevalence study indicated that 9% of men and 3% of women had gambled on the Internet in the last year (Wardle et al., 2007). A recent

more detailed analysis of this survey found that Internet gamblers were more likely to be male, single, well educated, and in professional or managerial employment than were non-Internet gamblers. Internet gamblers were also younger (55% were 34 years or younger) than non-Internet gamblers. This latter survey compared 476 Internet gamblers who bet or gambled on-line or used a betting exchange, but excluded lottery product buying, with the remainder of the sample who were non-Internet gamblers (Griffiths et al., 2009).

However, it is possible that these gender differences in Internet gambling will decrease over time, as has been found with non-Internet gambling (e-Commerce and Online Gambling Regulation and Assurance [eCOGRA], 2007). Whereas men generally start using the new technologies earlier than women, women take them up later once they recognise their convenience and ease, as with Internet shopping (Griffiths et al., 2009). It is also possible that women may find the Internet a more culturally acceptable way to gamble. One study of Internet gambling indicated that some women felt that Internet gambling was safer, less intimidating, and more anonymous, fun, and tempting than non-Internet gambling (Griffiths, 2001). This potentially large female market has been recognised by the gambling industry. Many of the gambling advertisements currently on television in the UK specifically focus on bingo and on encouraging women to gamble on-line.

Although a similar proportion of men and women may gamble, most studies and surveys suggest that men are at higher risk than women of developing a gambling problem (Bakken, Göttestam, Gråwe, Wenzel, & Øren, 2009; Griffiths & Barnes, 2008; Johansson, Grant, Kim, Odlaug, & Göttestam, 2009; Volberg, 2001; Wardle et al., 2007). For example, the UK prevalence survey found that the rate of problem gambling was 1% for men and 0.1% for women. However, international surveys have suggested that the gender gap in problem gambling is decreasing, especially in certain countries (Abbott et al., 2004) and may be associated with the availability of machines and casinos and with the “normalization” of gambling (Abbott et al., 2004).

Apart from prevalence, gender differences have been found for motivations to gamble and preferences for type of gambling chosen. Women generally prefer games of chance and those involving continuous forms of play; men prefer games with some skill and excitement (eCOGRA, 2007; Hing & Breen, 2001; Hraba & Lee, 1996; Wardle et al., 2007; Welte et al., 2002). Similarly, female problem gamblers have been shown to prefer a narrower range of games, predominantly those of chance, whereas problem gambling males tend to be multi-game players and to include activities that involve skill (Blanco, Hasin, Petry, Stinson, & Grant, 2006; LaPlante, Nelson, LaBrie, & Shaffer, 2006; Nower and Blaszczynski, 2006).

Escape from personal pressures, boredom, loneliness, social isolation, and depression are commonly cited reasons for gambling problems among females (Boughton & Falenchuk, 2007; Crisp et al., 2000, 2004; Legge, 1996; Lesieur, 1993; Lesieur & Blume, 1991; Trevorrow & Moore, 1998). These studies found that many women were gambling to escape from personal pressures and unpleasant inner feelings, gambling being seen as an avoidance strategy when under stress (Scannell, Quirk, Smith, Maddern, & Dickerson, 2000). Lesieur (1993) suggested that gambling can become a type of anaesthetic and can bring about a dissociative state, the gambler buying time away from problems.

There is also some suggestion that women problem gamblers are more socially anxious and avoid social activities compared with either male problem gamblers or women in general (Specker, Carlson, Edmonson, Johnson, & Kidman, 1996). This suggestion may partially explain female problem gamblers' choice of gaming activities, such as slot machines, where interaction with others is low. This finding also suggests that Internet gambling, which is playable in isolation, may be an attractive option for women problem gamblers.

Motivations for male problem gamblers are seen as being more associated with the enjoyment of the game itself, the sensory stimulation it produces, its excitement and arousal, and the possibilities of winning (Boughton & Falenchuk, 2007; Crisp et al., 2000, 2004). Some studies suggest that women have a more rapid progression into problem gambling than men do, although this could be a result of women generally starting gambling at a later age (Blanco et al., 2006; Nower & Blaszczynski, 2006; Potenza et al., 2001; Shaffer, LaBrie, LaPlante, & Kidman, 2002; Tavares, Zilberman, Beites, & Gentil, 2001).

The majority of studies have been conducted on men alone (or predominantly men) or mixed samples. Fewer studies have focused on women gambling or have used qualitative methods (Boughton & Falenchuk, 2007). This small-scale qualitative study focuses on female frequent Internet gamblers. It investigates in detail their views on Internet gambling, including both its attractions and risks.

Method

Participants, aged over 18 years, were recruited from a range of nationwide sources: special interest groups within Facebook, the GamCare Web site, membership of Gamblers Anonymous, university contacts and e-mail lists, and self-exclusion organisations. This wide range gave the study the advantage of being able to compare the experiences and views of frequent Internet gamblers with problem or ex-problem Internet gamblers.

Participants were given the option of an interview in person or on the telephone. Twenty-three participants preferred telephone contact. The interviews were semi-structured, generally took 1 hr, and were recorded digitally. The interviews were conducted in a supportive and non-judgemental manner. The majority of participants were offered £20 as reimbursement for their time.

The interviews focused on their views about Internet gambling, their gambling history, their motivations to gamble, and the impact that gambling had on their lives. Those who indicated that they had a problem with gambling were asked whether they have sought help and what they had found to be helpful.

Participants were given the Canadian Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001) through the post or by e-mail. Those that had given up gambling in the last 2 years were asked to answer the PGSI according to how they felt when they were last gambling. They were also asked to complete the Beck Depression Inventory to measure their current level of depression (Beck, Ward, & Mendelson, 1961).

Verbatim transcriptions were produced from the digital recordings. The analysis of the data was undertaken using NVIVO software. Key topics and issues were separately identified by the two investigators by reading the transcripts and listening to the recordings. Within-case analysis was conducted as well as across-case analysis. To protect participant identities, all names presented below are pseudonyms.

Results

All participants were British born, one defining herself as Black British and the others as White. They ranged in age from 22 to 59 years. Other demographic details are included in Table 1.

Nine frequent gamblers were identified. These participants scored from 0 to 6 on the PGSI screening tool (low or moderate risk gambling) but gambled at least twice a week on the Internet. Sixteen problem gamblers were identified. Their scores ranged from 9 to 26 (the cut-off point is 8 and the maximum score possible is 27). Problem gambling with the PGSI tool corresponds to pathological gambling as defined in the *Diagnostic and Statistical Manual of Mental Disorders DSM-IV* (American Psychiatric Association, 1994).

The women participants comprised a diverse population, from those with very limited resources and low incomes to those who were more middle class with some financial stability. One third of the participants were not working or off sick; the remainder were working part time or full time or were students. Employment ranged from poorly paid part-time work to highly paid professionals. Similarly, educational status ranged from leaving school at the age of 16 to postgraduate level.

Fifty-six percent of the women gambled entirely on games of chance, including bingo, slots, and casino-type games. The remainder either mainly played poker or played poker and games of chance.

The women were also asked to complete the Beck Depression Inventory (Beck et al., 1961). The mean and range of scores are given in Table 1. All the frequent players and 4 of the problem gamblers (none of whom were currently playing) had scores in the “normal, not depressed range” (scores from 0 to 10). Only 1 of the problem gamblers scored in the “minor depressed” range (scores from 11 to 17); 5 scored in the “moderately depressed” range (scores from 18 to 23); and 6 scored in the “severely depressed” range (scores of 24+; classification as suggested by Salkind, 1969).

Previous gambling patterns

Twenty-four participants indicated they had participated in different forms of non-Internet gambling before they started on the Internet. However, participation ranged from buying a lottery ticket once to very frequent casino gambling. Non-Internet gambling included

Table 1
Demographic characteristics and gambling activities

Characteristic	Problem gamblers (<i>n</i> = 16)	Frequent gamblers (<i>n</i> = 9)
Age (years)		
30 and under	2	2
31–40	9	4
41+	5	3
Marital status		
Married/cohabiting	12	3
Single/widowed/divorced	4	6
PGSI score		
Mean	18	3
Range	9–26	0–6
Beck Depression Score		
Mean	20	3
Range	3–34	0–8
Educational level		
Left school at age 16	5	5
Left school at age 18	5	2
Further education	2	1
Graduate education	4	1
Working		
Full time/part time/student	10	7
Not working/off sick	6	2
Recruitment source		
GamCare/GA/self-exclusion organisations	14	0
University e-mail/contacts (staff/students)	1	3
Facebook	1	4
Local advertisements	0	2
Currently gambling		
Yes	2	9
Gave up in last 3 months	9	0
Gave up for more than 3 months (up to 24 months)	5	0
Type of game played		
Games of chance only (including bingo)	10	4
Poker/mixed	6	5

Note. GA = Gamblers Anonymous; PGSI = Canadian Problem Gambling Severity Index.

bingo, the National Lottery, fruit machines and arcades, and scratch cards. Few women had gone to casinos or to betting shops.

Of the 16 problem Internet gamblers, 6 indicated they were problem non-Internet gamblers prior to starting on the Internet. However, 10 problem gambling participants did not appear to have previous non-Internet-based gambling problems. Two problem gamblers had hardly gambled prior to starting on the Internet. None of the frequent gamblers indicated a previous or current problem with non-Internet-based gambling.

How they first started Internet gambling

Six participants were first introduced to Internet gambling by friends or family. One participant had started by buying lottery tickets on-line. This led to scratch cards and then other gambling sites.

Nine participants indicated that they started Internet gambling as an impulsive response to an advertisement, pop-up, or promotion in a newspaper, on television, or on the Internet.

I have never dabbled in my life before, that's right and I just seen it one day in the XXX Newspaper and they had a promotion like, say if you put £10 on they would double your money . . . before I did this I never, I didn't even know they did on-line gambling. Never even thought of this, it never entered my head, I just honestly don't know what made me do it . . . Karen (problem gambler)

In the UK, the smoking laws changed in 2007 so that it was no longer possible to smoke while playing bingo in a bingo hall. This change led to a decrease in bingo attendance nationwide. In this study, 3 participants had stopped going to the bingo hall and had started Internet bingo instead.

Well, you can't sit and have a drink in the pub now – you can't smoke at all . . . I think that's why on-line bingo has become more popular . . . You can sit and have a drink and have a smoke in your own home. Sophie (frequent gambler)

Why is the Internet attractive to women?

Participants were asked when they started to gamble on the Internet and about their experiences. Although they were not specifically asked about the nature of Internet gambling, many talked about it being a medium that was particularly attractive for women who wanted to gamble. They also talked about the features of the Internet that encouraged excessive gambling.

Accessibility. Accessibility was mentioned by 23 participants as being an important factor in determining either their take-up of gambling or their degree of use. Once the Internet was available at home, gambling sites could be accessed on any day, at any hour. Participants did not need to go out, dress, or meet anyone else. Gambling was immediate and instant, and it was also safer than going out. All of these factors may be particularly important for women, who may need to spend long periods of time at home, often because of family responsibilities.

. . . it's very easy to go on-line and join it . . . there's no checks or anything, you can go in, you can plug in your credit cards, whatever, your debit cards and it takes out whatever you ask it to and that's it. Nicola (problem gambler)

I think it was maybe just about access. You know, I could play for 24 hours at a time without even having to get dressed, without even having to go out, it was brilliant it was . . . And there's so few controls . . . It's just far too easy, you know, just to log onto a site. Stephanie (problem gambler)

... a lot of people play bingo now instead of going out because going out to actually play it is probably more dangerous ... You know, you can go down the high street anywhere and get stabbed or something, you never know, and at least I am in the security of my own home ... Maggie (frequent gambler)

Privacy and anonymity. Another commonly mentioned factor (mentioned by 16 women) was that Internet gambling was anonymous and could be undertaken in privacy. This factor may be particularly important for women who may still feel that gambling carries a stigma. It may also be much easier to start playing games such as poker without the risk of embarrassment if one does badly.

... it's something that you can pick up anonymously ... When you log on you are anonymous, you know, you can have a go at this or that, no one knows what you are doing ... Rosemary (frequent gambler)

Less of a male domain. Twelve of the women interviewed felt that they would not feel comfortable in betting shops or playing live poker. Although there was some recognition that non-Internet gambling was changing, playing on the Internet was seen as much more acceptable and less intimidating.

I think it's just what's attached with it, the stigma I guess – it's seen as a man's thing ... I can remember as a little girl my nan saying "Oh, you can't go in the bookies with your dad, ladies don't go in there" and you know, the only gambling women would see was bingo ... Jackie (problem gambler)

Women will not go into bookies. Some will – obviously you get a percentage of women who will, but it's ... being on the Internet is ... I could hide everything. I went three years, three or four years just hiding it ... Lucy (problem gambler)

... you have got sites specifically aimed at women now. You have got XXX [bingo site], you have got XXX [bingo site] and they are all aimed at women ... Sophie (frequent gambler)

It is also possible to obscure one's gender on the Internet. One participant had originally used her own photograph but had changed it to a cartoon character because she had sometimes received negative comments about her appearance from other poker players.

... they just assume that you are a man unless you tell them otherwise ... I think some men do put women's pictures up to fool people and I think it probably works ... Rebecca (frequent gambler)

Ability to play for points or for free. Five participants had started playing because there was the facility to play for points rather than money. Gambling was therefore seen as a fun

activity without any cost, which may encourage those with limited resources to play. Some participants started off playing for points, as it gave them an opportunity to practice their gambling skills.

However, once they started playing for money, it was difficult to go back:

... when I first started I wasn't playing for real money; I first started on the free rolls, because I made sure I had a kind of an awareness of the game before I ever put any money in ... Rebecca (frequent gambler)

I tried to do it without the money but it didn't work. The money helps you to concentrate the mind, not just playing a game – it only works when you are gambling with money. Ruth (problem gambler)

Some of the women who had played for points commented that the odds of winning were often much more favourable for points than for money, leading to incorrect conclusions about the possibilities of winning.

And while I was playing bingo for real I would be playing slots for fun and the points mounted up and mounted up and mounted up, but when you started playing for real money, it didn't work like that ... you know you start to look at the small print and then it does tell you that when you are playing for points that the odds are different than when you are playing for real money ... Pam (problem gambler)

Socialising while still being at home. Many women had young children or caring responsibilities and were not able to go out easily. Gambling was something that they could do in the safety of their own home.

All of the frequent gamblers indicated the pleasure they derived from Internet gambling. This included not only the game, but the social aspects of the sites. It was “me” time. They could enjoy playing and chatting with people from the safe environment of their own home. Playing was seen as a very positive and fun activity, one with financial costs that were well worth it. Women playing poker mentioned the pleasure from developing a skill, competing, and winning.

... on the bingo site that I go on, you have got chat as well, so you can speak to people while you are gambling ... It's like being in a bingo hall again, so you still get to speak to the people while you are playing. Millie (problem gambler)

So then I got involved with the forums and chatting about things and there's quite a lot of us and actually there's more girls probably than what you think, purely of course because they don't go out if they have got kids ... it gives me something to do ... Maggie (frequent gambler)

... I chat to my friends ... I have met quite a lot of them. We all went on a cruise in March and so a lot of us met up and we had a great couple of days. I even took my nan with me! ... Hannah (frequent gambler)

The accompanying risks

These attractions mean that it is not only easy to gamble on the Internet, but it is also easy to gamble excessively. All of the women interviewed were aware of the risks. Frequent gamblers often had had problems in the past (or had a short period when they spent too much) and were aware that it could easily happen again. These frequent gamblers were aware of other women on the Internet sites who were gambling too much.

Not “real” money. Seven women talked about it not being “real” money and that they had to be careful not to lose track of spending. Either debit or credit cards are registered at the start of play, although participants generally regarded debit cards as more like real cash than credit cards.

...when you put the money in your account, it's just numbers on the screen. It isn't like you are handing money ... I couldn't imagine giving somebody £1,000 in cash for an hour's entertainment. It would be ludicrous, but I thought nothing of spending a whole month's salary in two hours ... Jackie (problem gambler)

If you were going to a bingo hall there is no way you would spend more than £10 because it is actually real money then, you see with a bank account, you don't think, it is not real money sort of thing. Karen (problem gambler)

Multiple game playing. Some participants (but not all) played multiple games on-line. They indicated that playing more than one game tended to increase the money they spent. Some found that playing one game could be too slow, others liked the challenge of playing multiple hands, and some believed that playing multiple hands would increase their chances of winning.

... when I was playing poker, I very rarely played less than three hands at once, or three games at once, and you can't do that in a live game ... I would do that for hours and hours and hours and hours at a time. It was just quite incredible. Stephanie (problem gambler)

Progression to problem gambling. The women's accounts suggest that progression to problem gambling could be relatively quick in many instances, taking between 2 and 4 months. The main factor that appeared to influence the development of problem gambling was that it provided escape and relief from problems. The second was winning, especially an early or a big win. The two together appeared to increase play.

For those who already had problem gambling in non-Internet modes, transferring their problem gambling patterns to the Internet seemed a rapid process. However, it seems just as rapid for those without prior problems.

I just thought it would be a bit of fun . . . and it was like that for the first two or three months I would think . . . Once or twice a week and usually once at the weekend . . . and then I had a big win off a 20p bet, I won a couple of thousand and then it changed into “Oh, if I bet more, I will win more” which I did, to the point that I was going on there every day when I got home from work and then until I went to bed – I was on there all weekend . . . that was in the February, I logged on first in the February and by the October . . . all of my savings had gone . . . Just under £60,000. Jackie (problem gambler)

Strategies used to avoid developing problems with gambling

Frequent gamblers talked about the strategies they used to keep their gambling within reasonable limits. Some focused totally on winning a poker game, played single rather than multiple hands, and avoided chat alongside play. Others spent more time on the chat games on sites, or by playing mainly for points. Overall, frequent gamblers planned before a session started, both in terms of financial limits and game strategies; stakes were kept small; and losses were not chased. This prior planning with controlled routines appeared to minimise the risks of being overridden by impulsivity.

Frequent gamblers also talked about their attitude towards winning and losing. Frequent gamblers did not always play to win and they certainly did not want to risk their financial security.

It was always very much a game, it's almost like you pay for the enjoyment of playing; it was never to get rich if you know what I mean. I think it's what causes people problems in gambling, when they think that it's going to lead them to get rich . . . it was never about the money. The money is a bonus if you are lucky enough to win, but it was always seen as luck, it was never “This could be a real way out, it could lead to something.” Anne (frequent gambler)

Difficulties in giving up and the ease of relapse

The problem gamblers' accounts indicate that giving up Internet gambling was not easy. The constant availability of the Internet meant that it was all too easy to relapse after a difficult or stressful day.

Every single person except for me had called in sick and something in my head snapped and without even consciously thinking about it, I had called my bank and got an overdraft again; I had called the gambling Web site that I went on and unblocked my account and spent £2,000 within 25 minutes and something switched in my head to say “Come on, what on earth are you doing?” and I stopped . . . Jackie (problem gambler)

Some problem gamblers talked about being tempted back into gambling by advertising or by receiving personal e-mails and promotions with bonus payments from the gambling industry.

I then stayed away from it for maybe about 6 months, 8 months um, and then I had been on the computer again one day and a pop-up came on for XXX [bingo site] and the next thing I knew I was on to the XXX [bingo site] um, and before I knew it I was gambling . . . Pam (problem gambler)

There are a number of external controls that people could use to avoid exposure such as the use of gambling blockers or the closure of their Internet account. These mechanisms were not commonly used. Only 2 of the 15 problem gamblers had disconnected the Internet or discarded their computer (one of these had not found that the blocker worked). The reasoning of others was that they did not wish to deprive other family members from this resource.

In addition to these 2 problem gamblers, 3 had successfully installed gambling blockers.

I am still on the Internet but I also have a block . . . so I actually can't go on anything like that. I can't do anything like that at all. I can only go to certain pages on the Internet now . . . I wanted to do that. Eileen (problem gambler)

However, another had managed to take the block off by rebuilding her computer and consequently started to gamble again.

The women were more likely to try to stop by asking the sites to ban them or by asking their banks not to supply credit. This was not straightforward, as often the sites (which were not always UK based) would refuse to ban them. For those that did, the bans were often only temporary and women could re-register easily, even the next day, by supplying their details. The women often found that the banks were not always helpful and it was all too easy to open up an additional credit card account with another company to access more funds.

Discussion

Participants' accounts suggest that the Internet is a much more attractive medium than traditional gambling venues for women gamblers. Many of the women interviewed did not feel comfortable in betting shops or playing live poker. Traditional gambling (apart from bingo) was seen as male dominated and women may feel out of place or embarrassed by their lack of knowledge or experience. Although non-Internet gambling may be changing, playing on the Internet was seen by participants as much more acceptable and less intimidating.

In addition, the traditional place for women to gamble, the bingo hall, is in decline. Many of the women had regularly played non-Internet bingo, although none had indicated that they had developed a problem from playing at these venues. Three of the women in this study had started playing on the Internet because of the smoking ban.

As has been found in the majority of other studies, probably the most important factor in determining use of the Internet is accessibility (American Gaming Association, 2006; Griffiths, 2003; Griffiths & Barnes, 2008; Wood & Griffiths, 2008; Wood, Williams, & Lawton, 2007). Accessibility was mentioned by nearly all participants as being an important

factor in determining either their take-up of gambling or their degree of use. It was easy to start gambling for the first time (apart from the lottery), and many women started impulsively after seeing a pop-up or advertisement. However, playing from home is not only accessible and easy, but it is also relatively safe, which may be another important factor for women (as found in the eCOGRA survey, 2007).

Another important factor is anonymity. Gambling can be done in secret, where one can try one's hand at a variety of games and gradually build up skills, experience, and knowledge without seeming a fool.

Internet gambling was seen by many as a free, fun activity. Women were able to start playing for points while they were learning the game. However, once they started playing for money, it was difficult to go back.

These reasons have also been found in large-scale surveys of both men and women. One study, which included 1,920 participants (44% were women), mainly from the US and Canada, found that people preferred the Internet because of its relative convenience, comfort, ease, and privacy (Wood et al., 2007). A recent American Gaming Association (2006) study found that the main reasons people gave for gambling on-line were convenience (48%); fun/excitement/entertainment (24%); greater comfort and not having to drive (24%); ability to win money (9%); and enjoyment of the anonymity and privacy (6%). Wood and Griffiths (2008), in their study of Internet poker players, found that casual players (as opposed to professionals) played for the convenience, ease of learning, low stake size, relief from boredom, and social interaction.

However, the very attractiveness of the Internet means that there are accompanying risks. Griffiths's (2003) work has suggested that specific features of the Internet that encourage problem gambling include the ability to play continuously and rapidly, large stakes, and often playing several games at once. Findings in the current research agree with this conclusion. Certain aspects of the Internet encouraged women not only to gamble, but to gamble excessively. This included gambling for long periods without detection, the use of multiple games, and high stakes. Women are still more likely to play non-skill games such as the slots or bingo, which can be particularly problematic because they are continuous forms of play (Cornish, 1978; Orford, Sproston, Erens, White, & Mitchell, 2003).

Another difficulty, however, is that Internet gambling may be particularly attractive for many of the more vulnerable groups in the UK. These groups include those spending long periods at home, including the ill, disabled, socially isolated, or housebound. They also include women with caring responsibilities, either for young children or for the elderly or disabled. The gambling may start off as a form of entertainment to stop them from feeling lonely, isolated, or bored. For many (as in this sample), gambling may continue in the same way; however, in a proportion of them it will not.

One important issue is whether the Internet gambling will increase the problem gambling prevalence rate. Whereas 6 of 16 problem gamblers had had problems with gambling prior to their use of the Internet, 10 indicated that they had not. These 10 had either gambled

very little or had managed to keep their gambling under control when it was non-Internet based. Other studies suggest that the prevalence of problem gambling is higher among Internet gamblers than among non-Internet gamblers (Griffiths & Barnes, 2008; Griffiths et al., 2009; Wood et al., 2007). However, it is difficult to ascertain whether these high prevalence rates are due to the Internet offering less protection to those who may be “at risk,” or whether these vulnerable gamblers are more likely to opt to gamble on the Internet because of its constant accessibility and ease of use.

It is also possible that progression to problem gambling from more normal levels of play may be quicker with Internet gambling than with non-Internet gambling. It may be more difficult to give up Internet gambling and easier to relapse. The Internet can be accessed during periods of vulnerability and impulsivity. Problem gamblers found that they were being bombarded by e-mails or pop-ups as soon as they turned on the computer. By contrast, traditional non-Internet-based gambling venues will normally entail a journey and may not be open, thus giving a little more time for reflection.

One relatively easy way of giving up would be to install a blocker or to disconnect the Internet. However, most problem gamblers reasoned that the family needed the Internet and it would be unfair to deprive them. Only 3 of 16 had successfully installed blockers. Others were unsure how these blockers would work. However, it is likely that much of this reticence against the use of blockers or discontinuing the Internet was due to ambivalent feelings surrounding gambling.

None of the participants in this study engaged in Internet sport betting, which has been found to be popular among male Internet gamblers (Valentine & Hughes, 2008; Wardle et al., 2007). However, it is likely that these traditional differences are being broken down. Approximately one third of the women in this study were predominately playing poker, they were thrilled and excited by the challenge and competition, and they could obscure their gender if they so wished. It seems likely that with the advent of the Internet, the gap between the two genders will decrease still further, with women trying their hand at different games because of the complete anonymity and lack of stigma. The survey conducted by eCOGRA (2007) also suggested that this may be the case.

Social responsibility measures

One of the great difficulties with Internet gambling is that it is provided by a range of international providers, many of whom are not subject to UK regulations and may not have signed up for socially responsible gambling. Providers can even specifically target problem gamblers to continue their excessive gambling, if they so wish. This international provision means that it is particularly difficult to regulate Internet gambling and ensure that social responsibility measures are in place.

Griffiths (2003) has made a number of suggestions to encourage social responsibility in Internet gambling and the results of the current study would endorse these suggestions. Measures include ensuring that Web sites display prominent links to their social responsibility partners, the use of cautionary notes, information on where to obtain help, accreditation by

external organisations, built-in pauses, and procedures for the confirmation of bets or the right to change one's mind.

However, a number of other measures may be valuable. It is important that vulnerable groups are not specifically targeted by the gambling industry, and measures offering protection need to be considered. Excessive spending, long periods spent gambling, and gambling late at night could be used to identify women (and men) at risk. Another measure is to make self-exclusion easier and less temporary. The women in this survey found that self-exclusions were often temporary and that banks and credit card companies were not willing to act or enable this process of self-exclusion or agree to set credit limits on spending.

The practice of giving different and better odds for free or practice games was also problematic. Having the same odds or displaying them prominently on the Web site (rather than in small print) may improve matters. Similarly, the practice and impact of offering advertising promotions, such as being given extra free plays or doubling the stake money, may not only encourage women to start gambling, but also to overspend. These practices were also the reason that some problem gamblers relapsed.

Although the material obtained was rich and detailed, there were a number of limitations to this study. Recruitment was difficult, which made the sample size small. Women were recruited from a wide range of sources, which would have influenced the nature of the sample. The majority of the problem gamblers who agreed to be interviewed were in the process of trying to give up, or had given up, and this would have affected their recall. Three participants, who were classified as problem gamblers, indicated that they would not have been able to discuss their gambling while they were still immersed in it. This seems a very likely reason that currently active problem gamblers were difficult to recruit. The £20 voucher was mainly given at a later stage of the project in order to encourage frequent gamblers to take part. Few problem gamblers took up the offer.

Despite these limitations, a qualitative study such as this can obtain very detailed information on the experiences of these women, their motivations, and their views. The findings of the study can be used to provide a starting point for further quantitative studies to investigate certain aspects in more depth.

Further studies

A range of studies is necessary to ascertain whether there are more inherent risks associated with Internet gambling and what these may be. Studies are needed to investigate whether progression to problem gambling can occur at a quicker pace on the Internet and whether the constant accessibility means that it is more difficult for gamblers with difficulties to give up, cut down, or not relapse back into gambling.

Additional studies and evaluations need to investigate how best to support Internet gamblers, both those at risk and those who already have problems. These studies should include the evaluation of preventive, social responsibility, and educational measures, as well as the role of non-specialist agencies, self-help groups, and support and treatment facilities. It is also

important to ensure that women are adequately represented. Different methods of support may be necessary to engage women or to reduce the impact of excessive gambling. They may respond differently than men to different types of preventive activities, educational messages, and treatment strategies.

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For correspondence: Professor Roslyn Corney, PhD, C.Psychol, University of Greenwich, Bronte Hall, Avery Hill Road, London SE92UG, +44(0)208 331 8926, Email:R.H.Corney@gre.ac.uk

Roslyn Corney is currently Professor of Psychology at the University of Greenwich. Her current research is focused on problem Internet gambling. Her previous research at the Institute of Psychiatry focused mainly on the treatment of depression and anxiety within the general practice setting. Her research studies have included the evaluation of counsellors attached to general practice; gender differences in help-seeking; the use of formal and informal sources of help; assessing psychosocial and psychosexual adjustment following surgery for cancer; GP attitudes towards preventive medicine; patient satisfaction with medical care; and studies of clients' views about treatment.

Janette Davis (BSc Hons Psychology) is a BPS registered psychologist and is completing her doctorate in Internet gambling at the University of Greenwich. Her interests are in Internet gambling and the role of gender and type of game played.

Roslyn Corney wrote the project proposal, received the funding, conducted the interviews, was involved in the data analysis, jointly wrote the final report, and wrote the paper. Janette Davis was involved in the data analysis and jointly wrote the report for RGF on which this article was based. She also made comments and contributed to the paper.

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Implicit measures of attitudes toward gambling: An exploratory study

Sunghwan Yi & Vinay Kanetkar

University of Guelph, Guelph, ON

E-mail: syi@uoguelph.ca

Abstract

Gambling researchers have used self-report measures in order to assess gamblers' attitudes toward gambling. Despite their efficiency, self-report measures of attitudes often suffer self-presentation and social desirability bias when they are used to assess socially sensitive or stigmatized issues. This concern has led to the recent development of indirect, non-reactive measures of attitudes in psychology. These implicit measures of attitudes tend to reveal automatic, impulsive mental processes, whereas the self-report measures tap conscious, reflective processes (F. Strack & R. Deutsch, 2004). In this paper, we demonstrate how response latency-based measures can be used to investigate attitudes toward gambling. We report findings of our empirical study, in which evaluative priming (Fazio et al., 1995) and the Single Category Implicit Association Test (SC-IAT; Karpinski & Steinman, 1996) were used to assess implicit attitudes toward gambling, and the Single Target IAT was adapted to assess implicit arousal-sedation associations of gambling. With a sample of 102 undergraduate students, we found that latency-based measures of attitudes toward gambling were not significantly correlated with self-report measures. Moderate-to-high-risk gamblers held more positive attitudes toward gambling in the SC-IAT and exhibited more positive and more negative attitudes toward gambling in the evaluative priming task than did low-risk gamblers.

Keywords: implicit attitudes, attitudes toward gambling, automatic processing, response latency

Introduction

Attitudes are defined as “a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor” (Eagly & Chaiken, 1993, p. 1). Attitudes are an important construct in psychology and behavioural science because they provide valenced summaries of an object or issue that serve as “predisposition or readiness for response” (Allport, 1935, p. 805). In other words, attitudes signal individuals about whether objects are good or bad and thus serve as an important precursor of relevant behaviour. Attitudes have been theorized as being one of the most important predictors of behaviours (e.g., Fazio, 1990; Fishbein & Ajzen, 1975), and attitudes have been found to be highly predictive of addictive behaviour (e.g., Leigh, 1989a). The importance of studying attitudes toward gambling has been recently recognized in the field of gambling (e.g., Breen & Zuckerman, 1999; Jackson, Dowling, Thomas, Bond, & Patton, 2008; Kassinove, 1998; Moore & Ohtsuka, 1997).

The assessment of attitudes has traditionally relied on self-report measures in the area of gambling and addiction research, as well as in psychology. Even though self-report measures of attitudes have many advantages, such as efficiency and reliability, they are often subject to limitations. According to Brunel, Tietje, and Greenwald (2004), self-report measures of attitudes are based on three assumptions: (a) that the participant has already formed an opinion or is able to construct one spontaneously, (b) that the participant has conscious access to his or her attitudes, and (c) that the participant is willing to share his or her attitude accurately with the researcher. Among these, the second and the third assumptions are problematic in assessing attitudes toward addiction and gambling. Because gambling activities are often socially stigmatized (Preston, Bernhard, Hunter, & Bybee, 1998), explicit attitude measures may suffer substantial impression management issues and social desirability bias. In other words, gamblers are highly likely to be motivated to underreport their favourable beliefs about gambling on self-report measures. Furthermore, individuals who recently started gambling may not have conscious access to their attitudes toward gambling because they have not had sufficient opportunities to deliberate on their gambling experience. These limitations of self-report measures of attitudes have led psychologists to consider implicit or automatic measures of attitudes (Greenwald & Banaji, 1995) toward sensitive objects and issues.

Overall, the topic of automatic processes has not received wide attention in the field of gambling. We review a small number of recent studies on automatic activation of gambling-related *non-evaluative* associations. McCusker and Gettings (1997) used a modified Stroop task in order to explore the automatic accessibility of gambling concepts in problem gamblers' memory. In the classic Stroop task, participants are instructed to name, as quickly as possible, the colour of ink in which words (e.g., red) are written. Participants tend to take longer to do so when other colour name words (e.g., blue, yellow) are presented than when non-colour words are presented. This finding is interpreted as the automatic activation of a colour word's meaning interfering with the task of naming ink colour. McCusker and Gettings (1997) found that when asked to name the colour of ink in which words were written, problem gamblers took much longer to colour name gambling-related words than non-gambling words. Similarly, Boyer and Dickerson (2003) reported that gamblers who suffer impaired control took significantly longer to name the colour of the words related to gambling, whereas this finding was not observed among high control gamblers. These findings suggest that gamblers have a high activation potential of gambling-related associations in their memory due to frequent gambling.

Zack and Poulos (2004) studied the priming effect of an amphetamine on automatic activation of the gambling concept. The priming of the amphetamine significantly increased problem gamblers' response to gambling words in the lexical salience task, but it inhibited their responses to neutral words. As expected, the amphetamine's selective activation of gambling words was not observed among non-problem gamblers. In another study, Zack, Stewart, Klein, Loba, and Fragopoulos (2005) assessed the extent to which gambling wins are associated with alcohol consumption in problem gamblers' memory using a response time-based measure. They found that gamblers who drank when they won showed faster response times on trials when alcohol-related words were paired with gambling win words than when they were paired with gambling loss words. This finding

suggests that frequent drinking in response to gambling wins creates strong associations between gambling wins and alcohol in the gambler's memory. These automatic associations are likely to prompt gamblers to drink when they are winning or when they anticipate winning.

These studies clearly demonstrate the importance of automatic memory processes in studying the psychology of gambling. However, to the best of our knowledge, no previous study has investigated the implicit attitudes or automatic processes behind the evaluation of gambling. In the next section, we provide a brief overview of implicit attitudes and recently developed measures of implicit attitudes.

Implicit attitudes

According to dual process models, addictive behaviours are determined by the dynamic interaction of two different qualitative processes: the fast, automatic "impulsive system" and the slow, deliberative "reflective system" (Strack & Deutsch, 2004). The reflective system is responsible for carrying out processes of rule-based reasoning and of symbolic representation. For example, the reflective system generates deliberative judgments and decisions, and serves executive functions, such as scheduling casino trips in advance, resisting the temptation to gamble, or preparing plans for reducing the frequency of casino visits. Because the reflective system is slow and amenable to conscious access and deliberation, self-report measures are suitable for assessing the reflective processes of gambling.

On the other hand, the impulsive system refers to "a network in which information is processed automatically through a fast and parallel spread of activation along the associative links between contents" (Strack & Deutsch, 2004, p. 208). Specifically, the impulsive system represents patterns of activation in an association network, which are organized on the basis of close temporal or spatial proximity. For example, the impulsive system is mainly responsible for the simultaneous activation of the concept of gambling and positive affect in memory, which is thought to be prevalent in individuals who find themselves engaging in Internet gambling against their resolution not to gamble on-line. Unlike the reflective system, the impulsive system is posited to operate on the basis of automatic activation of associative links in memory and to require little cognitive capacity (Strack & Deutsch, 2004). Implicit measures of attitudes have been considered one promising way of assessing the strength of automatic association between a focal concept (e.g., gambling) and valence (i.e., positivity/negativity) in memory.

A popular definition of implicit attitudes is "introspectively unidentified traces of past experience that mediate favorable or unfavorable feeling, thought, or action toward social objects" (Greenwald & Banaji, 1995). Even though this definition of implicit attitudes is often interpreted as implicit measures of attitudes that provide "unconscious" access to attitudes, recent studies show that individuals often realize that they possess the attitude that is being assessed by response time-based measures (De Houwer, 2006). However, recent empirical findings suggest that response time-based implicit measures of attitudes

have other functional properties of “automatic” or “implicit” mental operation. Specifically, compared with self-report measures, implicit measures of attitudes are less susceptible to deception and social desirability bias (i.e., “uncontrollable”) and reflect the to-be-measured attitude even though individuals try not to reveal it (i.e., “unintentional”) or even when individuals’ cognitive resources are diverted into other demanding tasks (i.e., “efficient”; see De Houwer, 2006, for a review). These automatic properties of implicit measures of attitudes are ideal in assessing attitudes toward objects or issues that individuals are motivated to hide or underreport.

Originally developed to assess attitudes toward racial stereotyping (e.g., Greenwald & Banaji, 1995), several implicit measures of attitudes have been developed and used to study diverse issues, such as attitudes toward racial and gender stereotypes, consumer products (e.g., Brunel et al., 2004), and voting behaviour (Bassili, 1995). Despite several differences between these measures, the commonality is that they indirectly assess attitudes by measuring response latency; in other words, they measure how quickly participants perform some tasks that are indirectly associated with the target issue. It is inferred that the faster a participant responds to the combination of the focal issue (e.g., slot machines) and positive stimuli (i.e., words or pictures), in comparison to their response time to the same focal issue and negative stimuli, the more favourable are their attitudes toward the focal issue. Previous research on implicit attitudes toward addictive behaviours such as smoking and alcohol use attests to the usefulness of implicit measures of attitudes (see Wiers & Stacy, 2006, for a review). For example, a recent meta-analysis by Rooke, Hine, and Thorsteinsson (2008) of 72 studies confirmed a strong relationship between implicit attitudes toward substance use (including alcohol and cigarettes) and substance use behaviour ($r = .27, p < 0.001$).

Implicit measures of attitudes may be also highly relevant in the clinical setting because their indirectness enables clinical practitioners to circumvent gamblers’ motivations to hide or underreport their positive attitudes toward gambling. Furthermore, implicit measures of attitudes may be particularly useful to detect extremely positive automatic associations of gambling in some gamblers before their gambling problem becomes extremely serious. However, to the best of our knowledge, implicit measures of attitudes have never been used to assess attitudes toward gambling.

The main purpose of this manuscript is to introduce implicit measures of attitudes to the field of gambling research and to demonstrate the implementation of these measures in the gambling context. We will offer a brief overview of implicit measures of attitudes used in the fields of alcoholism and smoking and of the major findings from previous research. Next, we will report our empirical study in which three implicit measures of attitudes toward gambling, as well as explicit measures of gambling attitudes, were employed. We will discuss major findings of the study and implications for future research.

In this section, we provide a brief overview of implicit attitude measures used recently in alcoholism and smoking research, and a synopsis of the major findings (for an extensive review, see Wiers & Stacy, 2006).

Evaluative priming. The evaluative priming procedure was originally designed by Fazio, Jackson, Dunton, and Williams (1995) to assess implicit attitudes toward racial prejudice. In this paradigm, respondents are first asked to categorize positive and negative words followed by a mask (e.g., a string of X's). In the next phase, respondents are briefly presented with exemplars of attitude objects, such as visuals (e.g., bottles of alcoholic beverage) or words (e.g., "bar," "whiskey"), which are immediately followed by the mask and the presentation of positive and negative words (i.e., "targets"). The participant's task is to categorize the target word as quickly as possible by pressing a "good" or a "bad" response key. Responses to the target are likely to be faster if the evaluations of the prime and the target match (e.g., both are negatively evaluated) than if they mismatch. The magnitude of the response time difference between the match and the mismatch indicates a person's attitude toward the prime.

Palfai and Ostafin (2003) used this procedure to assess implicit attitudes toward alcohol. Participants engaged in the evaluative priming task either before or after consumption of beer. The investigators found that heavy drinkers responded significantly faster in response to positive words than to negative words, which were preceded by alcohol-related words, after they consumed beer. But heavy drinkers' response time to negative words was also faster when preceded by alcohol-related words than it was when preceded by neutral words. This finding indicates that heavy drinkers' implicit attitude is ambivalent even though it is more positive than negative.

The advantage of evaluative priming is that it is better suited to explore ambivalent attitudes toward the focal category because this procedure was designed to separately assess positive and negative automatic associations of the category.

The Implicit Association Test. The Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998) is probably the most widely used implicit measure of attitudes in the field of social cognition. The IAT is designed to assess the extent to which the target issue or object (e.g., alcoholic drinks) is more or less strongly associated with positivity rather than negativity relative to the comparison issue or object (e.g., soft drinks). In the IAT, this relative strength of automatic associations is revealed by faster or slower performance in categorizing stimuli in the two different combinatory key assignments. The task for participants is to categorize a series of stimuli appearing in the centre of the computer screen into four categories (e.g., alcohol, soft drinks, positive, and negative) by typing one of the two keys. In one combination block, the target issue and the positive category are assigned to one key and the comparison issue and the negative category are assigned to another key. In the other combination block, the key assignment is reversed. The less time it takes for the participant to respond to stimuli in the former versus the latter combination task, the more strongly the target (e.g., alcohol) is associated with the positive valence than the negative valence relative to the comparison category (e.g., soft drinks). In essence, the IAT assesses attitudes toward the focal issue relative to another issue in a bipolar fashion (e.g., on a positive-negative continuum).

Wiers, van Woerden, Smulders, and de Jong (2002) used the IAT to assess heavy and light drinkers' attitudes toward alcoholic drinks relative to soft drinks on the valence dimension. These researchers found that both heavy and light drinkers were much faster when alcoholic

drinks were associated with negative words (and sodas with positive words) than when alcoholic drinks were associated with positive words (and sodas with negative words). In other words, both heavy and light drinkers held negative implicit attitudes toward alcoholic drinks relative to soft drinks. In contrast, both groups of drinkers reported positive attitudes on the explicit measures (above the midpoint of the scale). This finding showed a clear dissociation between explicit and implicit measures of attitudes toward alcoholic drinks.

In the same study, Wiers et al. (2002) adapted the IAT to assess drinkers' implicit associations of alcoholic drinks relative to soft drinks on the arousal-sedation dimension. They found that heavy drinkers were much faster when alcoholic drinks were associated with arousal words (and sodas with sedation words) than when alcoholic drinks were associated with sedation words (and sodas with arousal words). In other words, heavy drinkers showed stronger arousal associations toward alcoholic drinks relative to soft drinks. Light drinkers did not show such a difference. Finally, the combined score of the two IATs significantly increased the prediction of alcohol use, after the investigators controlled for age, gender, and explicit measures of attitudes. Similar findings were reported in Wiers et al. (2003); Wiers, van de Luitgaarden, van den Wildenberg, and Smulders (2005); and De Houwer, Crombez, Koster, and De Beul (2004).

One disadvantage of the standard IAT is that it assesses participants' attitudes toward a focal object *in relation to* another object (i.e., the "comparison category"). For example, the IAT has been used to study individuals' attitudes toward alcoholic versus non-alcoholic drinks in the field of addiction research. This poses challenges when there is no natural comparison category, as unfortunately is the case with both smoking and gambling. Specifically, the positivity of individuals' attitudes toward gambling assessed with the IAT will be highly dependent on the attractiveness of the comparison category. Furthermore, the relative nature of the standard IAT makes it difficult to draw a conclusion from, say, negative implicit attitudes toward alcohol versus soft drinks. This result may be because individuals have a negative attitude toward alcohol, or because they have a positive attitude toward soft drinks, or both.

Single Category IATs. Recently, researchers have developed IAT variants that are designed to assess absolute attitudes toward a single object or issue: Single Target IAT (ST-IAT; Wigboldus, Holland, & van Knippenberg, 2004) and Single Category IAT (SC-IAT; Karpiński & Steinman, 2006). These two procedures are conceptually identical, differing only in minor procedural details. Even though the SC-IAT has not been used to assess attitudes toward addiction behaviour, it has been successfully used to gauge individuals' attitudes toward tempting food (e.g., chocolate and potato chips; Frieze, Hofmann, & Wänke, 2008). Huijding and de Jong (2006) used the ST-IAT to assess attitude toward smoking and found that habitual smokers showed strong positive (rather than negative) implicit associations with pictorial smoking stimuli. In contrast, non-smokers showed negative (rather than positive) implicit associations with smoking stimuli. Furthermore, Huijding and de Jong (2006) reported that implicit associations assessed with the ST-IAT were significantly correlated with craving for smoking, but self-reported attitudes were not. This finding is in contrast to previous findings based on the standard IAT that heavy smokers showed negative implicit attitudes in relation to contrast categories (e.g., Swanson, Rudman, & Greenwald, 2001).

In our view, the SC-IAT and ST-IAT are better suited to the assessment of automatic associations of gambling than the standard IAT because they are designed to assess automatic cognitions in an absolute rather than a relative manner.

Research questions

In this paper, we pursue the following two research questions. First of all, we attempt to explore the utility of response latency measures of attitudes in assessing individuals' attitudes toward gambling. We expect that to the extent that response latency measures of attitudes tap more automatic processes of gambling than do self-report measures of attitudes, the association between the two will be relatively small.

Further, we predict that individuals with a greater risk for gambling problems will have more positive implicit measures of attitudes than will those with a lower gambling risk. In other words, problem gamblers are likely to have highly accessible automatic links between the concept of gambling and positive affect because of the high frequency and long duration of their gambling activities. Thus, the strength of positive implicit associations of gambling is likely to increase as problem gambling severity rises.

However, it is possible that problem gamblers may also have a strong automatic association between the concept of gambling and negative affect in their memory to the extent that they consistently experience negative affect in the course of gambling (e.g., disappointment, guilt). The view that as the frequency of substance use increases, both positive and negative automatic associations about substance become highly accessible has received empirical support (e.g., Jajodia & Earleywine, 2003). This finding was often obtained when researchers used implicit measures of attitudes that enabled them to separately assess positive associations and negative associations of gambling (e.g., evaluative priming task). Unlike IAT variant procedures, the evaluative priming task produces unipolar effect sizes, one for positive implicit associations and another for negative implicit associations. We predict that the evaluative priming task will reveal that as a gambling problem becomes more severe, both positive and negative automatic gambling associations will become stronger. In contrast, SC-IAT produces the bipolar effect size estimate, or the extent to which the focal object or issue is more strongly or weakly associated with the positive category than the negative category. Because we do not have an a priori hypothesis about the directionality of the SC-IAT effect estimate, we decided to investigate this issue in an exploratory fashion.

Lastly, we assessed the strength of automatic arousal-sedation associations of gambling. Arousal-sedation has been conceptualized as a predominant dimension of human affective experiences along with valence (Lang 1995; Russell, 1980). Previous findings that problem gamblers revealed greater autonomic arousal when exposed to gambling stimuli (Sharpe, Tarrier, Schotte, & Spence, 1995) suggest the possibility that problem gamblers may have strong automatic arousal associations. Related to these results, recent findings from alcohol research showed that heavy drinkers had stronger arousal-related automatic associations than did light drinkers, whereas the two groups did not differ in sedation-related automatic associations (De Houwer et al., 2004). Thus, we hypothesized

that to the extent that problem gamblers strive for increasingly more intense stimulation and excitement from the act of gambling than other gamblers do, the index of problem gambling is likely to be positively correlated with arousal-implicit associations of gambling.

We presumed that the arousal-sedation dimension might be highly informative in gambling attitudes even though this dimension was distinct from the valence or attitudes. In other words, it is likely that gambling motivations are accounted for by the extent to which gambling is automatically associated with arousal and/or sedation. The arousal-sedation dimension was found to be an important component of implicit associations of alcohol (Wiers et al., 2002). This presumption is further corroborated by findings from research in emotions that arousal and valence are two predominant dimensions of human affective experiences (Lang 1995; Russell, 1980).

Method

Participants

One hundred and five undergraduate students in a medium-sized university in North America participated in the study in exchange for partial course credits (mean age = 21 years, $SD = 1.12$). Fifty-six percent of the participants were male. The majority were Caucasian (i.e., 78%), and 17% were of Asian decent.

Instruments

Measure of problem gambling. We used the Canadian Problem Gambling Index (CPGI; Ferris & Wynne, 2001) in order to measure the degree of problem gambling. The CPGI offers a 9-item based index that assesses problem gambling behaviour and consequences (e.g., “How often have you bet more than you could really afford to lose?”, “How often has your gambling caused any financial problems for you?”). Each item uses a 4-point scale, anchored by 0 (*never*) and 3 (*sometimes*).

Explicit measures of attitudes. We selected Breen and Zuckerman’s (1999) Gambling Attitudes and Beliefs Scale (GABS) as a self-report measure of attitudes toward gambling. GABS is a 35-item, 4-point scale, which is anchored by *strongly disagree* and *strongly agree*. GABS items were constructed to capture a wide array of positive evaluation of gambling (e.g., “Gambling makes me feel alive”), cognitive biases and irrational beliefs (e.g., “Sometimes I just know I am going to have good luck”), and chasing behaviours (e.g., “If I lose, it is important to stick with it until I get even”). According to the authors, all the items of GABS loaded on one big factor, which can be represented as a general affinity to gambling.

In addition, we included Steenbergh, Meyers, May, and Whelan’s (2002) Gamblers’ Beliefs Questionnaire (GBQ) as another self-report measure of gambling cognition. GBQ is a self-report measure of gambling-related cognitive distortions that assesses illusion of control and overestimation of the likelihood of winning. Even though GBQ is not a

measure of gambling attitudes, we included it to assess non-evaluative gambling-related cognitions.

Implicit measures of attitudes toward gambling. We used three response latency procedures in order to assess participants' implicit gambling associations. All of the implicit attitude procedures were designed with DirectRT software.

Evaluative priming. We adapted Fazio et al.'s (1995) evaluative priming procedures in order to assess automatic positive and negative associations of gambling. The purpose of the first block was to obtain baseline data. The mask (i.e., a string of X's) was shown for 300 ms and was followed by positive words or negative words (see the Appendix for the list of words used in the procedure). Participants were asked to categorize each of the words in the positive and negative categories as fast as possible. One half of the participants pressed the "/" key in response to pleasant words and the "Z" key in response to unpleasant words. The key assignment was the opposite for the other half of the participants. The DirectRT software recorded response time, categorizing the positive words (i.e., P_N) and the negative words (i.e., N_N).

In the second block, participants were exposed to "target" (i.e., gambling) visuals (e.g., playing slot machines). Participants were told that they would be asked to remember these visuals in the next phase. The third block involved a recognition test of the visuals presented in the second block. Participants were asked to press the "/" key if the visual had appeared in the previous task or to press the "Z" key otherwise. Each visual remained on the screen for a maximum of 5 s. A 2.5-s interval separated each trial. Participants were exposed to eight "target" visuals that had appeared in Block 3 and eight "filler" visuals not previously presented (i.e., non-gambling related visuals such as playing pool).

The last block involved the priming followed by participants' response to the target. Specifically, gambling visuals were primed for 275 ms, followed by the mask (i.e., a string of X's) and a 250-ms interval before the onset of the target adjectives, which were either positive or negative. A 2.5-s interval separated each trial. Half of the participants were asked to press the "/" key if the target word was positive and the "Z" key if it was negative. The key assignment was the opposite for the other half. The DirectRT software recorded response time for categorizing the positive words (i.e., P_X) and the negative words (i.e., N_X) following the participants' exposure to the gambling visuals. Response latency for gambling-positive association was calculated as the extent to which brief exposure to gambling visuals facilitated the task of categorizing positive (negative) words in Block 4 compared with the baseline task in Block 1. We followed the convention of subtracting the reaction time (RT) in Block 4 from the RT in Block 1 for positive associations and negative associations separately (i.e., the priming positive latency = $P_N - P_X$; the priming negative latency = $N_N - N_X$). Thus, the positive sign of the latency indicated that the facilitation effect of priming visuals was strong in relation to the baseline.

SC-IAT. We adapted Karpinski and Steinman's (2006) SC-IAT procedure in order to assess the non-relative implicit attitude toward gambling. Our SC-IAT unfolded in two stages, each of which consisted of one practice block and two test blocks. In the first phase, participants

were instructed to press a left-hand key (e.g., the “E” key) as soon as possible in response to exemplars of the “pleasant” category and the target category (i.e., gambling) and to press a right-hand key (e.g., the “I” key) in response to exemplars of the “unpleasant” category. Following the procedures used by Karpinski and Steinman (2006), each block included in the first phase consisted of 24 trials, and gambling pictures, “pleasant” words, and “unpleasant” words were presented in a 7:7:10 ratio in order to prevent a response bias. In the second phase, the “unpleasant” category and the target category were assigned to the right-hand key, and the “pleasant” category that was assigned to the left-hand key was categorized on a different key. In each block included in the second phase, gambling pictures, “pleasant” words, and “unpleasant” words were presented in a 7:10:7 ratio. When participants made an inaccurate response, a red X appeared in the centre of the screen for 150 ms until it was followed by a correct response. We did not use a response window (i.e., “Please respond more quickly!”), which appeared if participants failed to respond within 1,500 ms in the study by Karpinski and Steinman (2006).

To compute the effect size of the SC-IAT, we followed the calculation procedure reported in Karpinski and Steinman (2006). As in Karpinski and Steinman (2006), data from the practice blocks were discarded. Responses of less than 350 ms were discarded and error responses were replaced with the block mean plus an error penalty of 400 ms. Then we subtracted the average response times of the test blocks in the first phase from the average response times of the test blocks in the second phase. The effect of valence SC-IAT was computed by dividing this quantity by the standard deviation of correct response times and error response times that included the 400-ms error penalty within test blocks. Thus, higher SC-IAT scores reflected faster response to positive rather than to negative gambling associations.

Arousal-Sedation ST-IAT. We assessed automatic arousal-sedation gambling associations with the ST-IAT procedure (Wigboldus et al., 2004) because there is no obvious contrast category for gambling. This variant of IAT consisted of five blocks. In the first block, participants categorized arousal and sedation exemplars (e.g., “calming,” “exciting”) into the arousal category (i.e., “E” key) and the sedation category (i.e., “I” key). In the second block, participants were instructed to press the “E” key in response to gambling and non-gambling images. In the third block, the arousal category and the target category (i.e., “gambling”) were categorized on to the same left-hand key (the “E” key), whereas the sedation category was assigned to the “I” key. The third block consisted of 32 trials, in which gambling visuals, “arousal” words, and “sedation” words were presented in an 8:8:16 ratio. In the fourth block, participants were asked to press the “I” key in response to images. The fifth block was also the same as the third block, except that the sedation category and the target category were paired together (i.e., the “I” key) this time, whereas the arousal category was assigned to the “E” key. In the fifth block, gambling visuals, “arousal” words, and “sedation” words were presented in an 8:16:8 ratio. The key assignment was counterbalanced for one half of the participants, and no significant effect of key assignment was found. We followed the D scoring algorithm (Greenwald, Nosek, & Banaji, 2003) to compute the effect of arousal-sedation ST-IAT. Higher D scores reflected faster performance when gambling shared the key with arousal words rather than with sedation words.

Table 1
Means of self-report measures across the gamble groups

	Non-gambler (CPGI = 0)	Low-risk gambler (CPGI = 1–2)	Mid-to-high-risk gambler (CPGI = > 3)	<i>F</i> [2,102] (<i>p</i> -value)
<i>N</i>	54	30	21	
Means of CPGI score	0 _a	1.33 _b	5.42 _c	193.21 (<i>p</i> < .001)
GABS	2.15 _a	2.36 _b	2.63 _c	17.52 (<i>p</i> < .001)
GBQ	2.32 _a	2.91 _b	3.72 _c	23.71 (<i>p</i> < .001)

Note. Means that bear different letters across each row are significantly different under $p < .05$. CPGI = Canadian Problem Gambling Index (Ferris & Wynne, 2001). GABS = Gambling Attitudes and Beliefs Scale (Breen & Zuckerman, 1999). GBQ = Gamblers' Beliefs Questionnaire (Steenbergh et al., 2002).

Procedures

Participants completed the study in groups of 2 or 3. After filling out a consent form, participants sat in front of an IBM-compatible computer. They completed the three implicit attitude tasks in the order of evaluative priming, the arousal-sedation IAT, and the SC-IAT. Two-minute distractor tasks were inserted between tasks, in which participants solved simple calculation questions.

When participants completed the implicit tasks, they were given a booklet that contained GABS, GBQ, and CPGI scales, as well as the final page that asked their age, gender, and whether English was their mother tongue. After this, participants were thanked and debriefed about the purpose of the study. Each session took approximately 30 min.

Results

Problem Gambling Index

Internal consistency of the CPGI was acceptable (coefficient alpha = 0.60). As recommended by Ferris and Wynne (2001), participants were classified into four CPGI status categories. Fifty-four participants were non-gamblers (i.e., a CPGI score of zero), 30 participants were low-risk gamblers (i.e., a CPGI score of 1–2), 17 participants were moderate risk gamblers (i.e., a CPGI score of 3–7), and 4 participants were pathological or high-risk gamblers (i.e., a CPGI score of 8 and above). The omnibus test of one-way analysis of variance (ANOVA) of group means was significant ($F_{2,102} = 193.21, p < .001$). As expected, mid-to-high-risk gamblers had the highest score, followed by moderate-risk gamblers and then by low-risk gamblers (see Table 1). Because the number of high-risk gamblers was extremely small, we combined moderate-risk gamblers and problem gamblers to create the category of moderate-to-high-risk gamblers.

Explicit measures of attitudes

GABS showed good internal consistency (coefficient alpha = 0.87). GABS was highly correlated with problem gambling tendency measured with the CPGI ($r = .48, p < .01$).

The means of GABS per CPGI gambling status listed in Table 1 showed that mid-to-high-risk gamblers indicated the most positive explicit attitudes, followed by low-risk gamblers and non-gamblers. The one-way ANOVA showed that the mean difference of GABS was significant across these three groups of individuals ($F_{2, 102} = 17.52, p < .01$). Further, Tukey post hoc tests showed that mid-to-high-risk gamblers reported more favourable attitudes toward gambling than did low-risk gamblers. Moreover, mid-to-high-risk gamblers' mean scores on GABS were not significantly different from the midpoints (i.e., 2.5), which indicated that even mid-to-high-risk gamblers indicated neutral attitudes toward gambling. Table 1 shows that differences in the GBQ score between the three groups were also significant.

Implicit measures of attitudes

The raw means and standard deviations of the RT scores of the three implicit measures of attitudes are reported in Table 2. We determined the reliability of each latency index for IAT variants by calculating latency scores separately for each of the two test blocks and gauging the correlation between the two latency scores, following the procedure used by Karpinski and Steinman (2006, p. 19). Specifically, because simply dividing test block trials into halves underestimates the reliability of the entire measure, we applied the Spearman-Brown correction in order to compensate for this underestimate of the true internal consistency for the entire measure (designated adjusted r ; Nunnally, 1978). The adjusted r was .54 for the valence SC-IAT latency score, whereas it was .61 for the arousal-sedation ST-IAT latency score. Even though these reliability estimates were slightly lower than reliabilities of standard IAT (e.g., Greenwald et al., 2002), they were comparable to reliability estimates of SC-IAT scores reported by Karpinski and Steinman (2006). Thus, the reliability of our gambling SC-IAT and arousal-sedation ST-IAT was deemed acceptable. On the other hand, reliability estimates for the priming task was relatively low: .45 for the gambling-positive index and .28 for the gambling-negative index. However, our estimates were considered comparable to low reliability estimates of the priming task reported in previous studies (Fazio & Olson, 2003). In addition, engaging in the three RT tasks involved relatively infrequent errors (8.25% for the valence SC-IAT, 10.45% for the arousal-sedation ST-IAT, and 11.02% for the priming task).

First, we calculated zero-order Pearson correlations between latency indices (see Table 3). The priming positive latency was positively correlated with the priming negative latency ($r = .45, p < .01$). Neither positive latency nor negative latency drawn from the priming procedure was significantly correlated to the response latency scores of IAT variants. However, we found a significantly positive correlation between valence SC-IAT latency and arousal-sedation ST-IAT latency ($r = .19, p = .04$).

Next, we computed correlations between self-report measures and response latency indices (see Table 4). Because the CPGI score was negatively skewed, we computed Kendall's tau to calculate correlations between the CPGI score and response latency indices. We used the Pearson correlation for GABS and GBQ.

The priming positive and negative latencies were not significantly correlated with any self-report measures. The SC-IAT latency was positively correlated with the CPGI score

Table 2
Means and standard deviations of raw RT scores

The Evaluative Priming Task			
	Non-gamblers	Low-risk gamblers	Mid-to-high-risk
1 st phase "Positive"	733.53 (230.81)	666.45 (191.14)	819.06 (230.79)
1 st phase "Negative"	755.85 (201.43)	667.68 (152.42)	832.16 (255.52)
Last phase "Positive"	862.81 (385.81)	865.69 (349.38)	772.59 (343.89)
Last phase "Negative"	963.87 (481.31)	929.91 (391.21)	872.55 (392.17)
The Single Category IAT			
	Non-gamblers	Low-risk gamblers	Mid-to-high-risk
Test Block I (positive vs. gambling or negative)	738.29 (266.81)	745.15 (289.49)	837.55 (357.63)
Test Block I (gambling or positive vs. negative)	712.48 (290.74)	689.85 (225.57)	806.24 (357.63)
Test Block II (positive vs. gambling or negative)	735.39 (247.99)	755.18 (248.89)	820.28 (378.09)
Test Block II (gambling or positive vs. negative)	717.16 (272.22)	697.82 (261.48)	773.79 (339.99)
The Arousal-Sedation ST-IAT			
	Non-gamblers	Low-risk gamblers	Mid-to-high-risk
Combination Block I (arousal versus gambling or sedation)	810.63 (306.99)	746.34 (257.77)	830.92 (285.40)
Combination Block I (gambling or arousal versus sedation)	742.23 (258.12)	740.92 (281.07)	821.32 (340.84)
Combination Block II (arousal versus gambling or sedation)	832.27 (284.62)	771.56 (255.55)	843.07 (300.67)
Combination Block II (gambling or arousal versus sedation)	784.06 (298.77)	754.65 (270.83)	826.54 (332.65)

Note. Numbers in parentheses are standard deviations. IAT = Implicit Association Test; RT = reaction time; ST-IAT = Single Target Implicit Association Test.

($r = 0.29, p < .01$), which indicated that individuals with greater gambling risk were faster in responding to gambling pictorials when they shared the key with positive stimuli than when they shared it with negative stimuli in the SC-IAT task. The SC-IAT score was also positively correlated with GBQ, which is a measure of gambling-related cognitive distortion ($r = 0.19, p = .05$). However, the correlation between SC-IAT and GABS was below the

Table 3
Correlations between response latency indices

	1.	2.	3.	4.
1. Evaluative priming positive latency				
2. Evaluative priming negative latency	0.45* (< .01)			
3. Evaluative priming difference score	-0.61* (<.01)	0.50* (<.01)		
4. Valence SC-IAT latency	-0.04 (.73)	0.19 (.07)	0.08 (.43)	
5. Arousal-Sedation ST-IAT latency	0.05 (.65)	-0.01 (.94)	0.07 (.46)	0.19* (.04)

Note. Numbers with an asterisk are significant at $p < 0.05$. P -values are reported in parentheses. SC-IAT = Single Category Implicit Association Test; ST-IAT = Single Target Implicit Association Test.

Table 4
Correlations between response latency indices and self-report measures

	Priming positive	Priming negative	Priming difference	Valence SC-IAT	Arousal- Sedation ST- IAT
CPGI	0.08 (.30)	0.01 (.92)	-0.09 (.39)	0.29* (<.01)	0.05 (.56)
GABS	0.10 (.35)	0.01 (.97)	0.04 (.73)	0.12 (.22)	0.02 (.81)
GBQ	0.09 (.40)	0.00 (.98)	0.04 (.69)	0.19* (.05)	0.06 (.52)

Note. Numbers with an asterisk are significant at $p < 0.05$. P -values are reported in parentheses. CPGI = Canadian Problem Gambling Index; GABS = Gambling Attitude and Beliefs Scale (Breen & Zuckerman, 1999); GBQ = Gamblers' Beliefs Questionnaire (Steenbergh et al., 2002); SC-IAT = Single Category Implicit Association Test; ST-IAT = Single Target Implicit Association Test.

conventional significance level. On the other hand, the arousal-sedation ST-IAT score was not significantly correlated with any of the self-report measures.

Finally, we conducted a one-way ANOVA for each response latency index. The main effect of the CPGI group was significant for positive latency indices from the evaluative priming procedure and the SC-IAT. Table 5 lists the omnibus F statistics associated with each latency index and the means of the response latency indices for the three CPGI status groups. Even though the omnibus F statistics for evaluative priming latency scores were only marginally significant, the Tukey comparison showed that, compared with low-risk gamblers, mid-to-high-risk gamblers were significantly faster for both positive and negative latencies of the evaluative priming ($t = 2.24$, $p < .02$ and $t = 2.37$, $p = .02$, respectively). Furthermore, mid-to-high-risk gamblers were also significantly higher than non-gamblers and low-risk gamblers in the SC-IAT scores. However, a significant mean difference between the three categories of problem gambling risk was not observed for the arousal-sedation ST-IAT.

Table 5
Means of response latency indices per CPGI status group

	Non-gambler	Low-risk Gambler	Mid-to-high-risk gambler	<i>F</i> [2,102] (<i>p</i> -value)
Evaluative priming				
Positive latency	−96.18 _a	−229.61 _a	22.67 _b	2.58 (.08)
Negative latency	−206.06 _a	−414.56 _b	−79.52 _a	2.87 (.06)
Valence SC-IAT	−0.06 _a	−0.06 _a	0.14 _b	5.26 (<.01)
Arousal-Sedation ST-IAT	0.07 _a	0.08 _a	0.06 _a	0.52 (.59)

Note. Means that bear different letters across each row are significantly different under $p < .05$. CPGI = Canadian Problem Gambling Index; SC-IAT = Single Category Implicit Association Test; ST-IAT = Single Target Implicit Association Test.

Discussion

In this paper, we provided a brief overview of response latency measures of attitudes and discussed how these measures may help gambling researchers better understand automatic, impulsive associations of gambling. Specifically, we maintained that whereas self-report measures provide a reliable and efficient measurement of deliberative processes of attitudes, response latency measures help researchers tap automatic processes of attitudes toward gambling. We reported findings from our empirical study that employed response latency measures as well as self-report measures of attitudes toward gambling. Our findings indicated that response latency measures of attitudes used in this study were reliable and valid.

Our empirical study revealed several interesting findings. First of all, we found evidence that implicit measures of attitudes reflect more positive automatic associations in problem gamblers' memory structure. Specifically, our valence SC-IAT was positively correlated with the index of problem gambling severity (i.e., CPGI). Also, we found that moderate-to-high-risk gamblers held more positive attitudes toward gambling than did low-risk gamblers and non-gamblers. The finding that as gambling problem severity increases, the automatic association between the concept of gambling and positivity relative to negativity becomes stronger is probably due to the possibility that positive affect associated with gambling (i.e., pleasure or relaxation) is more proximal than negative affect (e.g., guilt, disappointment) among high-risk gamblers. Further, this finding is consistent with empirical findings from the field of substance use and addiction that heavy substance users' implicit attitudes toward the substance are more positive than those of other individuals (e.g., Rooke et al., 2008).

However, our findings from the evaluative priming procedure were more complex. Moderate-to-high-risk gamblers held not only more positive but also more negative attitudes toward gambling than did low-risk gamblers. Thus, our moderate-to-high-risk gamblers' attitudes toward gambling can be characterized by implicit ambivalence. This finding suggests that as individuals become more vulnerable to gambling severity, not only positive but also negative automatic gambling associations become stronger. This interpretation was

corroborated by the finding that the “positive” latency was positively correlated with the “negative” latency in both the evaluative priming task and the valence SC-IAT. Furthermore, this is analogous to a recent finding in the alcoholism domain that habitual drinkers had strong positive and negative associations of alcohol (Houben & Wiers, 2006).

Even though our finding from evaluative priming may appear at odds with the finding from the valence SC-IAT, there is no reason to cast doubt on either finding. There are at least two different reasons for the seemingly conflicting results. On the one hand, the SC-IAT procedure is a bipolar measure of attitudes in which participants are asked to map their attitudes toward gambling in the positive-negative bipolar dimension. Further, the convention of taking the difference of two combination blocks (i.e., the “gambling + positive” vs. negative block and the positive vs. “gambling + negative” block) prevents researchers from exploring the possibility that individuals have simultaneously strong positive and negative attitudes toward the focal concept. In contrast, evaluative priming is designed to provide a unipolar measure of attitudes because it separately records participants’ improved response latency for positive and negative targets when the targets are preceded by primes (e.g., pictures of gambling scenes) compared to when such primes are not used (i.e., the baseline condition). Thus, our finding can be explained by the possibility that as gambling severity increases, both positive and negative automatic associations become stronger but at different rates. We presume that unipolar measures of implicit attitudes provide a better assessment of automatic evaluative processes that lie behind socially sensitive issues, such as gambling and addiction. Recently, Houben and Wiers (2006) reported the development of a unipolar variant of IAT that separately measured latencies on the positive-neutral dimension and on the negative-neutral dimension. It would be interesting to employ unipolar IAT and evaluative priming to assess implicit attitudes toward gambling in a unipolar way and to see if the results converge.

Aside from the unipolar versus bipolar distinction, another reason for seemingly different results obtained from the SC-IAT and evaluative priming is that the underlying processes behind these procedures substantially differ in at least two important ways (Fazio & Olson, 2003). First, even though both procedures are regarded as measures of automatic attitudes and preference, the term “automatic” has different meanings for each procedure. In the priming procedure, exposure to the prime activates the positively or negatively valenced associations and readies the participant when the subsequently presented target word is evaluatively congruent. Therefore, the evaluative priming procedure is automatic in the sense that it assesses “the spontaneous activation of evaluative associations in response to the primed stimulus” (Fazio & Olson, 2003, p. 315). On the other hand, the IAT procedure is considered automatic in the sense of uncontrollability rather than spontaneity. In other words, it is possible that participants who engage in the IAT task find it difficult to control their sorting responses even though they are consciously aware of the relative ease of sorting tasks. Second, the average response latency across the set of exemplars of the focal category is used as a measure of attitude toward the category in the priming procedure. Thus, the validity of priming measures depends on the representativeness or prototypicality of the exemplar chosen to serve as primes (Fazio & Olson, 2003, p. 313). In contrast, the IAT assesses the extent to which the category label (e.g., “gambling”), rather than individual exemplars of the focal category, is associated with positive or negative valence.

Our finding of low correlations between latency scores of the two procedures may be due to the possibility that the visuals used in the priming task were not equally prototypical of the gambling category. Alternatively, it is possible that different results might have emerged if we had used “slot” or “poker” rather than “gambling” as the category label in the IAT.

On the other hand, we found that self-report measures of attitudes (i.e., GABS and GBQ) were more positively correlated with problem gambling severity. Even though mid-to-high-risk gamblers expressed more positive attitudes toward gambling than did low-risk gamblers, their attitude was not significantly different from the midpoint. The best interpretation of this finding is that even mid-to-high-risk gamblers expressed neutral attitudes toward gambling in the self-report mode, which is an indication that their response was partially influenced by self-presentation bias.

Further, we found that our response latencies of gambling attitudes were not strongly correlated with self-report measures of attitudes. Latency scores derived from priming were not significantly correlated with any of the self-report measures of gambling cognition. The valence SC-IAT latency score was only weakly correlated with a self-report measure of gambling-related cognitive distortion (i.e., GBQ), but its correlation with GABS was not significant. The lack of strong convergence between implicit measures and self-report measures of gambling attitudes may be simply attributed to the use of different modes of response (i.e., response latency vs. rating). However, there are at least two other explanations for the lack of strong convergence between explicit and implicit attitudes toward gambling. First, this divergence may occur because response latency measures of attitudes have the property of being “uncontrollable” and thus suffer less social desirability bias than do self-report measures (De Houwer, 2006). For example, even though our mid-to-high-risk gamblers may have tried to underreport their positive attitudes toward gambling, SC-IAT and evaluative priming are generally known to be less susceptible to such attempts. On the other hand, an alternative explanation for this finding may be that the bipolar scale used in the self-report measures of attitudes (i.e., “I agree” vs. “I disagree”) is ill-suited to capture ambivalent attitudes (Cacioppo, Gardner, & Berntson, 1997; Leigh, 1989b). When responding to the bipolar scale, individuals who hold ambivalent attitudes tend to choose the midpoint, which is offered as the neutral attitude option. Thus, neutral attitudes reported by mid-to-high-risk gamblers may also be interpreted as ambivalent attitudes. However, this concern is partially mitigated by the fact that the GABS employed an even-numbered point scale and thus a neutral midpoint was not available to participants. However, a stricter test of superiority of response latency measures in assessing gamblers’ ambivalence toward gambling would require the use of a unipolar scale self-report measure of attitudes, which gauges positive and negative attitudes of gambling separately. Future studies are necessary in order to test this possibility.

However, we did not find a significant difference between mid-to-high-risk gamblers and low-risk gamblers in the arousal-sedation gambling IAT. One possible reason for this null effect may be derived from the distinction of the coping versus enhancement motive of gambling (Stewart & Zack, 2008). Some high-risk gamblers may have a predominantly coping motive (i.e., finding solace from stress and negative affect), whereas other high-risk gamblers may have a predominantly enhancement motive (i.e., seeking excitement and

arousal from gambling). It is possible that the bipolarity of our ST-IAT procedure may be ill-suited to detect copers and enhancers in the high-risk gambler segment. Alternatively, if only problem gamblers have extremely strong automatic associations of gambling related to arousal or sedation, our study lacks sufficient power to detect this difference because of the small number of problem gamblers included. It is necessary to conduct a study in which the arousal-sedation gambling IAT is administered to a clinical sample that includes a large number of problem gamblers.

We note that one of the criticisms of the IAT is that it seems to pick up environmental associations in society or a general opinion about an object (i.e., “extra-personal influences”; Karpinski & Hilton, 2001). Applied to the gambling context, negative implicit attitudes toward alcoholic drinks may reflect extra-personal cultural norms about gambling (e.g., “gambling is bad for you”) rather than, or in addition to, individuals’ unique associations. Olson and Fazio’s (2004) personalized IAT has been developed as an alternative to the standard IAT, and this procedure was successfully used by Houben and Wiers (2007). Houben and Wiers’ (2007) personalized IAT revealed that heavy drinkers held significantly more positive automatic attitudes toward alcohol than they did to soda. Our finding that mid-to-high-risk gamblers showed faster RT for both positive and negative latencies of the SC-IAT suggests that the concern for extra-personal influences probably was not high in our study. However, it is possible that the personalized IAT procedure may help reveal additional insights into uniquely personal processes.

Finally, it should be emphasized that implicit measures of attitudes toward gambling are not necessarily “better” measures than self-report attitude measures. Self-report measures are valid measures of attitudes as long as participants are aware of their attitudes toward the topic of interest and are not motivated to underreport or hide their attitudes from the researcher. Self-report measures also have the advantage of being efficient and inexpensive to administer. However, implicit measures of attitudes are useful when individuals have not had opportunities to deliberate on their (dis)liking of gambling or when they are unwilling to disclose their positive attitudes to others. Furthermore, according to theorists of dual processes, implicit attitudes are valuable in predicting spontaneous behaviours, whereas self-report measures of attitudes predict deliberative behaviours well (Fazio, 1990; Wilson, Lindsey, & Schooler, 2000). In addition, implicit attitudes tend to be a better predictor of actual behaviour than self-report measures of attitudes when individuals’ mental resources are depleted or when they are under time pressure (Friesen et al., 2008). Because gamblers’ mental resources are reduced when they engage in gambling activity for a long time, their gambling behaviour toward the end of a long session is likely to be better predicted by implicit measures of attitudes than by explicit measures.

In this study, we demonstrated that response time-based attitude measures of gambling have acceptable reliability and validity. We acknowledge that this study had several limitations. We used a non-clinical university student sample, and thus our sample did not include many individuals with high problem gambling severity. It would be ideal to conduct a similar study using a clinical adult gambler sample and to look into whether stronger effects of implicit attitudes toward gambling are obtained. In addition, we used a fixed order of response latency measures for all participants. We always presented the evaluative priming

task because this task is believed to be more reactive than IAT variants to participants' knowledge of the purpose of the experiment (Sherman, Rose, Koch, Presson, & Chassin, 2003). However, it is possible that the fixed order might serve as a confounding factor because response latencies might have become faster overall in the last task than in the first task. It is necessary to counterbalance the order of presenting response time-based measures in future studies and to assess potential order effects. Another limitation of our study is that we were not able to test the predictive validity of the implicit attitude measures because we did not collect behavioural measures of gambling. We feel that it is necessary to assess the extent to which implicit measures of attitudes predict future gambling frequency and the amount of money spent on gambling over and above self-report measures of attitudes. This will provide a stringent test of practical utility of implicit measures of gambling.

In sum, we applied the implicit attitude assessment procedures to the study of gambling and illustrated the utility of these techniques in this paper. We hope that gambling researchers will adopt these techniques and explore automatic processes that underlie attitudes toward gambling.

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For correspondence: Dr. Sunghwan Yi, PhD, University of Guelph, Guelph, ON, N1G 2W1, E-mail: syi@uoguelph.ca

Contributors: Sunghwan Yi designed the studies, supervised data collection, analyzed the data, and wrote the final report. Vinay Kanetkar assisted with the design and data analyses.

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Dr. Sunghwan Yi is an assistant professor at the Department of Marketing & Consumer Studies, University of Guelph, Ontario. Having been trained in consumer psychology and social cognition, he has recently expanded his research interests in gambling and impulsive consumer behaviour. His recent research interests include automatic associations of impulsive consumer behaviour, such as gambling, tempting foods, and shopping, as well as the use of coping responses to self-regulation failure in the context of gambling,

overeating, and shopping. He has employed up-to-date methodologies such as response time latency-based measures of attitudes and Ecological Momentary Assessment.

Dr. Vinay Kanetkar is an associate professor at the Department of Marketing & Consumer Studies, University of Guelph, Ontario. He holds a doctorate in commerce and a master's degree in architecture. His research explores consumer processing of implicit and explicit marketing stimuli, particularly price and advertising and managing price and value responsiveness.

Appendix

Word exemplars used in latency tasks

Evaluative priming		SC-IAT		Arousal-Sedation IAT	
Positive	Negative	Positive	Negative	Arousal	Sedation
good	nasty	terrific	awful	thrilling	serenity
pleasant	awful	awesome	bad	electrifying	soothing
excellent	unpleasant	marvelous	terrible	exhilaration	relaxation
nice	terrible	great	depressing	stimulating	contentment
terrific	bad	splendid	humiliating	energetic	restful
awesome	disagreeable	wonderful	painful	arousal	at ease
marvelous	dreadful	superb	disastrous	animating	unwinding
great	appalling	friendly	disappointing	cheerful	peaceful
		satisfying	discouraging	vigorous	tranquil
		enjoyable	gloomy	enthusiastic	quiet

Note. IAT = Implicit Association Test; SC-IAT = Single Category Implicit Association Test.

Bingo playing and problem gambling: A review of our current knowledge

Jean-Claude Moubarac, N. Will Shead, & Jeffrey L. Derevensky

International Centre for Youth Gambling Problems and High-Risk Behaviors, McGill University, Montreal, Quebec, Canada Email: jean-claude.moubarac@mcgill.ca

Abstract

Bingo has a long history as a popular gambling game. Previous research on bingo has been almost exclusively limited to qualitative research. Consequently, little is known about the prevalence of bingo playing, the potential risks associated with regular bingo playing, and its possible influence on the development of problem gambling. The present paper provides a review of the literature on bingo in Western countries using published articles focused on bingo and reports of broad-based gambling surveys containing data on bingo participation. Available data show relatively high rates of past-year bingo participation among adolescents. Within the adult population, females and individuals in poor health reported the highest bingo participation rates. Three general groups of bingo players were identified: low-income individuals, seniors, and young adults. It is argued that although bingo is generally viewed by the public as a “soft” form of gambling, it has the potential to lead to significant problems.

Keywords: bingo, gambling problems, literature review

Introduction

Problem gambling continues to gain recognition as an important public health issue (Korn & Shaffer, 1999). However, not all forms of gambling are viewed as carrying the same level of risk. One activity often considered a low-risk form of gambling is bingo, which has received little attention from researchers in the field of gambling studies. In early studies, bingo was described as a relatively innocuous leisure activity, mostly popular among working class women in search of entertainment, socialization, and friendship (Dixey, 1987, 1996; King, 1990). Today, bingo is often viewed as a social game without labels of deviance and, in fact, enjoys an air of benevolence due to its common association with fundraising efforts (Chapple & Nofziger, 2000; Derevensky, Gupta, Messerlian & Gillepsie, 2004). However, in recent ethnographical accounts scholars have revealed the other side of bingo, describing signs and symptoms among regular bingo players that may be associated with excessive gambling and the development of problem gambling (Chapple & Nofziger, 2000; O'Brien Cousins & Witcher, 2004, 2007; Maclure, Smith, Wood, Leblanc, Li, & Cuffaro, 2006).

Despite some progress in examining the negative impact on players, the double-sided nature of bingo as both a form of entertainment and as a source of potential harm is not

well understood. In the absence of a theoretical framework, previous research on bingo has been almost exclusively limited to sociological perspectives using qualitative methods to explore and understand the experience of regular bingo players. Studied samples have been limited, often including regular female bingo players with problem gambling seldom being evaluated. As a result, very little is known about the prevalence of bingo playing, the potential risks associated with regular bingo playing, and its possible influence on the development of problem gambling.

In Western countries the bingo industry has transformed and expanded since the 1980s to attract a larger and more diverse player pool (Dixey, 1996). Considerable efforts have been made to modernize the game, including the development of electronic bingo, the expansion of bingo contests and high-stakes cash prizes, the establishment of land-based bingo room networks, the development of hundreds of online bingo websites, the appearance of bingo games on television, and the creation of bingo clubs. These marketing strategies have broadened the bingo clientele to now include a younger group of participants. From 1982 to 1999, the percentage of United Kingdom (UK) bingo players under 35 years of age doubled from 18 to 36% (Dixey 1996; Lamacraft, 1999). Across Canada, between 8.6% and 19.8% of high school students reported trying bingo at least once in the previous year (Phare, Lane, & Elliott-Erickson, 2007; Dubé, Tremblay, Traore, & Martin, 2007). This increase in the number of young bingo players warrants concern considering that adolescents and young adults are at increased risk for developing gambling and gambling-related problems compared to adults (Derevensky et al., 2004). With the rapid expansion of the bingo industry underway, it is imperative that we gain a better understanding of the game to evaluate the potential risks posed to bingo players and the unique risk factors involved.

The present paper aims to provide a comprehensive review of the literature on bingo and problem gambling. Published articles with a focus on bingo were selected using the MEDLINE and PsycInfo databases, as well as materials retrieved through bibliography-directed searches. Inclusion criteria for bingo-focused research articles were: (1) studies conducted in Western World countries (i.e., countries of Western Europe, North America, Australia, or New Zealand), and (2) studies in which bingo was the primary focus. Key words in the search included gambling, problem gambling, and bingo. In our search, we found 17 studies that fit the above two criteria. Six studies were conducted in the UK (Dixey & Talbot, 1982; Dixey, 1987, 1996; Downes, Davies, David, & Stone, 1976; Griffiths & Bingham, 2002, 2005), one in New Zealand (Clarke & Rossen, 2000), six in the United States (Burger, 1991; Chapple & Nofziger, 2000, King, 1985a, 1985b, 1987, 1990; Reitz, 2004) and three in Canada (Maclure et al., 2006; O'Brien Cousins & Witcher, 2004, 2007). Because previous research with a focus on bingo has been almost exclusively limited to qualitative studies, other sources of data need to be tapped to examine quantitative data on bingo prevalence, player characteristics, and relationships between bingo play and problem gambling. For this purpose, we collected reports of large-scale gambling surveys that queried bingo participation among other types of gambling. Reports of gambling surveys were identified through web-based searches using *Google*. Reports published between 2001 and 2007 conducted in Canada, the US, the UK, Australia, and New Zealand were selected.

In the following section, qualitative data from bingo-focused studies are reviewed. First, the game of bingo is described along with some of its unique features. Next, descriptions of typical bingo player behaviours are provided. The second section presents a summary of quantitative data on bingo, including prevalence and frequency of play and player characteristics. Quantitative data is also examined to explore the association between bingo play and problem gambling. Finally, the existing body of research is discussed as a whole along with suggestions for future research.

Qualitative Data

The Game of Bingo

Bingo's origins come from a Genoese lottery game played throughout Europe in the 16th century. Although the term *bingo* has been used as the name of several different games, the current version of the game was first played in Jacksonville, Florida and then brought to New York City in 1929, before spreading across the US during the Great Depression (Schwartz, 2006). Spurred by Carl Leffler, a mathematics professor at Columbia University who developed 6,000 non-repeating cards, the game was quickly adopted by churches and charitable organizations as a fundraising activity. Of particular significance and importance is that "bingo laid a solid foundation for the public acceptance of gambling as a tolerable fund-raising tool" (Schwartz, 2006, p. 380).

Bingo is a game solely based on luck in which numbered balls are drawn at random while players mark off the corresponding numbers on their purchased cards that feature randomly chosen numbers arranged in columns and rows (usually five-by-five matrices). As the game is played in real time players follow the sequence of numbers revealed one at a time which adds suspense as the outcome of each game looms. A game concludes when the first player achieves a unique combination of numbers that completes a pre-specified pattern (e.g., five-in-a-row). At that point the winner typically calls out "Bingo!" to signify that they possess a winning card. In contrast to other games where the outcome is quicker, such as lottery scratch tickets and video lottery terminals (VLTs), bingo can be characterized as an ongoing game whose outcome is revealed relatively slowly, with players reporting a moderate to a high level of excitement (Chapple & Nofziger, 2000). In traditional bingo, players are minimally involved; their only task is to mark the numbers called on the bingo card. However, in contrast to lottery draws, bingo players must be physically present as the game unfolds. Superstitious beliefs and practices, which are believed to influence the outcome of the game, are highly prevalent in the bingo culture. Players might "reserve" special seats, use *troll dolls* as good luck charms, and wear "lucky" outfits (Griffiths & Bingham, 2005). Bingo is commonly played in bingo halls, local churches, community centres, and casinos. In contrast to bingo halls, casino bingo has fewer socialization opportunities, larger cash prizes, and tends to be more competitive (Chapple & Nofziger, 2000).

With the recent introduction of electronic bingo, numbers are automatically marked on the card, leaving bingo players to merely follow the game as it unfolds. In this modern form of bingo, the machine informs the players how many numbers are missing before they can win, ultimately adding an aspect of perceived suspense and excitement to the

experience. Bingo is now readily offered in the form of a network where players from multiple jurisdictions compete simultaneously against each other for a cumulative jackpot sometimes in excess of \$100,000. More than a hundred internet websites now offer bingo online for both entertainment and money. Some of these websites make use of structural properties (design, colors, and content) to specifically target adolescents (Derevensky & Gupta, 2007).

Bingo Players' Behaviour

Bingo players tend to view bingo as a game of chance or luck (King, 1990; Griffiths & Bingham, 2005); yet, the use of superstitious beliefs and practices among bingo players has been reported in numerous studies and clinical observations (Chapple & Nofziger, 2000; Dixey 1987; King, 1990; Griffiths & Bingham, 2005). Dixey (1987) observed that many bingo players have ritual routines such as purchasing cards for the game in a particular order, selecting the same seat, wearing "lucky" clothes, and using specific pens and daubers. Chapple and Nofziger (2000) observed the use of coins, rocks, figurines, stuffed animals, and framed pictures during play that are shifted around on the bingo cards as numbers are called. King (1990) argued that "assigning luck to an object or practice is an ongoing process" (p.57) and "some players contend that what they do inside and outside the bingo parlour greatly affects how much they win" (p. 53). On the other hand, Griffiths and Bingham (2005) observed that more quotidian superstitious beliefs (e.g., a belief that the number 13 is always unlucky) were reported by bingo players compared to superstitious beliefs specifically related to bingo play (e.g., sitting in the same seat for luck).

Different explanations have accounted for the use of superstition during bingo play. Griffiths and Bingham (2005) suggested that having superstitious beliefs may simply be a way to add excitement to the game. King (1990) believes that bingo players are in a conflict between playing for charity and playing to win. She argues that because of this dilemma, players employ various strategies to deny responsibility of winning and justify their involvement in the game. By adopting superstitious behaviour and attributing luck to objects, players put an emphasis on the chance aspects of bingo which lowers personal commitment towards playing to win. King also notes that other players justify their bingo playing by stressing the charitable aspects of the game.

Alternatively, the use of superstitious practices in bingo might reflect a coping strategy used by players to gain perceived control in a game where the outcome is completely unpredictable and requires no skill (Reith, 1999). However, it is not clear if bingo players believe they can exert control over the outcome of a bingo game using superstitious beliefs and practices. This is an important question to address since an illusion of control is thought to be associated with the development of problem gambling (Joukhaider, Maccallum, & Blaszczyński, 2003). According to Chapple and Nofziger (2000), bingo players who used charms during bingo play believe on some level that the charm can influence the outcome of the game. Based on informal observations, they noted that players with the most elaborate shrines or collection of charms played the greatest number of cards.

In Griffiths and Bingham's study (2005) only one significant result was found regarding superstitious beliefs when playing bingo – a greater percentage of heavy spenders (those

who spend £20 or more in one bingo hall visit) stated they always sat in the same seat for luck. According to Burger's (1991) experimental studies on the desire for control in games of chance, bingo players incorporating superstitious behaviour have a low desire for control and do not view themselves as having power or control over the outcome. Instead, as the author suggests, these players may relinquish control to another source, a lucky object, when they believe this action leads to a more desirable outcome. This finding fits with the type of superstitious beliefs and practices reported in previous studies and the fact that bingo players tend to view bingo as a game of chance and not as a game of skill where control lies within players (Griffiths & Bingham, 2005; King, 1990). However, very little research has been conducted so far to understand the relation between superstition and bingo play.

Quantitative Data

Prevalence and Frequency of Play

Reports based on large-scale gambling surveys were reviewed for bingo-related data. These studies were mostly conducted within specific regions of Western countries (e.g., state-wide in the US or province-wide within Canada). A summary of the prevalence of bingo playing across regions is presented in Table 1. For adolescents, past-year bingo participation among high school students ranged from 1.5% in Nevada (Volberg, 2002) to 19.8% in Alberta (Phare et al., 2007). Bingo was found to be slightly less popular among the general adult population, where participation over the last year ranged from 1.9% in New Zealand (Ministry of Health, 2006) to 12.9% in Manitoba (Lemaire, MacKay, & Patton, 2008).

Only two surveys reported data on frequency of bingo play for adolescents. In Nevada, 0.1% of adolescents reported playing bingo monthly and none weekly (Volberg, 2002), while a more recent study in New York State revealed that 2% of students in grades 7 to 12 (ages 12 to 18) played bingo for money 20 or more days in the past year (Rainone & Gallati, 2007). Data on frequency of play among adolescents are too scarce to determine if bingo play is an important gambling activity in a younger population. More data was available on the frequency of bingo play among the general adult population. Monthly participation in bingo varied considerably from 0.4% in California (Volberg, Nysse-Carris, & Gerstein, 2006) to 7% in New Brunswick (New Brunswick Department of Health & Wellness, 2001), while weekly bingo playing ranged across regions from 0.2% (California) to 4% (New Brunswick) (Volberg 2002; Volberg Bernhard, 2006; Braid & Volberg, 2008; New Brunswick Department of Health & Wellness, 2001).

Among gamblers only, frequency of bingo play also varies widely across regions. Volberg and Bernhard (2006) reported that in New Mexico, among the gambling population, 4.3% of respondents had played bingo in their lifetime but not in the past year, 2.0% were past-year bingo players, 3.4% were monthly players, and 2.5% were weekly players. Within the bingo player population in the UK and New Brunswick, prevalence of weekly participation was 35% and 55%, respectively (Wardle, Sproston, Orford, Erens, Griffiths, Constantine et al., 2007; New Brunswick Department of Health & Wellness, 2001). Similar results were reported in a study of 412 UK bingo players by Griffiths and Bingham (2002), who found that 57% of respondents played once or twice per week, 17% played three times per week, and 3% played five or more times per week. Finally, in Saskatchewan, the most prevalent

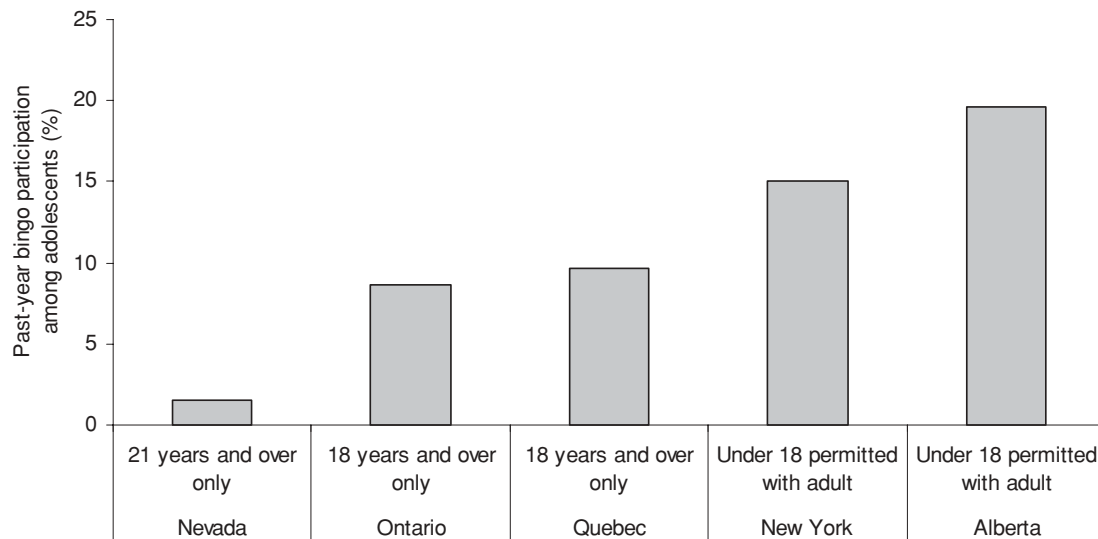
Table 1
Past year bingo participation

Region (Study)	Population	Sample description	Past-year prevalence
Quebec (Dube et al., 2006)	Adolescent	4571 students in public and private high schools; French and English	9.7%
Ontario (Adlaf et al., 2006)	Adolescent	6323 students in grades 7–12	8.6%
Alberta (Phare et al., 2007)	Adolescent	3915 students in public, Catholic, and charter schools in grades 7–12	19.8%
New York (Rainone & Gallati, 2007)	Adolescent	5800 students in public and private schools in grades 7–12	15.0%
Nevada (Volberg, 2002)	Adolescent	1004 residents aged 13–17	1.5%
Quebec (Ladouceur et al., 2005)	Adult	8842 adults; sample weighted by gender and region	9.0%
Ontario (Wiebe et al., 2006)	Adult	3604 adults aged 18 and over; stratified by gender	4.8%
Manitoba (Lemaire et al., 2008)	Adult	1848 adults aged 19 and over; stratified by gender and region	8.4%
British Columbia (Braid & Volberg, 2008)	Adult	3000 adults aged 18 and over; stratified by gender, age, and region	5.0%
New Brunswick (NB Department of Health & Wellness, 2001)	Adult	800 adults; two independent samples for gender split	11.0%
California (Volberg et al., 2006)	Adult	7121 adults aged 18 and over; stratified by age, gender, and ethnicity	2.1%
New Mexico (Volberg & Bernhard, 2006)	Adult	3007 adults aged 18 and over; stratified by gender, ethnicity, and age	5.5%
New Zealand (Ministry of Health, 2006)	Adult	12929 residents aged 15 and over; weighted to represent the adult population	1.9%
Queensland, Australia (Schofield et al., 2004)	Adult	1029 adults aged 18 and over; sample representative of Central Queensland	6.2%
United Kingdom (Wardle et al., 2007)	Adult	9003 individuals aged 16 and over; weighted by age, gender, and region	7.0%

weekly gambling activities were lottery ticket purchases (34.2%), playing bingo (23.9%), and playing Sport Select (23.5%) (Wynne, 2002).

In summary, although past-year bingo prevalence appears to be higher among adolescents, adults are likely playing more frequently. Weekly participation was found to be higher

Figure 1. Past-year bingo participation among adolescents in five North American regions, with age at which one may legally play government-sanctioned forms of bingo.



among bingo players than for most other games. This finding is consistent with previous findings that, among people who play bingo, it is their preferred gambling activity (Dixey, 1996). In other words, individuals who include bingo as one of their gambling activities are likely to spend most of their time playing bingo as opposed to any other game. For the adult population, frequency of play varies greatly between regions and may be linked to local availability, hours of operation, and accessibility. For adolescents, differences in rates of bingo participation may be linked to region-specific age restrictions. For example, the adolescent data in Table 1 suggest that higher proportions of adolescents play bingo in jurisdictions where the legal age to play bingo is lower. In Nevada, with the lowest yearly prevalence rate of 1.5%, individuals under the age of 21 are not permitted to participate in all regulated forms of gambling, including casinos, bingo, and horse race wagering (Volberg, 2002). In Ontario and Quebec, where relatively high participation rates were found (8.6% and 9.7%, respectively), individuals as young as 18 years old are permitted in bingo halls (Ontario Lottery and Gaming Corporation, 2007; Société des bingos du Québec, 2009). In New York State, where prevalence rates are higher than in Quebec and Ontario (15%), individuals under the age of 18 are permitted to play bingo if accompanied by an adult (Humphrey, 2005). In Alberta, where the highest bingo participation rate was found (19.8%) (Phare et al., 2007), small non-association bingo licensees can apply for an exemption from current policy to allow minors, accompanied by an adult, to play bingo for small cash prizes not exceeding \$50 (Alberta Gaming and Liquor Commission, 2009). This apparent inverse-relationship between age restriction and bingo participation among adolescents is depicted in Figure 1.

Clearly, there is a great deal of variability in the prevalence and frequency of bingo participation across regions. Although these differences can be partially attributed to true differences in gambling participation between regions, it is likely that a substantial portion

of this variability is due to unreliable data. Take, for instance, two separate gambling studies conducted in Ontario in 2001 and 2006 (Kelly et al., 2001; Wiebe, Mun, & Kauffman, 2006). Kelly et al. reported that 9.7% of the Ontario population played bingo whereas Wiebe, Mun, & Kauffman reported a prevalence of almost half that at 4.8%. It is possible that this difference is the result of a downward shift in the popularity of bingo between the years of 2001 and 2006 but it is more likely caused by error variance. Because most gambling studies are conducted by different sets of researchers in different regions, with varying methodological approaches, including sampling methods and wording of questionnaire items, they are bound to result in less-than-reliable results. So while the cited data is useful for gaining rough estimates of bingo participation in Western countries, comparisons across regions cannot be made with much confidence. This difficulty in integrating cross-regional data suggests the need for more uniformity in the methods used to collect large-scale gambling data.

Player Characteristics

Gender. All gambling surveys revealed that women are at least twice as likely to be involved in bingo playing than men. In a recent California gambling prevalence study, respondents who played in bingo halls (as opposed to in casinos) during the past year were significantly more likely to be female (Volberg et al., 2006). Similarly, in Nevada, among adolescents, girls were found to be twice as likely as boys to gamble on bingo (Volberg, 2002). The predominance of female bingo players is consistent with previous studies on bingo (Dixey, 1996; Griffiths & Bingham 2002; Chapple & Nofziger, 2000, King, 1990; O'Brien Cousins & Witcher, 2004, 2006; Maclure, Smith, Wood, Leblanc, & Cuffaro, 2006). In a national survey carried out amongst 7,166 bingo players in clubs throughout the UK, Dixey (1996) reported that the clientele of commercial bingo was overwhelmingly female (85%). Griffiths and Bingham (2002) found that 86% of respondents in a convenience sample were women while a telephone survey of regular senior bingo players by O'Brien Cousins and Witcher (2007) revealed that female players in Alberta outnumbered male players approximately four to one.

Age. Differences in bingo participation rates across age group vary greatly between regions. In the UK, bingo participation was found to be approximately 7% across all age groups among adults (16 to 74 years old) (Wardle et al., 2007). In Canada, age differences in participation vary considerably across provinces. In a 2001 Ontario study, 18- to 24-year-olds were found to be more than twice as likely to play bingo in the past year compared to adults over the age of 65 (13.6% vs. 6.5%) (Kelly, Skinner, Wiebe, Turner, Noonan, & Falkowski-Ham, 2001). In 2005, despite overall bingo participation decreasing, participation remained highest among the 18- to 24-year-olds (7.6%) (Wiebe, Mun, & Kauffman, 2006). Similar to Ontario, a higher prevalence of past-year bingo playing was found among 18- to 24-year-old Manitobans (Lemaire, MacKay, & Patton, 2008). In Manitoba, however, older adults were more likely to spend more money monthly on bingo than their younger counterparts (Lemaire et al., 2008). Popularity of bingo amongst youth is also reported in a New Zealand study of 1,200 individuals (15 to 24 years old) which revealed that on a monthly basis, bingo, casino gambling, and lottery playing were the activities on which gamblers spent the most money compared to other forms of gambling, with bingo being the primary activity (Clarke & Rossen, 2000). In California, bingo players

tended to be older than the general population, with over half (56%) exceeding the age of 40 (Volberg et al., 2006). A study of Iowa residents indicated that after lottery play, bingo was the most popular gambling activity among older adults (65 years and older) (Mok & Hraba, 1991). In addition, within each type of gambling, individuals between 65 and 74 years old were the least likely to participate with the exception of bingo. Bingo participation was second highest among 65- to 74-year-olds and highest among 18- to 24-year olds. These data suggest two things: first, there appears to be a shift as individuals reach old age away from most forms of gambling and toward a preference for bingo; and second, despite a general preference among older adults for bingo, past-year participation in bingo is found to be highest among younger adults (18 to 24 years old) which is likely due to their higher overall participation rates in gambling.

Ethnicity. Prevalence rates of gambling and problem gambling differ between ethno-cultural groups (Ellenbogen, Gupta, & Derevensky, 2007; National Research Council, 1999; Raylu & Oei, 2004; Sallaz, 2008). Very few regional surveys have examined cultural differences among bingo players. However, in New Mexico, Native Americans were found to be significantly more likely to have gambled in the past year at a casino and to have played bingo outside a casino, while non-Native Americans were more likely to have gambled in the past year on horse races, sports, and private games (Rainone & Gallati, 2007). Similarly, a regional analysis revealed that compared to Winnipeg and Western Canada, more gamblers in Northern Manitoba—a region where First Nations people comprise 62% of the population (Hallett, Thornton, Stevens, & Stewart, 2006)—reported playing bingo at least once during the past year (Lemaire, MacKay, & Patton, 2008). Although data is scarce regarding ethnicity, it appears that bingo participation is particularly high among First Nations/ Native Americans.

Socioeconomic status. Socioeconomic factors such as employment, education, and income have been shown to significantly impact gambling patterns and gambling expenditures (Layton & Worthington, 1999). In Dixey's UK studies (1987, 1996), bingo was found to be especially popular among working class women. In fact, according to the work of Downes et al. (1976), bingo in the UK was a game played exclusively among the working class rather than a game played exclusively among females. However, this trend appears to have changed since bingo has expanded in popularity in Western countries. In fact, Griffiths and Bingham (2002) found that 30% of the younger age group (18 to 45 years old), and 15% of the older group (over 46 years old), were in "white collar" occupations. With respect to education, a positive relationship was found between level of education and bingo playing in the UK, where more educated individuals tended to be more likely to participate in bingo compared to those with lower levels of education (Wardle et al., 2007). However, in Canada, with respect to educational attainment and bingo playing, both the Ontario and British Columbian studies reported an inverse relationship, such that bingo participation decreased among individuals with higher education (Braid & Volberg, 2008; Wiebe et al., 2006). These contrasting findings between the UK and Canada are difficult to interpret at the moment considering the limited available data.

Four surveys conducted in Ontario, New Brunswick, British Columbia, and the UK have looked at participation rates in bingo and income (Braid & Volberg, 2008; Wardle

et al., 2007; New Brunswick Department of Health & Wellness, 2001; Wiebe et al., 2006). Each Canadian study reports that bingo participation is significantly higher among lower annual income residents (\$20,000-\$30,000) compared to individuals having higher income (\$50,000 – \$100,000). Similarly, in the UK, past-year participation in bingo was significantly higher among the lowest income households (9%) than the highest income households (4%).

Health status. In the UK, bingo prevalence was highest among individuals who reported fair health (11%) and lowest among those who reported good or very good health (7%) and those with bad or very bad health (8%). Survey respondents with a longstanding illness did not engage in any one particular activity more often than respondents with no longstanding illnesses, with the exception of bingo (Wardle et al., 2007). This relationship may be confounded by age, as older individuals tend to be less healthy. However, O'Brien Cousins and Witcher (2007) found that among individuals aged over 65, more bingo players reported physical health limitations that would prevent them from participating in physical activities compared to non-players. Additionally, sedentary living was the only significant predictive lifestyle pattern for seniors engaged in bingo.

In summary, bingo players are predominantly female and the game remains one that is primarily popular among individuals living in households with low relative incomes. In regards to age, it seems that adolescents and young adults have the highest participation rates. At the same time, bingo appears to be a favoured gambling activity among elderly people. The relation between bingo playing and ethnicity merits further attention. High rates of bingo playing in First Nations communities may be due to the greater abundance of bingo halls and gambling facilities, as well as their widespread social acceptance in these communities. However, the relationship between ethnicity and bingo play is perhaps better explained in terms of the socio-economic conditions affecting certain cultures and communities, since bingo players tend to have less income than non-bingo players. Finally, having a physical health limitation seems to be associated with bingo playing. Based on these data, it seems that bingo players are more likely to be female, living in a working class or lower-income household, and either a senior or young adult.

Bingo Play and Problem Gambling

Problem gambling is characterized by continued gambling despite harmful negative consequences such as disrupted interpersonal relationships, emotional distress, and financial problems (American Psychiatric Association, 2000). A recent estimate of past-year gambling problems in the UK indicated that 0.6% of the adult population fit the clinical definition of a problem gambler (Wardle et al., 2007).

The association between bingo play and problem gambling has received little attention from researchers. In early studies, there were few accounts of researchers being concerned about excessive gambling or other potential negative consequences attached to bingo play. For example, according to Dixey (1996), “there is no reason to suggest that there are any more ‘problem’ bingo players than there are problem horse race bettors or problem drinkers” (p.149). In contrast, King (1990) identified several statements made by bingo players in which they expressed fears of showing self-interest in the game, losing self-control,

becoming addicted, and committing the “sins” of gambling. In their study of the social construction of bingo players and bingo playing, Chapple and Nofziger (2000) reported that the occasional drinking, chain smoking, and participation in other gambling activities by bingo players may be considered “acts of deviance.” As well, they observed that some players reported feeling distress with their bingo playing as it takes time away from family and home responsibilities. In their study of bingo playing in the UK, Griffiths and Bingham (2002) noted that some bingo players spent an inordinately large amount of money on bingo (9% of players spending £30 or more per session). However, as they explained, money spent is not, by itself, an indication of excessive gambling. In their ethnographic study of seniors playing bingo, O’Brien Cousins and Witcher (2004) reported that although none of the eight players they interviewed qualified for pathological gambling according to DSM-IV-TR criteria (American Psychiatric Association, 2000), one woman was possibly gambling “on the edge” and concerned about her debts as a result of excessive bingo play. In their ethnographic study of women’s involvement in bingo, Maclure et al. (2006) considered imprudent the actions of some players who overspent or admitted to jeopardizing their relations with close family members. Additionally, women with family responsibilities and those in a low-income situation reported feelings of stress and guilt over the amount of time and money devoted to bingo. Examination of previous studies suggests that although bingo is a harmless pastime for the majority of individuals, there is evidence of signs of at-risk gambling among some regular bingo players. However, little is known about the prevalence of problem gambling among regular bingo players or about the specific risk factors associated with bingo play.

Data from regional surveys on gambling and problem gambling suggest that problem gambling among bingo players may be more prevalent than previously thought. In British Columbia, it is estimated that 16.1% of past year bingo gamblers are moderate problem or severe problem gamblers. This proportion is significantly higher than the estimated problem gambling rate among all British Columbians (4.6%) and among all past year gamblers (6.3%) (Braid & Volberg, 2008). In Manitoba, in a sample of 5,096 individuals, 10.4% of non-problem gamblers, 22.5% of low-risk gamblers, 23.8% of moderate-risk gamblers, and 30.8% of problem gamblers had played bingo in the past year. In Saskatchewan, the greatest difference in past-year participation rates between problem and non-problem gamblers was found for VLTs (78.3% and 14.8%, respectively), instant win tickets (78.3% vs. 27.7%), bingo (47.8% vs. 7.5%), and slots (47.8% vs. 19.5%). Also, problem gamblers were found to be more likely than non-problem gamblers to spend more each month on bingo (median monthly expenditures of \$160 and \$15.50, respectively). Similarly, moderate-risk gamblers spent twice as much money on bingo compared to non-problem gamblers (\$32.50 vs. \$15.50); however, the expenditure differences between low-risk and non-problem gamblers were less pronounced (\$20.00 vs. \$15.50) (Wynne, 2002). In New Brunswick, over the past year, regular gamblers were significantly more likely than casual gamblers to have played bingo (18% vs. 8%) (New Brunswick Department of Health & Wellness, 2001). In Ontario, severe problem gamblers reportedly spent 10.2 hours per month on bingo, whereas the mean for all gamblers playing bingo was 2.5 hours (Wiebe et al., 2006).

In California, the lifetime prevalence rate of pathological gambling was found to be 200% higher among bingo gamblers than among gamblers of the general population (Volberg

et al., 2006), while in New Mexico, problem gamblers were more likely to have played bingo in the last year (23.3%) when compared with at-risk gamblers (7.1%), and non-problem gamblers (6.0%) (Volberg & Bernhard, 2006). In the UK, while 3.1% of past-year gamblers playing bingo qualified as problem gamblers, 5.0% of those who had played in the past week were identified as problem gamblers (Wardle et al., 2007). Finally, in a comparative study of older and younger adults in New Zealand, preferences for electronic gaming machines (EGMs) and bingo were related to problem gambling scores for both age groups (Clarke, 2008). Judging from the available data there remains little doubt that problem gamblers tend to gamble more often on most forms of gambling, with bingo being no exception. Not surprisingly, problem gamblers seem to wager more money and spend more time per bingo session than non-problem gamblers.

Further understanding of the association between bingo playing and problem gambling can be gained from descriptions by gamblers of the activities they judge to be problematic. In a study of gamblers in Ontario, over half of the respondents (51.5%) indicated that there were specific games related to their difficulties, with almost one-third (30.4%) identifying bingo as a particularly problematic gambling activity (Wiebe et al., 2006). In New Brunswick, for adults who live with or know of someone with a gambling problem, bingo is seen as playing a greater role in problem gambling compared to lottery or casino games (New Brunswick Department of Health & Wellness, 2001). In Queensland, Australia, the main source of gambling problems were reported as EGMs (67%), horse racing (18%), and a combination of horse racing, bingo, EGM, and scratch tickets (15 %) (Schofield, Mummery, Wang, & Dickson, 2004). These findings suggest that from problem gamblers' perspectives as well as their family and friends, bingo plays a significant role in gambling problems.

Our examination of the link between bingo and problem gambling suggests that, for adults, bingo playing is more common among at-risk and problem gamblers than non-problem gamblers. It is unclear, however, if bingo plays a role in the initial development of gambling problems or if it only contributes to the maintenance of these problems. It may be that involvement in bingo may put someone at increased risk of developing a gambling problem or that individuals with existing gambling problems are more likely to seek out bingo compared to non-problem gamblers.

One aspect of bingo that might contribute to increased problems is the scheduling of bingo events. These events normally occur in regular intervals (e.g., weekly or daily) which encourage regular involvement. Unlike lottery draws, bingo events feature multiple games in succession, requiring gambling for longer periods of time, and players must be physically present as each game unfolds, thus increasing player involvement in the activity. As well, the availability of food and opportunities to socialize facilitate player attachment to bingo. Nevertheless, interpretations of the association between bingo play and problem gambling should be made with caution given that problem gamblers are normally involved in multiple gambling activities. In fact, in some jurisdictions bingo halls offer other gambling opportunities apart from bingo. Between or before bingo games, it is common for individuals to play cards, purchase instant-win lottery tickets, or play EGMs (Chapple & Nofziger). One study showed that a greater percentage of heavy gamblers

(spending £30 or more per session) played both the parti-bingo (an instant play game where players insert a coin in a slot and can win money or sweets) and the fruit machines (i.e., electronic gaming machines) between the bingo games (Griffiths & Bingham, 2005).

Discussion

Our examination of the literature on bingo suggests that gambling research on bingo, particularly empirical data, is relatively scarce. Most of the published studies have taken a sociological or ethnographical approach and have used participant observation and interviews to investigate the experience of bingo from the players' perspectives. A few studies have examined the question of whether or not there are risks associated with regular bingo participation. Our review of published studies and of data contained in general gambling prevalence surveys supports the idea put forward that bingo, like other gambling activities, has the potential to either be a harmless form of entertainment or a risky behaviour with addictive properties and damaging consequences (Chapple & Nofziger, 2000; Maclure et al., 2006). However, the specific risk factors associated with bingo play, the elements of bingo that make it particularly addictive for some, as well as the characteristics of players who experience problems with bingo remain to be investigated in detail.

One of the important findings in our review is the relatively high rate of past-year participation in bingo among adolescents. Perhaps this finding is not too surprising given the public perception of bingo. Compared to other gambling activities, bingo is generally viewed as a "soft" form of gambling as evidenced by its pervasiveness in schools, community centres, and churches as both a fun activity and fundraising venture. These same organizations, meanwhile, tend to adopt harsher stances regarding other types of gambling such as VLTs. Because bingo is, by many, perceived as an innocuous form of gambling, adolescents are likely to have increased exposure to it and adopt a more accepting attitude toward bingo. Such attitudes among adolescents are reinforced further by parents who play bingo regularly and approve of their children's participation. Past research has shown that parents who give lottery tickets as gifts to their teenaged children may send them mixed messages about gambling (Felsher, Derevensky, & Gupta, 2004). This may be the case to an even greater extent with bingo, which already constitutes a socially acceptable pastime with little perceived harm. Clearly, future studies should be directed at understanding the gambling behaviour of adolescents as it relates to bingo. Finally, as for other forms of gambling, information about the risks associated with bingo play should be included in youth gambling prevention activities.

For the adult population, our examination of the demographic characteristics of bingo players suggests that regular players are more likely to be female, in poor health, and belong to at least one of three groups: low-income individuals, seniors, and young adults. For low-income individuals, Dixey (1996) provides a clear description of the social and cultural context in which working-class women were engaged in playing bingo in the 1980s. For regular female bingo players, bingo was "an invaluable source of companionship, a refuge which offers excitement, and an opportunity to celebrate 'traditional'

working-class values such as neighbourliness, non-intimate companionship, the right to entertainment and so on” (p.149). Similarly, for low-income individuals (including the working class women mentioned in Dixey’s work), playing bingo seems to be a way to affirm one’s social identity and gain empowerment (Maclure et al. 2006). This intriguing conceptualization holds potential for future research examining motives for bingo participation. Empirical studies should test the impact of bingo play on self-concept and related variables.

Bingo participation among seniors is another cause for concern. While researchers have proposed that the entertainment and socialization opportunities may have a therapeutic value for seniors who are lonely or bored in their everyday lives, problems may arise. As O’Brien Cousins and Witcher (2004) explained, seniors are at a point of their life where “widowhood, inadequate pension income, isolation from family, and living in close proximity to other older people who they do not want to spend time with, lead both single and married older people to want to get out and meet people by participation in an affordable form of entertainment” (p.144). Factors including reduced mobility, health problems, fear of being alone, and boredom may explain why spending time in the bingo halls is important to them. For seniors, the game is simple and fun, food is often available, and they can meet people and have a feeling of belonging.

Low-income individuals and seniors share common ground in terms of their social position which might contribute to their mutual attraction to bingo. Low-income individuals and seniors are groups that are more susceptible to feeling excluded from society. Individuals of lower socio-economic status are limited by their incomes, which restricts their choices for leisure. Seniors, meanwhile, can often be marginalized by their retirement status, limited income, or impaired health, all factors which may reduce their possibilities for entertainment. Consequently, to socially-excluded individuals, bingo may be the ultimate refuge for entertainment. The popularity of bingo among seniors and low-income individuals speaks of the overall organization, structure, and values of society. Geertz (1973) contended that gambling contexts can be viewed as microcosms that mirror the structure and values of society. The fact that studies have consistently reported that bingo halls have a communal atmosphere and regular players become attached to their role as bingo players may indicate how poorly surrounded and supported these same individuals are outside the bingo halls. It follows that the bingo hall may be viewed as a microcosm of society, where bingo players represent individuals who are circumstantially limited based on their age, gender, or income, and regular bingo play is the remedy against social exclusion. Accordingly, variability in social structures across countries might also be reflected in regional differences in the experiences of bingo players.

Involvement in bingo may have a therapeutic value for individuals who are in need of meeting people or adding excitement to a lonely and boring day. However, research has yet to show whether bingo can have a beneficial effect for regular bingo players and to what extent their participation impacts the lives of their relatives and friends. Interpersonal problems may arise if regular attendance at bingo keeps one away from family or loved ones and if household and work responsibilities are neglected. A downward spiral can

develop if individuals are using bingo as an escape to avoid responsibilities or to forget about personal problems. Clearly, individuals who engage in gambling in order to escape personal problems are at a greater risk of developing a gambling problem. For low-income individuals, regular bingo participation may lead to even greater financial problems which may be particularly problematic for seniors who more often live on fixed incomes. Finally, bingo is a sedentary form of leisure. For individuals who regularly play bingo, especially seniors, this may lead to a more rapid physical decline, health issues, and a lower quality of life (O'Brien Cousins & Witcher, 2007). Both the positive and negative effects of bingo participation on seniors and low-income individuals have yet to be studied extensively.

Similarly, bingo play among young adults is not well understood by gambling researchers. The popularity of bingo among young adults may be linked to the modernization of the bingo industry. These changes first came in the UK with the creation of a national game with larger prizes in the attempt of attracting a younger, more affluent clientele (Dixey, 1996). With its technological advancements, electronic bingo on the internet may have gained popularity among a younger group of gamblers. Similar to adolescents, young adults may have been introduced to bingo by family or friends and accompanied their parents to bingo as part of family activities (Chapple & Nofziger, 2000; Dixey, 1996). In one study, a young adult bingo player was described as a young mother who was introduced to bingo by her mother-in law (Chapple & Nofziger, 2000). For this woman, bingo represented the opportunity to stop daily chores, leave the house, and socialize with other people. Young adults who are regular bingo players may share with older bingo players the same difficulties and worries of life associated with household and personal responsibilities. The notion of bingo as a form of escape, particularly among young adults experiencing inordinately high amounts of stress, warrants more rigorous investigation by gambling researchers.

Our review clearly suggests the need for additional research on bingo, particularly a closer analysis of bingo players who are involved in the game on a regular basis. Research should focus on understanding the motivations and frequency of play of young adults, as well as the potential consequences playing bingo has on their daily lives. Furthermore, the relation between regular bingo play and social exclusion should be investigated. Attention should also be given to the time and involvement spent by players at bingo and its impact on their interpersonal relationships.

These factors could be investigated by examining the behaviour of online bingo players. In an online study of poker players (Griffiths, Parke, Wood, & Rigbye, 2009), it was suggested that "online poker may be producing a new type of problem gambler where the main negative consequence is loss of precious time (rather than loss of money)" (p.88). Loss of time may be more problematic for individuals who have household responsibilities, and less problematic for seniors who in fact may be trying to fill their time. Nevertheless, the traditional view that bingo is uniquely a game of socialization should be reconsidered in light of this research.

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For correspondence: Jean-Claude Moubarac, M.Sc., International Centre for Youth Gambling Problems and High-Risk Behaviors; Email: jean-claude.moubarac@mcgill.ca

Contributors: Jean-Claude Moubarac conducted the literature review and wrote the initial draft of the paper. Will Shead assisted with the revised draft, making significant changes to the paper. Jeffrey Derevensky contributed with final comments and additional revisions to the paper.

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Jean-Claude Moubarac is a PhD candidate in the Department of Public Health at the Université de Montréal where he is studying the contextual factors associated with sugar

consumption. He completed an MSc in Anthropology at the Université de Montréal. His research interests include socio-cultural studies in public health related to gambling, sugar consumption, and the concept of ethnicity. He is currently employed as the coordinator of the *Reseau québécois de recherche sur le suicide* and continues to collaborate on projects with the International Centre for Youth Gambling Problems and High Risk Behaviors at McGill University in Montreal where he worked for two years.

Dr. N. Will Shead is a post-doctoral fellow at the International Centre for Youth Gambling Problems and High-Risk Behaviors at McGill University in Montreal, QC. He completed a PhD in Clinical Psychology at the University of Calgary. His work has been published in a variety of gambling and psychology-based academic journals. His research interests include cognitive mechanisms underlying problem gambling, affect-regulation expectancies and motives related to gambling, internet gambling, sports betting, and poker playing.

Dr Jeffrey L. Derevensky is Professor and Director of Clinical Training, School/Applied Child Psychology, Department of Educational and Counselling Psychology, and Professor, Department of Psychiatry at McGill University. He is a clinical consultant to numerous hospitals, school boards, government agencies, and corporations. Dr. Derevensky has published widely in the field of youth gambling, is associate editor of the *Journal of Gambling Studies*, and is on the editorial board of several journals. He is co-director of McGill University's International Centre for Youth Gambling Problems and High-Risk Behaviors.

book review

Out of the Shadows: Exploring the Many Facets of Gambling and their Implications to Society

By Edward H. Sodergren, Ph.D. (2007). Mill City Press, Minneapolis, MN, USA. x, 74pp. ISBN 978-1-934248-10-2, \$12.95 USD (paperback).

Reviewed by: Joanna Franklin, MS NCGC II

Out of the Shadows is a brief book of only 74 pages. The intention of the author, as stated in the subtitle, is to explore the many facets of gambling and their implications to society. Indeed, in just these few pages, the author visits a great deal of research and quotes many authors, in an effort to paint a picture of the “history of gambling, its evolution, growth, prevalence, participants, and potential for problems, as well as recommended treatment responses” (p. vii).

The table of contents, introduction, and outline of the central chapters together take a full third of the actual book. I was confused about the author’s decision to overview the book’s material in Chapter 2 for about ten pages, and then begin with this same material in a bit more detail in Chapters 3 through 9. The overview seems to jump from topic to topic, and perhaps the pages could have been better spent in a more in-depth review of the topics listed. Rather than reading a description of what is coming in the following chapters, I would rather just get to it. Instead, in Chapter 2 we have eight sections — of several paragraphs each — telling us what will be discussed in the next seven chapters, which ultimately disturbs the flow.

Sodergren provides a short review of the landmark writings of several early researchers and treatment professionals in an effort to explain various aspects of problem gambling. This general but concise summary gives the reader an overview and a glimpse at the work of these selected authors. Some authors are discussed in more detail than others, but Sodergren seems to have a clear focus on what he wants to pull from these contributors in order to paint a picture of his selected facets of gambling.

I must say I enjoyed reading about some of the lesser-quoted authors that did indeed make significant contributions to our understanding of problem gambling. The author’s overview of historical contributions is a focused collection with clear intention. However, I was disappointed with the dated references. Roughly three-quarters of the references are from the 1990s, about one-quarter are from the 1980s, and only one research reference is from the last decade. Though any good work should indeed explore the historical works of early authors, one would expect a recent publication to include more recent findings.

This limitation is particularly of issue when trying to answer the author’s question of whether pathological gambling is a treatable disorder, and if so, how best to treat it. The

author states that he has used “available research and theory and provided an overview of the problem, both historical and current” (p. 71). But in limiting his review to research prior to 2001, the author fails to inform his readers of the several drug trials with problem gamblers, advances in neurobiology, biogenetics and brain scan contributions, as well as research on brief therapy, motivational interviewing, Stages of Change, Integrated Couples Behavioral Therapy, and other more current avenues to treatment for problem gamblers and their families.

Readers of this text will be left with the impression that there are inpatient programs treating gamblers in the United States, when in fact, what the US currently has is a small selection of residential programs, at least three of which are state funded. Outpatient gambling treatment services, today, have grown well beyond the 100 counselors nationally he cites. In fact, several states have more than 100 gambling counselors, and every year more states begin to provide training and treatment for problem gambling. This constitutes slow, but steady and significant, progress.

In fairness, Sodergren has not tried to make his book a literature review. In fact, he indicates clearly on the back cover that he is trying to offer the layperson and those in the helping professions who are inexperienced with gambling issues a view of the potential for problems and some considerations for treatment.

Sodergren has incorporated in several places selected lists, bullet points, and research findings in an easy-to-read and useful manner. Lists culled from articles by Rosenthal, Lesieur, Custer, Blume, Miller, and others speak quickly and clearly to topics such as the definition of a gambling problem, important elements of assessment, possible predisposing factors, enabling, when to consider residential or inpatient care, treatment planning elements, policy recommendations, and suggestions for future research. For so short a work, he has packed it with references and findings, and tried hard to paint an accurate picture of problem gambling. Though not a complete or comprehensive overview as such, and far from a spotlight on the problem, this flashlight does offer a great deal of information in a few short pages and will indeed make a contribution to diminishing the shadows for those new to the problem gambling research and treatment field.

Competing interests: None declared.

book review

Crossing the line: When gamblers turn to crime

By Hale Humphrey-Jones and Melvin A. Slawik. (2008). iUniverse Inc., New York. 120pp. 9780595495337, \$12.95 USD (paperback).

Reviewed by: Nigel Turner

Crossing the line: When gamblers turn to crime, by Hale Humphrey-Jones and Melvin A. Slawik, is a fascinating, case-study-based account of the varied ways in which pathological gamblers cross the line into criminal behaviour. It is important to note that this book is not intended as a scientific account of the issue. Rather, it is a guide to counsellors, teachers, and students who are interested in the broad scope of criminal involvement in pathological gambling. In addition, the book has many of the qualities of a self-help guide for problem gamblers who wish to avoid turning to crime and for families dealing with the aftermath of the disorder (including a list of indicators of victimization).

This short book is organized into five main parts: (I) Phases and stages, (II) Why can't I control this, (III) The addictive brain, (IV) The criminal mind, and (V) Treatment. Each section contains between three and seven case descriptions. Most of these descriptions are composites of actual cases in order to protect the anonymity of individual clients. Each case is followed by a brief description of the legal, social, medical, and/or theoretical issues related to the case.

The book also includes brief descriptions of various interventions, including cognitive behavioural therapy, motivational interviewing, gambling court, pastoral counselling, and Gamblers Anonymous. There is also a short and easy-to-follow description of the neuroscience of pathological gambling, as well as of personality disorders that are often associated with pathological gambling.

The one criticism I have pertains to the formatting of this book – the introduction for each case is usually positioned in the final paragraphs of the prior chapter, rather than as the introduction to the next case.

Overall, this is an excellent and comprehensive (albeit short) account of the manner in which gambling and crime can become entangled.

Competing interests: None declared.

book review

Cowboys Full: The Story of Poker

By James McManus. (2009.) Farrar, Straus, and Giroux, New York, USA. 528 pp. \$30.00 USD, ISBN 978-0-37-429924-8 (hardcover edition).

Reviewed by: Leslie R. Herbert, LMSW, University of Georgia School of Social Work

From the opening paragraphs, James McManus — journalist and poker player — makes it clear that the history of poker is also a history of powerful capitalists, movers and shakers, and world leaders. *Cowboys Full: The Story of Poker* takes us on an informative tour of some of the more important political events in United States' history, highlighting the influence of poker and poker players.

Our tour begins with the transformation of *poque* — a French and Persian parlor diversion — into a bawdy frontier game favoring the most effective cheaters. It then follows through to the gentrification of poker and, finally, its meteoric rise in popularity after the introduction of the “pocket cam,” which evolved poker from a table game into a profitable spectator sport. McManus examines in great detail how this metamorphosis represents the changing face of American culture, from fledgling frontier nation to dominant political and economic force, from outlaws in dirty saloons to average Joes and Janes in spotless, well-lit poker rooms complete with hand sanitizer dispensers.

One of the more interesting, and justifiably controversial, concepts is that of a supposed “immigrant gene” and its potential influence on American history and culture. McManus cites Peter C. Whybrow (2005), a behavioral scientist at UCLA, who asks (as if wondering aloud) why Canadians, South Americans, and other Western colonial cultures do not seem as predisposed to move inexorably from one risk to the next, in search of greater and greater reward, as US culture (unfortunately, he provides no evidence for this observation). Relying heavily on Whybrow's suggestion of a genetic marker that predisposes certain individuals to search for greener pastures during difficult times, McManus indicates that the US's unique history may have facilitated the concentration of this as-yet unidentified gene in the U.S. population.

Much of the book is concerned with cheating, bluffing, and reading opponents' bluffs — skills that can prove invaluable at the table, as well as in other high-stakes situations. In many cases, effective leadership involves winning decisive victories from positions of weakness. One of the many examples he related was a story about Nathan Bedford Forrest, a confederate general in the Civil War, infamous for his merciless treatment of enemy combatants and civilians (and even more infamous for starting the Ku Klux Klan). Forrest pulled off a monumental bluff, convincing Colonel Abel Streight to surrender, even though Streight had Forrest significantly outnumbered and outgunned. (The humiliated Colonel

was later offered the “comforting” line, “Cheer up, Colonel. This is not the first time a bluff has beat a straight.”)

It seems that the main point McManus wants to convey is that poker playing at its most skillful is a manifestation of traits and abilities possessed by many dominant historical figures. Opponents square off, and quite frequently, the random cards do not determine the outcome. Instead, the winners are often the players who correctly guess their opponents’ positions and effectively portray themselves as holding the stronger hand.

While this kind of maneuvering can lead to decisive victories, it can also backfire. In McManus’ opinion, George W. Bush misread a colossal bluff by Sadaam Hussein with regard to weapons of mass destruction, while also appearing unaware of how his own position was perceived. Obama, still a fledgling senator, correctly read the situation and voted against the invasion of Iraq. Here, the reader is gently reminded that Obama is a poker player, and Bush is not.

Poker skills, then, are separated from the game itself. Chief among these are “shrewdness, psychological acuity, risk management, and the ability to leverage uncertainty.” McManus quotes Andy Bloch, a professional poker player who once said, “you have to put yourself in the shoes of your opponents, get inside their heads and figure out what they’re thinking, what their actions mean, what they would think your actions mean.” This recurring theme seems to reflect McManus’ fundamental belief that poker represents a neutral or healthy manifestation of these traits. There is very little discussion of the behavioral and societal dysfunction associated with gambling. Though clearly not blind to its downside, McManus has presented a perspective highlighting the challenges of poker as analogs to the challenges of negotiating life, even to the highest levels of international significance.

That said, McManus does include the heartbreaking stories of several poker players whose lives were destroyed by addiction to the game. Most notably, he recounts the mercurial life of Stu Ungar, the three-time World Series of Poker Main Event winner, who earned \$25 million over 20 years as a gambler. McManus explains, “The anterior cingulates of the frontal cortex [of pathological gamblers] have more vulnerable dopamine systems, ‘psyches’ (as we used to call them) more easily hijacked by rewards like sex, dope, money, or laurels.” He feels this was especially true for Ungar, who died broke, sick, and alone in a motel room. “Poker exemplifies the worst aspects of capitalism that have made our country so great,” as Walter Matthau once observed.

Cowboys Full is a lengthy endeavor, numbering 528 pages (including table of contents, notes, glossary, and index section). It feels as if all but a very small proportion of these pages accentuate the positives of poker. Perhaps McManus’ goal is to indirectly remind therapists, policy makers, and researchers that the vast majority of people (up to 95 percent of gamblers, by some estimates) gamble responsibly for entertainment, social networking, and intellectual challenge. McManus, who has earned \$740,000 as a tournament poker player, would include himself in that category.

McManus maintains that the game and the institution of poker can embody the best attributes of the “American spirit,” which he views as exceptional. It could be argued that at times, he stretches to prove this point (e.g., was Kennedy’s handling of the Cuban Missile Crisis really relevant to this topic?). If there is a stylistic hair to be split, it could be argued that after the exhaustive treatment of the history of poker, *Cowboys Full* does not so much end as trail off. Nevertheless, it presents a fresh perspective and a rich store of knowledge — two valuable tools for understanding the language and culture of both the casual and pathological gambler.

Reference

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book review

Midbrain Mutiny: The Picoeconomics and Neuroeconomics of Disordered Gambling

By Don Ross, Carla Sharp, Rudy E. Vuchinich, and David Spurrett. (2008). MIT Press, Cambridge, Mass., USA. x; 301pp. ISBN: 978-0-26-218265-2, \$40.00 USD (hardcover).

Reviewed by: Ari Kalechstein, Ph.D. Adjunct Associate Professor, Department of Psychiatry, Baylor College of Medicine

Editor's Note: This review by Dr. Ari. Kalechstein is the second in a two-part series on neuroeconomics. The first part is published in our 23rd issue.

Disordered Gambling – Addiction or Not Addiction. That is the Question.

Disordered gambling has been on the radar of researchers and clinicians for decades. It gained acceptance as a diagnostic entity approximately 30 years ago with the publication of DSM-III (American Psychiatric Association, 1980). However, from this reviewer's perspective, the condition of disordered gambling has long been underappreciated with respect to the prevalence of the disorder or the level of devastation with which it is associated. Several factors most likely underlie the increased interest in the condition. First, with the advent of online gambling and easier access to land-based gambling venues in many countries, more people are affected by the disorder. Second, a growing appreciation for the existence of behavioral addictions has emerged amongst researchers, clinicians, and laypeople. Third, the advent of technologies that enable researchers and clinicians to characterize brain structure (e.g., magnetic resonance imaging, or MRI) and function (e.g., fluorodeoxyglucose positron emission tomography, or FDG-PET) have spurred an interest in the study of addiction. Finally, as the field of neuroeconomics has gained traction in the scientific community as a legitimate area of study, there has been increased interest in the related phenomenon of disordered gambling.

Not surprisingly, this increased interest in disordered gambling has been accompanied by an increase in the number of peer-reviewed articles on the topic. Yet, there existed, to this reviewer's knowledge, very few scientific texts on the topic at the time this book was published (e.g., Glimcher, 2004). Thus, one potential indicator of increased interest in disordered gambling is that this text prepared by Ross, Sharp, Vuchinich, and Spurrett was published at approximately the same time as that of Dr. Peter Politser's book, entitled *Neuroeconomics: A Guide to the New Science of Making Choices* (reviewed in the last issue of JGI).

With regard to the intended audience, it is this reviewer's opinion that the text is prepared in a manner that will stimulate interest across a broad readership. For example, neurologists, neuropsychiatrists, neuropsychologists, and cognitive neuroscientists are likely to appreciate the chapters that focus on brain structure and function. Experimental psychologists, particular those with a behavioral theory background, can appreciate the probative nature of the chapters that focus on this topic. Moreover, interested treatment providers will find useful the chapter on the clinical implications of disordered gambling.

The authors have prepared the text in a manner that aims to educate readers regarding the fields of picoeconomics and neuroeconomics. It is assumed that the reader is familiar with the structure and function of the brain, such as the cognitive functions mediated by specific regions of the brain and/or particular neurotransmitters, behavioral theory, and various clinical syndromes that occur in conjunction with disordered gambling. Readers without a background in these areas may find the book less accessible. Thus, the text is most appropriate for relatively knowledgeable researchers and clinicians. Graduate students who are brave and interested are encouraged to read this book. Other readers are encouraged to wade in at their own discretion.

Using picoeconomics and neuroeconomics as a context for the discussion of disordered gambling, the authors review a wide array of topics. These include chapters that focus on defining the basic concept of addiction, impulsive consumption, addiction from a neuroeconomics perspective, the place of disordered gambling within the field of addiction, clinical evidence that disordered gambling is anchored in neuroscience, and, finally, why it is that gambling disorders should be parsimoniously renamed as addictive gambling.

Overall, Ross and colleagues provide a thorough review of multiple topics in 249 densely packed pages. In retrospect, the first chapter portends the authors' intent to cover a wide array of topics in the book, when they begin by asking the question, "Is there such a thing as addiction?" They then seek to prove the point by recruiting research findings from seemingly diverse sources and effectively integrating them. While such a question might initially be dismissed because the answer seems obvious, the authors do not accept the premise as a *fait accompli*. Instead, they provide a methodical and well-reasoned argument in support of the premise that the concept of addiction exists and that the fields of neuroeconomics and neuroscience are well-positioned to explain how and why addiction occurs.

Much of the text reviews extant literature while concurrently discussing disordered gambling and the concept of addiction. It is the final chapter, however, in which the historical data are truly synthesized and the authors' thinking is crystallized. Ross and colleagues argue strongly for the reconceptualization of pathological gambling as addictive gambling. Moreover, they offer formidable counterarguments to those researchers who disagree with them (on a personal note, I found it refreshing that the authors were willing to take a bold stand, rather than providing a milquetoast opinion). Regardless of whether one agrees with them (and this reviewer is withholding his opinion as a courtesy to future readers), researchers and clinicians would be well-served to read and carefully consider the logic

presented in this text. It is this kind of bold thinking that will serve as catalyst for researchers and clinicians who study addictive gambling.

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