

éditorial/editorial

Éditorial : La réalité virtuelle arrive à nos portes

Il existe plusieurs stratégies thérapeutiques pour intervenir auprès des personnes souffrant de troubles de dépendance au jeu de hasard et d'argent (Palessent et al., 2005; Toneatto & Ladouceur, 2003). L'un des défis rencontrés par les intervenants repose sur la difficulté d'appliquer dans le bureau du professionnel des interventions alors que le joueur est « à chaud émotionnellement » (Janis & Mann, 1977), c'est-à-dire stimulé par ses émotions comme il le ressent dans les situations quotidiennes qui éveillent le désir de jouer et de continuer à jouer. Dans un vieux classique sur le traitement des dépendances, Alan Marlatt (1985) argumentait en faveur de mettre le client dans des situations où il ressent la tentation de s'engager dans ses comportements de dépendance afin de l'aider à ce que les stratégies acquises en thérapie puissent se généraliser là où ça compte réellement. Quelques études ont documenté la pertinence de l'exposition *in vivo* (Echeburua, Baez, & Fernandez-Montalvo, 1996; Echeburua & Fernandez-Montalvo, 2002; Echeburua et al., 2000; Symes & Nicki, 1997) et en imagination (Blaszczynski, Drobny, & Steel, 2005; McConaghy, Armstrong, & Frankova, 1991). Comparativement à l'exposition en imagination, l'exposition *in vivo* a pour avantages de permettre au thérapeute de savoir réellement à quoi s'expose le client, d'observer divers comportements dysfonctionnels pouvant contribuer au maintien du jeu pathologique, de stimuler au maximum le désir, et d'inclure de potentiels stimuli évocateurs comorbides. Néanmoins, l'exposition aux situations de jeu demeure peu utilisée par les intervenants dans les divers centres d'intervention. Plusieurs intervenants sur le terrain expriment des craintes vis-à-vis l'exposition *in vivo* et certains ressentent un inconfort idéologique avec l'idée de se retrouver dans une maison de jeu.

Depuis quelques années, les développements technologiques permettent de contourner certains de ces problèmes et préoccupations grâce aux immersions en réalité virtuelle. Dans la sécurité du bureau de l'intervenant, le joueur peut enfiler une paire de lunettes 3D et se retrouver devant des appareils de jeu vidéo ou dans un casino (voir Figure 1). L'intervenant peut alors effectuer différentes interventions classiques (Ladouceur, Sylvain, Boutin & Doucet, 1998) alors que le joueur est progressivement amené dans une situation qui éveille le désir de jouer. L'intervenant pourra par exemple se servir de la réalité virtuelle pour identifier les situations, pensées et comportements à risque du joueur, effectuer de la restructuration cognitive de facteurs de maintien du jeu pathologique, ou appliquer des stratégies de résolution de problèmes.

Figure 1. Images tirées d’immersions en réalité virtuelle dans un bar (à gauche) ou un casino (à droite) virtuel créés pour le traitement des problèmes de jeu. Image - Laboratoire de cyberpsychologie de l’UQO.



Bien qu’intuitivement intéressante comme approche, il faut se demander si la réalité virtuelle permet réellement d’induire des états affectifs à vocation thérapeutique. Les premières études documentent la pertinence de cette approche novatrice. Une première étude (Loranger et al., 2011) a été effectuée avec 31 joueurs fréquents (jouent au moins une fois par mois aux appareils de loteries vidéo ou aux machines à sous) et 36 non-joueurs (jouent un maximum de deux fois par année, et donc de façon très occasionnelle), tous des familiers avec les appareils de loterie vidéo (ALV). Lors de l’expérimentation, tous les participants devaient jouer durant sept minutes : (a) au ScrabbleTM (condition témoin), (b) à un vrai jeu de hasard sur un ALV bien réel, ou (c) à des ALV dans les deux environnements virtuel illustrés à la Figure 1 (un bar et un casino). Les résultats ont montré que les joueurs fréquents, par opposition aux non-joueurs, présentent une augmentation significative du désir de jouer dans les environnements virtuels, et ce avec autant de force que l’utilisation d’un vrai ALV. Les données récoltées suggèrent aussi la possibilité d’utiliser cet outil à des fins d’identification des joueurs à risque, et peut-être même de prévention (par exemple, en observant les comportements à risque d’autres joueurs). Les mêmes environnements virtuels ont été utilisés auprès de 10 joueurs pathologiques. Les résultats ont révélés que l’immersion permettait une induction soutenue du désir de jouer durant 20 minutes d’immersion (Giroux et al., 2013). Une étude subséquente menée auprès de 28 joueurs en traitement a montré qu’une immersion en réalité virtuelle permettait aux intervenants d’effectuer les exercices de prévention de

rechute plus efficacement que sans l'utilisation de cette technologie (Bouchard et al., 2012). Bref, la réalité virtuelle semble une option prometteuse pour développer des traitements novateurs. Déjà, dans le cas du tabagisme (Park et al., 2014), une étude pilote clinique comparant une thérapie cognitive comportementale brève à un programme reposant uniquement sur des immersions en réalité virtuelle montre que cette dernière modalité peut s'avérer efficace.

Les professionnels peuvent déjà avoir accès aux applications cliniques de la réalité virtuelle, mais ces produits ne sont pas encore prêts pour le marché de masse. Il faut considérer ici deux enjeux, soit l'équipement et les logiciels. Les ordinateurs dédiés aux jeux 3D possèdent depuis plusieurs années la puissance nécessaire à un prix abordable. Le problème réside dans le coût des visiocasques et capteurs de localisation. Ces périphériques représentent une technologie ultraspécialisée relativement difficile à sélectionner et se procurer pour les non-initiés, dispendieuse et parfois complexe à installer. Toutefois, il y a beaucoup d'effervescence dans l'industrie du jeu en raison de l'arrivée sur le marché de périphériques comme le Rift d'Oculus et le Morpheus de Sony qui pourraient changer complètement la donne dès la fin de 2014, avec des combos visiocasques et capteurs de localisation pour moins de 500 \$. Reste alors la disponibilité des logiciels. Pour l'instant, les équipes de recherche peuvent parfois revendre certains logiciels, dans le cadre d'ententes avec les universités ou les chercheurs. Il y a fort à parier que l'apparition de périphériques moins coûteux et simples à utiliser va stimuler l'intérêt de l'industrie du 3D et démocratiser l'accès aux applications cliniques de la réalité virtuelle. Son utilisation nécessite tout de même une formation minimale de quelques heures, en plus d'une bonne compétence dans l'application de traitements validés empiriquement pour la dépendance au jeu.

Il semble donc y avoir un potentiel intéressant à explorer par les chercheurs. Espérons que dans quelques années, nous aurons le plaisir de lire dans *Journal of Gambling Issues* les résultats d'études empiriques testant les avantages et les limites de cette nouvelle façon d'appliquer la thérapie.

Stéphane Bouchard, Ph.D.
Université du Québec en Outaouais

Editorial: Virtual reality is upon us

There are many therapeutic approaches for working with individuals seeking treatment for pathological gambling (Pallesen et al., 2005; Toneatto & Ladouceur,

2003). One of the challenges that therapists encounter is that of applying therapeutic interventions in the office when a patient is emotionally driven (Janis & Mann, 1977), that is, when a patient is stimulated by emotions in daily life that trigger the urge to gamble and to continue gambling. In his seminal work on relapse prevention, Alan Marlatt (1985) argues in support of placing the client in situations in which he or she experiences the temptation to engage in dependency behaviours so that the strategies acquired in therapy can be applied where it really counts. Studies have documented the relevance of *in vivo* exposure (Echeburua, Baez, & Fernandez-Montalvo, 1996; Echeburua & Fernandez-Montalvo, 2002; Echeburua et al., 2000; Symes & Nicki, 1997) and imaginal desensitization (Blaszczynski, Drobny, & Steel, 2005; McConaghy, Armstrong, & Frankova, 1991). Compared to imaginal desensitization, *in vivo* exposure has the benefit of enabling the therapist to know what a client is actually exposed to; to observe the dysfunctional behaviours that contribute to the continuation of pathological gambling; to stimulate the urge to gamble as much as possible; and to include potential co-morbid triggers. However, exposing clients to gambling situations is not widely practised by therapists in treatment centres. Many in the field have expressed concerns with respect to *in vivo* exposure and some have an ideological objection to the notion of entering a gambling environment.

In recent years, technological developments have made it possible to circumvent some of these challenges and concerns through the creation of virtual environments. In the safety of the therapist's office, a client can put on 3D glasses and enter a 3D world containing virtual video lottery terminals or a virtual casino (see Figure 1). The therapist can then use various conventional interventions (Ladouceur, Sylvain, Boutin & Doucet, 1998) to progressively draw the gambler into a situation that increases his or her urge to gamble. The therapist can also use virtual reality to identify situations, thoughts, and behaviours that pose risks for the gambler; perform cognitive restructuring of the factors that maintain pathological gambling; and apply problem-solving strategies.

While this approach is interesting, intuitively, one wonders whether virtual reality truly makes it possible to induce emotional states that can be used for therapeutic purposes. Early studies have, in fact, found that this innovative approach is relevant. One such study (Loranger et al., 2011) involved 31 frequent gamblers (i.e., individuals who played a video lottery terminal or slot machine at least once a month) and 36 non-gamblers (i.e., individuals who played a maximum of twice a year or very occasionally). All were familiar with video lottery terminals (VLTs). During the experiment, all of the participants had to play for seven minutes on: (a) ScrabbleTM (control condition), (b) a real game of chance on a real VLT or (c) VLTs in both of the virtual environments illustrated in Figure 1 (a bar and a casino). The study results showed that, compared to non-gamblers, frequent gamblers presented with a significantly higher increase in the urge to gamble in virtual environments. Moreover, the urge was as strong as when playing a real VLT. The study data also suggested that this tool could be used to identify at-risk gamblers and for

Figure 1. Images of virtual cue exposures in a virtual bar (left) and casino (right) created for the treatment of pathological gambling. Image - Cyberpsychology Lab, UQO.



preventative purposes (observing the risk behaviours of other gamblers, for example). The same virtual environments have been used with 10 pathological gamblers. In this case, virtual reality immersion resulted in sustained induction of the urge to gamble during 20 minutes of immersion (Giroux et al., 2013). In a subsequent study involving 28 gamblers in treatment, virtual reality exposure enabled therapists to conduct relapse prevention exercises more effectively than without the use of this technology (Bouchard et al., 2012). Thus, virtual reality seems to be a promising option for the development of innovative treatments. In the case of nicotine dependence (Park et al., 2014), a clinical pilot study comparing the effectiveness of cognitive behaviour therapy and virtual cue exposure therapy demonstrated that the latter modality can be effective.

Professionals already have access to the clinical applications of virtual reality; however, these products are not yet ready for the mass market. There are two challenges, which are the hardware and the software. For several years, 3D gaming computers have been both powerful enough and affordable; the issue is with the cost of the 3D headsets and tracking sensors. These peripherals represent a category of ultra-specialized technology that is relatively difficult for the uninitiated to select and purchase; they are expensive and can be difficult to install. However, the boom in the gaming industry as a result of peripherals like Oculus Rift and Sony Morpheus could completely change the market by late 2014 and headsets and

tracking sensors could be available for less than \$500. This leaves us with the software issue. For now, research teams can sometimes resell software under agreements with universities or researchers. It's a safe bet that the emergence of less expensive and more user-friendly peripherals will stimulate interest in the 3D gaming industry and democratize access to the clinical applications of virtual reality. The use of 3D technology will require some training (a few hours) as well as competency in the application of empirically-validated treatments for gambling addiction.

There is some interesting potential here for researchers. We hope that, in a few years, we will be reading about empirical studies on the benefits and limitations of this new therapeutic approach in the *Journal of Gambling Issues*.

Stéphane Bouchard, Ph.D.
Université du Québec en Outaouais

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Relating severity of gambling to cognitive distortions in a representative sample of problem gamblers

John A. Cunningham,^{1,2,3} David C. Hodgins,³ & Tony Toneatto⁴

¹Centre for Mental Health Research, the Australian National University, Canberra, Australia

²Centre for Addiction and Mental Health, Toronto, Ontario, Canada

³Department of Psychology, University of Calgary, Calgary, Alberta, Canada

⁴Department of Psychiatry, University of Toronto, Toronto, Ontario, Canada

Abstract

The current study explored the relationship in a general population sample between problem gambling severity and cognitive distortions about gambling. A representative sample of problem gamblers (N = 766) was asked about cognitive distortions related to gambling. A positive association between gambling severity and cognitive distortions emerged, even when the variables associated with participants' demographic characteristics were accounted for. The current study demonstrates that the relationship between problem gambling severity and cognitive distortions does exist in the general population of problem gamblers. This finding emphasizes the key role that cognitive distortions may play in the development and maintenance of pathological gambling.

Résumé

Notre étude visait à examiner la relation entre la gravité des problèmes de jeu et la distorsion cognitive dans la population générale des joueurs à problèmes. Nous avons interrogé les membres d'un échantillon représentatif (n=766) sur les distorsions cognitives à l'égard du jeu. Même lorsqu'on tient compte des variables liées aux caractéristiques démographiques des participants, on relève une association positive entre la gravité des problèmes de jeu et les distorsions cognitives. Notre étude confirme donc l'existence d'un lien à cet égard dans la population générale des joueurs à problèmes. Cette conclusion met en lumière le rôle important des distorsions cognitives dans le développement et la persistance du jeu pathologique.

Introduction

Cognitive distortions are thought to play a central role in the development and maintenance of gambling problems (Goodie & Fortune, 2013; Johansson, Grant, Kim, Odlaug, & Götestam, 2009; Toneatto & Millar, 2004). Research has demonstrated that samples of problem gamblers are more likely than social gamblers to endorse such distortions (Joukhador, Maccallum, & Blaszczyński, 2003; McInnes, Hodgins, & Holub, under review; Myrseth, Brunborg, & Eidem, 2010; Toneatto, Blitz-Miller, Calderwood, Dragonetti, & Tsanos, 1997). Furthermore, interventions targeting cognitive distortions have enjoyed some success in motivating gamblers to reduce their problems (Fortune & Goodie, 2012).

Work to date investigating cognitive distortions has employed samples of gamblers from different settings (e.g., treatment, community recruited). It is important to establish the generalizability of the following fact, as it is crucial to the validity of this research: The relationship of cognitive distortions to problem gambling also functions in representative samples of problem gamblers. One published report has used general population data; however, the severity of gambling problems were related to two single-item questions that asked about irrational cognitions regarding randomness in gambling (Miller & Currie, 2008). The present brief report presents results from a general population sample of population gamblers, and reports on both the prevalence of different cognitive distortions and the relationship of severity of problem gambling to the strength of endorsement of these faulty beliefs about gambling.

Methods

This study employed data from a random digit dialing telephone survey of 8015 respondents, each of them 18 years of age or older, who spent more than \$100 on gambling in the preceding year (Cunningham, Hodgins, Toneatto, & Murphy, 2012). The survey identified current problem gamblers using the Problem Gambling Severity Index (PGSI) (score of 3 or more) (Ferris & Wynne, 2001) and asked a series of questions regarding gambling behaviours and beliefs, and regarding respondent demographic characteristics. These items included the PGSI and the Gambling Cognitions Questionnaire (GCQ) (Toneatto, 1999, August).

Results

Of the 8015 respondents interviewed, 766 scored three or more on the PGSI and were asked to complete the GCQ. The mean (SD) age of respondents was 48.3 (15.2), 56% were male, 55% were married or living in a common law relationship, 57% were employed either full or part-time, half (51%) had earned at least some post-secondary education, and 18% had a household income of CAN\$30,000 or less. Finally, the mean (SD) PGSI score was 6.0 (4.0).

Table 1 displays the descriptive statistics for each of the eight items on the GCQ. A reliability analyses was conducted and found that the eight items of the GCQ could function adequately as a scale with a Chronbach's alpha of 0.65. In addition, a principal components analysis was conducted. While two eigenvalues greater than one were observed (with the second eigenvalue being only marginal), the rotated factor matrix did not yield two interpretable scales. Furthermore, as all items loaded positively on one scale in the unrotated factor matrix (correlations of 0.38 or greater), we decided to treat the GCQ as a unidimensional scale for the purposes of these analyses.

A linear regression was performed to predict the strength to which respondents endorsed cognitive distortions on the composite GCQ scale. Demographic variables we entered in the first block, and gambling problem status we added to the second block. Table 2 shows the results of the regression analysis. Even after controlling for demographic characteristics, the severity of gambling problems was positively associated with the strength of cognitive distortions endorsed ($p < .001$).

Discussion

People with more severe gambling problems are more likely to endorse cognitive distortions about gambling than those people with less severe gambling concerns. Previous research has already demonstrated this finding in convenience samples of gamblers (Joukhador et al., 2003; Myrseth et al., 2010; Toneatto et al., 1997). The current study demonstrated this positive relation even among a representative sample of problem gamblers from the general population.

A limitation of this finding is the conceptual overlap between the PGSI measure of problem gambling and the GCQ. Specifically, the GCQ item "Try to win back money you have lost" is almost identical to the PGSI item "When you gambled, did

Table 1
Descriptive statistics for the Gambling Cognitions Questionnaire

How often do you ...	N	Min	Max	Mean	Std. Dev.
Pick your favourite places to buy tickets or play?	759	0	5	2.82	1.535
Try to figure out a way to win?	753	0	5	3.03	1.619
Think about how much money you could win?	750	1	5	3.73	1.260
Try to keep a winning attitude?	741	1	5	4.17	1.188
Spend time with people who you think are lucky?	733	0	5	2.05	1.278
Go with your gut instincts and feelings?	739	0	5	3.54	1.326
Try to figure out what your luckiest numbers are?	736	0	5	2.31	1.418
Try to win back the money you have lost?	738	0	5	2.82	1.487
Valid N (listwise)	684				

Note. For each item: 0 = Respondent volunteers does not gamble; 1 = never; 2 = rarely; 3 = sometimes; 4 = often; 5 = always. Min = minimum; Max=maximum; Std. Dev. = standard deviation.

Table 2

Relationship between strength of cognitive distortions and gambling severity, after controlling for demographic characteristics

Predictor	Predicting GCQ ^a		
	ΔR^2	F	β
STEP 1	.034	3.8**	
Age			-.06**
Sex			1.03*
Married			-.38
Some post-secondary			-.48
Employed			.03
Income <\$30,000			-.11
STEP 2	.078	11.6**	
PGSI ^b			.42**

Note. * $p < .05$. ** $p < .001$.

^a Composite Gambling Cognitions Scale.

^b Problem Gambling Severity Index.

you go back another day to try to win back the money you lost?” A replication of the analysis reported here we conducted with this GCQ item removed (not shown here) and found the same pattern of relationship between these two measures. However, the overlap of items still emphasizes the degree to which gambling severity and cognitive distortions are conceptually linked. Further research is needed to explore this overlap. Nevertheless, the current study does add to this literature by demonstrating the link between cognitive distortions and severity of gambling in the general population of problem gamblers.

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For correspondence: John Cunningham, Centre for Mental Health Research, Building 63, Australian National University, Canberra, 0200, Australia. Tel: +612 6125 1859. Fax: +612 6125 0733. E-mail: john.cunningham@anu.edu.au

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John A Cunningham, PhD, is a Professor and Deputy Director of the Centre for Mental Health Research at the Australian National University. He is also a Senior Scientist at the Centre for Addiction and Mental Health in Toronto, Canada.

David C. Hodgins, PhD, is a Professor in the Program in Clinical Psychology at the Department of Psychology of the University of Calgary. He is also Head of the Department, and a coordinator with the Alberta Gaming Research Institute. He is registered as a clinical psychologist in Alberta.

Tony Toneatto, PhD, is an Associate Professor in the Department of Psychiatry at the University of Toronto and is cross-appointed to the Human Development and Applied Psychology Program at the Ontario Institute of Studies in Education. He is also a registered clinical psychologist. Dr. Toneatto is currently the director of the Buddhism, Psychology and Mental Health undergraduate program at the University of Toronto.

Is “pop-up” messaging in online slot machine gambling effective as a responsible gambling strategy?

Michael Auer,¹ Doris Malischnig,² & Mark Griffiths³

¹neccton, Vienna, Austria

²Österreichische Lotterien GmbH, Vienna, Austria

³Nottingham Trent University, Nottingham, UK

Abstract

Certain gambling operators now provide social responsibility tools to help players gamble more responsibly. One such innovation is the use of pop-up messages that aim to give feedback to the players about the time and money they have thus far spent gambling. Most studies of this innovation have been conducted in laboratory settings, and although controlled studies are indeed more reliable than real-world studies, the non-ecological validity of laboratory studies is still an issue. This study investigated the effects of a slot machine pop-up message in a real gambling environment by comparing the behavioural tracking data of two representative random samples of 400,000 gambling sessions before and after the pop-up message was introduced. The study comprised approximately 200,000 gamblers. The results indicated that, following the viewing of a pop-up message after 1000 consecutive gambles on an online slot machine game, nine times more gamblers ceased their gambling session than did those gamblers who had not viewed the message. The data suggest that pop-up messages can influence a small number of gamblers to cease their playing session, and that pop-ups appear to be another potentially helpful social responsibility tool in reducing excessive play within session.

Résumé

Certains opérateurs de jeu proposent aujourd’hui des ressources visant à inciter les usagers à jouer de façon plus responsable. Parmi les innovations, on compte les messages flash destinés à indiquer le temps passé à jouer ou l’argent qu’on a dépensé. La plupart des recherches sur le sujet ont été réalisées en laboratoire; même si elles sont plus fiables que les études menées sur le terrain, leur validité écologique reste à déterminer. Nous avons étudié l’effet d’un message flash sur une machine à sous dans un environnement de jeu réel. Nous avons comparé les données sur le comportement recueillies avant et après l’apparition du message à l’écran, auprès de deux échantillons représentatifs aléatoires totalisant 400 000 séances de jeu (environ

200 000 joueurs). Les joueurs qui ont vu un message apparaître au bout de 1000 jeux consécutifs sur une machine à sous en ligne ont été neuf fois plus nombreux à interrompre leur séance de jeu par rapport à ceux qui n'en ont pas reçu. D'après ces résultats, les messages flash inciteraient un petit nombre de joueurs à mettre fin à leur séance de jeu. Ils pourraient ainsi constituer un autre moyen de responsabilisation utile pour réduire le jeu excessif à l'intérieur d'une même séance.

Introduction

Innovative interactive gambling technologies now provide socially responsible opportunities to support players and to help them control the amount and time and money they spend gambling (Auer & Griffiths, 2013; Griffiths, 2012; Griffiths, Wood, & Parke, 2009). One such innovation is the use of pop-up messages that aim to give feedback to the players about the time and money that they have thus far spent gambling. Doing so allows players to reflect on their immediate gambling and decide if they need a break from their play. However, the question remains as to whether pop-up messages do in fact bring about a substantial effect on gambling behaviour and whether they indeed help players control their gambling.

Slot machine games are associated with problem gambling and are considered potentially dangerous for vulnerable and susceptible players such as minors, problem gamblers, and the intoxicated. Slots players can experience erroneous perceptions of their immediate situation and become dissociated from their immediate actions (Griffiths, Wood, J. Parke, & A. Parke, 2006; Jacobs, 1988). This abandonment of self-control leading to a state of disassociation may lead in turn to those excessive playing sessions that have already been observed in both real-life settings (e.g., Griffiths, 1991) and ecologically valid experiments (e.g., Griffiths, 1994).

Among slot machine players, studies have reported that static informative messages were no more effective in influencing player cognitions than were static warning signs without further informative content (i.e., Monaghan, Blaszczynski, & Nower, 2009; Monaghan & Blaszczynski, 2010). These studies also reported that dynamic messages were recalled more often than were static messages, and that messages encouraging self-appraisal resulted in significantly greater effect on self-reported thoughts and behaviours during gambling. Thus, message content and how that content is displayed both appear to play critical roles in subsequent player behaviour.

Gallagher, Nicki, Otteson, and Elliott (2011) reported that faulty gambling beliefs decreased, in both problem and non-problem video lottery terminal (VLT) gambling gamblers, as a result of exposure to a warning banner. This banner informed players

of the randomness of outcomes of VLT games. Wohl, Christie, Matheson, and Anisman (2010) showed that animated educational information on slot machines can be an effective way to increase user adherence to maintain predetermined monetary spending limits. Stewart and Wohl (2013) demonstrated that participants who received a monetary limit pop-up reminder were significantly more likely to adhere to monetary limits than participants who did not. Wohl, Gainsbury, Stewart, and Sztainert (in press) simultaneously investigated two responsible gambling tools that targeted adherence to monetary limits among 72 electronic gaming machine (EGM) gamblers. Those tools comprised an animation-based educational video (used previously by Wohl et al., 2010) and a pop-up message. To investigate the effect of the pop-up window, gamblers were required to set a monetary limit on their gambling; half the participants were informed via a pop-up message when they had reached their limit. The goal of the study was to investigate both the single and additive effects in addition to possible linear or non-linear interactions. Consistent with previous findings, both responsible gaming tools achieved the single effects they were intended to do. More specifically, the findings showed that a pop-up limit reminder helped gamblers stay within their pre-determined monetary limits. However, there was no additive effect, meaning that the adherence to the preset limit did not improve for players who received the pop-up window in addition to the animation-based educational information.

To date, most studies on pop-up messaging have mainly been conducted in laboratory settings, although some research has in fact been conducted in venues (Monaghan, 2008). The present study investigated the effects of a pop-up message among online slot machine players in a real online gambling site. A few studies have obtained data from real-world operators. For instance, Broda et al. (2008) examined the effects of player deposit limits on Internet sports betting from customers of *bwin Interactive Entertainment*. Overall, the study found that fewer than 1% of the players (0.3%) attempted to exceed their deposit limit. However, Wood and Griffiths (2010) argued that the large mandatory limit may have been the main reason for this finding as Broda et al. (2008) noted that the majority of online gamblers never reached the maximum deposit limit. Though not focusing on interactive messaging, Haefeli, Lischer, and Schwarz (2011) also used data from real-world operators. Their focus was on early warning signs for problem gambling and found out that, to some extent, self-exclusion can be predicted by using information about communication between the player and operator. Given the relatively small empirical base on the effectiveness of pop-up messages from real-world data, this study therefore investigated the effects of a slot machine pop-up message in a real gambling environment.

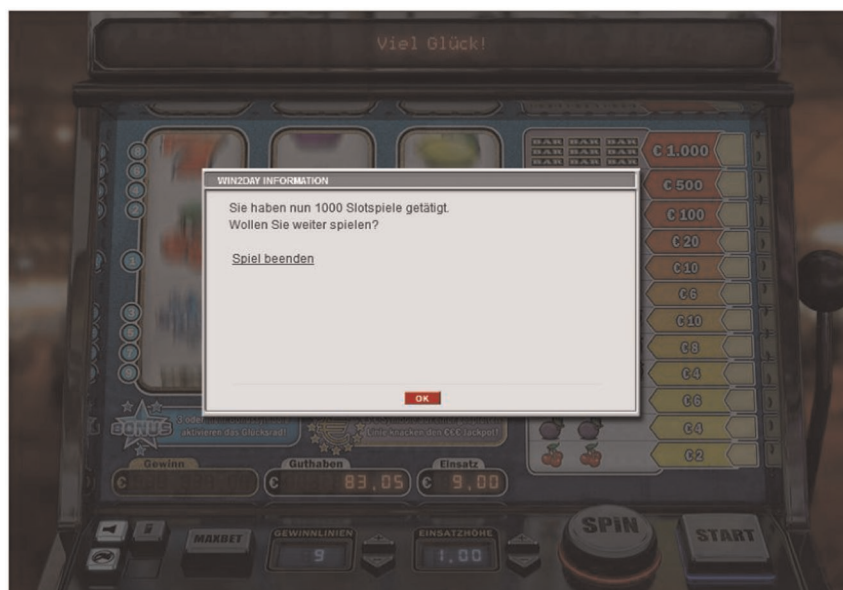
Method

The authors were given access to a large anonymized dataset by a commercial gambling operator (i.e., *win2day*). *win2day* offers Austrian citizens a wide range of games, among them lottery, casino games, and poker, via the online casino and

lottery portal of *Österreichische Lotterien GmbH* and *Casinos Austria AG*. During the registration process, it is a mandatory requirement that all players set time and cash-in limits. Furthermore, the weekly cash-in limit cannot exceed 800 Euros at any time during and after registration. Following registration, players can voluntarily lower their time and money limits at any time.

In 2011 *win2day* decided to enhance further their responsible gambling features and introduced pop-up messages (see Figure 1) that are triggered if customers play 1,000 consecutive games on slot machines during a single online gambling session. A gambling session at *win2day* is initiated when a player logs into their individual account and terminated if the player logs out or closes their web-browser. The pop-up informs players that they have just played 1,000 slot games within a single gambling session. The exact words on the pop-up are “You have now played 1,000 slot games. Do you want to continue? (YES/NO)”. The chosen threshold was the operator’s decision and the authors did not have any influence on the operator’s pre-set limit. The operator’s reason for choosing a threshold of 1,000 slot games was based on the findings of previous studies (i.e., Ladouceur & Sévigny 2009; Schrans, Grace, & Schellink, 2004). Ladouceur and Sévigny (2009) reported that the most effective social responsibility feature was a 60-minute pop-up reminder, which resulted in a decrease in the length of time spent gambling among players. Schrans, Grace, and Schellink (2004) investigated the benefits of a 30-minute pop-up compared to a 60-minute pop-up on VLTs. Schrans et al. found that earlier exposure to pop-up messages during gambling did not influence either the likelihood of reading the message or the choice to stop playing instead of selecting “yes” to

Figure 1. View of the “pop-up” message that appears after the playing of 1,000 consecutive games on slot machines



continue. A study by Schellink and Schrans (2002; cited in Monaghan, 2008), carried out for the *Atlantic Lottery Corporation* in Canada, demonstrated that the 60-minute pop-up message was associated among high risk players with a small reduction in session length and a decrease in expenditure.

Technically, it was easier for *win2day* to track the number of games played rather than the playing time. Given that a typical slot game lasts 3 to 4 seconds, a 1,000 slot games roughly corresponds to a playing time between 50 and 66 minutes. For that reason, *win2day* chose to display a pop-up message after the playing of 1,000 slot games. Following the message, the player can then decide whether to stop or to continue the session. The pop-up that appears in the centre of the screen (see Figure 1) reminds the player that 1,000 games have been played, and gives the player the option to continue or to stop gambling. The pop-up remains on the screen until the player has pressed “yes” or “no” as to whether he or she wants to continue gambling. If the player presses “yes,” the pop-up message immediately disappears. If the player presses “no,” the game window immediately closes. The size of the pop-up is approximately one-eighth that of the full screen.

To analyze the effect of the recently introduced pop-up message, the authors accessed two representative random samples of 400,000 sessions, one sample each for before and after the pop-up message was introduced. The total dataset consisted of 800,000 game sessions comprising between them approximately 200,000 gamblers. To investigate the effect of the pop-up message on slot machine playing behaviour within single playing sessions, a random sample of 400,000 playing sessions that took place before the introduction of the mandatory pop-up message was compared to 400,000 random sessions after the introduction of the message. It was hypothesized that the introduction of the pop-up message would lead to an increase in gamblers terminating their gambling session after 1000 consecutive plays.

Results

Results showed that approximately 1% of playing sessions before and after the introduction of the slot pop-up message exceeded 1,000 consecutive slot games within a single gambling session. Results also indicated that players who exceeded 1,000 consecutive plays did so twice (on mean average) during the analyzed time period. Therefore, such behaviour was relatively rare among the players of the *win2day* platform. Without information about the actual intensity of play among this group of gamblers, it can be reliably assumed that a threshold of 1,000 slot games identifies only the most highly involved gamblers.

Of the 400,000 sessions that were sampled before the slot pop-up message was introduced, it was found that 4,220 sessions contained at least 1,000 consecutive plays of the online slot machine. Only five sessions terminated at 1,000 slot games. Of the 400,000 sessions that were sampled following the introduction of the slot pop-up message, 4,205 sessions contained at least 1,000 consecutive plays of the online

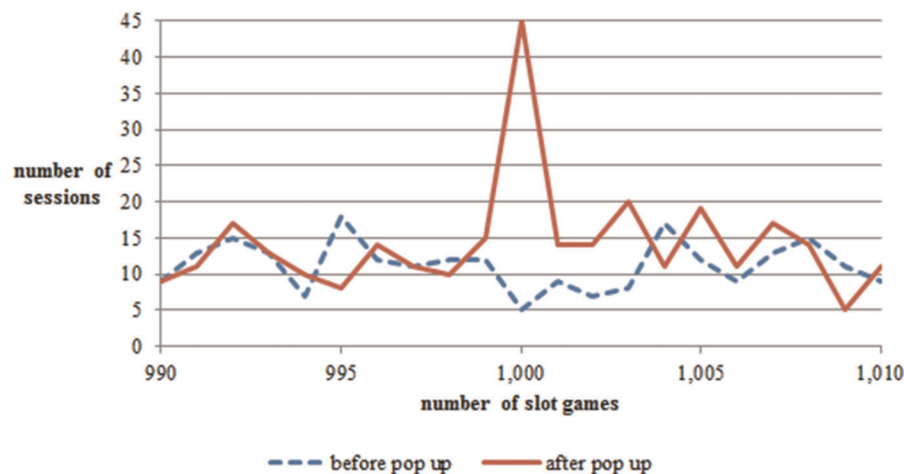
slot machine. Of these, 45 sessions terminated at 1,000 slot games. The sample was too large to conduct inferential statistics. Figure 2 shows the number of sessions ended by players between 990 and 1,010 consecutive slot machine games before and after the introduction of a pop-up warning message. This result clearly shows no differences except at the 1000th consecutive game when the pop-message was shown.

Discussion

To date, relatively few studies have collected empirical data relating to the effectiveness of social responsibility tools. This study adds to the sparse empirical base both generally and, in relation to pop-up messaging, more specifically. Previous research has often comprised laboratory studies to investigate the effects of pop-up messages on behavioural and cognitive processes such as belief patterns or dissociative states. Although such work is valid and important, laboratory study samples are typically much smaller than other methods (e.g., surveys and behavioural tracking studies), and behavioural results in laboratory situations can be distorted by the non-ecological validity of artificial settings. Gainsbury and Blaszczynski (2011) concluded that both laboratory and field studies provide valuable contributions to the field, but also observe that caution should be taken in interpreting results. Where possible, they asserted that both methods should be used to verify conclusions. This real-world study, which utilized a real-world sample of 800,000 game sessions, provided much more ecologically-reliable behavioural information on the effectiveness of pop-up messaging while gambling, and is not subject to the recall bias effects of self-report methods.

It cannot be definitively concluded from this study that it was the pop-up message only that had an impact on gamblers stopping after 1000 consecutive plays of the slots game because we can only infer the number of gamblers who saw this message,

Figure 2. Number of sessions ended between 990 and 1,010 slot games before and after the introduction of a pop-up warning message



and did not stop. However, the results obtained appear to show that the introduction of a mandatory pop-up message had an effect in stopping gambling behaviour among a small number of gamblers. More specifically, the results indicated that nine times more gamblers ceased their gambling session, following the viewing of a pop-up message after 1000 consecutive gambles on an online slot machine game, compared to those gamblers who had not viewed a pop-up message. Although the difference was relatively small, it is argued that it was most likely caused by, and was the direct result of, the displaying of a pop-up message after 1000 consecutive plays. The reason for this confidence was that the only peak of that magnitude occurred after the playing of 1,000 consecutive game following the introduction of the pop-up.

There are, of course, major limitations to the data collected. The researchers did not have access to any information about the samples (e.g., age, sex, income, ethnicity, levels of pathology) so it is not known if the two groups differed on any important variables. Another limitation to the study was that it was cross-sectional in design. As such, gamblers were not the same pre- and post- the intervention of the pop-up, and this fact may be a significant limitation for interpretation of the results. Notwithstanding these limitations, the data suggest that pop-up messages can influence a small number of gamblers to cease their playing session, and that pop-ups appear to be another potentially helpful social-responsibility tool in reducing excessive play within session.

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For correspondence: Michael Auer, neccton, Davidgasse 5, 7052 Muellendorf, Austria. Tel: 0043 650 4783160 www.neccton.com. E-mail: m.auer@neccton.com

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Contributors: Michael Auer is a PhD student at Nottingham Trent University. For this article, he performed data analysis. He also wrote the principal parts of the article along with Professor Griffiths. Dr. Griffiths is Auer's PhD supervisor and provided input to the data analysis and re-writing of the manuscript. Doris Malischnig is working for the online operator that provided the data for this analysis. She also conceived the idea for this research.

Michael Auer, a director of neccton ltd., is an established expert in gaming and responsible gaming. He is a frequent presenter globally at both universities and

responsible gaming conferences. He has published numerous important studies in peer reviewed journals about the effectiveness of responsible gaming features. Michael Auer is also an expert in the development of software in the field of responsible gaming, and has developed an excellent overview of developments throughout the world in the field. Through work with principal members of the gambling industry Michael Auer remains deeply familiar with the responsible gaming framework.

Doris Malischnig is a qualified clinical psychologist and Head of the Prevention Department at the Casinos Austria/Austrian Lotteries Group. In this capacity, she is responsible for the development, implementation and assessment of responsible gaming training for all staff, as well as for the group-wide appraisal and update of responsible gaming measures and policies, for crisis intervention and for the evaluation of the established preventive measures. Ms. Malischnig is a regular speaker at national and international industry congresses and lectures at all university-level responsible gaming courses in Austria.

Mark Griffiths is a Chartered Psychologist, Professor of Gambling Studies and Director of the International Gaming Research Unit at Nottingham Trent University. He is internationally known for his work on gambling and gaming addictions. Professor Griffiths has published over 450 research papers, three books, more than 120 book chapters and over 1000 other articles. He has also served on numerous national and international committees, among them the British Psychological Society (BPS) Council, the BPS Social Psychology Section, the Society for the Study of Gambling, the Gamblers Anonymous General Services Board and the National Council on Gambling. He is a former National Chair of Gamcare.

Comparing the Japanese Version of the Gambling Functional Assessment – Revised to an American Sample

Jeffrey N. Weatherly,¹ Kenjiro Aoyama,² Heather K. Terrell,¹ & J.Colleen Berry¹

¹University of North Dakota, Grand Forks, North Dakota, United States

²Doshisha University, Kyoto, Japan

Abstract

The Gambling Functional Assessment – Revised (GFA-R) was developed to determine the degree to which gambling behaviour was maintained by positive reinforcement or escape. For this study, the GFA-R was translated into Japanese and completed by 126 Japanese university students, who also completed the Japanese version of the South Oaks Gambling Screen (SOGS). Their results were compared to those from 133 American university students. All respondents endorsed gambling for positive reinforcement to a greater extent than as an escape. For both samples, the factor structure for the original GFA-R adequately fit the data, and internal consistency measures were very good. SOGS scores correlated more strongly with gambling as an escape than for positive reinforcement. The Japanese version of the GFA-R may be a useful research tool in a variety of ways, and may be helpful for practitioners in Japan interested in knowing the contingency maintaining their client's gambling behaviour.

Résumé

Le questionnaire *Gambling Functional Assessment – Revised* (GFA-R) vise à déterminer dans quelle mesure on peut attribuer la persistance des comportements de jeu au renforcement positif ou à la recherche d'évasion. Dans cette étude, le GFA-R a été traduit en japonais et rempli par 126 étudiants japonais qui ont répondu en outre à la version japonaise du *South Oaks Gambling Screen* (SOGS). Les résultats obtenus ont été comparés à ceux de 133 étudiants américains. Ils accordent au renforcement positif un plus grand poids qu'à l'évasion. La structure factorielle du GFA-R pour les deux échantillons correspondait adéquatement aux données et les mesures sur la cohérence interne étaient très bonnes. Les résultats du SOGS indiquent pour leur part que le jeu est plus fortement corrélé avec l'évasion qu'avec le renforcement positif. La version japonaise du GFA-R pourrait s'avérer

un instrument de recherche utile à certains égards, notamment pour les intervenants japonais qui s'intéressent aux raisons contribuant à la persistance des comportements de jeu chez leurs clients.

Introduction

Pathological and problem gambling are major societal problems. Although determining exact prevalence rates is difficult, research suggests that somewhere between 1%–2% of the population suffers from pathological gambling (see Petry, 2005). An additional 5% or more may suffer from problem gambling, which is a subclinical version of pathological gambling (Petry, 2005).

Because gambling problems are such a major concern, a great deal of research has focused on designing diagnostic measures that identify the potential presence of pathology. One such attempt was the creation of the South Oaks Gambling Screen (SOGS) (Lesieur & Blume, 1987). The SOGS is a 20-item self-report measure that asks questions about the respondent's gambling history. A score of 5 or more on the SOGS suggests the probable presence of pathological gambling and researchers (e.g., Weiss & Loubier, 2010) have suggested that scores of 3 or 4 suggest the potential presence of problem gambling. Many other assessment tools have also been developed, such as the Addiction Severity Index (McLellan et al., 1988) and the Canadian Problem Gambling Index (Ferris, Wynne, & Single, 1999), all in an attempt to identify individuals who may be pathological or problem gamblers.

Far less research has focused on developing measures that determine *why* an individual gambles. Dixon and Johnson (2007) made an initial attempt when they introduced the Gambling Functional Assessment (GFA). The GFA is a 20-item self-report measure designed to assess four possible maintaining contingencies for the respondent's gambling behaviour: (1) tangible outcomes (i.e., money), (2) social attention, (3) sensory experience, and (4) escape, or of any combination of (1) to (4). Modified from a similar measure in the self-injurious-behaviour literature (Durand & Crimmins, 1988), the idea behind the GFA was that the category in which the respondent scored the highest was likely the primary contingency maintaining the respondent's gambling.

Subsequent psychometric research, however, indicated that the GFA was not measuring four different potential contingencies as designed. Instead, the GFA appeared to be measuring only two: gambling for positive reinforcement, gambling as an escape, or both (Miller, Meier, Muehlenkamp, & Weatherly, 2009). Likewise, this research also indicated that the GFA was not cleanly parsing these two contingencies. For instance, some items intended to identify gambling maintained by one contingency did not load onto the factor associated with that contingency. Still other items were not associated with either contingency.

Thus, Weatherly, Miller, and Terrell (2011) developed a revised version of the GFA (GFA-R). The GFA-R consists of 16 self-report items, eight of which are designed to measure gambling for positive reinforcement and eight that are designed to measure gambling as an escape. Exploratory and confirmatory factor analyses, conducted on data from two separate samples, showed that each of the 16 items clearly loaded onto their respected factor. Likewise, Weatherly, Miller, Montes, and Rost (2012) showed that the GFA-R has good internal consistency, with Cronbach's alpha ranging from 0.87–0.94 for the overall score and scores on the two subscales. Weatherly et al. (2012) also demonstrated that the temporal reliability of the GFA-R scores ranged from good to excellent across 4-week and 12-week periods. Overall, the psychometric results for the GFA-R were superior to those found with the original GFA (for the English version of the GFA-R, see Appendix A).

The GFA-R may be useful for both practitioners and researchers. For practitioners, the GFA-R potentially identifies whether an individual is gambling to obtain something or to remove oneself from something. Such information could be beneficial for designing successful treatments for different individuals who are gambling for different reasons.

For researchers, the GFA-R represents a measure that potentially supplies several independent pieces of information. For instance, although the GFA-R measures gambling maintained by two different contingencies, research using the GFA-R (e.g., Weatherly, 2011b; Weatherly et al., 2011) has repeatedly found that participants tend to endorse gambling for positive reinforcement to a significantly greater extent than they endorse gambling as an escape. Thus, the GFA-R provides a relative measure of the contingencies maintaining gambling behaviour. However, research has also shown that endorsing gambling as an escape is more highly associated with the potential presence of gambling problems, at least as measured by the SOGS, than is endorsing gambling for positive reinforcement (Weatherly & Derenne, 2012; Weatherly et al., 2012; Weatherly, Dymond, Samuels, Austin, & Terrell, 2014). Thus, the absolute scores on the GFA-R subscales may also provide useful information pertaining to the respondent's gambling.

The GFA-R may also be useful in identifying differences that exist at the group level. For instance, Weatherly (2011a) had 29 American Indian and 29 matched Caucasian university students each complete the GFA-R. Results showed that the American Indian participants scored significantly lower on the positive reinforcement subscale than did the Caucasian students, suggesting that the Caucasian students' gambling was more motivated towards the obtaining of something than was the American Indians' gambling. However, scores did not differ between groups in terms of gambling as an escape. Montes and Weatherly (2012) used the GFA-R to demonstrate differences in both the positive and negative reinforcement contingencies that maintained the gambling behaviour of military-affiliated university students (i.e., Reserve Officer Training Corps) and those university students

without a military affiliation. In general, knowing whether such differences exist between groups may be informative for both preventative and treatment purposes.

The present study involved translating the GFA-R (originally created in English) into Japanese and recruiting Japanese university participants to complete the translated measure. A group of American university participants was also recruited for purposes of comparison. Translating measures into different languages or using them to collect data in different cultures, or both, may provide a number of potential benefits. For one, if the measure is psychometrically valid in its translated form, then its usage could benefit practitioners and clients who use that language. Next, it allows for between-cultural comparisons. It is possible that different relationships could be found between the subscales and other measures than are found in the original version within that culture in which the original culture was created. (An example of such a measure is the SOGS, either in the translated version or in another culture.) Such a finding would suggest that the phenomenon under study—in this case gambling behavior—may in fact be fundamentally different between the respective cultures.

Such attempts have been made in the past. For instance, Kido and Shimazaki (2007) tested the Japanese-translated version of the SOGS on a group of Japanese university students and Japanese gamblers. They reported that both the reliability and validity data from the translated measure were satisfactory relative to the original. The fact that the psychometric properties of the SOGS were retained when translated into Japanese and used in a Japanese sample suggests that where gambling is concerned similarities exist between the American and Japanese cultures. However, there are also overt differences in regards to gambling between these two cultures. For instance, skill-stop and pachinko machines, which are popular in Japan, are virtually, if not completely, absent in American casinos (e.g., Brooks, Ellis, & Lewis, 2008). Likewise, activities that would be considered “gambling” in America may not be viewed as such in Japan (e.g., pachinko; see Brooks et al., 2008). Thus, one might expect to see differences between the cultures in terms of why people report that they gamble.

In the present study, a group of Japanese university students completed a translated version of the GFA-R and the SOGS. A similarly-sized group of American university students also completed the GFA-R and the SOGS. GFA-R data from each group were then entered into a confirmatory factor analysis, with the factor structure identified in the original tests of the construct validity of the English version of the GFA-R (i.e., Weatherly et al., 2011) used as the model.

Based on the previous research with the GFA-R and the translated version of the SOGS we made the following predictions. First, the Japanese participants would endorse gambling for positive reinforcement to a significantly greater degree than they would endorse gambling as an escape. Second, similar to the results of Weatherly (2011a), the Japanese and American participants might differ in their

endorsement of gambling for positive reinforcement, but they would not differ in their endorsement of gambling as an escape. Third, the same factor structure identified for the original GFA-R would adequately describe the data for both the Japanese and American participants. Fourth, the translated version of the GFA-R would retain sound psychometric properties (e.g., internal consistency measures). Finally, escape subscale scores on the GFA-R for both groups would be more highly correlated with the SOGS scores than would be GFA-R subscale scores for gambling for positive reinforcement.

Method

Participants

The Japanese participants were 126 students attending Doshisha University in Kyoto, Japan. The American participants were 132 students attending the University of North Dakota in Grand Forks, ND. All participants were recruited from psychology courses at their respective university. The demographic information for both groups is presented in Table 1. All participants were compensated with extra course credit in return for their participation.

Materials and Procedure

For the Japanese participants, all procedures were conducted in accordance with the ethical guidelines mandated by Doshisha University. Data collection for the American participants was approved by the institutional review board at the University of North Dakota.

All participants completed three questionnaires. The Japanese participants completed the questionnaires in paper-pencil format, whereas the American participants completed them using an online experiment management system (Sona Systems, Ltd, Version 2.72; Tallinn, Estonia) available to them through their enrollment in a psychology course. Although data collection methods differed between the two samples, research on the GFA-R with American participants has indicated that the psychometric properties of the measure do not differ as a function of whether the measure is completed in a paper-pencil or an online format

Table 1

Demographic characteristics of both groups of participants (with standard deviations in parentheses)

University	Male	Female	Mean Age	Mean GPA
Japanese ($n=126$)	34	92	20.1 (1.2) years	2.5 (0.7) out of 4.0
American ($n=132$)	33	99	19.7 (3.8) years	3.5 (0.5) out of 4.0

Note. GPA = grade point average

(Weatherly et al., 2011; 2014). The first questionnaire was a short demographic form that asked about the information presented in Table 1.

The second questionnaire was a translated version of the GFA-R (Weatherly et al. 2011). Prior to administering the translated version, the researchers first translated the original version of the GFA-R into Japanese. The translated version was then back-translated into English by someone unfamiliar with the original English version of the GFA-R to ensure that the original content had been retained in the translation. In an attempt to anticipate any differences that might exist between the two cultures, no changes to the original GFA-R were made; the goal of the present research was to test a direct replication of the GFA-R in another culture. The translated version of the GFA-R, completed by the Japanese participants, appears in Appendix B.

Participants endorsed each item on a scale of 0 (Never) to 6 (Always). Items 1, 4, 6, 7, 8, 13, 14 and 16 are associated with gambling for positive reinforcement and scores on those items are summed to give a score for that subscale. Items 2, 3, 5, 9, 10, 11, 12 and 15 are associated with gambling as an escape and scores on those items are summed to give a score for that subscale.

The third questionnaire participants completed was the SOGS (Lesieur & Blume, 1987). The Japanese participants completed the Japanese version (Kido & Shimazaki, 2007) while the American participants completed the original version. The structure of the Japanese version of the SOGS is nearly identical to that of the original with the exception of the response options. Some of the options have been phrased in terms of yen (instead of dollars). Next, many of the yes-no questions on the original SOGS have been replaced with a five-point scale that ranges from 1 (Often) to 5 (Never). For questions in which a “yes” would have been counted on the original SOGS, responses of either 1 (Often) or 2 (Modestly) are counted on the Japanese version. This translated version of the SOGS has been shown to have sound psychometric properties (see Kido & Shimazaki, 2007).

Results

Subscale Differences

Mean scores on the GFA-R, as well as for each subscale, for both groups are presented in the top half of Table 2. Mean SOGS scores for both groups are also reported. Results from a Wilcoxon signed-rank test on the data from the Japanese participants indicated that the difference in scores on the two subscales of the GFA-R was statistically significant ($p < .001$). Results from this analysis, and all that follow, were considered significant at $p \leq .05$. An identical analysis on the data from the American participants also indicated a statistically significant difference ($p < .001$). Thus, the gambling behaviour of both groups of participants was maintained by positive reinforcement to a greater extent than it was by escape.

Table 2

Mean scores on the GFA-R and its two subscales and on the SOGS (with standard deviations in parentheses) for (a) all participants, and (b) only those who scored above 0 on the GFA-R

All Participants				
University	GFA-R			SOGS
	Total	Positive	Negative	
Japanese ($n=126$)	7.5 (10.6)	6.0 (8.1)	1.5 (3.5)	0.4 (1.4)
American ($n=132$)	20.2 (15.1)	17.8 (12.6)	2.4 (5.3)	1.2 (1.7)
Participants Who Scored > 0 on the GFA-R				
Japanese ($n=68$)	13.9 (10.9)	11.2 (8.0)	2.7 (4.4)	0.7 (1.9)
American ($n=109$)	24.5 (13.1)	21.6 (10.5)	2.9 (5.7)	1.4 (1.8)

Between-group comparisons were made by conducting separate Mann-Whitney U tests on scores from both GFA-R subscales, as well as the SOGS. Results indicated that the American participants scored significantly higher on the GFA-R positive reinforcement subscale than did the Japanese participants ($p < .001$), but the difference in scores on the escape subscale was not statistically significant ($p = .110$). American participants also scored significantly higher on the SOGS than did the Japanese participants ($p < .001$).

Fifty eight (46%) of the Japanese and 23 (17%) of the American participants scored 0 on the GFA-R, suggesting that these participants either did not gamble or gambled for reasons not measured by the GFA-R. Results from a difference in proportions test indicated that this difference was statistically significant ($p < .01$), indicating that a greater proportion of the Japanese than American participants scored 0 on the GFA-R.

Mean scores from the GFA-R and the SOGS for only those participants who scored greater than 0 on the GFA-R are presented in the bottom half of Table 2. Results from Wilcoxon signed-rank tests indicated that the difference between the GFA-R subscales remained statistically significant for both the Japanese and American participants ($p < .001$). Results from Mann-Whitney U tests indicated that the American participants still scored higher on both the GFA-R positive reinforcement subscale ($p < .001$) and the SOGS ($p < .001$) than did the Japanese participants. Again, the difference observed for the GFA-R escape subscale was not statistically significant ($p = .410$).

GFA-R Factor Structure

Mplus 6.0 structural equation modelling software (Muthén & Muthén, 2010) was employed to perform a confirmatory factor analysis on the GFA-R data for each

group of participants. Mplus offers several options for estimation, and MLMV estimation was utilized for the analyses that follow. This type of estimation was chosen because the response distributions for several items were skewed. MLMV estimation uses “maximum likelihood parameter estimates with standard errors and a mean- and variance-adjusted chi-square statistic that are robust to non-normality” (Muthén & Muthén, 2010, p. 533). Furthermore, because the GFA-R was designed to measure the reasons why the respondent gambles, data from participants scoring 0 on the GFA-R were excluded from the analyses because these participants either did not gamble or gambled for reasons not measured by the GFA-R.

Model fit for each analysis was assessed via multiple fit indices, including the chi-square test of model fit (recommended $\chi^2 \leq 0.01$) (Hu & Bentler, 1999; Yu, 2002), Comparative Fit Index (CFI; recommended CFI ≥ 0.95 for good fit and CFI ≥ 0.90 for adequate fit: Hu & Bentler, 1999; Rigdon, 1996; Yu, 2002), root mean square error of approximation (RSMEA; recommended RSMEA ≤ 0.05 ; Hu & Bentler, 1999; Rigdon, 1996; Yu, 2002), and standardized root mean square residual (SRMR; recommended SRMR $\leq .07$; Hu & Bentler, 1999). For models based on small samples (approximately 75 to 200 cases), chi-square can be interpreted a reasonable measure of model fit and the null hypothesis is that the model provides an adequate fit. The present analyses were based on a sample of 68 (Japanese) and 109 (American) participants after participants with GFA-R scores of 0 were excluded, so the chi-square test was expected to be consistent with other fit indices.

Items 1, 4, 6, 7, 8, 13, 14 and 16 were specified to load on Factor 1 (gambling for positive reinforcement) and items 2, 3, 5, 9, 10, 11, 12 and 15 were specified to load on Factor 2 (gambling as an escape). Modification indices that would result in a chi-square change equal to or greater than four were examined. Based on these modification indices and the interpretability of the suggested modifications, some pairs of residuals were allowed to correlate.

For the model tested on the data from the Japanese participants, all items loaded significantly onto their respective factors; these loadings are presented in Table 3. The two factors were moderately correlated, $r = .578$ ($SE = .152$), $p < .001$. The chi-square value for overall model fit was not significant, $\chi^2(93) = 114.06$, $p = 0.07$, which indicates good model fit. The CFI was 0.91, which indicated a good model fit. The RMSEA was 0.06 and the SMSR was 0.09, which were slightly higher than the recommended cut-offs. Overall, however, the results indicated that the factor structure of the original English version of the GFA-R provided an adequate fit to the translated version. The resulting model for the Japanese participants is presented in Figure 1.

For the model tested on the data from the American participants, all items loaded significantly onto their respective factors; these loadings are illustrated in Table 4. In this model, the two factors were weakly correlated, $r = .238$ ($SE = .081$), $p < .01$. The chi-square value for overall model fit was not significant, $\chi^2(92) = 114.29$,

Table 3

Unstandardized and standardized loadings (standard errors) for 2-factor confirmatory model using data from the Japanese participants (n=68)

Item	Unstandardized (SE)		Standardized (SE)	
	Factor 1	Factor 2	Factor 1	Factor 2
1	1.00 (—)		0.42 (0.11)	
4	1.22 (0.29)		0.55 (0.11)	
6	1.76 (0.43)		0.75 (0.07)	
7	1.84 (0.45)		0.87 (0.06)	
8	0.83 (0.40)		0.29 (0.12)	
13	0.69 (0.25)		0.39 (0.13)	
14	0.77 (0.27)		0.31 (0.11)	
16	1.66 (0.45)		0.70 (0.09)	
2		1.00 (—)		0.64 (0.12)
3		2.16 (0.50)		0.95 (0.04)
5		1.59 (0.46)		0.84 (0.06)
9		2.65 (0.74)		0.78 (0.08)
10		1.91 (0.48)		0.93 (0.03)
11		2.30 (0.79)		0.47 (0.12)
12		1.88 (0.83)		0.70 (0.11)
15		1.29 (0.46)		0.66 (0.10)

Note: Dashes (—) indicate that the standard error was not estimated.

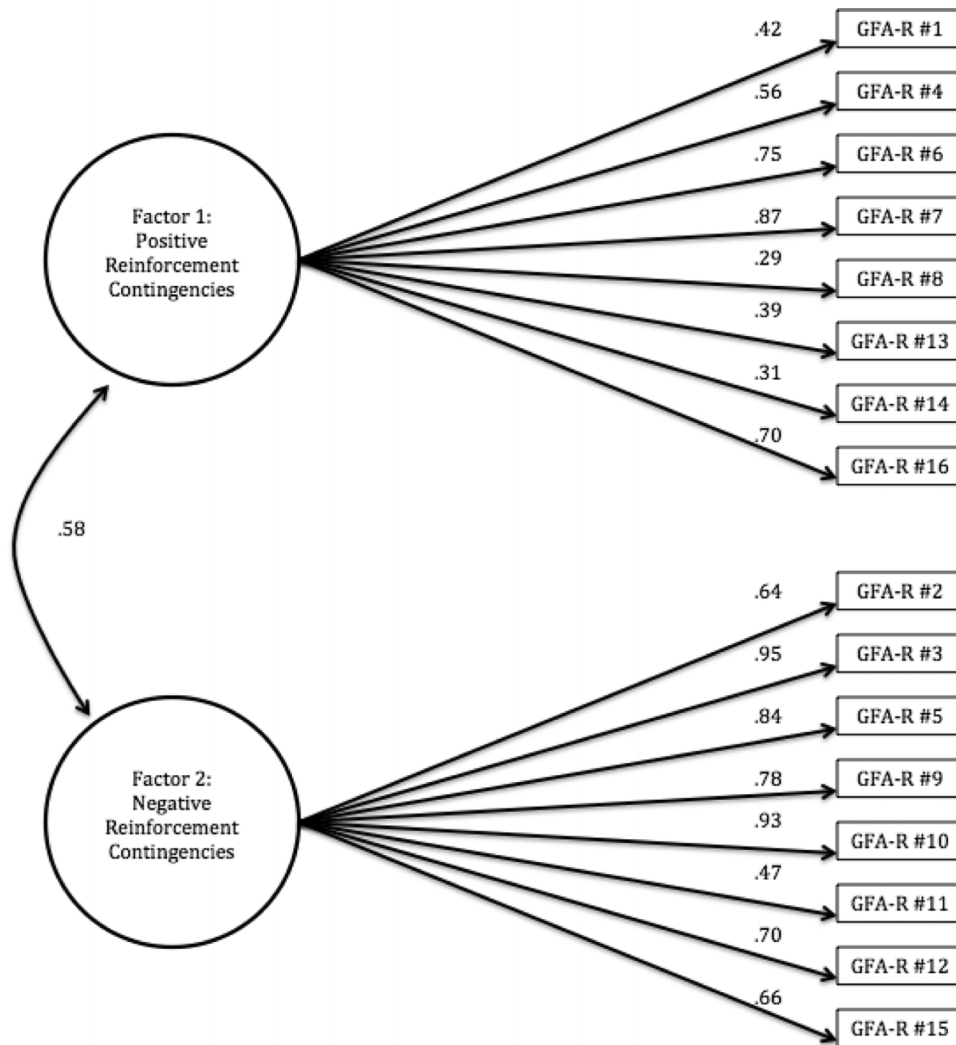
$p = 0.06$, again indicating a good model fit. Further, examination of the other fit indices, CFI = 0.92, RMSEA = .05, and SMSR = .07, also indicated a good model fit. The resulting model for the American participants is presented in Figure 2.

Internal Consistency

When data from all 126 Japanese respondents were analyzed, the internal consistency (i.e., Cronbach's alpha) for the entire GFA-R (i.e., all 16 items) was 0.89. Cronbach's alphas for the GFA-R positive reinforcement and escape subscales were 0.87 and 0.88, respectively. When the data from participants who scored 0 on the GFA-R were excluded, good internal consistency was retained. Cronbach's alphas for the entire GFA-R, positive reinforcement subscale, and escape subscale were 0.85, 0.78 and 0.88, respectively.

When data from all 132 American respondents were analyzed, the internal consistency (i.e., Cronbach's alpha) for the entire GFA-R (i.e., all 16 items) was also 0.89. Cronbach's alphas for the GFA-R positive reinforcement and escape subscales were 0.90 and 0.91, respectively. When the data from participants who scored 0 on the GFA-R were excluded, good internal consistency was again retained. Cronbach's alphas for the entire GFA-R, positive reinforcement subscale, and escape subscale were 0.84, 0.84 and 0.90, respectively.

Figure 1. Factor loadings for the 16 items on the translated GFA-R tested in the confirmatory factor analysis using the data from the Japanese participants



Correlations with the SOGS

For the Japanese sample, one participant (0.8%) scored between 3 and 4 on the SOGS and five participants (4.0%) scored 5 or more. For the entire sample of Japanese participants, the SOGS scores were significantly correlated with both the positive ($r = 0.53, p < .001$) and negative reinforcement ($r = 0.56, p < .001$) subscales of the GFA-R. When participants who scored 0 on the GFA-R were excluded, the SOGS scores remained more weakly correlated with the positive ($r = 0.50, p < .001$), than with the negative ($r = 0.52, p < .001$), reinforcement subscale scores on the GFA-R, although the difference between the correlations remained small.

For the American sample, ten participants (7.6%) scored between 3 and 4 on the SOGS and eight participants (6.0%) scored 5 or more. Results from a difference in

Table 4

Unstandardized and standardized loadings (standard errors) for 2-factor confirmatory model using data from the American participants (n=109)

Item	Unstandardized (SE)		Standardized (SE)	
	Factor 1	Factor 2	Factor 1	Factor 2
1	1.00 (—)		0.44 (0.07)	
4	2.24 (0.44)		0.79 (0.05)	
6	2.50 (0.52)		0.81 (0.04)	
7	1.82 (0.43)		0.66 (0.06)	
8	1.30 (0.33)		0.42 (0.08)	
13	1.91 (0.42)		0.55 (0.08)	
14	2.28 (0.48)		0.67 (0.07)	
16	1.86 (0.42)		0.59 (0.07)	
2		1.00 (—)		0.80 (0.10)
3		1.52 (0.19)		0.89 (0.05)
5		1.13 (0.23)		0.74 (0.08)
9		0.96 (0.19)		0.49 (0.10)
10		1.03 (0.14)		0.82 (0.07)
11		1.25 (0.20)		0.69 (0.08)
12		1.23 (0.19)		0.83 (0.06)
15		1.05 (0.22)		0.70 (0.09)

Note: Dashes (—) indicate that the standard error was not estimated.

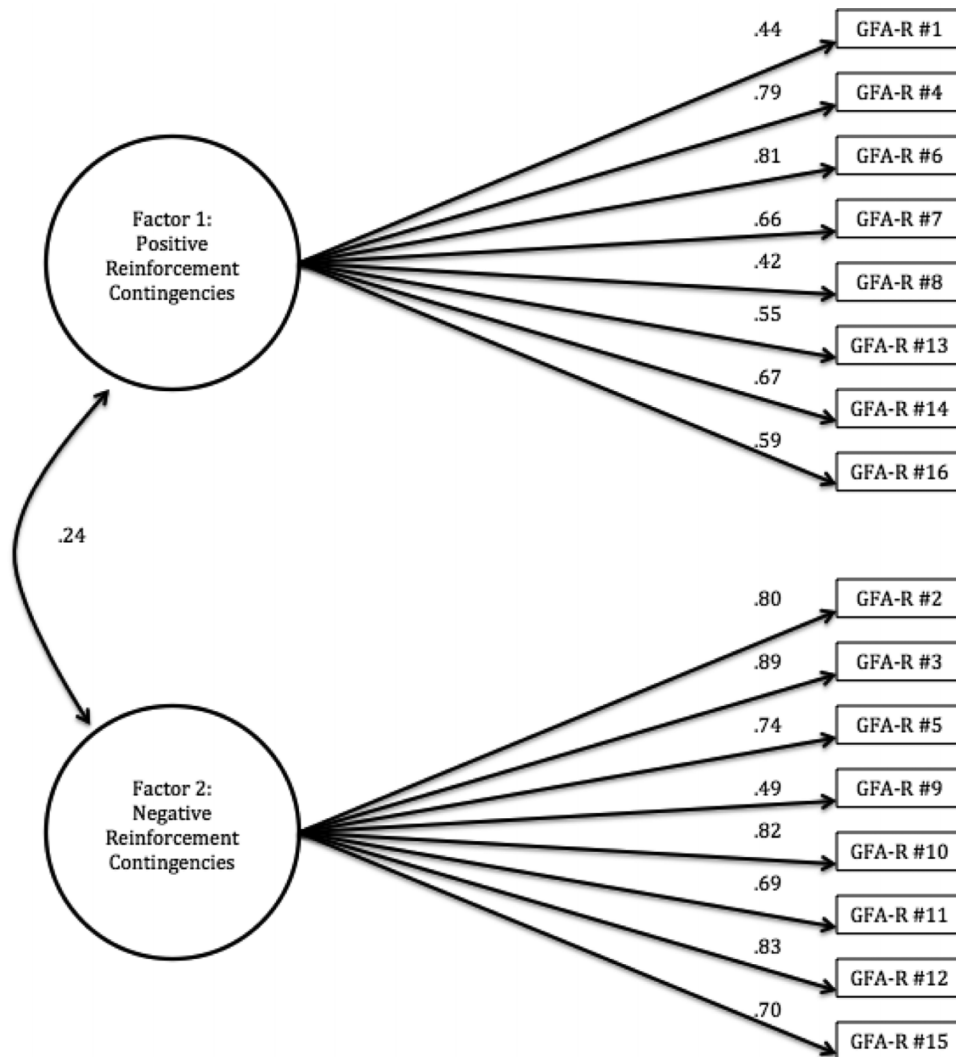
proportions test indicated that the percentage of American participants scoring 5 or more on the SOGS was not significantly higher than the Japanese participants.

For the entire sample of American participants, the SOGS scores were significantly correlated with both the positive ($r = 0.36, p < .001$) and negative reinforcement ($r = 0.59, p < .001$) subscales of the GFA-R. When participants who scored 0 on the GFA-R were excluded, the SOGS scores remained more weakly correlated with the positive ($r = 0.28, p = .003$) than with the negative ($r = 0.57, p < .001$) reinforcement subscale scores on the GFA-R.

Discussion

The present study involved translating the GFA-R (Weatherly et al., 2011) into Japanese, administering the translated version to a sample of Japanese university students, and comparing the results to those findings obtained from a sample of American university students. The first hypothesis was that the Japanese participants would endorse gambling for positive reinforcement to a greater extent than gambling for negative reinforcement. That hypothesis was supported. The second hypothesis was that the groups would differ in their endorsement of gambling for positive reinforcement, but not in their endorsement of gambling as an escape. This hypothesis was also supported. The third hypothesis was that the same

Figure 2. Factor loadings for the 16 items on the GFA-R tested in the confirmatory factor analysis using the data from the American participants



factor structure that described the data for the original English version of the GFA-R would adequately fit the data for the translated version. That hypothesis was also supported. The fourth hypothesis was that the translated version would display good internal inconsistency measures, which was found to be the case. The final hypothesis was that the participants' scores on the SOGS (Kido & Shimazaki, 2007) would correlate more strongly with their scores on the GFA-R escape subscale than with their scores on the positive reinforcement subscale. Correlations with both subscales were statistically significant for both groups, but the SOGS scores more strongly correlated with the scores on the GFA-R negative reinforcement subscale than with the scores on the GFA-R positive reinforcement subscale. The difference was small for the Japanese participants, however.

Thus, the present results suggest that the Japanese version of the GFA-R represents a reasonable functional assessment measure. The same two-factor structure that described the English version provided an adequate fit for the data collected using the Japanese version. Furthermore, the internal consistency measures on the translated version of the GFA-R were very good, even when data from participants who scored 0 on the overall measure were excluded from analysis.

One notable difference between the models for the Japanese and American participants was the correlation between the two factors measured by the GFA-R. As can be seen in Figures 1 and 2, the factors were more strongly correlated for the Japanese sample than for the American sample. This difference would suggest that the contingencies of gambling to obtain something versus to remove oneself from something were more distinct for the American, than for the Japanese, respondents.

A second notable difference pertains to participants' scores on the positive reinforcement subscale of the GFA-R. Specifically, the American participants scored significantly higher on this subscale than did the Japanese participants, even when data from participants who scored 0 on the GFA-R were removed from the analysis. This result would indicate that, at least when it comes to university students, the gambling behaviour of Japanese individuals was less controlled by positive reinforcement contingencies than was the gambling behaviour of American individuals. This difference might also explain why a higher proportion of the Japanese participants scored 0 on the GFA-R than did the American participants.

There were also several notable failures to find differences between the two groups of participants. One such failure was with the escape subscale of the GFA-R, with the groups not scoring significantly differently on this subscale. This lack of difference was predicted based on other cross-cultural comparisons (i.e., Weatherly, 2011a). Given that research has indicated that endorsing gambling as an escape is more strongly related to gambling problems than endorsing gambling for positive reinforcement (Weatherly & Derenne, 2012; Weatherly et al., 2012; Weatherly, 2013), this result would suggest that the groups did not differ in their risk for pathological gambling. This suggestion is actually supported by the other notable lack of difference from the present study: the proportion of participants who scored 5 or more on the SOGS did not differ between groups, suggesting that the frequency of pathological gambling did not vary significantly between the two groups.

With that said, it is important to note that the present results, and those of Weatherly et al. (2011; 2012) for that matter, do not necessarily apply to pathological gamblers. That is, the current and past analyses have been done with university samples and have not specifically targeted problem or pathological gamblers. Thus, it is not possible to conclude that the same relationships between the subscales of the GFA-R, or correlations between the SOGS and GFA-R scores, would be found with problem or pathological gamblers.

Likewise, the present sample consisted of students from one particular Japanese and American university each, students most of whom were both young and female. One cannot assume that similar results will be observed when a more diverse pool of participants is sampled, especially when one recognizes that males are at a greater risk for developing pathological gambling than are females (see Petry, 2005). On the other hand, being young is also a risk factor for pathological gambling and research has also suggested that university students display the disorder at a greater rate than the general population, at least in the United States (e.g., Neighbors, Lostutter, Crouce, & Larimer, 2002).

It should also be noted that the present results are based completely on self-reports. That is, there is no guarantee that the results from either the GFA-R or the SOGS correlate perfectly with overt behaviour. The factor analyses were also conducted only on the data from participants who scored more than 0 on the GFA-R. Exactly why certain individuals scored 0 on the GFA-R is not known. It could be assumed that these individuals do not gamble, but this assumption may be incorrect: It is possible that these individuals do indeed gamble, but that they do so for reasons not addressed by the GFA-R. If this latter possibility is correct, then the GFA-R is not an exhaustive functional assessment tool. Determining which of these possibilities, if not both, are correct might be worth future research.

With these limitations in mind, however, the present results support the conclusion that the Japanese version of the GFA-R may have utility for researchers and, potentially, practitioners. To our knowledge, the present data represent the first reporting of the function of gambling behaviour in a sample of Japanese individuals. The results suggest that, although an absolute difference between Japanese and American respondents in how much they endorse gambling for positive reinforcement may exist, the relative difference between gambling for positive reinforcement or as an escape appears to be similar across cultures. Thus, the Japanese version of the GFA-R may not only be useful for researchers interested in gambling behaviour in Japan, but also to those researchers interested in studying cross-cultural differences.

Practitioners may find the GFA-R useful because knowing whether an individual suffers from problem or pathological gambling does not necessarily inform one about why that person is gambling. The GFA-R represents one possible measure of making that determination. It may be the case that the problem or pathological gambling of two different individuals is being maintained by different contingencies. If so, their scores on the GFA-R would be informative so that individualized treatment plans could be developed.

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Appendix A*Gambling Functional Assessment – Revised (GFA-R)*

Please answer each question with the appropriate number from the following scale:

0	1	2	3	4	5	6
Never	Almost Never	Seldom	Sometimes	Usually	Almost Always	Always

- ____ 1. After I gamble, I like to go out and celebrate my winnings with others.
- ____ 2. I gamble after fighting with my friends, spouse, or significant other.
- ____ 3. I gamble when I feel stressed or anxious.
- ____ 4. I like the sounds, the lights, and the excitement that often go along with gambling.
- ____ 5. If I have a hard day at work or school, I am likely to gamble.
- ____ 6. I gamble when my friends are gambling with me.
- ____ 7. I find myself feeling a rush, and getting excited, when I gamble.
- ____ 8. When I gamble, I choose which games to play based upon my best chance of winning.
- ____ 9. I gamble to get a break from work or other difficult tasks.
- ____ 10. I gamble when I am feeling depressed or sad.
- ____ 11. I find that gambling is a good way to keep my mind off of problem I have in other parts of my life.
- ____ 12. I gamble when I am in debt or need money.
- ____ 13. I really enjoy the complementary perks that come along with gambling, like free points, drinks, comp coupons, etc.
- ____ 14. I enjoy the social aspects of gambling such as being with my friends or being around other people who are having a good time and cheering me on.

____15. I gamble when I have a work project or class assignment that is due in the near future.

____16. I gamble primarily for the money that I can win.

Items 1, 4, 7, 8, 13, 14, and 16 should be summed to give a score for gambling maintained by positive reinforcement. Items 2, 3, 5, 9, 10, 11, 12, and 15 should be summed to give a score for gambling maintained by negative reinforcement.

Appendix B

Japanese translation of the Gambling Functional Assessment (GFA-R)

1. ?????????????????????????????????
2. ?????????????????????????????????
3. ?????????????????????????????
4. ?????????????????????????????????
5. ?????????????????????????????????
6. ?????????????????????????????????
7. ?????????????????????????????
8. ?????????????????????????????????
9. ?????????????????????????????????
10. ?????????????????????????????
11. ?????????????????????????????????
12. ?????????????????????????????
13. ?????????????????????????????????
14. ?????????????????????????????????
15. ?????????????????????????????
16. ?????????????????????????????

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For correspondence: Jeffrey N. Weatherly, Ph.D., Department of Psychology, University of North Dakota, Grand Forks, ND, 58202-8380, USA. Tel: (701) 777-3470. Fax: (701) 777-3454. E-mail: jeffrey.weatherly@und.edu

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Jeffrey N. Weatherly is a Professor of Psychology at the University of North Dakota. His research expertise is in the area of behaviour analysis.

Kenjiro Aoyama is a Professor of Psychology at Doshisha University. His research expertise is in the area of the experimental analysis of behaviour.

Heather K. Terrell is an Assistant Professor of Psychology at the University of North Dakota. Her research expertise is in the area of social and quantitative psychology.

J. Colleen Berry is an Associate Professor in the Department of Modern and Classical Languages at the University of North Dakota. Her areas of expertise include Japanese and Chinese languages and literature.

Making a living online: Problem gambling and workaholism in high earning online Texas hold'em poker players

Anthony A.B. Hopley,^{1,2} Jennifer Wagner,² & Richard Nicki²

¹Centre for Addiction and Mental Health, Toronto, Ontario, Canada

²University of New Brunswick, Fredericton, New Brunswick, Canada

Email: nick@unb.ca

Abstract

The skill component of Texas hold'em online poker (THOP) adds a unique element to the assessment of risk for problem gambling (PG). The current study examined whether PG among a high earning subgroup of THOP players was analogous to workaholism. Participants were self-selected online poker players ($N = 31$), and results revealed that participants played an average of 30.5 hours per week, and had an average annual online poker earning of CAD 29 995. Furthermore, 32% of the sample gambled problematically according to the PGSI. In accordance with previous findings, PG was uniquely predicted by time played and stress. However, PG in this subset of THOP players was associated with an external locus of control. Contrary to expectations, the personality variable of neuroticism was unrelated to PG and workaholism. Furthermore, workaholism was unrelated to any variables in the model, and no significant relationship emerged between workaholism and PG.

Résumé

Les habiletés requises pour s'adonner au jeu en ligne Texas Hold'em Online Poker (THOP) ajoutent un élément inédit à l'évaluation du risque associé aux problèmes de jeu. Nous avons cherché à déterminer s'il était possible d'établir une analogie entre le jeu problématique chez un groupe de joueurs de THOP qui remportent gros et l'ergomanie. L'échantillon ($n=31$) était composé de participants volontaires. Les résultats montrent que ceux-ci consacrent en moyenne 30,5 heures par semaine au jeu en ligne et que leurs gains annuels moyens s'élèvent à CAD 29 995. Par ailleurs, 32 % d'entre eux se classaient dans la catégorie des joueurs compulsifs suivant l'IGJC. D'après des résultats antécédents, le temps passé à jouer et le degré de stress seraient les seuls facteurs de prédiction du jeu problématique. Chez le groupe de joueurs de THOP, toutefois, les problèmes de jeu sont associés à un locus de contrôle externe. Contrairement à nos attentes, la variable du névrosisme n'était pas

associée aux problèmes de jeu et à l'ergomanie. De plus, aucun lien n'a été relevé entre l'ergomanie et les autres variables du modèle; aucun lien significatif n'est ressorti entre l'ergomanie et le jeu problématique.

Introduction

The worldwide play of online Texas Hold'em Poker (THOP) in the last decade raises concerns about the possibility of increased problem gambling rates in online poker players. However, the skill component of THOP may add a unique element to the assessment of risk of problem gambling in THOP players, in contrast to video lottery terminal players and players of other games solely based on chance (Bjerg, 2010; Hopley & Nicki, 2010). Hopley and Nicki (2010) reasoned that major differences exist between THOP players and other types of gamblers, and suggested that the Problem Gambling Severity Index (PGSI) (Ferris & Wynne, 2001) and other measures of problem gambling may not validly predict problem gambling in this demographic. In a direct comparison of professional and pathological gamblers, the latter score higher on problem gambling screeners, impulsivity, mental health symptomatology and Axis I diagnoses, and lower in quality of life, self-esteem, perceived social support, gambling self-efficacy, and past-90-day gambling frequency (Weinstock, Massura, & Petry, 2013). Consequently, the measurement of problem gambling among THOP players who either earn a living or supplement their income with winnings might better be reconceptualised to consider this fact: The motivational basis for excessive play by THOP players pertains more to work than to entertainment.

Hopley and Nicki (2010) investigated the association between variables regularly linked to problem gambling in general (i.e., impulsivity, boredom proneness, negative emotions, and dissociation) and problem gambling in online poker players. The authors found that hours played per week, dissociation, boredom proneness, impulsivity, and negative emotionality were all predictive of problem gambling among online poker players, as defined by the PGSI. Furthermore, the amount of hours spent playing THOP was significantly and positively correlated with PGSI scores. Noteworthy was the finding that on average, participants reported having won rather than lost money. Specifically, 34% of the sample made a living or supplemented their income with their online poker earnings. With respect to other kinds of gambling activity, such as blackjack, this outcome would be a rare one.

The findings of Hopley and Nicki (2010) were replicated and extended by Hopley, Dempsey, and Nicki (2012), who asserted that, because of the skill component of THOP, poker players differed from other types of gamblers. Furthermore, they proposed that certain questions of the current PGSI may not be applicable to this skilled and high-earning subset of the THOP population. For example, the question "thinking about the past 12 months, how often have you gone back another day to

try to win back the money you lost?” may not be relevant to poker players who earn a living or supplement their income with their online poker winnings, since the nature of their work requires them to continue playing to earn a living. This viewpoint is supported by the Orford, Wardle, Griffiths, Sproston, and Erens’ study (2010), which revealed that the presence of the question pertaining to chasing the gambler’s losses in both the PGSI and the Diagnostic and Statistical Manual Fourth Edition (DSM-IV) lowered the internal consistency of these measures. Therefore, the PGSI may incorrectly categorize this specific high-earning population as problem gamblers because of the nature of certain questions.

In the current study, we adopted a different approach to this issue, and investigated whether problem gambling among this specific population was analogous to workaholism. That is, poker players who consider online poker playing as a job that provides their primary or secondary source of income may have a different relationship to playing poker than people who play solely for enjoyment. Accordingly, THOP players who devote significant hours to online play may be better characterized as being overly absorbed in work. This argument is supported by the findings of Weinstock and colleagues (2013) who noted that professional gamblers had increased frequency of gambling in the previous 90 days compared to problem gamblers. For those players who use THOP as employment, playing for greater amount of hours might well be associated with increased earnings, similar to working increased hours. At the same time, because the high-earning population of THOP players spend many hours playing THOP, they would presumably be more prone to the development of problem gambling. Thus, the adoption of a complementary approach to the assessment of problem gambling in this special population is warranted, an approach that involves a consideration of how the construct of workaholism applies to THOP players.

Workaholism refers to the widely acknowledged phenomenon occurring when an individual becomes overly involved in work life, has difficulty disengaging from work, and continually thinks about work. As a result, other significant life aspects tend to suffer, such as relationships (Griffiths, 2005). However, workaholism is not associated with financial strain, much in the same way excessive online poker play may be linked to increased financial reward. This definition also relates to a number of diagnostic items of pathological gambling of the DSM-IV criteria: (A1) the individual demonstrates a preoccupation with gambling; (A3) the individual has repeated unsuccessful efforts to control, cut back, or stop gambling; (A7) the individual lies to family members, therapist or other persons to conceal the extent of involvement with gambling; and, finally, (A9) the individual has jeopardized or lost a significant relationship, job, educational, or career opportunity because of gambling (American Psychiatric Association, 2000). For a detailed comparison between problem gambling and workaholism, see Table 1.

Workaholism is typically conceptualized from a trait theory perspective. This viewpoint maintains that workaholic behaviour develops and progresses from stable

Table 1
Construct comparison between problem gambling and workaholism

Attribute	Construct	
	Problem Gambling	Workaholism
Time	Spend a lot of time devoted to gambling-related activities ^{1,2,3}	Spend a lot of time in work-related activities ^{4,5}
Salience	Preoccupation and cognitive distortions ¹	Preoccupation and cognitive distortions ^{4,5}
Cravings	Inability to control, cut back, or stop gambling ¹	Cravings to work ^{4,5}
Mood modification	Arousal or dissociation that is reinforcing ^{1,2,3}	Arousal or dissociation that is reinforcing ^{4,5}
Tolerance	Needs to gamble with increasing amounts to achieve mood modification ¹	Increased hours of work required to achieve mood modification ^{4,5}
Withdrawal	Restlessness or irritability when unable to gamble ¹	Unpleasant feelings/physical effects (e.g., shakes, moodiness, irritability if unable to work) ^{4,5}
Conflicts	Jeopardized or lost a relationship, job, educational or career opportunity due to gambling ¹	Interpersonal conflict or a work-life conflict with other activities as a consequence of neglect ^{4,5}
Relapse	Course of pathological gambling tends to be chronic ¹	Tendency to return to early patterns of excessive work after a period of control ^{4,5}
Illness	Prone to developing stress related illness (e.g., hypertension, migraines, ulcers) ¹	Prone to stress related illnesses, chronic fatigue and anxiety ⁴
Concealment	Lying to others to conceal gambling involvement ¹	Workaholism is socially acceptable and less frequently hidden, in fact it can be praised or expected ⁴
Chasing	Chasing to recuperate financial losses ¹	Not associated with financial loss—chasing does not occur
Illegal acts	Committing illegal acts to finance gambling ¹	Not associated with financial loss—illegal acts are not required
Reliance	Relying on others to relieve a desperate financial situation ¹	Not associated with financial loss—reliance on others is unnecessary

personality traits, as well as internal and external stressors, and is maintained by reinforcement (Burke, Matthiesen, & Pallesen, 2006; Griffiths, 2005). In addition, the personality variable of neuroticism may predispose individuals to workaholic behaviour by increasing the likelihood of experiencing negative emotional states, such as anxiety, anger, guilt and depressed mood (Burke et al., 2006; Myrseth, Pallesen, Molde, Johnsen, & Lorvik, 2009). Consistent with this viewpoint, stress was found by Spence and Robbins (1992) to be linked to workaholism, and also was found to be uniquely predictive of problem gambling by Hopley and colleagues (2012). The latter finding was consistent with earlier reports, by Coman, Burrows, and Evans (1997), of an association between negative mood states such as

depression, anxiety, and stress and the development and maintenance of problem gambling.

Spence and Robbins (1992) proposed the existence of three dimensions of workaholism: Work Involvement (WI), Enjoyment (E), and Drive (D) (McMillan, Brady, O'Driscoll, & Marsh, 2002). The WI dimension consists of the level of psychological involvement with work. As individuals high in workaholism can enjoy and be satisfied with their work, the E dimension pertains to the level of pleasure with work. Lastly, the D dimension refers to the degree of intrinsic personal ambition—that is, an internal demand rather than an external pressure to work and succeed. Burke and colleagues (2006) conducted a study examining the association between the Big Five personality factors (neuroticism, extraversion, conscientiousness, agreeableness, openness) and the three components of workaholism. They found a significant relationship between neuroticism, extraversion, and conscientiousness, and the three workaholism components. In addition, Spence and Robbins (1992) found a moderate positive correlation between hours worked and overall workaholism levels, a finding comparable to the findings of Hopley and colleagues (2012) and Hopley and Nicki (2010), and which indicated that problem gambling was uniquely predicted by time played. Therefore, spending more time playing THOP may increase both the risk of workaholism and problem gambling in this population. However, the converse remains possible, as high levels of workaholism may also engender an increased risk of playing excessive amounts of online poker. Longitudinal research is lacking, and therefore, directionality has yet to be determined.

Finally, locus of control (LOC) refers to an individual's perception about the underlying causes leading to an outcome (Duttweiler, 1984; Rotter, 1954). High internal LOC involves the perception of personal control over the outcome, whereas high external LOC involves the perception that the outcome is dependent on external causes, such as fate, luck, or powerful others (Duttweiler, 1984; Rotter, 1954). Hopley and colleagues (2012) found that internal LOC was a unique predictor of problem gambling among THOP players: people classified as problem gamblers had greater internal LOC. This finding was supported by Lester's (1980) report that individuals with a high external LOC tend to play games of luck more frequently rather than games of skill, such as poker. With regard to THOP, a high internal LOC should foster the perception of greater control over the outcome of the game in skilled players.

This study aimed to examine whether problem gambling among people who earn a living or supplement their income with their online poker winnings was analogous to workaholism. Therefore, we investigated the relationship between the current PGSI (Ferris & Wynne, 2001) and Spence and Robbins' (1992) Work-BAT (Workaholism Battery). It was hypothesized that there would be a positive correlation between these two criterion variables, with high scores on the PGSI relating to high scores on the Work-BAT. Furthermore, an exploration of the relationship between stress,

neuroticism, and locus of control, with respect to the PGSI and the Work-BAT, was undertaken using a canonical correlation analysis in one model. We hypothesized that high scores among all of the three variables—stress, neuroticism, and LOC—would be related to high scores in both the PGSI and the Work-BAT.

Method

Participants

Participants were self-selected THOP players with average annual online poker earnings of at least \$10,000 who were recruited from poker forums and advertising on social networking sites (all dollar figures in this article are presented as Canadian dollars). A total of 102 participants (80 males, 5 females, 17 undisclosed) started the survey; after screening, 31 male participants completed the entire survey and provided usable data. Participants were screened out if they were multivariate outliers, the questionnaires were unscorable, or they dropped out. The mean age of the screened sample was 28.77 (19–53, $SD = 8.81$). Participants primarily identified as being Caucasian (64.5%) or other (25.8%), and fewer participants identified as African-American (3.2%), Latino (3.2%), and bi- or multi-racial (3.2%). Approximately 39% of the sample supported themselves solely with THOP and 19% reported supplementing their incomes with their earnings. The highest 40% of the screened sample earned between \$25,000–120,000; the middle 20% earned between \$18,000–25,000; and the lowest 40% earned under \$18,000 in net yearly income.

Materials

The online survey was hosted by SurveyMonkey (<http://www.surveymonkey.com>), a third party surveyor, and one which employs multiple layers of security, layers that maintain the privacy and security of data. The survey consisted of a general demographics questionnaire that included questions pertaining to age, sex, race and education, followed by a gambling demographics questionnaire that contained questions relating to the amount of hours spent playing poker in a typical week, multi-tabling (amount of games played at once), and yearly net profit. Specifically, participants were asked “on average, how much real money do you wager on Texas Hold’em poker in one day?” and “since starting to play Texas Hold’em poker, approximately what is your yearly net profit or net loss?” The criterion used to capture the specific high earning population was a cut-off value of players who earned at least \$10,000 annually. This cut-off was chosen because Hopley & Nicki (2010) and Hopley and colleagues (2012) had discovered that \$10,000 represented earnings at the 60th and 70th percentiles respectively. Furthermore, the aforementioned studies noted that THOP players report playing as a primary source or supplement to their income. A cut-off of \$10,000 is roughly equivalent to yearly part-time work at minimum wage, and when paired with part-time income would

place the player above the Canadian after-tax low income cut-off rate (i.e., poverty line), according to Statistics Canada, for a one person family.

Depression Anxiety Stress Scales (DASS). The negative emotional symptom of stress was assessed using the stress subscale of the DASS (Lovibond & Lovibond, 1995). Overall, the DASS possesses strong discriminant and convergent validity, distinguishing between the three negative emotional syndromes, which supports the use of this subscale (Lovibond & Lovibond, 1995). Research reveals that the DASS is reliable and valid for use in an online format (Zlomke, 2009). The stress subscale of the DASS has been found to have very good internal consistency ($\alpha = .94$) (Zlomke, 2009). A Cronbach's Alpha value of .95 was found in the current study. Previous research has identified that the test-retest reliability of the online format across a six week period was adequate ($r = .57-.67$) (Zlomke, 2009). Furthermore, the means and standard deviations for the online administered DASS were not significantly different from the results of the paper-and-pencil form (Zlomke, 2009). The 14-item stress subscale of the DASS has participants rate themselves on a 4-point scale from "did not apply to me at all" to "applied to me very much, or most of the time." The scores on the stress subscale range from 0 to 42, with high scores reflecting more stress and low scores indicating less stress.

Internal Control Index (ICI). LOC was assessed using Duttweiler's (1984) ICI. The ICI has good reliability and convergent validity (Duttweiler, 1984; Goodman & Waters, 1987). It also enjoys good internal reliability ($\alpha = .84$) (Duttweiler, 1984). In this study, a Cronbach's Alpha value of .83 was found, a value that is a good level of internal consistency. The 28-item ICI has participants rate themselves on a 5-point scale from "rarely" to "usual," where half of the items are reversed scored. The scores on the ICI range from 28 to 140, with high scores indicating a higher internal LOC and low scores reflecting an external LOC.

Revised NEO Personality Inventory (NEO-PI-R). Neuroticism was assessed using the neuroticism subscale of Costa and McCrae's (1992) NEO-PI-R. The domains of the NEO-PI-R have shown good internal consistency ($\alpha = .88-.92$) (Gaughan, Miller, Pryor, & Lynam, 2009). Furthermore, the NEO-PI-R has demonstrated both convergent and discriminant validity across multiple empirical examinations (Costa & McCrae, 1992; Morey et al., 2002). However, in this study, a low Cronbach's Alpha value ($\alpha = .41$) was found for the neuroticism subscale; therefore, results pertaining to neuroticism herein must be interpreted with caution. The 20-item neuroticism subscale has participants rate themselves on a 5-point scale from "very inaccurate" to "very accurate." Scores on the neuroticism subscale range from 20 to 100, with high scores indicating a higher tendency towards emotional instability.

Workaholism Battery (Work-BAT). Workaholism was assessed using Spence and Robbins' (1992) Work-BAT. Spence and Robbins (1992) found that the Work-BAT contained face validity, adequate to good internal consistency ($\alpha = .67-.86$),

and adequate convergent validity. The WI component has been found to have good internal consistency ($\alpha = .80$) (McMillan et al., 2002). The E domain also has shown evidence of having high internal consistency ($\alpha = .85$) (McMillan et al., 2002). The D subscale has yielded acceptable internal consistency ($\alpha = .74$; Spence & Robbins, 1992). In this study, a Cronbach's Alpha value of $\alpha = .85$ was found for the Work-BAT. The 25-item Work-BAT has participants rate themselves on a 5-point scale from "very untrue of me" to "very true of me." Scores on the Work-BAT range from 25 to 125. High scores indicate a higher tendency to display workaholic behaviours.

Problem Gambling Severity Index (PGSI). Finally, gambling severity was assessed using the PGSI subsection of the Canadian Problem Gambling Index (Ferris & Wynne, 2001). The PGSI has shown evidence of high internal consistency ($\alpha = .90$), internal reliability, unidimensionality, and good item-response characteristics (Abbott & Volberg, 2006; Hopley et al., 2012). A Cronbach's Alpha value of $\alpha = .88$ was found in this study. The PGSI and DSM-IV measures of problem gambling are strongly correlated and distinguishes problem gamblers from non-problem gamblers to a reasonable extent ($r = .65$) (Ferris & Wynne, 2001). The 9-item PGSI has participants rate themselves on a 4-point scale from "never" to "almost always." A total score of zero indicates a non-problem gambler, total scores of one and two show a low risk for problem gambling, total scores of three to seven points towards moderate risk, and total scores eight and above reflect problem gambling (Ferris & Wynne, 2001).

Procedure

Individuals who viewed the online advertisement were offered a chance to win one of four \$50 prizes. A random number generator was then used to select four participant ID numbers, who were then contacted by electronic mail and their inducements were transferred via Paypal. Once individuals clicked on the link, they were brought to the consent form outlining the nature of the study, the confidential and anonymous nature of their responses, and their right to withdraw. Participants then completed a demographics questionnaire, followed by a gambling demographics questionnaire. Participants then proceeded to complete the questionnaires measuring the variables of interest in the study; the order of the questionnaires was randomized. In total, participants answered 103 questions, a process which took approximately 30–45 minutes to complete.

Results

Data Screening

Prior to the analysis, the data were conditioned to meet the assumptions of regression. The assumption of normality was met, as skewness and kurtosis were absent. Furthermore, missing value analysis indicated that the overall pattern of

missing data corresponded to the pattern: missing completely at random (MCAR), as Little's MCAR Test was non-significant ($\chi^2 = 0.00$; $df = 1136$, $p > .05$). Therefore, listwise deletion was used to eliminate participants with incomplete data, as missing values were not dependent on any measured variables. One multivariate outlier was removed from the original sample, and no univariate outliers were found with regard to questionnaire scores.

Gambling and Workaholism Demographics

Participants reported a variety of hours played per week with minimum amount of 5 hours and a maximum amount of 70 hours ($M = 30.55$; $SD = 15.90$). The question relating to multi-tabling revealed that participants played from one to 17 games at one time ($M = 5.00$; $SD = 3.75$). Average annual online poker earning ranged from a minimum profit of \$10,000 to a maximum profit of \$120,000 with a median value of \$22,000 ($M = 29,994.85$; $SD = 23,936.84$). PGSI scores varied from 0 to 21 ($M = 6.10$; $SD = 5.34$). Based on PGSI scores, 9.68% of the participants were non-problem gamblers; 22.58% were low-risk gamblers; 35.48% were moderate-risk gamblers, and 32.26% of the sample consisted of problem gamblers. Finally, total Work-BAT scores varied from a minimum score of 55 to a maximum score of 112 ($M = 82.29$; $SD = 15.01$). While no cut-off scores were proposed to distinguish workaholics from non-workaholics, participants in this study reported moderate-high elevations in workaholism levels.

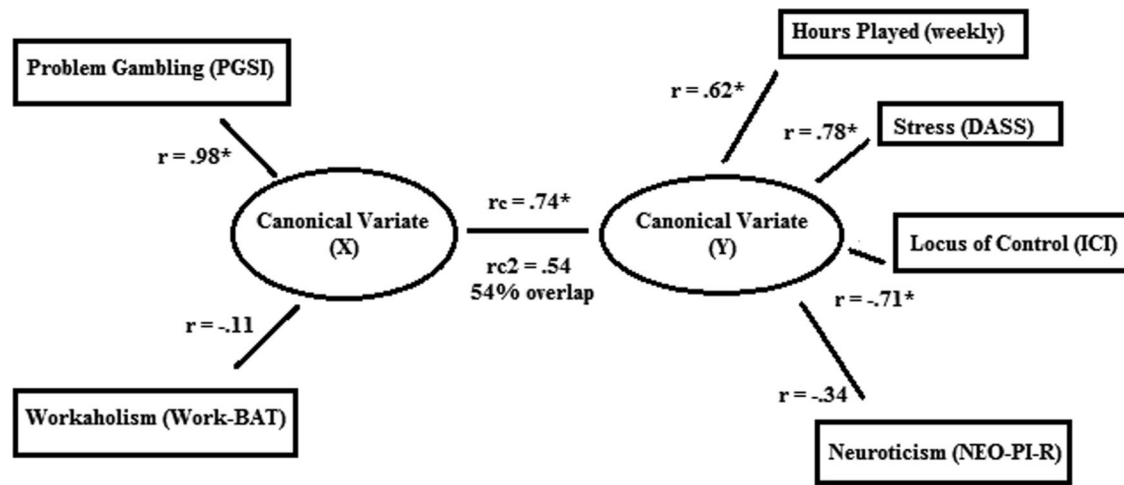
Pearson Correlations

Pearson correlations were calculated for all pairs of variables. Moderate negative correlations were found between neuroticism and time spent playing online poker ($r = -.40$, $p < .05$), LOC and stress ($r = -.43$, $p < .05$), and PGSI scores and LOC ($r = -.56$, $p < .05$). PGSI scores were moderately positively correlated with stress ($r = .56$, $p < .01$), and time spent playing THOP ($r = .42$, $p < .05$). Workaholism was not significantly correlated with time spent playing online poker. Furthermore, workaholism and problem gambling were not significantly correlated. Problem gambling was not significantly correlated with the Drive subscale of the Work-BAT.

Linear Combinations

To examine the predictors of problematic gambling and their relationship to both problem gambling and workaholism, a canonical correlation analysis was conducted with two canonical variable sets. Canonical variate X consisted of PGSI total score and Work-BAT total score, whereas Canonical variate Y was made up of weekly hours played, DASS stress scores, ICI total score, and Neuroticism total score. This analysis determined which combination of predictors best related to problem gambling and workaholism through a linear combination of weighted measures (see Figure 1).

Figure 1. Canonical model representing the optimal linear combination of variables and their degree of overlap



The Wilks multivariate test was significant ($Wilks \lambda = .37$, $F(8,50) = 3.92$, $p < .01$) with an overall effect size of $R^2 = .62$. Of two possible canonical correlations, only one was significant, $r_c = .74$ (54% overlapping variance). The relationship between dependent variables and Canonical variate X was strong for problem gambling scores ($r = .98$) and weak for workaholism scores ($r = -.11$). The relationship between predictors and Canonical variate Y was moderate for hours played ($r = .62$) and neuroticism ($r = -.34$) strong for stress ($r = .78$) and locus of control scores ($r = -.71$). The dependent variables account for 26.44% of the variance in Canonical variate X, whereas the predictors accounted for 21.75% of the variance in Canonical variate Y. The canonical function (i.e., the pair of canonical variates) consisted of a positive relationship between time played and stress, and a negative relationship between LOC and problem gambling scores, indicating that an external LOC was predictive of problem gambling in this subsample of THOP players. Both workaholism and neuroticism made only minimal contributions to the model.

Discussion

In this study, we investigated an alternative viewpoint of playing THOP involving workaholism in addition to problem gambling among THOP players who earned a living or supplemented their income with their online poker winnings. This was a novel step towards a greater understanding of problem gambling in this population. The relationship between the PGSI and the Work-BAT was examined. It was hypothesized that there would be a positive correlation between these two variables, with high scores on the PGSI relating to high scores on the Work-BAT. The respective relationships of three variables—stress, neuroticism, and LOC to the PGSI and the Work-BAT—were assessed. In accordance with the findings of Hopley and colleagues (2012), it was expected that stress and internal locus of

control would be significant predictors of problem gambling. Furthermore, we expected that scores among all of the three variables (locus of control, stress, and neuroticism) would significantly overlap with the canonical variate pertaining to the combined PGSI and Work-BAT.

The results of the current study partially replicated the findings of Hopley and colleagues (2012), in that we found that hours spent playing online poker, stress, and LOC were significant predictors of problem gambling. However, the personality variable of neuroticism was not found to significantly predict problem gambling as hypothesized. Furthermore, none of the variables were significant predictors of workaholism, contrary to expectations; nor did workaholism load onto the canonical variate with problem gambling. While LOC was related to problem gambling, a strong negative correlation was found. Therefore, among high earning online THOP players, an external LOC was predictive of problem gambling, contrary to the findings of Hopley and colleagues (2012).

In the current study, a large number of the participants were identified as problem gamblers (32.25% of the sample). This is approximately twice the amount that was found in both Hopley and Nicki (2010) and Hopley and colleagues (2012) studies. In this study, because our target population was high-earning THOP players, this finding reinforces our concerns about the validity of the PGSI as an assessment of problem gambling among this demographic. Alternatively, this may indicate that high earning THOP players are at increased risk for the development of problem gambling, when compared with casual players. At the same time, the findings of this study do not support the use of the Work-BAT as a measure of problem playing of THOP gamblers.

Time spent playing online poker was found to be a significant predictor of problem gambling in accord with Hopley and colleagues' (2012) findings; however, time was not related to workaholism in the canonical model. The former result supports previous research, a finding which suggests that the ease of access to online games may increase the opportunity to play. This increase may lead to greater risk for problem gambling (Hopley et al., 2012). Because Spence and Robbins (1992) found a moderate positive correlation between hours worked and Work-BAT scale scores, we expected that time spent playing online poker would be a significant predictor of workaholism. However, the results did not support this hypothesis, and indicate instead that an increased amount of hours playing THOP leads to problem gambling but not workaholism.

When the effect of stress was analyzed in relation to problem gambling and workaholism, it was found to be strongly related only to problem gambling, which replicated Hopley and colleagues' (2012) findings. This correspondence is consistent with research by Coman and colleagues (1997), who found that individuals use gambling as a way to reduce stress that is caused by other unpleasant emotional states, and the association between these variables hypothesized in this study. On the

other hand, Spence and Robbins (1992) found a link between stress and workaholism, one which was consistent with our hypothesis, but not supported by our findings. Therefore, the relationship between stress and problem gambling in THOP gamblers may be fundamentally different from the relationship between stress and workaholism in THOP gamblers.

LOC was found to be a significant predictor of problem gambling, but in the direction opposite to our expectations, and contrary to the findings of Hopley and colleagues (2012). That is, an external LOC was related to higher scores on the PGSI. Previous research has linked LOC to problem gambling, in that problem gamblers develop illusory perceptions of control over the outcome, and, as a result, develop an internal LOC (Carroll & Huxley, 1994). However, this explanation would not be applicable to THOP players, who differ from other types of gamblers because of the presence of a skill component in THOP, one where perceptions of control may indeed reflect reality. Therefore, it seems reasonable to expect that feelings of control would occur in situations where skillful players are controlling the games and consistently winning, and that losses would be attributed by them as chance-outcome events. Furthermore, among highly-skilled players, loss of this perception of control may reflect or precipitate movement towards problem gambling. Conversely, less skilled players may increase their vulnerability to problem gambling by possessing a strong internal locus of control (Hopley et al., 2012). A relationship between LOC and workaholism was not found. This would suggest that LOC is not a variable linked to workaholism, and that variations in LOC do not have an effect on workaholic behaviour, or vice versa.

The personality variable of neuroticism did not contribute to the canonical variates, and was unrelated to problem gambling and workaholism, contrary to hypotheses. Our hypothesis was partly based on Burke, and colleagues' (2006) findings that there was a significant relationship between neuroticism, extraversion, and conscientiousness, and the three workaholism components. Neuroticism, in particular, was positively related to feeling driven to work (Burke et al., 2006). However, in testing for this effect, we did not find any significant results. In regard to problem gambling, Myrseth and colleagues (2009) and Bagby and colleagues (2007) found the neuroticism was significantly related to problem gambling. In the current study, however, a moderate negative correlation was found between neuroticism and time spent playing online poker; therefore, neuroticism increased while time spent playing online poker decreased or vice versa. Unfortunately, conclusions about the relationship between neuroticism and both problem gambling and workaholism cannot be drawn because of the weak psychometric properties of the NEO-PI-R used in this study; therefore, replication is necessary.

The current study possessed several limitations that must be acknowledged. First, there was a large discrepancy between our target sample size of 100 participants and our obtained sample size of 31 participants, a discrepancy which reduced the statistical power of the study. Furthermore, the self-report nature of the

questionnaires limits the validity of the responses as response biases (e.g., social desirability, deception) may have influenced the nature of the responses. Moreover, although we had a large number of participants who initially began the survey, relatively few participants completed it; therefore, the sample may be biased and, consequently, the generalization of the findings is correspondingly reduced. This possibility may in turn indicate a limitation of our measures, and suggests that briefer measures should be adopted for future research. In addition, the entirety of participants in the study were male; therefore, the findings cannot be generalized to female THOP players. As noted above, the very low internal consistency found for the NEO-PI-R prevented conclusions to be drawn surrounding that measure, and this level of consistency may explain why we were unable to identify any significant relationships with the theoretically relevant variable or neuroticism. Lastly, as noted earlier, certain questions on the PGSI may not be appropriate, and may not predict with validity problem gambling in those THOP players who earn a living or supplement their income with their online poker winnings.

Although there are concerns with the validity of the PGSI, workaholism was found to be unrelated to problem gambling and, therefore, not a meaningful construct for triangulating problem gambling. The current study was the first to propose the possible connection between problem gambling among THOP players who earn a living or supplement their income with their winnings, and workaholism. The absence of any significant findings with regard to workaholism could be attributed to the small sample size, or that the two variables, problem gambling and workaholism, measure very different constructs, ones which may not in fact complement each other. In addition, to target the higher earning population of THOP players, we used a cut-off rate of \$10,000 average annual online poker earnings. However, the use of this cut-off rate may have been too arbitrary, and may not have been the optimal way of recruiting participants who consider THOP as a primary source of income. A possible alternative approach to overcoming this issue would have been to use a screening test to capture a more detailed representation of the participants' work situation relating to poker, and to gain more information about their poker earnings. Furthermore, it may be beneficial to compare scores on the Work-BAT between THOP players and people in different occupations who work for a similar amount of hours and have approximately the same income. Such a project would allow us to identify if workaholism could, in fact, be applicable to THOP as a work occupation, and also control for certain extraneous variables.

As suggested by Hopley and colleagues (2012), a longitudinal study further investigating the development and maintenance of stress would help overcome the issue of causality. Furthermore, as mentioned above, high internal LOC feelings may be appropriate in this successful sample, and future investigations to explain this discrepancy between the current study and those of Hopley and colleagues (2012) are warranted. Future research should investigate this relationship among losing players, as well as the relationship between LOC and skill in THOP players. The pursuit of these questions would be consistent with the recommendation by

Bjerg (2010) that distinctions should be made among losing, break-even, and winning players to understand more fully problem gambling in poker players. With respect to the personality variable of neuroticism, it would be beneficial to examine other personality traits and dimensions suggested to be linked to problem gambling, such as openness and conscientiousness, with questionnaires that have stronger psychometric properties. Finally, time played has consistently emerged as a behavioural predictor of online problem gambling; therefore, gambling frequency and time played could be used to identify problematic gambling patterns and separate these from professional play, furthering the findings of Weinstock and colleagues (2013). Behavioural data centering on amount wagered or net income (i.e., regular versus high stakes online play), initially examined in this study, should be replicated with regard to differentiating between problem gamblers and normative play.

In brief, this study partially replicated the findings of Hopley and colleagues (2012) because it found that stress and time spent playing online poker were significant predictors of problem gambling; however, an external LOC was also strongly related to problem gambling. Furthermore, this study attempted to adopt a unique approach in the assessment of problem gambling among high earning THOP players, from a workaholism perspective. Consequently, we found that the two constructs were not related; therefore, workaholism is likely not an appropriate alternative or complementary measure of problem gambling. The results of this study, however, may further initiate the development of a valid measure of problem gambling among THOP players who earn a living or supplement their income with their online poker winnings.

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For correspondence: Richard Nicki, PhD, Department of Psychology, University of New Brunswick, 38 Dineen Drive, Room 126, Keirstead Hall, Fredericton, New Brunswick, E3B 5A3. Tel: (506) 452-6104. Fax: (506) 447-3063. E-mail: nick@unb.ca

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Anthony Hopley is a PhD candidate at the University of New Brunswick and is completing his pre-doctoral internship at the Centre for Addiction and Mental Health in Toronto, Ontario. Both branches of his research interests center on addiction. First, he is completing his dissertation, which is focused on the development of a comprehensive typology of substance misusing offenders. Second, he has investigated the predictors and correlates of excessive online Texas Hold’em Poker.

Jennifer Wagner, BA, completed her honour’s thesis under the supervision of her co-authors.

Dr. Richard Nicki is a Professor Emeritus in the Department of Psychology at the University of New Brunswick in Fredericton. He is a licensed psychologist, and a specialist in the areas of motivation and cognitive behaviour therapy. For many years, his laboratory research group has investigated factors relating to the causes and prevention of problem gambling in video lottery terminal and online Texas Hold’em Poker players.

Is the secrecy of the parametric configuration of slot machines rationally justified? The exposure of the mathematical facts of games of chance as an ethical obligation

Cătălin Bărboianu

Infarom, Division of Applied Mathematics, Craiova, Dolj, Romania

Abstract

Slot machines have gained high popularity despite a specific element that could limit their appeal: non-transparency with respect to mathematical parameters. The PAR sheets, which expose the parameters of the design of slot machines and probabilities associated with the winning combinations, are kept secret by game producers, and the lack of data regarding the configuration of a machine prevents people from computing probabilities and other mathematical indicators. In this article, I argue that there is no rational justification for this secrecy for two reasons: one psychological and the other mathematical. For the latter, I show that mathematics provides us with some statistical methods of retrieving the missing data, which are essential for numerical probability computations in slots. The slots case described herein raises the problem of exposing the parametric configuration and mathematical facts of any game of chance as an ethical obligation.

Résumé

Les machines à sous jouissent d'une grande popularité en dépit d'un élément particulier qui pourrait en limiter l'attrait : l'absence de transparence en ce qui touche les paramètres mathématiques qui déterminent leur fonctionnement. Les fabricants de jeu ne divulguent pas les documents précisant les paramètres de conception des machines à sous ainsi que les probabilités associées aux combinaisons gagnantes. Cette absence de données sur la configuration des appareils empêche quiconque de faire un calcul des probabilités et d'autres indicateurs mathématiques. Dans le présent article, j'avance qu'aucune explication rationnelle ne justifie le maintien du secret en me fondant sur deux arguments, l'un relevant de la psychologie et l'autre, des mathématiques. En ce qui concerne le second, je démontre qu'il existe des méthodes statistiques qui permettent de récupérer les données manquantes, essentielles au calcul des probabilités

numériques. Le cas des machines à sous soulève le problème de la divulgation des configurations paramétriques et des principes mathématiques des jeux de hasard en tant qu'obligation d'ordre éthique.

Popularity of Slot Machines and Their Particularities in Regard to Exposure of the Parametric Configuration

There is a relation between the popularity of a game and excessive gambling in it, which is also visible on any pathway model to problem gambling in its first phase, namely, *ecological factors* involving *availability* and *accessibility* (Blaszczynski & Nower, 2002). For decades, the slots game has remained one of the most popular games of chance, and the main elements that contribute to its position—from the perspective of both a problem gambler and a non-problem gambler—are as follows:

1. Variety. Players may choose from among a wide palette of games with respect to rules, parameters, and design according to their profile, goals, or even hobbies (Griffiths, 1999; Wood, Griffiths, Chappell, & Davies, 2004).
2. Privacy. Slots games, played either in a public place or in front of the computer, assume a private space with minimal exposure in which there is only the player and the machine (Parke & Griffiths, 2002), unlike a roulette table, for example, where you place your bets together with other players.
3. Attractive design. From the graphics of the symbols to the design of the interface, all is sparkling and brightly colored (Wood et al., 2004).
4. Brevity. A game timeline is short, lasting a few seconds from credit insertion to the stop of the spin, and players prefer a high number of games played within a time unit (Griffiths, 1999).
5. Illusions and sensations. Multiple design and configuration features distort players' perceptions (e.g., just missing the jackpot by one symbol can cause players to think a big win is imminent; use of a "stop" button can foster the illusion of control over machine outcomes; Griffiths, 1999).

Slot machines gained and maintained this popularity despite some specific elements that could limit their appeal, particularly:

1. Non-transparency. Players do not know the configurations of the machines they play, as this information is not exposed. Blackjack players know the composition of the decks in play, roulette players know the numbers on the wheel, lottery players know the numbers from which the winning line is drawn, and so on. Slots remains the only game in which players are not aware of the essential parameters of the game, such as the number of stops of the reels, the number of symbols, and the distribution of the symbols on the reels.

2. Prevention from odds estimation. The lack of data regarding the configuration of a machine prevents people from computing the odds of winning and other mathematical indicators.

The so-called PAR sheets (Probability Accounting Reports)) – documents that expose the weighting of the reels, some of the probabilities associated with the winning combinations, and other statistical indicators – are kept secret by game producers.

Practical questions arise about whether slot machine popularity would decrease and the slot player's behavior would be influenced if these hidden probabilities were exposed, and whether there exists a rigorous method through which qualified persons studying slot games (e.g., statisticians, applied mathematicians, programmers) can retrieve the parameters of the configurations of slot machines in order to generate their own PAR sheets for the players. I answer the first question in the sections *The Psychological Argument Related to Competition* and *The Psychological Argument Related to Players*, and the second question in the section *Statistical Methods for Estimating the Parameters of the Configuration of a Slot Machine*.

The Parametric Configuration of Slot Machines as a Base for the Probabilistic Models for Slot Games

Although less difficult than other games with respect to the ease of probability calculus (compared with card games, for example), slot games still fall into that category of games of chance for which the probability computations cannot be conducted and performed by the average player, as such computations require medium to advanced knowledge and skills in probability theory. Therefore, the final probability results for these games, in the form of numerical probabilities or formulas (or software programs/applets using those formulas) ready to be computed by inserting the parameters of the specific game design and of the event to be measured, can be delivered to gamblers only by qualified persons.

For the applied mathematician, the hardest task in establishing the mathematical model for the probability calculus in slots is the optimal categorization of slot games so as to be able to obtain general probability formulas with variables describing all possible parametric designs of the machines and all winning events. This difficulty is due to the wide variety of existing and possibly forthcoming slot games with respect to their parametric configuration, which consists of configuration of the reels and configuration of the display.

Configuration of a Reel

The configuration of a reel refers to the distribution of the symbols over the stops of that reel and the arrangement of the symbols:

Denoting by t the number of stops and by p the number of distinct symbols $S_1, S_2, \dots, S_p$ on the reel, and denoting by c_i the number of symbols S_i on the reel ($1 \leq i \leq p \leq t$), then the vector $c_1, c_2, \dots, c_p$ is called the *distribution of the symbols* $S_1, S_2, \dots, S_p$ on the reel, also known as the *weighting* of a reel. Each reel has its own distribution of symbols.

Given the number of stops t , the number of distinct symbols p , and a distribution $c_1, c_2, \dots, c_p$ of the symbols on a reel, there are several ways of arranging those symbols on the stops of that reel. Any function a from the set of stops to the set of distinct symbols, such that $|\{x | a(x) = S_i\}| = c_i$ for any i from 1 to p (that is, the number of stops having assigned symbol S_i by function a is c_i), is called the *arrangement of the symbols* on the reel.

The distribution and arrangement of the symbols on each reel identify a slot game and are determined by the game producer.

The configuration parameters are essential for the probability computations. The numbers of stops of the reels and the symbol distributions on the reels stand as variables for any general formula for the probability of a winning event defined on a payline made of independent stops (stops belonging to independent reels, that is, a payline that crosses over the reels without overlapping them). The symbol arrangements on the reels count toward the probability computations of winning events defined on paylines that hold stops of the same reel, assuming the arrangement is known.

Consequently, for ethical reasons, the parameters of the configuration of a slot machine should be present in any technical sheet describing that machine—for either internal or external use—and in its associated PAR sheet, along with the computed probabilities of the winning combinations and other statistical indicators, which I advocate for later in this article.

Configuration of the Display

The configuration of the display refers to the shape and structure of the set of windows showing the visible symbols of the reels, which produce the outcome of the game, as well as the shape, length, and position of the paylines. All of these properties are described mathematically through geometrical and topological properties of those sets (a rigorous model for the configuration of the display is a rectangular grid in which the lines are defined as discrete paths linking neighboring points).

From the whole configuration of a display, the length of a payline is the only parameter that counts toward the probability computations for events related to that line, regardless of its shape or other properties; however, for more complex events defined on several paylines (for instance, of the type “*a specific winning*

combination of symbols on any payline from a given group of paylines''), particular properties and parameters of that group, such as those related to *intersection* and *independence*, also count.

The mathematical model of the configuration and the probabilistic models based on it are idealized models that do not represent all types of slot machines on the market.

Variables for the General Formulas of Probability and Expected Value

Under the assumption that the reels spin independently (either physically or virtually, in the sense of probabilistic independence), we can obtain general formulas for the probability of the various winning events related to one or several paylines, having as variables the parameters of the configuration of the slot machine described in previous sections.

Most slot machines do not have the same number of stops on their reels, nor the same distribution of symbols on them (unfortunately, for the ease of computations!). Yet we can assume the same number of distinct symbols on each reel (denoted by p) through a convention: If a symbol does not appear on a reel, we could simply take its distribution on that reel as being zero. A blank is considered as a distinct symbol within the mathematical model.

We distinguish two possible types of slot machines with regard to the parametric equality of their reels:

Type A – All reels have the same number of stops and the same distribution of symbols; each symbol S has the same distribution (number of instances) c_S on the t stops of each reel; denote by c_i the distribution of symbol S_i on each reel ($1 \leq i \leq p$);

Type B – The reels have different numbers of stops t_j and each symbol has different distributions on the stops of the reels, denoted by c_i^j (c_i^j is the distribution of symbol S_i on reel number j ($1 \leq i \leq p$ and $1 \leq j \leq n$), where n is the number of reels).

Call the two situations case A and case B.

Given a specific symbol S_i , the probability of S_i occurring on a reel after a spin is

$$q_i = \frac{c_i}{t} \text{ in case A and } q_i^j = \frac{c_i^j}{t_j} \text{ in case B}$$

where j is the number of that reel. The numbers q_i and q_i^j are the *basic probabilities* in slots.

For an event E related to an independent-stops line of length n , the general formula of the probability of E is as follows:

$$P(E) = \frac{F(E)}{t^n} \text{ in case A and } P(E) = \frac{F(E)}{\prod_{j=1}^n t_j} \text{ in case B,} \quad (1)$$

where $F(E)$ is the number of combinations of stops favorable for the event E to occur. For winning events E defined in a cumulative manner (that is, through numbers [quantities] of specific symbols necessary for the payline to hold, regardless of their position on the payline), which is the case for most slot games, $F(E)$ has a polynomial expression, being a function of t and c_i in case A or of t_j and c_i^j in case B ($1 \leq i \leq p$ and $1 \leq j \leq n$). For instance, if the event E is in particular *exactly one instance of a specific symbol S* , formula (1) is written as follows:

$$P(E) = \frac{nc_s(t - c_s)^{n-1}}{t^n} \text{ in case A and } P(E) = \frac{\sum_{i=1}^n c_s^i \prod_{\substack{1 \leq j \leq n \\ j \neq i}} (t_j - c_s^j)}{\prod_{j=1}^n t_j} \text{ in case B} \quad (2)$$

Still, in particular, for an event E expressed through the number of instances of each symbol on a payline in case A, formula (1) becomes the classical formula of probability in a polynomial field:

$$P(E) = \frac{n!}{a_1! a_2! \dots a_p!} (q_1)^{a_1} (q_2)^{a_2} \dots (q_p)^{a_p} \quad (3)$$

where a_1 is the number of instances of S_1 , and so on, and a_p is the number of instances of S_p ($a_1 + a_2 + \dots + a_p = n$). Parameters a_1 to a_p characterize the winning combination, while q_1 to q_p characterize the configuration of the reels.

Formula (3) is used when the winning event is defined through an exact distribution of all symbols on the payline (even if some of them do not appear in the winning combination, having the distribution zero).

Particularizing in case B, consider the event E as *exactly m instances of a specific symbol S* ($m \leq n$). Formula (1) becomes in this particular case:

$$P(E) = \sum_{1 \leq i_1 < i_2 < \dots < i_m \leq n} \prod_{j \in \{i_1, i_2, \dots, i_m\}} q_S^j \prod_{\substack{1 \leq k \leq n \\ k \neq i_1, i_2, \dots, i_m}} (1 - q_S^k) \quad (4)$$

where q_S^i is the basic probability of occurrence of symbol S on reel number i .

The general formula (1) holds for simple events related to one payline. For more complex events such as unions of winning events on one or several paylines, formula (1) is used along with other properties of probability and methods of

approximations for obtaining applicable (although overloaded) formulas for the probability of those events (Bărboianu, 2013a).

From the expression of the probability formulas presented, one can see that these are functions of n (the length of the payline), t , and c_i in case A, or of t_j and c_i^j in case B (t or t_j are the numbers of stops of the reels; c_i or c_i^j are the distributions of the symbols on the reels), and of other variables describing the event to be measured. For events related to several paylines, other variables describing the event also appear in the formulas (the number of lines of the group, cardinalities of the intersections of those lines, etc.). The formulas can also be written in terms of basic probabilities q_i or q_i^j , which can replace the c and t variables as ratios between them.

The same variables will also appear in the general formulas of the expected value of the slots bets, along with the payout rates from the payout schedule of the game.

I present this overview of the basic elements of the mathematical model necessary for probability calculus in slots, as well as a few general results, to emphasize the necessity of having the data describing the configuration of a slot machine as inputs for the probability computations. By applying mathematics within a general model, we can obtain only general formulas for probability and expected value. However, these formulas or even associated tables of values are useless for the player without final numerical computations for a given game, and these can be performed only if we are provided in advance with the numerical parameters of the configuration of that game.

The Secrecy of Slots PAR Sheets: Facts, Justifications, and Implications

The secrecy of game producers on PAR sheets is verified by the lack of availability of these files. One can see unsuccessful PAR sheet requests from slot players by browsing their forums, while game researchers can obtain them only through legal intervention.

Since 2007, game researchers have obtained the PAR sheets of some slot games through the Freedom of Information and Protection of Privacy Act in Canada (Harrigan & Dixon, 2009). Most of these PAR sheets became public after researchers studied them; others were also available before 2007 through other channels (see Wilson 2004a, 2004b, 2004c, 2004d, 2004e). Still, these are the PAR sheets of a miniscule part of all slot games on the market. *Slot Tech* magazine has published articles dedicated to PAR sheets; however, they are limited in the number of games covered and in that the description is adapted to the audience of this magazine, that is, technicians servicing the machines (Harrigan & Dixon, 2009).

Browsing the appeal decisions of the Information and Privacy Commissioner (IPC) in Ontario, Canada, with respect to PAR sheet requests, one can see that game producers who declined requests invoked the exemption set forth for scientific and technical information, through one or more of the facts that PAR sheets contain information routinely considered to be trade secrets in the gaming industry and consist of mathematical formulas and equations developed by their engineers. They further claim that information provided on PAR sheets significantly compromises their competitive position and interferes significantly with the contractual obligations of the company (IPC, 2009, 2010).

Major slot companies have brochures in circulation presenting their games to players, more promotional than informational, in which mathematical aspects of the games are barely touched upon. For instance, a brochure by International Game Technology (IGT), called *Introduction to Slots and Video Gaming*, has a section titled “Slot Math,” that presents three examples of games, each from a large category (three-reel, four-reel, and five-reel slot machines), for which the following configuration parameters and mathematical facts are shown: number of stops of each reel, the distribution of the top-award symbol (that symbol triggering the jackpot in a line-up combination) on each reel, hit frequency of the top-award combination, and the overall hit frequency of any winning combination. Summarizing the math section, it provides the player with the numbers of stops of the reels, distributions of one symbol on the reels, and two probabilities (one for the top-award combination and the other for any winning combination) for three specific games; there are no distributions of the other symbols, no probabilities for other winning combinations, and no expected value, which is a relevant indicator of the practical risk over the long run. In addition, the use of the term *symbol combination* in probability context is confusing because with this term, the winning combinations shown on the payout panel are defined; the combinations involved in the probability computations are *combinations of stops* (holding those symbols), not combinations of symbols. To “explain” the brevity of their math section, the editor wrote in the introduction (IGT, 2009):

[...] One such tool, par sheets, can be complicated to understand. However, investing the time learning to read them is time well spent. They offer important information for optimizing the revenue for each machine, as well as offering data for technicians. In this section, we provide examples of simple slot math that is found on par sheets for three types of games – spinning reel and video reel slots, video poker, and bonus games. These equations represent the most basic operations only. For more detailed information, please ask a gaming representative or attend training classes. Par sheets for all IGT games [...] are available online at [...]

Going to the webpage indicated as providing PAR sheets for all IGT games, I found a link labeled “PAR sheets” hidden on a third-level page, for which the browser returned a 310 error when accessed. The problem of accessing that section might

have been temporary; however, there is a disclaimer on that page that certain areas of the site are secured and require an active member account. I made no further investigation of whether opening such an account leads unconditionally to a positive answer regarding a PAR sheet request.

Given all the facts presented above, it is clear that slot producers are strongly reticent in exposing the parametric configuration of their games.

The Psychological Argument Related to Competition

Coming now to the justification of this reticence, the slot producers' reasons for declining PAR sheet requests, shown in the IPC's appeal decisions, seem to be judicially formal rather than factual. I present the following arguments for this claim:

- The trade secret and intellectual ownership reasons fail against the generality of the math formulas and equations. Although the parametric details vary from game to game, the mathematical results concerning probability, expected value, and other statistical indicators are just applications of general formulas that are publicly available in mathematics, thus common across all slot machines, and no individual or corporate body can claim ownership of such a pattern or formula. The argument also holds if talking only about the protection of the parametric configuration. Protecting a certain finite sequence (combination or arrangement) of symbols reverts to protecting the sequence of numbers that can be put in bijection with the former, since others may use it by just replacing the symbols with new ones through a new bijection on that sequence. But protecting a sequence of numbers falls within the same argument that mathematics is freely available.
- There are three possible reasons for competitive prejudice against competition, two of them coming from the situation in which another producer copies and uses the revealed parametric configuration: (a) the possibility of losing a share of the market to the infringer, (b) the unethical development of the infringing company, and (c) the exposure to bad publicity from a competitor or neutral entities. The arguments as to why these reasons fail are the following:
 - a. The infringing company would develop a slot machine different in its external (physical) design from the machine having the original parametric configuration and yet having this configuration in common with the original (because the entire machine of the original producer is patented, even though its parametric configuration in and of itself may not be). With the parametric configuration invisible, if the new machine is successful at and after launch, there may possibly be three types of elements responsible for this success, alone or in combination: its physical design, the marketing, and its statistical indicators.

The first two types of elements have nothing to do with parametric configuration, and so they do not apply to the original producer's

competitive-prejudice argument. If statistical indicators such as frequency of wins and payback percentage prove in time to be responsible for the new machine's success—which is very likely to happen—this is not a consequence of the use of that specific parametric configuration alone, but of that together with a given payout schedule. A producer can manipulate the game parameters, including the payout schedule, in unlimited ways so as to obtain the desired statistical indicators for the house. That is, if the goal is to have the payback percentage of another machine, a better alternative is to use a new parametric configuration yielding the same percentage instead of replicating one; besides, within the same goal, if copying the parametric configuration of the reels, the infringing company would also need to copy the payout schedule. While the parametric configuration itself may not fall within patent restrictions, parametric configuration plus payout schedule is likely to do so; therefore, the infringing company should expect the original producer to recognize its own payout schedule on the new machine and take legal action toward the potential (at that time) infringers.

- b. The infringing company would get a ready-to-use parametric configuration, possibly non-patented, which can be used in two ways: keeping the original statistical indicators, including payback percentage, or adding a new payout schedule and getting different statistical indicators. The former alternative assumes copying the entire game parameters (and avoiding the expense of the mathematical work, which compounds the unethical behavior), which may be protected as a whole. If this happens, the infringing company exposes itself to lawsuit and bad publicity, since the parametric configuration used can be discovered through statistical observation (see the next section) by the original producer. The latter alternative gives no rational motive for the infringing company to use a copied parametric configuration instead of a new one, since the math work must be done for finding a payout schedule that will yield the desired statistical indicators. In addition, using only the copied parametric configuration would again expose the infringing company to bad publicity when revealed through statistical observation.
- c. In the situation of bad publicity as a result of revealing a PAR sheet (which would have as an issue the fact that probabilities and/or statistical indicators are not favorable for the players), the producer would have the option of defending him- or herself with an acceptable answer: the fact that all existent slot games have similar figures attached, not much different from those exposed, while the producer at least showed them to the public (“I am not the bad guy here—just those who keep the PAR sheets secret”). Such an answer may turn the negative publicity into a good marketing strategy.

The hypothetical situations related to reasons (a) and (b) would apply to a start-up company in the role of the infringing company, as it is very unlikely that an established producer would risk his or her position just to avoid the expense of the math work.

Thus, the slot producers' justification for the secrecy of PAR sheets related to competition is insubstantial, as I argue above, even though some of them claim the opposite in their judicial litigations. The previous arguments (related to competition) are part of what I called at large *the psychological argument*. The possible justification exclusively related to their players remains to be considered. That would mean that they are afraid of losing players who see the PAR sheets of their games, and so the popularity of slots would decrease. I argue in the next section that such a claim is likewise insubstantial, and I propose further research to confirm what is hypothesized.

The Psychological Argument Related to Players

The facts are as follows:

1. PAR sheets are kept secret by slot producers, with isolated and rare exceptions.
2. Slot players continue to play slots in the absence of information regarding parametric configuration, probabilities, and statistical indicators of the games, maintaining the popularity of these games.

When we talk about hiding a data sheet, it is the content that is hidden, and for a PAR sheet this means parametric configuration (numbers of stops and symbol weighting of the reels), probabilities for the prize-award combinations, other probabilities, frequencies, and other statistical indicators.

With respect to the content of a PAR sheet, by putting myself in both the producer's and the player's position, I see two possible reasons for the secrecy, one related to competition (hiding the parametric configuration and the statistical indicators) and the other related to players (hiding probabilities and statistical indicators). Further empirical study on slot players can confirm the existence of these two reasons and perhaps find others, which may be treated thereafter.

The former reason cannot change players' behavior with regard to willingness to play slots, as that is not related to any new unethical or fraudulent strategy of the producer against them—everything is the same as it was.

In treating the latter reason, I will focus on the content of the PAR sheet that is the most accessible (as knowledge) to gamblers and has the greatest impact on them. Among all of the mathematical data related to a game, the *probabilities* of the various winning events are the most important for a player with respect to the objective evaluation of winning/losing possibilities and general gaming knowledge, even though their influence might not lead to gaming decisions and changes in gaming behavior. This top status of probabilities is because all players, regardless of their level of mathematical knowledge, have a basic understanding (although many times distorted or misconceived) of the notion of probability according to its common classical definition (the ratio between the situations favorable for an event

to occur and the number of all equally possible situations) and a basic interpretation of it as a degree of belief in the occurrence of an event. Moving then to *expected value*, this notion (the mean of a discrete random variable) already requires a new level of mathematical education not available to most slot players. Thus, it can be hypothesized that players perceive that the main reason for the secrecy of PAR sheets (related to themselves) is to hide the odds/probabilities of winning. If further empirical research confirms this hypothesis, we shall arrive at the conclusion that slot players expect low to very low odds of winning without acquiring this information,¹ since there is no other reason for keeping the odds secret if they were high compared with other types of games on the market.

Now, fact 2, along with the previous conclusion, leads to the prediction that slot gamblers will not stop playing in the event of exposure of the PAR sheets of the games they play, since they already expect low to very low odds of winning. Other visible elements of the games keep them attractive and popular (Griffiths, 1999; Wood et al., 2004) despite their special status among games of chance (in respect to the exposure of their parametric configuration, which I discussed in the first section of this article). There is also an addictive component of the other elements of attractiveness, and slots addiction should be studied as a particular type of addiction, given the missing-parametric-configuration feature of the slot games.

Further empirical study of slot players can confirm this theoretical prediction of not quitting slots under the condition of low to very low odds of winning exposed through PAR sheets. Such studies could possibly be conducted together with those proposed earlier as stand-alone research. Until then, we have an example provided by lottery players whose behavior seems to confirm my prediction in the slots case.

The Lottery Example

From all games of chance, the lottery offers by far the lowest odds of winning its top prizes, on the order of one to millions or tens of millions for the first prize, and one to tens or hundreds of thousands for the second prize, for common lottery designs.

With a history traced back to antiquity (B.C.) for its birth and to the 15th–16th century

¹I have excluded the statistical indicators from this analysis and focused on probabilities, also given the possibility of their being misinterpreted by non-math gamblers. A proper interpretation of the mathematical data of a game with respect to favoring the player takes into account both probabilities and statistical indicators based on expected value, not one category or the other individually. For instance, a payback percentage of over 90% can be seen as high and therefore favorable by (and for) a player. However, it is mainly the probability of the biggest win (along with the payout of that win) that yields this high payback percentage, and the calculation is a mean over the long run (infinity in mathematical terms). Since probability translates to frequency in the gaming experience, it will not be the same for the player if that winning event (balancing the computed payback percentage) occurs on average in a lifetime or less. Besides, payback percentage is an indicator usually exposed outside the PAR sheet.

for expansion, the lottery remains the most stable and respected game of chance; contemporaneous studies of this game recognize its popularity and the fact that no decrease in this popularity has been reported (National Impact Gambling Study Commission, 2004). Most lottery players play regularly and are aware of the very low odds of winning. Even though most of them might not know the exact figures, all have a clue about the size of these odds, knowing that they are very close to zero, because this information has spread widely enough in common communication between lottery players and through the media to become a proven well-known characteristic of a lottery. Even knowing that the winning odds are very low, lottery players still continue to buy tickets on a regular basis and the lottery has never lacked for business. Why, then, should slot game producers worry about slots doing otherwise, since the odds of winning at slots are generally higher than those of winning a lottery?

Some will be quick to point out the following elements in which the two types of games differ, at least with respect to financial expectations and players' options to estimate and manage these expectations:

- Prize amount. Lottery games offer first- to third-category prizes in amounts higher than similar prizes in slots games, and the high prizes somehow compensate for the low probabilities of winning with respect to the decision of quitting the game.
- Enhancing the probability of winning. Lottery games allow an increase in the overall winning probability² through buying several tickets or playing systems with several lines in unlimited numbers for the same draw, while in slots the player may enable only a limited number of paylines for such an increase.
- Game frequency. Slot players can spin the reels of a slot machine thousands of times in a day, whereas in lottery, players must wait several days for a new game.

In response, I would argue that these non-equivalences should be ignored, as follows:

- Prize amount. The objection argument assumes that the high prize amount is the dominant factor in the lottery player's behavior of playing against the minute odds of winning. My argument: If this factor is merely addictive, in parallel, the slot games also have their specific addictive and entertaining components, and the existent balance between lottery and slots is inclined toward the latter because of its generally higher odds of winning. If the high-prize factor has a practical side in the lottery player's mind, such as "someday these [high prizes] will make me rich," given the assumed basic knowledge of the probabilities involved, the player can estimate and face the overall probability of this fortunate event happening in a lifetime as very low and the invested money as serious, which eliminates the

²"Overall" has the sense of a disjunction of winning events that is measured in probability, that is, "winning with line no. 1" or "winning with line no. 2" and so on in our lottery example. The increase in probability refers to moving from a single event to a disjunction of events that includes that single event. This convention applies in every instance where these terms are used in the article.

practical expectation, contradicts the assumption, and thus reduces the factor to its addictive component, which has been already addressed. (Such probability estimation is at hand for everyone, by taking an average playing lifetime, assuming a weekly play, and multiplying the winning probability by the total number of plays).

- Enhancing the probability of winning. My argument: This increase is actually limited by the player's available funds for the total price of the ticket(s), and therefore, increasing the probability of winning cannot change the size of this probability from very low or low (for a one-line ticket) to medium (for a multi-line ticket or several tickets). For example, assume a player buys 500 one-line tickets at \$2 each (a serious investment for one draw), or an equivalent line-system ticket, at a 6/49 lottery. The overall winning probability will increase a maximum of 500 times, leading to a maximum of 0.00003575 (from 0.0000000715) for the first-category prize and 0.0092 (from 0.0000184) for the second-category prize, which are very low and low, respectively (these maximums apply if the played lines are independent, in the sense of a restriction on the number of the common numbers of those lines; Bărboianu, 2009). There is another limitation in playing large numbers of lines once, coming from the distribution of the prize fund—the prizes are not given by a fixed payout schedule, but the lottery company assigns a certain prize amount for each prize category as a fixed percentage from the ticket sales of that draw. Therefore, investing large amounts of money for increasing the chances for a draw might result at some point in winning less than invested. On the other hand, in slots, the payout schedule of a machine is fixed for all games (spins), and the increase in the overall winning probability can be acquired not necessarily by enabling more paylines, but by running more spins: With the technical features of the slot game, a player can run hundreds of independent spins in a reasonable time, and so we get the equivalent effect as in the multi-line play in the lottery case with respect to the probability increasing.
- Game frequency. My argument: This conclusion was drawn based on the criterion of probability size for one game, under the assumption that basic probability knowledge is accessible to most gamblers. Game frequency is not a criterion for and does not change the argument of the conclusion, as it does not change the probabilities attached to a game; game frequency can be a criterion for other comparative analyses of the two types of games, for instance, regarding how deviation from the expected value is directly perceived and accounted for by the math-inclined player.

In my analysis, when talking about probabilities of winning, I considered the slots prizes as given only by the winning combinations of a single machine and I ignored the progressive jackpot prizes, because including them would just incline the balance more toward slots in the comparison between lottery and slots games with respect to the analyzed prediction of not quitting slots under the condition of PAR sheets exposure.

With the preceding counter-arguments, I conclude the lottery example and declare it as relevant within the psychological argument for arguing for the prediction of not quitting slots under the condition of PAR sheets exposure. There are, of course, other characteristic features (except those related to financial expectation) that distinguish the two types of games from each other and might be responsible for a different behavior of the slot players than of the lottery players. Further research is needed to confirm or refute that idea.

In the next section, I also present another argument, this time merely mathematical, for the insubstantiality of the secrecy of slots PAR sheets.

Statistical Methods for Estimating the Parameters of the Configuration of a Slot Machine

The methods I briefly describe here can be applied in an organized professional environment in order to estimate and expose the parametric configuration of any slot game whose PAR sheet is missing.

In the next sections, I use the same denotations as used in the section The Parametric Configuration of Slot Machines as a Base for the Probabilistic Models for Slot Games.

The Raw Approximation

This method is based on the well-known result from probability theory called Bernoulli's theorem, which states that in a sequence of independent experiments performed under identical conditions, the sequence of the relative frequencies of the occurrence of an event is convergent toward the probability of that event.

Applied to slots, that principle says that if N is the number of spins of a reel with t stops, where we observe as an outcome a specific symbol S that is placed on c stops, and $n(N)$ is the number of occurrences of S after the N spins, then the sequence $(n/N)_N$ is convergent toward the probability of occurrence of S , namely $P(S) = c/t$.

The ratio n/N is the relative frequency of occurrence of S . It follows that for large values of N , the relative frequency of occurrence of S approximates the probability of S occurring. The higher the N , the more accurate this approximation. Obviously, the number of spins N must be large enough to obtain good approximations of the ratios c_i/t , and this is the main issue of this method. As theory does not provide us with tools for choosing N for a given error range, all we have is the principle "the larger the N , the better".

As one can notice, this method of approximation, which is based on statistical observation, is subject to errors coming from idealizations and various assumptions,

and the error ranges are not even quantifiable. Given these issues, the best way to use this method is not for individual records, but for cumulative records coming from several sources and for refining the estimations in correlation with the increase in the total number of spins N . This principle is also common for the odds calculators based on partial simulations, which are used for various games.

Note that the described method provides us with approximations of the ratios c_i/t (the basic probabilities) for each reel and not the parameters of the configuration individually (c_i and t). However, knowing the basic probabilities is enough for any probability computation for a slot game, as seen in the section The Parametric Configuration of Slot Machines as a Base for the Probabilistic Models for Slot Games.

A more accurate approximation of the ratios c_i/t and even of c_i and t individually is still possible through statistical observation, using a method that can refine the raw estimations obtained through the previously described method. Such a method is briefly described in the next section.

Denominator-Match Method

Denote by $n_1(N), n_2(N), \dots, n_p(N)$ the number of occurrences of symbols S_1 to S_p , respectively, after (N) spins of a reel. There is a slight correlation between the recorded values $n_1, n_2, \dots, n_p$ for various large numbers of spins (N) . From this correlation, we can refine the estimation of the ratios c_i/t obtained through the previous method and also find estimations for $c_1, c_2, \dots, c_p$ and (t) , by recognizing a numerical pattern across some sequences of fractions representing the ratios between possible values for c_i and (t) .

The denominator-match method is based on the numerical analysis of the fractions n_i/N and on a five-step algorithm briefly explained below.

We write each fraction n_i/N as a chain of equal fractions, having numerators from 1 upward and denominators that are not necessarily integers, for every i from 1 to p . Across the p chains of equal fractions obtained, we choose that of minimal length (let m be the minimal length). Then, across the p chains of equal fractions, we extract m sequences of fractions (one fraction from each equality chain) having the denominators nearest to the denominators from the minimal equality chain. From the m sequences of fractions obtained, we choose one sequence of p fractions by applying progressively the following filtering criteria: the denominators are as close to each other as possible, there is the highest number of instances of the same denominator, and the repeating denominator with the largest share is an integer. As a final step, we adjust the numerators of the final sequence of fractions as follows: If the sum of the numerators lies between the minimum and maximum of the denominators, then we take the numerators as the symbol distribution on the reel

(c_i) and their sum as the number of stops of the reel (t); if their sum does not lie in that interval, then through addition or subtraction, we distribute, proportionally with their values, the difference between their sum and the integer nearest to the mean of the minimal and maximal denominator, rounding the added/subtracted quantities to integers. For our resulting estimation, we take the adjusted numerators as the symbol distribution on the reel (c_i) and the integer nearest to the mean of the minimal and maximal denominators as the number of stops of the reel (t).

This method provides us with the most probable number of stops t and associated symbol distribution $c_1, c_2, \dots, c_p$ of a reel in a certain probability field; the error range of this approximation is quantifiable in terms of probability (Bărboianu, 2013b).

Regarding the practical application of the methods through statistical observation, it is obviously an arduous task, since we have to watch and record spins in the numbers of thousands. For online games, software can be developed to help in such an endeavor. For physical machines, it is far more difficult to watch and note thousands of outcomes just for one reel of a machine, not to mention that the slots operator might not allow this action. Of course, technology based on video capturing might help with such a task, but that is not the concern of the current study.

Physical Measurements

Any information acquired on (t) besides the presented statistical methods of estimation is useful with respect to the accuracy of the approximations because it can provide a clue as to how high we should choose (N) in order to avoid irrelevant results (for example, if (t) = 100, we intuit that choosing (N) = 1,000 or lower would not be high enough for relevant results).

Besides the methods based on statistical observation, there exists a method of estimating t through physical measurements, applicable to some particular types of slot machines. This method exploits the information given by the appearance of the reel on the display. As we know, only a small part of the reel (either physical or virtual) is visible on the display and this part can be seen as one or several adjacent symbols (usually three, but up to five). Thus, we can view from one to five consecutive symbols of the reel. If the appearance of this part of the reel is three-dimensional (which is possible for both physical and virtual reels), by measuring some parameters of this image, we can deduce an estimation for the number of stops of that reel (t). Basically, the apparent lengths of the visible symbols give full information on the curvature of the reel, which then leads to an estimation of the entire number of stops, since the number of visible symbols per the circular length of the visible reel is proportional to the total number of stops per the circular length of the entire reel (Bărboianu, 2013c). This method can be applied only to reels showing at least two consecutive symbols on the display in three-dimensional view. The method cannot be applied to virtual reels showing

several consecutive symbols in a flat image. As in the case of the previous method based on statistical observation, there are issues with the practical application of the method based on physical measurements. There might be technical issues regarding acquiring the proper position for measurement or placing the measurement tool on the surface of the machine. In addition, for this method, an alternative would be for the observer to take photos and make measurements on the photos. Of course, the slot machine operator might not allow direct measurement and/or taking of photos.

With this incursion into the mathematical methods of approximating the parameters of the configuration of a slot machine through statistical observation, I conclude the analysis of the possible reasons for slot producers keeping their PAR sheets secret. Summarizing below the arguments against the justifications for these possible reasons, I draw the conclusion that the secrecy of slot producers on the parametric configuration of their slot machines is not rationally justified:

- Protection against competition fails against the generality of the math formulas and equations and the open possibility for all slot producers to configure any parametric design for their slot machines and in so doing, manipulating the game parameters and the payout schedule in unlimited ways, so as to obtain the desired statistical indicators for the house.
- The fear of losing players who face the real odds of winning attached to their games, thereby affecting the popularity of slot games, fails against the a priori expectation of the players for low and very low odds of winning induced by the experienced secrecy of PAR sheets and against the lottery example, in which lottery players continue to play against the lowest odds of winning because of other addictive elements, which slots also hold.
- The secrecy itself fails against the statistical methods that mathematics provides us with for retrieving the missing data through statistical observation, even as approximated results.

The Exposure of the Parametric Configuration and the Mathematical Facts of a Game as an Ethical Obligation

The requirement for the exposure of the parametric configuration applies only to slots, since it is the only existent game of chance for which such data are hidden. Indeed, while a slot machine displays only a part of each reel in the stop position, for the other games, all of the configuration from which the outcome is produced is visible for the players—the roulette numbers are shown on the wheel and table, the deck composition is known for every card game, dice faces and the number of dice are visible for every dice game, lottery numbers are known for each lottery design, and so forth.

The information to be exposed would be in the form of a technical/mathematical sheet specific to each slot game, either consisting only of the parametric

configuration, or of the parametric configuration plus basic mathematical results such as the probabilities of the winning combinations shown on the payout schedule, probability of any win, and expected value. For the former variant, which is merely informative and provided either by the slot producer or retrieved through the methods I described in the previous section, it would remain for the player to inquire further for the mathematical results as an optional action. For the latter variant, the probability/statistics part that comes along with the parametric configuration would be completed by an assigned mathematical authority.

The goal of exposing parametric configurations for slot games is not so much to place slots in the same status as other games of chance, as it is a matter of ethics.

The exposure of the parametric configuration of a game to the player prior to playing is an ethical obligation in two ways—one commercial and the other humanitarian.

The commercial way treats the game as any commercial service, for which full technical specifications are required from the producer to the customer. Just as a public coffee machine must show the coffee brand name and the coffee volume returned for the unit price, so the slot machine must show the reels' numbers of stops and the symbol weighting; a bet is still a purchased service once the players inserts a non-returnable coin in the machine. A relevant example of unethical procedures would be having identical-looking machines yielding different payback percentages as a result of different (missing) parametric configurations or even the same machine changing its payback percentage with the replacement of a single chip.

The humanitarian way is related first, to the free will of thought and second, to the limitation of addiction risk. Being informed on all parameters of a game one plays is a condition for unconstrained (constrained through omission) personal thinking leading to personal actions. It is as though someone asks you to bet that you can jump from a high place and land on your feet; if you know in advance the height from which you will jump, or if you measure it before you bet, you might decline the bet or propose another one for a certain measurement, and this implies a free decision. Such a comparison can also be an argument for the skeptical slot player who could ask: "Given that slots is not a strategic game played against opponents (as with poker, for instance, where the odds are essential in evaluating the advantage in a given situation), why do we need 'all the math stuff' associated with slots?" The answer is simple: information and strategy. The argument for information is expressed through the preceding comparison. Regarding strategy, in slots there is a trivial strategy, namely, the strategy of choosing: choosing one game or another, choosing how many paylines to enable, choosing the parameters of time and money management, and of course, choosing to quit one game for another or choosing not to play at all. The only objective criteria for such a strategy are probabilities and expected value. Similar comparisons that also hold in some ethical aspects are the

illness/danger warnings on cigarette packs and the “possible adverse effects” statistics in drug leaflets.

Regarding the limitation of addiction risk, past and ongoing studies debating the issue of whether mathematical knowledge (provided either as pre-calculated results such as winning odds and other statistical indicators, or in the form of learning theoretical and applied probability theory basics) causes a decrease in gambling behavior have not yet reached a clear conclusion. Several empirical studies found no significant changes in college students’ gambling activity after they received a didactic intervention on gambling mathematics (Hertwig, Barron, Weber, & Erev, 2004; Steenbergh, Whelan, Meyers, May, & Floyd, 2004; Williams & Connolly, 2006). On the other hand, more theoretical studies proved that postsecondary statistics education developed critical thinking, which also applies to gambling, and the gamblers who receive such education tend to have significantly lower rates of problem gambling (Abbott & Volberg, 2000; Gerstein et al., 1999; Gray & Mill, 1991). I am personally inclined to think that such a decrease follows optimal mathematical learning, which can be devised and developed according to its scope, and this will be the focus of forthcoming research.

Given the ethical obligation to expose the parametric configuration of the slot games, the question arises as to how this information can be technically exposed. With its relation to risk factors, exposure on a website would not be enough, because in a physical casino or slot room, there are specific physical addictive elements that might distract a player’s mind from the mathematical facts seen earlier on the Internet, not to mention that the player might encounter a slot machine for which he or she had not studied its technical/mathematical sheet beforehand. It follows that the technical/mathematical sheet must accompany each slot machine in printed form or at least be available upon request from the slot operator. Online sheets are applicable to the online slot games. Since slot operators, like slot producers, might consider that it is not to their advantage to provide the technical/mathematical sheets to their customers, such an action is impossible only by law, which can also certify an official authority to provide the mathematical facts of the games.

The debate remains open as to whether the technical/mathematical sheets must contain only the parametric configuration (as sufficient information for someone to optionally compute further mathematical results), or, in addition, basic mathematical results concerning probabilities and other statistical indicators with respect to the ethical requirement. The former alternative raises the question of the usefulness of mathematical didactical intervention for gamblers, and both alternatives raise the question of understanding and interpretation of the exposed or learned mathematical concepts and facts related to games of chance, since the simple acquisition of numerical probabilities and statistical indicators as mere quantities might not be enough for the decisions made based upon them. These issues will be treated in a

forthcoming article, as conditions for an optimal mathematical didactical intervention in gambling.

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For correspondence: Catalin Barboianu, MSc, Infarom, Division of Applied Mathematics, PO Box 1 – 230, Craiova, 200850, Romania. E-mail: cb@infarom.ro

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Catalin Barboianu is a gaming mathematician and author of eight books on the mathematics of gambling. He is the leader of a private research group in applied mathematics and advocates for the exposure of the mathematical facts of games of chance to gamblers.

Youth gambling as risky business: An examination of risk perception and perception of skill and luck among Danish adolescents

Søren Kristiansen,¹ Sara Marie Jensen,² & Maria Camilla Trabjerg¹

¹Aalborg University, Department of Sociology and Social Work, Denmark

²The Social and Health College in North Jutland, Aalborg, Denmark

Abstract

This study reports the findings from a national survey on gambling behaviour among students in Danish primary schools, with a special emphasis on risk perception, perceptions of skill and luck, and irrational beliefs. Two thousand two hundred and twenty-three (2,223) primary school students ranging in age from 11 to 17 years completed a questionnaire containing a gambling screen (SOGS-RA) and items measuring gambling behaviour, social networks, and cognitive perceptions. The results showed that the more frequently the individual gambles, the less risky he or she perceives gambling to be. Compared to females, males were less likely to regard frequent gambling as a risky activity, and had more confidence in their own gambling skills. The implications of the findings for further research and preventive measures are discussed.

Résumé

Cet article présente les résultats d'une enquête nationale sur les comportements de jeu dans les écoles danoises, en ce qui touche notamment les perceptions à l'égard du risque, des habiletés au jeu et de la chance, ainsi que la pensée irrationnelle. On a demandé à 2 223 élèves âgés de 11 à 17 ans de répondre à un questionnaire comportant un instrument de dépistage du jeu compulsif (SOGS-RA) et des questions sur les comportements de jeu, le réseau social et les perceptions cognitives. Les résultats montrent que plus on s'adonne au jeu, moins on en perçoit les risques. Les garçons sont moins enclins que les filles à considérer la fréquence de jeu comme un risque et manifestent une plus grande assurance quant

à leurs habiletés au jeu. Les pistes de recherche qui se dégagent de ces observations et la question des mesures de prévention sont abordées en conclusion.

Introduction

Despite the relatively high prevalence rates of gambling problems among youth (Hardoon & Derevensky, 2002; Volberg, Gupta, Griffiths, Ólason, & Delfabbro, 2010), only very limited research has been produced that explores how young people evaluate the risks associated with gambling behaviour, how they evaluate and understand the elements of skill and luck involved in various types of gambling activities, how they assess their own gambling skills, and how these factors are associated with gambling problems. Based on a survey among 302 undergraduates with a mean age of 20.5 years focusing on perceived availability, risks and benefits of gambling, Emerson et al. (2007) found that, in general, this subpopulation rated gambling as being less risky than cigarettes or alcohol. With regard to perceived risk, no correlation between perceived risk and gambling problems was identified.

However, it was also concluded that perceived risk was a significant predictor of regular gambling. Based on a survey among 926 young Australians with a mean age of 14.5 years, Delfabbro, Lahn, and Grabosky (2006) concluded that positive assessment of one's own gambling skills, the importance of gambling skills in general, and the profitability of gambling were all significantly more prevalent among problem gamblers compared to non-problem gamblers. But problem gamblers did not in fact show a lack of understanding of the actual probabilities involved in gambling activities. In a similar vein, Gupta and Derevensky (1998) reported that young problem gamblers in high school show greater trust in their own gambling skills than do non-problem gamblers, and that boys perceive themselves as skilled gamblers more frequently than do girls. Similar findings have been reported by other researchers (see Griffiths, 1995; Ladouceur, 2004; Lund & Nordlund, 2003).

The correlations between erroneous beliefs and adolescent gambling problems have been the subject of some studies. Turner, Macdonald, Bartoshuk, and Zangeneh (2007) surveyed 900 Canadian school students from four educational levels (junior, intermediate, junior high and senior high). It was concluded that, in general, participants maintained a poor understanding of random chance. They did, however, recognize that success in gambling owes itself primarily to luck. In addition, this study found that problem gambling was negatively correlated with the participant's understanding of random chance. Recently, Tang and Wu (2012) investigated the associations between gambling-related cognitive biases and levels of gambling problems among Chinese youth. Analysis of a sample of 2,825 youths and

934 young adults showed that some cognitive biases (with perceived inability to stop gambling and positive gambling expectancy as the most prominent ones) were correlated with pathological gambling in these age groups.

In general, then, research on gambling-related cognitions and perceptions of skill and luck in youth populations is relatively limited, and several important research issues remain to be investigated in detail. Examinations of gender differences constitute an important area. Research among adults provides mixed results in terms of gender differences in gambling-related cognitive biases (see Raylu & Oei, 2004; Toneatto, Blitz-Miller, Calderwood, Dragonetti, & Tsanos, 1997). Furthermore, investigations in youth populations would provide valuable information to determine the role of gambling cognitions and risk perception in the development of gambling problems. Another important issue is how cultural and structural conditions relate to gambling-related cognitions and risk perceptions. At present, the majority of research on gambling-related cognitions and perceptions of risk, skill and luck have been conducted among Caucasian adults in countries such as Australia (Joukhador, Blaszczynski, & Maccallum, 2004), United Kingdom (see Griffiths, 1995), Canada (Ladouceur, 2004), and Norway (Lund, 2011). Some adult studies have also involved Chinese populations (Lau & Raynard, 2005; Oei, Lin, & Raylu, 2008; Tang & Wu, 2012). At present there is a knowledge gap in terms of information on gambling-related cognitions, and perceptions of skill and luck among youth in a Scandinavian context.

The Present Study

This study adds to the research in gambling-related cognitions and risk perceptions in several ways. First, it contributes to filling the general knowledge gap in the field of gambling-related cognitions in youth populations. Internationally-generalized knowledge is important in the development of age-specific intervention and treatment programs. Second, it is the first study in a Scandinavian context to explore gambling-related cognitions in different types of games across various groups of gambling severity. This study, then, adds meaningfully to the existing body of literature. It does so by exploring constructs of risk perception, in relation to gambling, among youth living in a part of the world that differs—in terms of gambling legislation, gambling culture, and prevalence of gambling problems—from the most well-researched national contexts, contexts that include Canada, the United States, the United Kingdom and Australia. Third, it investigates gender differences in gambling-related cognitions and risk perceptions among youth.

Objectives and Research Questions

The two main questions asked in this study are: (1) how does gambling frequency correlate with the perception of skill and luck involved in gambling? and (2) how do conceptions of skill and luck involved in different types of games differ across groups of gambling severity? The exploration of the correlations between gambling

frequency and the perception of skill and luck involved in gambling is relevant to our understanding of gambling since it may add to our knowledge of how misconceptions among gamblers develop. Such knowledge might be important in programs aiming at reducing youth gambling problems, preventing those problems, or both.

A few notes on the national gambling context are appropriate. In Denmark, certain kinds of money gambling have been offered on legal grounds for decades, and Internet gambling has been legal since 2002. At present, Denmark is the only Nordic country that has opened the slot machine market to private actors. Among the adult population, the most popular games are scratch cards, Lotto, and lottery tickets, while among youngsters scratch cards, gambling machines, and Lotto and sport betting games are most popular (Nielsen & Heidemann, 2008). Compared to adults, access to gambling on the part of the young is restricted by legislation. Thus, adolescents aged 11 to 17 do not have access to all available games. The age limit for gambling in casinos, on slot machines, and on the Internet, is 18 years, and is 16 years for other kinds of gambling (Örnberg, 2006). According to the rules employed by Danske Spil, no games are sold to youngsters below 16 years of age, and registration as an Internet gambler on the agency's website is not allowed for adolescents below 18 years of age. Similarly, participation in Internet gambling is restricted by credit card rights. In Denmark, credit cards—such as Visa, which enables money transfers to Internet gambling sites—are issued only to persons 18 years of age or higher (Nielsen & Heidemann, 2008).

Method

Sample and Participants

This study was based on data from a national survey on youth gambling behaviour and risk perceptions. According to the project plan and the budget for data collection, the first objective was to produce a specific and designated representative sample. That sample was to be of approximately 2000 students, aged 11 to 17 years, from all existing Danish school types—public schools, private and free schools, youth schools, and continuation schools—and from each of the main regions of the country. Accordingly, the necessary proportion of schools and students from each school type and from each region was calculated. The total number of Danish municipalities was stratified by the three main Danish regions—Jutland, Sealand and Funen—and within each stratum municipalities were randomly selected. From the selected municipalities schools were randomly selected. The random selection followed the procedure of simple random sampling using a random number grid. From each selected municipality, four schools from each type were selected. Two major urban municipalities were strategically selected to secure representation of students living in major urban areas. In total 24 schools participated. In the participating schools, classes were selected by the local school authorities. The participation rate was approximately 91%. Only nine students chose not to

participate in the study, and on average only two students per class were not in attendance at the time of the data collection. These absentees were not contacted, and because of the budget for data collection, no follow-up visits were subsequently arranged. In one instance, a completed questionnaire from an absent student was forwarded to the research team by the school authorities. Participants included 2,223 pupils from each of the grades from six to ten; 79% were classified as being of Danish origin (both parents born in Denmark) and 21% were of other origin (one or no parents born in Denmark). The proportion of students from youth schools and continuation schools were strategically oversampled to achieve a reasonable sample size from these school types. We did so to allow separate analyses of this particular group of students, and for comparative purposes. To compensate for this oversampling, we performed corrective weighting on the school-type variable in subsequent analyses. Minor deviations between the achieved sample and the known population on other background variables (e.g., gender) were also observed. Since these deviations were minor and not caused by strategic oversampling, no further corrective weighting was consequently performed.

Data Collection

Senior researchers or research assistants on the study team administered the self-completion questionnaires to students during normal school lessons. The teacher remained in the classroom during completion of the questionnaires, and provided help occasionally, but only to students with poor reading skills. A member of the research team explained the main purpose of the study. The concept of gambling was explicitly defined as an activity where money is wagered and where money is either won or lost. Examples of gambling activities were mentioned for illustration purposes. Students were ensured confidentiality and were also instructed that they could refuse to answer specific questions and terminate their questionnaire at any time. In only one instance, this procedure was not possible, and questionnaires were instead administered by a teacher who had been instructed in introducing the questionnaire. Students required 15 to 25 minutes to complete the document. Prior to data collection, a letter describing the research project (aims and procedures) was sent to the school authorities (headmaster and school board). In those schools that chose to participate, a copy of the survey instrument was sent for inspection and final consent on behalf of the students. Subsequently, data collection was arranged with the local school authorities. Data was collected over a three-month period from August to October 2008. In Denmark, no ethics approvals for school surveys such as this present one are required. The study was compliant with research protocols.

Measures and Screening Instrument

The questionnaire used in this study contained series of questions clustered in three major domains and a gambling screen, the South Oaks Gambling Screen-Revised for Adolescents (SOGS-RA) (Winters, Stinchfield, & Fulkerson, 1993a, 1993b). The SOGS-RA is a widely used and youth-adapted version of the South Oaks Gambling

Screen (Lesieur & Blume, 1987). This particular instrument is widely used and has been used in various social and cultural contexts (Langhinrichsen-Rohling, Rohling, Rohde, & Seeley, 2004). The dimensions of problem gambling included in the scale are (1) chasing losses, (2) lying, (3) loss of control, and (4) borrowing or stealing money to cover gambling debts. The reliability and validity of the SOGS-RA has been assessed in a number of studies. Ladouceur et al. (2000) have argued that, because of an acquiescence bias, the SOGS-RA may lead to inflated prevalence rates. However, other authors (e.g., Derevensky, Gupta, Dickson, Hardoon, & Deguire, 2003) have instead contended that no psychological *a priori* reason would account for positively biased responses on ambiguous gambling survey questions. And still others (e.g., Poulin, 2002) have found the SOGS-RA to have adequate stability and good internal consistency. Finally, a number of studies (i.e., Derevensky & Gupta, 2000; Hodgins, 2004; Ólason, Sigurdardottir, & Smari, 2006) have suggested that the validity of the scale may differ according to gender and therefore be less sensitive to female gambling problems. The literature is thus somewhat inconsistent in terms of the validity and reliability of the SOGS-RA. To date, however, no perfect and universally adaptable screening tool has been proposed. Therefore the current instruments all need refinement (Derevensky & Gupta, 2004a). The SOGS-RA screen was translated into Danish from a Norwegian version of the SOGS-RA (Gyllström, Hansen, Skaug, & Wenzel, 2004), and then controlled against the original American version. Changes in relation to the American and Norwegian versions were made to accommodate to a Danish context (i.e., the list of available games and the wording of specific items). No SOGS-RA scoring questions or items were changed significantly or omitted. In terms of scoring procedure, the *narrow criteria* (see Stinchfield, 2010:82) have been used. Thus, those participants who scored 0–1 were classified as non-problem gamblers, those scoring 2–3 were classified as at-risk gamblers, and a cut score of 4 or more was used for the classification of problem gamblers. It is, however, important to note that these classifications merely *indicate* levels of gambling problems. To assess the level and scope of gambling problems we recognize that in-depth clinical interviews are necessary.

To eliminate potential problems of interpretability we conducted two separate pilot studies. First, questionnaires were distributed and collected in three different school classes, specifically grades 6, 7 and 8. A total of 56 completed questionnaires were collected. In each class, the questionnaire was discussed and evaluated by a member of the research team. Second, a focus group interview with five participants (two males and three females) aged 12 to 16 years was conducted. Each member of the focus group was administered a questionnaire, together with a description of the study and definition of gambling, and then asked to complete the questionnaire individually. After completing the questionnaire, all members of the group were asked to comment on the questionnaire, and to point out the questions that they found difficult to understand or answer. Both pilot studies revealed only minor problems with regard to the wording of the questionnaire and changes were made accordingly. Overall, the present researchers contend that the pilot test revealed that

the wording of the questionnaire was age-appropriate and reflected the specific context of this specific youth population.

In addition to the SOGS-RA items, the questionnaire included series of questions on the respondents' (1) gambling behaviour, including types of games played, gambling frequency, age of debut, gambling partners and gambling motives, (2) social networks and family gambling, including gambling behaviour of parents and friends, and (3) cognitive perceptions including notions of skill versus luck in relation to gambling, the understanding of probabilities, and risks involved in gambling relative to other activities, such as smoking or drinking alcohol. Perceptions of benefit and misconceptions of the chances of winning were measured by the question "Do you think that one day you will win a large sum of money by way of gambling?" with the answer categories (1) "Yes" (2) "No" and (3) "Don't Know." In addition, respondents were asked to consider the two following statements: "People who gamble usually lose" and "People who gamble often can become addicted to gambling." Respondents were then asked to agree, on a 4-point scale, with the answer categories "Completely Agree," "Agree," "Disagree" and "Completely Disagree." Assessments of the importance of skill versus luck in various games were measured by asking "Is it skill or luck that determines the outcome in these games?" Respondents were requested to provide their respective answers on a five point scale with the following answer categories: "Only Luck," "Mostly Luck," "Both Skill and Luck," "Mostly Skill" and "Only Skill." Risk perception was measured by the question "Is it risky for children or adolescents to gamble with money several times a week/a few times a month?" The term *risky behaviour* was defined in the questionnaire as "acts that may lead to loss or to addiction." Respondents were asked to indicate answers on a three point scale with the following answer categories: "Not Risky at All," "Slightly Risky" and "Very Risky." Two questions measured understanding of probability. The first question was: "Imagine you have flipped a coin ten times and had 'heads' ten times in a row, what is the most likely result if you flip the coin again?" The four answer categories for this question were: "Heads," "Tails," "Both Are Equally Likely" and "Do Not Know." The second question was: "If you role a normal dice, what is the most likely result?" The eight answer categories for this question were: "1," "2," "3," "4," "5," "6," "All Are Equally Likely" and "Do Not Know."

In the gambling literature, there is a lack of consensus regarding the nomenclature used to categorize children and young people who report personal problems related to gambling. It has been argued that the term *probable pathological gambler* is the description most appropriate to describe adult gamblers who have developed pathological gambling patterns over a period of several years. In other words, the term is, by definition, not appropriate as a classification for those young people who might have experienced gambling problems, but who cannot also reasonably be considered pathological gamblers (Derevensky & Gupta, 2004a). Following this argument, and acknowledging the lack of consensus in this matter, the terms *at risk gambler* and *problem gambler* are used in this paper. It need be stressed, however,

that these terms do not in fact reflect diagnostic assessment. They instead refer to a distinction made by a specific gambling screen administered by a specific research team (not by treatment professionals) and in an everyday life context (and not in a clinical setting) (Fisher, 1999).

Statistical analyses were carried out using SPSS. Chi-square tests were conducted to measure significant associations among categorical variables. To determine the strength of the observed significant associations and when the expected number of cases in every cell could not be expected to be more than five, we used Cramer's V. Being a contingency coefficient derived from Pearson chi-square analysis, Cramer's V is suitable for nominal data, especially when one or both variables have three or more categories. Similarly, gamma tests (γ) were used to measure the strength of the associations between ordinal variables. Multinomial logistic regression analysis was employed in exploring probabilities of gambling frequencies.

Results

Prevalence of Gambling and Problem Gambling

The vast majority of respondents had gambled. A total of 84% of the entire sample ($N = 2,223$) reported having gambled at least once in their lifetime while 70.1% had gambled during the past year. A minority of 3.6% reported gambling on a daily basis while 16.3% reported gambling "a few times a month." The sample ($N = 2,216$) was categorized into three gambling groups according to the score on the SOGS-RA. (A total of 2,223 students participated in the study. However seven of them gave invalid answers to one or more of the SOGS-RA items and could therefore not be categorized in accordance with the SOGS-RA scoring list.) Those who scored 0 to 1 were categorized as non-problem gamblers ($N = 2,088$); those scoring 2 to 3 as at-risk gamblers ($N = 100$) while those scoring 4 or more were allocated into the problem gambler-category ($N = 28$). The overall prevalence rate of problem gambling was 1.3%; the rate of at-risk gambling was 4.5% while 94% reported no gambling problems. Compared to girls (1.1%) boys were more likely (5.7%) to gamble either every day or several times a week. In general, the boys gambled significantly more often than did girls ($\gamma = -0.348, p = 0.000$). There was a weak, significant relation between age and the SOGS RA score ($\gamma = 0.162, p = 0.046$). Thus older respondents tended to report more gambling problems than did younger ones, but more than 90% of respondents in all age groups indicated no gambling problems. However, more at-risk gamblers were found among the 14–15 year olds (5.3%) and the 16–17 year olds (6.7%) compared to the 11–13 year olds (3.4%) whereas only minor differences were determined between the age groups in terms of the proportion of problem gamblers.

These gender and age effects on gambling frequency were further analyzed using a multinomial logistic regression analysis involving the following independent variables: gender, age, ethnicity, type of school, and social class. (The variable

was the question “How often do you gamble?” The reference category was “never gambles” and the dependent measure was “gambling frequency). The analysis showed that gender was the strongest explanatory variable, followed by age, while none of the other variables showed significant impact on gambling frequency. Boys thus had six times higher odds of being a daily gambler compared to girls ($\text{Exp}(\beta) = 6.36$, $p = 0.019$). Similarly, the odds of being a daily gambler doubled with each year of increase in age ($\text{Exp}(\beta) = 2.06$, $p = 0.038$).

Types of Gambling Activities

The three most popular gambling activities among male respondents were scratch cards (67.7%), cards (41.3%) and sports pool betting (40.1%). For female respondents, the three most popular games were scratch cards (62%), lotto (26.4%) and cards (16.7%). No major differences in terms of preferred types of games were identified across the three gambling groups (Table 1).

There was a statistically significant relationship between the number of games played and gambling severity. Problem gamblers reported having experienced significantly more different gambling activities compared to at-risk gamblers, who in turn had experienced more gambling activities than had non-problem gamblers (Table 2).

In 2012, 90% of all Danish households had access to the Internet and 96% of the population aged 16 to 89 years owned a mobile phone (Statistics Denmark, 2012). At present, nearly all Danish children and youngsters aged 8 to 13 years own a mobile phone or a tablet (Rydahl & Lauritsen, 2010). The majority of the respondents had never tried mobile phone gambling or online gambling. Of the entire sample, 91.7% had never tried mobile phone gambling and 78.4% had not gambled online. In total, 18.6% had gambled online a few times and 1.1% gambled online several times a week. Similar to land-based games, a tendency emerged for chance games (e.g., bingo) to be more popular among girls than were games that

Table 1
Five most popular games across gambling groups (lifetime)

Activity (#)	Gambling groups (%)		
	Non-problem gamblers	At-risk gamblers	Problem gamblers
Scratch cards*	63.6 (1)	82.5 (1)	93.1 (1)
Gambling machines*	48.6 (2)	68 (2)	88.9 (2)
Lotto*	28.2 (3)	54.3 (3)	60.7 (4)
Cards*	27.2 (4)	50.5 (5)	78.6 (3)
Sports betting*	23.4 (5)	54.1 (4)	59.3 (5)

Note. *Statistically significant ($p < 0.01$) as tested by Pearson chi-square analysis.

Table 2
Number of different gambling activities across gambling groups (lifetime)

Number of gambling activities*	Gambling groups (%)		
	Non-problem gamblers	At-risk gamblers	Problem gamblers
0 games	18.0	0	0
1–4 games	60.4	47.2	22.2
5–8 games	20.5	40.4	44.4
9–12 games	1.1	12.4	33.3

Note. *Statistically significant ($p < 0.01$) as tested by Gamma test ($\gamma = 0.714$, $p = 0.000$). Percentages are column percentages.

required a degree of skill or knowledge (e.g., sports betting), whereas the opposite was observed among the boys. There was a significant relationship between gambling behaviour and both mobile phone gambling and online gambling: Compared to non-problem gamblers, at-risk gamblers and problem gamblers played to a greater extent via their mobile phones ($\gamma = 0.679$, $p = 0.000$) and on the Internet ($\gamma = 0.618$, $p = 0.000$). For all three gambling groups, the most popular online games were card games followed by sports betting. However, for problem gamblers online casino gambling was equally popular.

Risk Perceptions

A total of 45.9% of the respondents thought that it was “very risky” to gamble several times a week, 31.4% thought it was “slightly risky” and 2.9% thought there was “no risk at all.” In total, 16.6% thought that “no risk at all” was involved in gambling a few times a month, 51.2% thought that was “slightly risky” and 8.2% “very risky.” However, a significant correlation did emerge between how often the individual gambles and whether he or she thinks that there is a risk involved in gambling. The *more frequently* the individual gambled, the *less risky* he or she perceived gambling (see Table 3). However, it should be noted that more than 50% of the participants who gambled every day, and more than 50% of the participants who gambled several times a week, did in fact think a slight risk involved in frequent gambling existed.

A significant gender difference was observed. Compared to boys (49.5%), girls (65%) found it more risky to gamble several times a week and a few times a month ($\chi^2 = 53.906$, $df = 2$, $p = 0.000$). The vast majority of respondents either strongly agreed or simply agreed that gambling was often linked to losing money (51%) and can lead to addiction (72.6%). However, slightly more boys than girls disagreed with the statements that gamblers usually lose their money ($\chi^2 = 23.608$, $df = 3$, $p = 0.000$) and that frequent gambling may lead to addiction ($\chi^2 = 26.105$, $df = 3$, $p = 0.000$). With regard to losing money when gambling, it was observed that more younger respondents than older respondents thought that gambling was linked to losing

Table 3

Perception of risk associated with frequent gambling across frequency groups

Perception of risk associated with frequent gambling (more than once a week)	Gambling frequency groups <i>N</i> (%)					Total
	Every day	Several times a week	A few times a month	A few times a year	Never	
No risk at all*	4 (44.4)	10 (27.0)	17 (7.5)	16 (2.2)	3 (1.0)	50 (3.8)
Slightly risky*	5 (55.6)	19 (51.4)	108 (47.6)	260 (35.7)	108 (35.4)	500 (38.3)
Very risky*	0 (0)	8 (21.6)	102 (44.9)	452 (62.1)	194 (63.6)	756 (57.9)
Total <i>N</i> (%)	9 (100)	37 (100)	227 (100)	728 (100)	305 (100)	1306 (100)

Note. *Statistically significant ($p < 0.01$) ($\gamma = 0.291$, $p = 0.000$) as tested by Gamma test. Percentages are column percentages.

money ($\gamma = -0.121$, $p = 0.003$). The distribution across age groups with regard to addiction did not show significant differences. Approximately 88% of respondents in all age groups either strongly agreed or simply agreed that gambling may lead to addiction.

Comparing responses concerning losing money and addiction across the three gambling groups it was observed that more problem gamblers compared to non-problem gamblers disagreed with the statement that gambling may lead to losing money ($\gamma = -0.204$, $p = 0.034$). This correlation was not, however, observed regarding the question concerning addiction. On this question, the majority of all three groups either simply agreed or strongly agreed. In the entire sample there were more problem gamblers who believed in their own gambling skills (Cramer's $V = 0.144$, $df = 3$, $p = 0.00$) compared to respondents with no gambling problems. Furthermore, some significant gender differences were observed. Compared to girls (0.7%), more boys (14.7%) believed that they had better gambling skills than their peers ($\chi^2 = 172.910$, $df = 2$, $p = 0.000$). Similarly, significantly more boys (32.5%) than girls (17.3%) believed that one day they would experience "the big win" ($\chi^2 = 38.176$, $df = 1$, $p = 0.000$). Across the age groups no significant differences were determined in the perception of own gambling skills and the belief in the big win.

Perceptions of Skill and Luck in Gambling Activities

Respondents were asked to assess the importance of skill and luck with regard to a number of different games. These games were then categorised into two groups: (1) chance-based games, including bingo, lotto, gaming machines, scratch card games, dice games, roulette and keno, and (2) games that required a degree of skill, including card games, horse betting, and sports betting games, including football pools.

With regard to both chance-based games ($\chi^2 = 15.757$, $df = 2$, $p = 0.000$) and games that required a degree of skill ($\chi^2 = 20.199$, $df = 2$, $p = 0.000$), boys were more likely to believe that skills are important compared to girls. However, with regard to chance games, a greater percentage of boys thought that luck was crucial whereas more girls than boys indicated that both luck and skill plays a role. Age appeared to enjoy significant importance concerning games that required a degree of skill. Here the older respondents, when compared to the younger ones, thought that skills were more important ($\chi^2 = 28.514$, $df = 4$, $p = 0.000$). No significant differences across age groups were observed for chance-based games.

The majority of respondents in all three gambling types thought that luck played a crucial role with regard to the outcome of chance games (see Table 4). However, more problem gamblers and at-risk gamblers, compared to respondents with no gambling problems, thought that skill played a crucial role compared to non-problem gamblers. With regard to games that required a degree of skill, a greater proportion of problem gamblers and at-risk gamblers compared with non-problem gamblers also thought that skill played either the only or primary role for the outcome. This correlation was not however statistically significant, however.

Respondents were asked to answer two questions concerning understanding of probability and the independence of random events. One question dealt with the probability of heads or tails when flipping a coin and the other question dealt with probability when rolling dice. The majority of the entire sample answered the coin-flipping question correctly (73.1%). Similarly, with regard to throwing dice, 78.7% of the entire sample answered correctly. Surprisingly, no significant age differences were observed. However, the older respondents (aged 14–17) showed a slight tendency to answer the questions concerning probability correctly more often than did the younger respondents. Similarly, no significant gender differences or differences were observed across gambling groups on these variables. The majority of both non-problem gamblers, at-risk gamblers and problem gamblers provided correct answer to both probability questions.

Table 4

Perception of skill and luck in chance-based games across gambling groups

Skill and luck	Gambling groups N (%)			
	Non-problem gamblers	At-risk gamblers	Problem gamblers	Total
Only or mostly luck*	798 (83.0)	31 (68.9)	13 (65.0)	842 (82.0)
Both*	147 (15.3)	10 (22.2)	4 (20.0)	161 (15.7)
Only or mostly skill*	17 (1.8)	4 (8.9)	3 (15.0)	24 (2.3)
Total N (%)	962 (100)	45 (100)	20 (100)	1027 (100)

Note. *Statistically significant ($p < 0.05$), ($\gamma = 0.404$, $p = 0.010$) as tested by Gamma test. Percentages are column percentages.

Conclusions

We investigated the gambling behaviours among Danish youth aged 11–17 years, specifically (1) how gambling frequency correlates with the perception of skill and luck involved in gambling, and (2) if conceptions of skill and luck involved in different types of games differ across groups of gambling severity. Besides some rather unsurprising results (e.g., that adolescent males gamble more frequently than females, and that males prefer skill-based games while females tend to prefer chance-based games) this study also made some interesting findings.

As the data show, it appears that that among Danish adolescents an adequate and reasonable understanding of the importance of luck versus skill involved in gambling activities does in fact exist. Among gamblers as well as non-gamblers, gambling is perceived primarily as a luck-driven activity. Another interesting finding was that respondents seemed to be well aware that both skill- and chance-based games involve high levels of luck, and they were able to differentiate between the level of skill or luck involved in these two types of games. Contrary to the findings of other studies (e.g., Turner et al., 2007), we ourselves did not find that problem gambling was negatively correlated with understanding of probabilities and the independence of random events.

In other words, among respondents in general an adequate and relevant understanding of the level of skill and luck that are involved in various types of games does in fact operate. This finding adds an important dimension to the research literature and to the understanding of youth gambling, as it indicates that some youths have a nuanced and differentiated view of gambling activities, and that not all young problem gamblers show poor understanding of probabilities and random chance. However, across the various gambling groups, some significant differences did nonetheless appear. Thus, more at-risk gamblers and problem gamblers (who gamble frequently), compared to non-problem gamblers, believed that skill plays an important role when gambling (i.e., both in chance games and games that require a degree of skill). This finding is overall consistent with previous research that has documented correlations between gambling problems and erroneous beliefs about random events (Griffiths, 1995; Toneatto et al., 1997; Turner, Macdonald, Bartoshuk, & Zangeneh, 2007). Perception of skill and luck involved in gambling thus seem to be contingent upon gambling frequency and the severity of gambling problems. Such findings suggest that adolescents' perceptions and conceptions of skill and luck (including mistaken and faulty ones) can affect their gambling involvement. Previous and recent research among adult gamblers suggests that increased gambling frequency is positively correlated with irrational beliefs (Griffiths, 1995; Lund, 2011). In addition, gender seems to be an important contributor, as males, perhaps as part of their externalizing behaviours, tend to maintain more optimistic views regarding their risks of experiencing problems while at the same time being aware that other people might be negatively affected by their assumption of those risks. Clearly, more research among youth is needed to clarify

and understand the relationships between gambling frequency, preferred types of games, and the development of irrational beliefs among young gamblers.

In terms of self-perceived gambling skills some expected gender differences were observed. Significantly more males than females reported that they enjoyed better gambling abilities than did their peers. Gender differences also appeared in terms of perception of potential benefits (financial gain) of gambling. Likewise, significantly more males than females anticipated a future “big win”. Since male respondents tend to prefer skill-based games, these findings also seem consistent with research indicating that gamblers who prefer ability games tend to attribute their wins to their own gambling skills (Fekjær, 2003).

The majority of respondents were relatively unconcerned about the risks of occasional gambling while the concerns about the risk related to frequent gambling were more prevalent, with more than 45% of respondents perceiving it to be very risky to gamble several times a week. Thus, these findings seem to indicate a sound understanding of the relation between gambling frequency and the risk of gambling-related problems. This finding is consistent with previous research on perceived risks and benefits of gambling among youths (Emerson et al., 2007). It also seems consistent with the fact that the majority of adolescents “engage in gambling activities as part of their normal behaviour and will not be adversely affected” (Derevensky & Gupta, 2004b, p. xxii).

The current results thus suggest affirmative answers to both research questions. First, as the more frequently adolescents gamble, the less risky they perceived gambling to be. Second, and likewise, significantly more problem gamblers compared to non-problem gamblers thought they had better gambling skills than did their peers, believed that one day they will experience a big win, and did not agree with the statement that gambling may result in a loss of money.

It is conceivable that the level of gambling involvement influences both the risk perceptions and the level of illusions of control and the relative evaluation of gambling skills. However, some qualifications are needed on the possible relations between gambling frequency, risk perceptions, the evaluation of relative gambling skills, and the outcomes of gambling. Until now, little was known about these inter-relations. Some evidence now suggests, however, that specific adolescent gambling styles, preferences and behaviours lead to certain ways of perceiving risks, gambling skills and possible outcomes of gambling. Thus, previous research has concluded that adolescent problem gamblers, the majority of which are males (Jacobs, 2004), prefer those gambling types that imply various degrees of skill, whereas non-problem adolescent gamblers, and especially females, prefer games involving chance or merely luck (Wynne, Smith, & Jacobs, 1996). Similar findings were made in this study.

Additionally, male respondents in Gupta and Derevensky's (1998) study of gambling behaviour among adolescent high school students in the Montreal region reported higher levels of self-perceived gambling skills by males over females. This finding may suggest that male adolescents are attracted to those games that imply both objective levels of skills and relatively high levels of perceived skill. Some researchers have suggested that skill-based gambling (such as poker) increases the risk of illusion of control (Mitrovic & Brown, 2009). It is therefore conceivable that these observed male gambling preferences and this particular gambling style may lead to an increased level of illusions of control. Increased level of illusions of control among males adolescent gamblers may in turn lead to perceptions of gambling as a potentially controllable and thus relatively harmless activity. Thus, the observed pattern of male gambling may be an indication of a characteristic male gambling style involving preferences for certain skill-based games. This would be a style that could lead to, or enhance, both overestimations of the role of skill in relation to gambling outcome, and relatively high evaluations of personal gambling skills. At present some empirical evidence (based on adult studies) does exist, supporting the proposition that cognitive biases are salient factors in the development of gambling problems (Tang & Wu, 2012).

Further research should explore how perceptions of possessing gambling skills are associated with gambling motivations. Furthermore, how adolescent gambling styles are developed and maintained should also be explored. Exactly how gambling preferences and gambling styles are socially mediated may be a leading question for future research projects. Focusing on sports gambling, DiCicco-Bloom and Romer (2011) have shown that adolescent gambling patterns are influenced by athletic participation, indicating that certain subcultures may stimulate certain kinds of gambling. Research in such a vein, one that takes into account the social structure, symbols and status systems of the adolescent world, may lead to important insights regarding the development of adolescent gambling styles and characteristics in terms of risk perceptions, self-evaluated relative gambling skills, and illusions of control.

Summing up, this study has added to the existing knowledge on youth gambling by examining how levels of gambling severity, gambling frequency, and gender correlate with perceptions of gambling and the associated risks among Danish children and adolescents. The study has shown that youngsters are able to differentiate the various levels of skill and luck that are involved in both chance-based and skill-based games. This research has also made the following conclusion. Conceptions of skill and luck in chance-based and skill-based games are positively, though not significantly, correlated with levels of gambling problems, as more at-risk and problem gamblers, compared to non-problem gamblers, tend to think that skill plays an important role in the gambling outcome. Moreover, this study has also pointed to the international generalizability of current findings on the correlations between levels of youth gambling problems, erroneous beliefs about random events, and self-perceived gambling skills.

Limitations and Implications

Some limitations of this present study need be mentioned. First of all, the items on risk perception were relatively general in nature (e.g., “People who gamble usually lose”) and therefore possibly somewhat difficult for some adolescents to address. Therefore, this study may underestimate the level of perceived risks among adolescents. It would have been preferable to have incorporated a wider battery of actual and more specific risks in the items measuring risk perception. In addition, the term *often* in the question “People who gamble often can become addicted to gambling” is rather subjective, and readers need bear this in mind when interpreting results. Second, the design did not allow for differentiations of risk perception in relation to different types of games. The variation of available types of gambling is huge, and it is possible that adolescents’ perceptions of risk differ across various forms and social contexts of gambling activities. These qualifications need to be considered in conducting further research in this area. Third, because of the correlational approach employed in this study it is not possible to evaluate whether gambling frequency influences risk perceptions or vice versa. Similarly, it is not possible to determine whether self-perceived gambling skills and expectation of future big wins are influenced by the level of gambling involvement and the severity of gambling problems. We are not, in other words, able to make causal inferences and suggest explanatory mechanisms. In exploring further such mechanisms prospective and longitudinal research is needed. In particular, research projects based on qualitative data may provide evidence of how the identified correlations develop in the trajectories or careers of young gamblers, and thus add important elements to our understanding of the mechanisms involved in the perception of risk in gambling among adolescents.

Despite the limitations, this study offers insights that may inform future educational or preventive purposes. Recently it has been emphasised that “youth gambling research should go beyond the basic risk prevention framework to one that fosters protective factors when helping develop youth gambling prevention initiatives” (Shead, Derevensky, & Gupta, 2010, p. 52–53). In turn, the framework of Positive Youth Development (PYD) “emphasises the manifest potentialities rather than the supposed incapacities of young people” (Damon, 2004, p. 15); we contend, following the observation of Shead et al., that our own findings are employed within that framework. Findings from this study provide some evidence in terms of the cognitive competencies of young people reporting possible gambling problems. For instance, it was found that problem gamblers tend to overestimate both the strength of their gambling skills and the importance that skill exerted in various types of games; that problem gamblers were less likely to agree that gambling leads to loss of money; and that an increase in gambling frequency is associated with a decrease in the perceived risks related to gambling. Preventive programs may utilize these findings by designing training and curricula that aim specifically to improve the cognitive competencies in question (e.g., cognitive training that aims to reduce erroneous beliefs and illusions of control, information about gambling and the role

of the cognitive biases associated with problem gambling, information about gambling statistics and the chance and random element inherent in gambling).

At present, only limited research is published examining the effects of preventive programs directed at youth. Examining two separate gambling prevention programs among Canadian university and high school students (one focusing on gambling-related statistics, another designed as broader gambling awareness sessions), Williams, Connolly, Wood, Currie, and Davis (2004) found that the programs were effective in improving gambling-related cognitions and knowledge about gambling and problem gambling. Similarly, Turner, Macdonald, and Somerset (2008) have evaluated a school-based problem gambling prevention program designed to improve students' knowledge of random events, problem gambling awareness, self-monitoring and coping skills. It was found that the designed curriculum was successful in educating the targeted students in terms of knowledge of random events and their relation to problem gambling (Turner, Macdonald, & Somerset, 2008). Thus, preliminary evidence has been found that programs focusing on improving cognitive competencies and awareness of both gambling and problematic gambling may stimulate important protective factors in terms of youth gambling problems. On the basis of this finding, it is recommended that further studies be conducted to examine, longitudinally, the potential effects of cognitive improvement programs in terms of improved cognitive competencies, gambling participation and gambling-related problems.

The findings that male gamblers tend to prefer skill-based games and to express higher levels of self-perceived gambling skills than do females might indicate that male gamblers should be specifically targeted in future prevention programs. However, because of the potential stigmatizing effects of selective programs, we recommend that future PYD programs focusing on promotion of cognitive competence should be conducted as universal programs targeting the total population of students in various educational programs. In designing preventive programs, however, we also recommend that professionals pay due respect to gender-specific needs.

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For correspondence: Søren Kristiansen, Department of Sociology and Social Work, Aalborg University, Kroghstræde 7, 9220 Aalborg Øst, Denmark. Tel: 45 9940 9606. Fax: 45 9815 7575. E-mail: samf-prodekan@adm.aau.dk

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Søren Kristiansen, PhD, is the Associate Dean at the Faculty of the Social Sciences, Aalborg University, Denmark. His primary research interest is in gambling, with a special focus on social dynamics and the relationship between gambling behaviour and the role of social contexts. In addition, he has conducted research in social problems and micro-sociological theory. Currently Dr. Kristiansen is heading a qualitative longitudinal research project on adolescent gambling careers.

Sara Marie Jensen received her master's degree in Sociology from Aalborg University. She is currently a development consultant at SOSU Nord (Health College) in Northern Jutland, Denmark. Prior to this position she was a research assistant at the Department of Sociology and Social Work at Aalborg University, where she conducted research on adolescent gambling behaviour and social problems.

Maria Camilla Trabjerg received her master's degree in Sociology from Aalborg University. Currently she is a research assistant at the Department of Sociology and Social Work at Aalborg University. Since May 2011 she has been recruiting, interviewing and re-interviewing 50 adolescents as part of a qualitative longitudinal research project on adolescent gambling careers.

Comparing the attitudes of recreational gamblers from Finland and France toward national gambling policies: A qualitative analysis

Virve Pöysti

University of Helsinki Department of Social Research, Helsinki, Finland

Abstract

Survey data from several countries indicate that public attitudes toward gambling and its deregulation are negative, or at best ambivalent. However, comparative studies on the attitudes of gamblers themselves have not been conducted, despite the valuable firsthand experience with gambling institutions that these people have. Using qualitative group interview data from recreational gamblers in France and Finland, the study asked how players from two different gambling contexts experience their national gambling arrangements. The study found that although gambling is government regulated in both countries, the Finnish respondents were generally content with their national gambling system while the French were highly critical and supported greater protective measures. The way in which gambling is experienced, and the degree to which national gambling policies are accepted among players, depend not only on objective structures, but also on the institutional and cultural context in which gambling takes place.

Résumé

Dans plusieurs pays, les données d'enquête indiquent que la population ont une opinion défavorable du jeu et de la dérèglementation des jeux de hasard ou, au mieux, ambivalente. Or aucune étude comparative à ce sujet n'a sondé les joueurs eux-mêmes, malgré le fait qu'ils ont une connaissance directe et précieuse des établissements de jeu. À partir de données qualitatives recueillies dans le cadre d'interviews de groupe auprès de joueurs occasionnels en France et en Finlande, nous avons voulu connaître le point de vue de joueurs évoluant dans deux contextes différents à propos de l'encadrement des jeux de hasard dans leur pays. Même si le jeu est réglementé par l'État dans les deux cas, les Finlandais se disent satisfaits en général avec le système établi, alors que les Français sont très critiques du leur et réclament davantage de mesures de protection. Nous concluons que les attitudes à

l'égard du jeu et le degré d'acceptation du cadre réglementaire ne dépendent pas seulement des structures objectives en place, mais aussi du contexte institutionnel et culturel dans lequel les activités de jeu se déroulent.

Introduction

Gambling occurs within a framework of nationally specific habits. Nevertheless, this institutional and cultural context in which opinions are formed has not been considered in previous studies on gambling attitudes. This study explores the link between national gambling policies and attitudes toward gambling, by employing a qualitative and comparative approach. Using group interview data collected from French and Finnish recreational players, the aim is to consider how well these gamblers accept their own national gambling arrangements and how their evaluations differ. The term *habit* is used to indicate the processual and habitual nature of attitudes (this definition of habit is further clarified at the end of this Introduction section). It is argued that attitudes are not formed in a void but rather within the national context of institutions and culture. The term *institutions* refers here to the legislative framework within which gambling providers operate, as well as to the traditions of governance in a national context. *Culture*, on the other hand, here refers to the national traditions of gambling practices, including and emphasizing in this research understandings of acceptable gambling behaviour, and what is thought to be socially just.

France and Finland were chosen as the countries of comparison because of the interesting differences in their application of gambling policies. In line with the European tradition of government controlled gambling provision (Orford, 2011), the gambling sectors in the two countries have only been open to national monopolies or companies licensed by the state. In both countries, the national lottery operators (La Française des Jeux or FDJ in France and Veikkaus in Finland) and the national horse betting agencies (Pari Mutuel Urbain or PMU in France and Fintoto in Finland) are monopolies. However, the French casino and online gambling sectors have been deregulated further than their Finnish counterparts. In Finland, casino and slot machine gambling are managed by still another national monopoly (Raha-automaattiyhdistys or RAY) while in France the casino sector is open to private providers that are required to have state licensing. The French casino sector policy creates strong legal restrictions: slot machines are only allowed inside casinos, which, not being allowed near Paris, are mainly located in coastal holiday resorts. The online gambling market in France also opened to competition in 2010 (became law as of May 12th 2010). In Finland, only the national gambling monopolies are authorized to offer legal online gambling.

These policy differences are relevant, because the juridical and institutional organization of gambling in a given country influences the forms of gambling that are offered. In France, casino gambling, and particularly slot machine gambling in casinos, is the most popular form and accounts for 35 percent of gross gaming revenues (Swiss Institute of Comparative Law, 2006). France also has the highest number of casinos in Europe (196 in 2012, compared to only one in Finland). In Finland, non-casino slot machines are the preferred form of gambling. Finland has one of the highest numbers of non-casino slot machines in Europe, representing 46 percent of the gross gaming revenues in the country (Swiss Institute of Comparative Law, 2006). The two countries also differ in how consumer protection has been undertaken. Preventative measures against gambling-related problems are not well established in either country, and are largely based on existing networks of alcoholism prevention. The Finnish model has tended to highlight social control policies while the French tradition of medical treatment has focused on the vulnerability of individual gamblers (Egerer, 2012; Jaakkola, 2009; Valleur, 2009).

These institutional frameworks of gambling have become *habitual* in the two countries, and therefore influence which forms of gambling are commonplace, popular, and acceptable, publicly and among gamblers. This study takes these cultural and institutional habits as a starting point and asks how well and why the national gambling configurations are accepted or rejected among recreational players in France and Finland. Its use of qualitative research methods further allows for the participating gamblers to elaborate on the particular features of their national gambling systems that evoke either confidence or mistrust, and to further explain the reasoning behind consumer attitudes to gambling.

Public Attitudes toward Gambling

Increased opportunities to gamble have gone hand in hand with its rising popularity. Today, gambling is a widespread leisure activity across the western world, with population survey data from different countries estimating 12-month gambling participation rates of around 70 to 90 percent (Abbott et al., 2004; Cox et al., 2005; Gambling Commission, 2011; Welte et al., 2007). Estimates from Finland are similar. According to survey data from 2011 (Turja et al., 2012), 78 percent of Finns had gambled within the previous 12 months. Recent data from France (Institut national de prévention et d'éducation pour la santé [INPES], 2011) shows a markedly lower 12-month participation rate of 48 percent. The popularity of gambling has been followed by the assumption that public attitudes toward it have also grown more positive (Orford, 2011). However, no scientific evidence exists to support this claim; in fact, studies have shown that the public's attitudes to gambling and its expansion have remained negative or at best ambivalent (e.g., Huhtanen et al., 2009; Orford et al., 2009; Productivity Commission, 1999).

Opinions about gambling have been measured through standardized questionnaire studies ranging from national surveys to smaller samples. Collected mainly in the

Anglo-American context, the most-used methodology has been to use simple statements on gambling with an “agree-disagree” Likert scale for responses. These studies have found that a full prohibition of gambling is generally rejected and that gambling is considered an acceptable activity (Azmier, 2000; Moore & Ohtsuka, 1999; Orford, et al., 2009). Nevertheless, opportunities to gamble have been seen as too easily available (Livingstone, 2005; McMillen et al., 2004; Moore & Ohtsuka, 1999; Orford et al., 2009; Productivity Commission, 1999) and gambling in general has been considered harmful rather than beneficial to society (Amey, 2005; Orford et al., 2009; Productivity Commission, 1999; Smith et al., 2011). Age limits and other restrictions on gambling have also been favourably regarded (Azmier, 2000). In line with these studies, a recent Finnish survey (Huhtanen et al., 2009) has reported cautious attitudes toward gambling: only 1.5 percent of respondents supported further deregulation of gambling while 50.8 percent wanted to maintain the status quo and 47.7 percent called for more regulation. In France, no survey studies on gambling attitudes have been conducted, although it has been estimated that restrictions on gambling are accepted and have even been demanded by French consumers (Trucy, 2006/2007).

As illustrative as participation rates or population opinion surveys may be, they cannot explain the social context in which attitudes toward gambling are formed. Indeed, although the need for comparative studies has been acknowledged (Kassinove et al., 1998), the role of nationally specific institutional and cultural habits has largely been overlooked. Valuable contributions with respect to the institutional and cultural contexts of gambling have, nevertheless, been made in other fields of gambling studies. Variables such as availability (Korn, 2000; Raylu & Oei, 2002), types of games offered (Lund, 2006; Welte et al., 2007), the social acceptability of gambling in a society (Cosgrave, 2006; Welte et al., 2007) and cultural understandings (Majamäki & Pöysti, 2012; Pöysti & Majamäki, 2012) have been identified as influencing gambling participation and the ways in which gambling is perceived in society.

The Habitualness of Attitudes

Following the assumption that consumer attitudes would become more positive with increasing exposure, evidence of positive attitudes correlating with higher gambling participation rates has been presented (Breen & Zuckerman, 1999; Strong et al., 2004). The importance of individual freedom to both gamble and to organize games, as well as the economic benefits of gambling, have been put forward (Collins, 2003a, 2003b; Costello & Millar, 2000; Forrest, 2003; Polders, 1997). Gambling is often described as a widespread and acceptable form of consumption (e.g., Reith, 2007). While the possibility of a bidirectional link between attitudes and behaviour has been acknowledged (Wood & Griffiths, 2004), the general expectation has been that increasing gambling opportunities is then followed by growing participation rates and more positive attitudes toward gambling (Orford, 2011).

The traditional understanding of attitudes toward services has, indeed, assumed a direct link between performance and satisfaction (Van de Walle & Bouckaert, 2003). Attitudes have been understood to result from economic cost/benefit calculations and therefore directly responsive to changes in the market. The expectation has been that the introduction of new gambling opportunities is to be followed by a phase of normalization during which players gradually get accustomed to and accept the altered configurations and the industry (or government) justifications given for them (Adams, 2007).

However, the negative public attitudes toward gambling that have been measured in population surveys reveal another reality. A longitudinal New Zealand study (Amey, 2005) has even shown that contrary to expectations, attitudes against gambling are actually hardening. Indeed, increases in the provision of gambling, and in positive messaging from the industry and/or government, do not automatically transpose themselves into positive public attitudes.

Pragmatist philosopher John Dewey (1927) may offer us some understanding when he argues that attitudes are not actually rational but habitual: the formation and modification of attitudes is not only based on changing circumstances but also on already existing cultural customs and institutions. The habitual basis of attitudes also makes them very hard to change. “Habits of opinion are the toughest of all habits,” as Dewey (1927, pp. 162) put it. This paper uses the term *habit* in Dewey’s sense to study attitudes qualitatively as habitual and social ways of thought. Attitudes need not be understood as rational calculations but instead as parts of social processes that are based on both institutional and cultural realities. Furthermore, just as cultural and institutional gambling habits differ between societies and social groups, attitudes can vary between national contexts.

Methods

The habitual basis of attitudes has largely been ignored in previous studies, which have focused on statistical descriptions of attitudes within a single cultural and institutional context. While quantitative data are beneficial for describing the general tendencies of public attitudes, spontaneous expressions of the features that either worry or evoke confidence in a system are lost. To understand these processes, the present study used qualitative methods to examine attitudes. Opinions on gambling were not solicited through questionnaires. Instead, opinions were elicited from open discussions on gambling-related topics in order to bring to the fore the interrelation between attitudes and social habits.

The analysis is based on group-interview data, consisting of 14 group interviews in France and 14 in Finland. The interviews were conducted in 2009 and 2010 with recreational gamblers recruited from various gambling venues in the capital regions of their countries. Advertisements were placed in gambling locations and online gambling forums. Some joined through use of the snowball recruitment technique.

The purpose was to include gamblers who would be familiar with a variety of different games and gambling environments but had not experienced problems with their gambling. Therefore, the main recruitment criterion was that the participant considered himself or herself a recreational gambler. Among the Finnish participants the most popular games were non-casino slot machines, lottery, casino games, and both table and online poker. The French gamblers who partook in this study typically played scratch cards, the lottery and casino games (including slot machines in casinos). Altogether 110 active gamblers participated, and 54 were female and 56 male. The participants were aged between 18 and 71 years. Table 1 presents demographic information on the research participants.

The purpose of the data collection was to identify the kinds of images and understandings players had of gambling and how these differed between the two cultural groups. Group interview methods were chosen over individual interviews in order to tap into the role of social interaction in cultural understanding. The interview method (Reception Analytical Group Interview [RAGI], Sulkunen & Egerer, 2009) was designed to use short film clips as stimuli to provoke discussion. The film clips depicted different gambling situations to encourage discussion on a variety of gambling-related topics. Scenes portrayed different games, gambling situations and included scenes that could be interpreted as showing problematic and non-problematic gambling. Subtitles and short synopses were added to ensure comprehensibility. Participants viewed the scenes in three series of two clips per series. After each series, approximately 15 to 20 minutes were devoted to open discussion on the clips and the ideas they evoked. The interview sessions lasted between 60 and 80 minutes.

The first series of film clips portrayed initiation to gambling and non-problematic recreational gambling. In a scene from *Going for Broke* (Campbell, 2003) a woman tries slot machine gambling for the first time and experiences the thrill of winning, while in a clip from *Rounders* (Dahl, 1998) a young student impresses his professors with his poker skills. The second series was designed to emphasize the line between recreational and problematic gambling behaviour. In a scene from *The Cooler* (Kramer, 2003) a young couple is enjoying a winning streak at a casino, while in *The*

Table 1
Research participants in Finland and France

	Total	Finland	France
All participants	110	48	62
Male participants	56	33	23
Female participants	54	15	39
Average age (total)	36.6	35.7	37.4
Average age (male)	34.6	33.7	35.8
Average age (female)	38.8	40.0	38.3

Gambler (Reisz, 1974) a man is experiencing a desperate losing streak in a private card gaming circle. The final series consisted of movie clips portraying problematic gambling. In a clip from *Bord de mer* [Seaside] (Lopes-Curval, 2002) a retired woman secretly sneaks into a casino to play the slot machines, while in an extract from *Owning Mahowny* (Kwietniowski, 2003) a man is unable to stop playing a game of dice that is going against him despite his guilty conscience.

Five of the six film clips shown were American. They offered a contrasting point of comparison for the participants to discuss their national gambling systems in relation to images of gambling in America. The researcher expected the participants to find cultural differences between the Finnish and French groups in the interpretations of the film clips. In particular, familiarity with the various games portrayed in the clips influenced to what degree participants mentioned personal gambling experiences. The respondents also had six orientation questions available on the table in front of them to help start the discussions (See Table 2). Certain orientation questions – especially “Could this happen in real life?” and “Should something be done about this?” – prompted discussion about the current institutional organization of gambling in their own country.

The RAGI method is particularly suitable for comparative studies, as the protocol is carried out in a similar manner in each cultural context, thus reducing the influence of individual interview situations and emphasizing cultural differences (Sulkunen & Egerer, 2009). Following the RAGI method, the role of the interviewer remained marginal during the discussions and participants were encouraged to freely discuss gambling. No participants were forced to discuss themes with which they were uncomfortable. Before the interviews took place, participants received instructions, a short description of the study, and means to obtain further information. Before commencing the interviews, the participants were informed that there were no correct or incorrect answers. The interviewees were aware of the conditions under which they would participate and were free to withdraw at any time.

The interviews were transcribed and coded using the qualitative data analysis software Atlas.ti. This program increases the efficiency of data processing by assisting in the code application process. Because conversation in the group

Table 2
Orientation questions distributed to participants

-
- 1) Describe what happens in the clip and what kinds of characters are present.
 - 2) What could have happened just before the clip?
 - 3) What will happen immediately after the clip?
 - 4) What will the characters be like in ten years' time?
 - 5) Could something like this happen in real life?
 - 6) Should someone do something to help the character(s)?
-

interviews was open-ended, there was discussion of a variety of gambling and even non-gambling related themes. However, only the aspects of gambling that can be controlled through legal or governmental measures were coded. This meant excluding statements calling for more personal responsibility from players, although it has been previously shown that Finnish gamblers tend to emphasize personal responsibility more than the French do (Pöysti & Majamäki, 2012). The gender distribution of the participants posed an issue, because the interviews conducted in Finland had more male respondents, while in France females were in the majority. Previous research has shown that males tend to be more favourable to deregulation in the gambling sector than females (Abbott et al., 2004; Volberg, 2003). To test whether the differences found between the two sets of data were in fact cultural in nature or influenced by the skewed gender distribution, each coded quotation also received a gender code (male/female). The data was then analysed separately by gender and this was taken into account in analyzing the results.

Results

In total, 102 quotes were coded in the French data and 103 in the Finnish data. A quote refers to an uninterrupted statement made by one participant. Quotes varied in length from a few words to several lines. If another participant later expanded on the topic, this was coded as another quote. The codes were initially grouped into three categories based on whether the participants considered the regulatory setting toward gambling in their respective countries to be a) satisfactory, b) in need of further deregulation, or c) in need of further consumer protection. Statements calling for further control of the gambling sector were further subdivided into different categories in terms of which aspects of the system were considered in need of this control. Figures for the numbers of quotes that were coded, which illustrates the general views that emerged in the discussions, are presented in Table 3. Its purpose is not to present generalizations or to turn qualitative data into numbers but merely to indicate in an easy-to-understand format the main differences between the Finnish and the French discussions. In the tradition of using quasi-statistics established by Becker (1970), the frequencies of particular themes are not meant to

Table 3

Gamblers in France and Finland: Respective views on their own nation's system of gambling regulation

	France		Finland	
	<u>Quotes</u>	<u>Percent (%)</u>	<u>Quotes</u>	<u>Percent (%)</u>
Support more deregulation	0	0.0	19	18.4
Support current configuration	13	12.7	49	47.6
Support more protection	89	87.3	35	34.0
Total	102	100	103	100

serve as statistical data but as illustrations to help the reader discern how common the different topics of discussion were.

As the numbers in Table 3 indicate, the main difference between the two sets of data lies in the predominance of statements by French participants approving further consumer protection, in contrast to statements by Finnish participants expressing relative satisfaction with national gambling regulation. Indeed, an overwhelming majority of the French quotes called for increased governmental control with only a few expressing satisfaction with current gambling regulation. In comparison, almost half of all statements made by the Finnish respondents were favourable to the status quo, whereas only about one third called for further regulation. Further deregulation was not widely supported in Finland or France, but it is still noteworthy that while no such sentiments were expressed in the French discussions, one-fifth of the Finnish quotes proposed liberalizing the system further. The participants spoke to issues that allow us to further develop in greater depth the themes of further deregulation, satisfaction with current institutional configurations, and more protection, focusing particularly on the content as well as the “why” of these attitudes.

More Deregulation

The absence of quotes from the French interviews calling for further relaxation of gambling sector policy illustrates not only the French participants’ attitudes toward gambling but is also an important result to consider in itself. Although the French gambling sector has seen more deregulation than in Finland, attitudes do not seem to have become more positive, as the French recreational gamblers saw no need for further gambling opportunities. Finnish respondents voiced some support for the possibility of deregulation in the state-monopoly Finnish gambling market, although these opinions were not numerous. In line with previous statistical studies, the majority of these statements were also made by young males, with only two of the 19 comments being made by females. The uneven gender division in the two sets of data may be a factor in these results.

Among Finnish participants, the interviewees that wanted more deregulation mainly indicated a desire for more and better games. Some respondents also mentioned opening the market to private providers, thinking that this would increase jackpots and improve the odds of winning. The traditional justifications for gambling monopolies, such as raising money for beneficial purposes, eliminating competition, and reducing gambling-related problems, were also regarded with some scepticism. They argued that the proceeds raised through national monopolies would be similar to the sums that could be collected by taxing gambling offered by private providers:

I think they [national monopolies] could be dismantled, like they did in Spain; they dismantled them and in the end the state got just as much money in taxes, or even more, from the private gambling companies than from the state monopoly. (29-year-old man, Finland)

The respondents also felt that national monopolies could not eliminate competition altogether or keep out illegal gambling providers, such as online casinos. A Finnish respondent remarked: “since it’s impossible to control, we might as well allow it” (21-year-old man, Finland). The same was true for reducing problem gambling. The respondents argued that countries with liberal gambling regimes experienced a similar degree of problems as Finland:

In the U.K., where policies are much more liberal, there are just as many problems, or just as few problems, as in Finland. (30-year-old man, Finland)

Respondents sceptical of restricting any sector of economic activity also regarded the Finnish tradition of control policies with some suspicion: It is “only a step away from communism” (30-year-old man, Finland). Another participant further emphasized that since Finland has not even tried to liberalize gambling, it is impossible to predict with any certainty what would happen:

And this comes back to the question of whether a monopoly is any better than a system of licensing. And the thing is, there’s no research to prove things either way. (36-year-old man, Finland)

Support for the Current System

Statements in support of the national status quo were common among the Finnish respondents but relatively scarce among the French. Indeed, while nearly half of all coded quotes from the Finnish interviews were favourable to the national gambling system, only about one tenth of the French quotes followed suit. Much like the lack of statements calling for further deregulation of the French gambling sector, the low level of satisfaction among the French participants in their own system showed that attitudes toward gambling do not necessarily become more positive in all cultural contexts with increasing gambling opportunities. However, the few quotes favourable to the current system found in the French discussions identified themes similar to those mentioned in Finland.

Both the Finnish and French participants who supported their national gambling arrangements did so by comparing them to other countries. In particular, they put forward their images of problems perceived to exist in the United States. The decision to compare national systems with the United States may have occurred because five of the six film clips were American. Participants emphasized that serious problems “only exist beyond the Atlantic Ocean” (21-year-old man, Finland), “only in America” (21-year-old man France) or as one Finnish participant argued, “We’re fine in Finland, [gambling] is not crazy like in Las Vegas” (32-year-old man, Finland).

The respondents underlined the general cultural attitudes toward gambling that they considered more problematic in the United States, when compared with France or Finland. They pointed out that their societies were less permissive of gambling than American society: “In France, winning money is not really approved of, especially by games” (35-year-old woman, France). The Finnish participants also emphasized “Finnish realism” in comparison to Americans’ perspectives. One respondent made this clear when commenting on the clip shown from *The Cooler*:

I was thinking that it’s a kind of cliché that everybody wins. Then I started thinking that there’s no romanticized joy about gambling like that in Finland. In Finnish films, if there’s gambling, people lose. (32-year-old man, Finland)

Differences between the Finnish and the French interview responses could also be found with respect to how the participants considered their national gambling regulations to be preferable to those in the United States. The Finnish respondents were particularly sceptical of American private casinos, in comparison to which they saw the Finnish version of state-provided casino gambling as safer and more trustworthy. It was even argued that the only Finnish casino, located in Helsinki, was less interested in making money than in providing an enjoyable and safe gambling experience, including small wins for everyone:

If [the casino] was private, I would be really sceptical. I mean if I went gambling to the United States or something, I’m sure I wouldn’t win a thing. (42-year-old woman, Finland).

The high level of trust in the national providers found in the Finnish data was also reflected in discussions about preventive measures. Young players were thought to be in special need of protection and age limits were considered a good way of preventing problems among them. The gambling age in Finland was in the process of being raised from 15 to 18 when the interviews took place (law 24.6.2010/661), a welcome development according to the respondents: “It’s good that they are putting some age restrictions on those machines” (25-year-old man, Finland). In addition, participants approved the availability of information about gambling-related problems in gambling venues. Indeed, consumer protection was considered the main justification for the national monopolies:

In Finland, it’s still really controlled, or the RAY takes care of the players. It is still different from American gaming arcades because in Finland there’s always some protection. (25-year-old man, Finland)

Similar views were not presented in the French interviews. As casinos in France are private, the respondents did not consider them to be particularly protective of their customers. Nevertheless, some French participants were content with the measures the state had taken to regulate casinos. The limitations placed on casino operations, as well as the regulation that casinos not be allowed near Paris, were considered

good features of the French system. As the respondents had been recruited from the Paris area, some pointed out that these “geographical limitations” (53-year-old woman, France) had helped them to not play to excess.

The acceptance of the regulatory framework for gambling in one’s country was also related to the types of games and gambling provided by one’s national gambling provider(s). In the French interviews, slot machines requiring small bets were considered acceptable, as “nobody can get into trouble by playing only two cents” (27-year-old man, France). The Finnish respondents on a similar track pointed out that slot machines located in public places are meant for “playing only a few coins at a time” (30-year-old man, Finland), making them less dangerous than machines in casinos:

What I like is that in Finland you get small wins, which are not that addictive. And it works well that they give more. And more often. You don’t have to sit there playing for an hour; you can play for just fifteen minutes. (45-year-old woman, Finland)

Another item in the Finnish interviews but not evident among the French were discussions of how the state uses gambling proceeds, particularly when used for social causes. Social causes were seen as important justification for the national monopolies and formed a theme that was pronounced in the Finnish group discussions. The participants described losing money in the national monopoly games as “donating money” (25-year-old woman, Finland), “giving money to charity” (20-year-old woman, Finland) or “almost like putting money in the bank, for national health!” (21-year-old man, Finland). Some Finnish respondents even considered the charitable use of gambling proceeds to be specifically Finnish. For these people, this made the national system highly appreciated:

It’s really contradictory [that the state offers games]. But then again, because they support social work and welfare, it’s a good thing; it’s unique in the world. (45-year-old woman, Finland).

Interestingly, although gambling proceeds are also used for public welfare in France, the French respondents did not mention this. It might be that the Finnish respondents were more aware of how gambling proceeds are used because this information is public, widely discussed in the media, and even put forward in advertisements. In France, gambling proceeds constitute a part of the state budget but are not specifically earmarked. The widespread approval of the existing regulatory system evident in the Finnish discussions seems to be at least partly due to the national gambling monopolies being able to appear protective and charitable in the eyes of the public. The French state does not appear have justified its administration of gambling to the public.

Finally, in addition to factors justifying the existence of gambling monopolies, both Finnish and French respondents stressed that it is not necessarily the fault of the

governing system if some individuals have problems with their gambling. Some respondents did not feel it fair to further control gambling if a small minority experiences problems. Some participants pointed out that competent adults must have the right to gamble if they want to: “you can’t ban everything either” (31-year-old man, Finland). Some Finnish respondents in particular considered individual responsibility for one’s gambling to be more important than the responsibility of the gambling providers:

They’re not doing anything wrong if they want to create a nice environment for people to gamble in. Nobody’s forcing you to do anything; it’s just an invisible form of encouragement to play. (25-year-old man, Finland)

More Regulation

The French participants, having been highly critical of their national system and even more so of further relaxations in gambling policy, were quick to suggest greater restrictions on gambling. Suggestions for more protection were also present in the Finnish data, but to a smaller extent. While the overwhelming majority of French quotations supported further regulation, this theme was only taken up in one-third of the Finnish quotes.

The concerns that the gamblers voiced and the interventions they called for can be divided into three groups. First and most commonly, the discussions concerned the policies and actions of the government, with respect to the type and availability of gambling, and permissive government policies (40 coded segments in the French interviews, 16 in Finland). Second, gaming provider problems were recognized, mainly focusing on casinos and online providers and the ways in which casinos or other gambling environments are structured to encourage further play (33 interview coded segments in France, 14 in Finland). Third, problems such as permissive cultural attitudes, or what they called the *poker trend*, were addressed (16 interview coded segments in France, five in Finland).

Concerns about government involvement. Both Finnish and French participants addressed concerns relating to the government or to issues requiring governmental intervention. The general attitude of the government was considered to be too indifferent but also too permissive in both country contexts. The French respondents in particular alleged that government indifference to problem gambling exists, by suggesting that the state is more interested in collecting gambling profits than preventing gambling-related problems. One French respondent even felt that “the government has never done anything to regulate gambling” (42-year-old man, France).

The Finnish participants offered a few similar opinions. While the benefits that the proceeds of gambling had for charities were generally recognized in the Finnish

interviews, some respondents still raised the question of whether these financial benefits were worth the negative side effects of problem gambling:

They justify their existence by saying that they give money to culture and sports, but then if there are [gamblers suffering from] problems it really raises the question of whether it's still worth it. I mean, at what price are we actually [offering gambling]? (21-year-old man, Finland)

In the French interviews the perceived indifferent attitude of the state was also linked to the issue of problem gambling. Participants argued that the government has remained too passive, and that more research and prevention measures were needed to help players:

Games are bad for you! Play responsibly. And in France, there's not much prevention; a lot of people suffer from [problem gambling] and it's not even acknowledged as a medical condition. (28-year-old woman, France)

In addition to its indifference, the state was also seen to be too permissive of gambling in both the French and the Finnish discussions. These concerns focused mainly on the proposed types and availability of gambling; that is, the factors influenced by government policy. Some gambling deregulation, such as greater availability and the introduction of new games, was criticized in both sets of interviews. The interviewees proposed fewer games and less availability in order to improve player protection.

Concerns over the availability of games were especially pronounced in the Finnish discussions. Although the Finnish participants were otherwise approving of the national gambling system, they still had negative views about the presence of slot machines in such everyday spaces as supermarkets and gas stations. Some respondents felt that “[gambling] has been made too easy” (20-year-old man, Finland). This respondent explained:

In Finland you can't avoid it. You go to the store to buy a carton of milk and you see the slot machines, the betting desk, and I think that's a bit strange. (21-year-old man, Finland)

In the French discussions, a similar concern about the availability of gambling opportunities centred mainly on the availability of scratch cards. Particularly, they saw it problematic that scratch cards are sold in tobacco shops:

[If scratch cards weren't sold in tobacco shops], I would buy much less of them. I've even had to buy cigarettes in cartons so that I wouldn't have to go into tobacco shops. Having cigarettes next to [scratch cards], it's horrible. (24-year-old woman, France)

Certain types of gambling were also regarded with suspicion. The French recreational gamblers were notably critical of the direction new games were taking. Referring to the Rapido instant lottery, it was argued that “before, people played the lottery once a week, whereas now it’s every five minutes” (58-year-old man, France). Finnish participants were less concerned about new games, but shared the suspicion toward recent developments in existing games. The ability to play slot machines with bank notes or bank cards particularly was frowned upon:

And don’t those Täyspotti [game arcades] nowadays have a few games in which you can directly insert your bank card? I’ve been thinking. ... Those, I think, I don’t know, I don’t think it’s really a good thing anymore, to be able to play directly from your bank account. (32-year-old man, Finland)

The Finnish participants also proposed solutions to the issues they had raised. Ideas such as games automatically shutting down if one plays too much, only being allowed to play a hundred Euros at a time, or having to take a break between games were suggested. Restricting all games to a few casinos was also proposed to reduce the constant exposure to gambling opportunities. The French participants, despite their generally critical attitude toward the government and gambling policies, did not propose interventions.

Concerns relating to gaming providers. National monopolies or strong state regulation of independent providers fundamentally link the state with the provision of gambling. This makes concerns related to gaming providers and governments difficult to separate. However, the respondents felt that gaming providers also had responsibility independent of government policy.

Discussions about game providers mainly focused on casinos, both online and offline. In the French discussions, casinos were considered to be even less trustworthy than the state, and were even described as “criminal” (24-year-old woman, France). The discourse mainly revolved around the question of what casinos should or should not be allowed to do to tempt gamblers to play. The Finnish participants did not view pleasant gambling surroundings negatively, and instead emphasized self-discipline. On the other hand, the ambience of casinos emerged as a great concern in the French discussions: “In a casino, you always see people everywhere who are winning, that’s the trap of casinos” (46-year-old woman, France). Furthermore, for some French interviewees, the absence of clocks and windows and playing with chips instead of real money were seen as troublesome features that can blur one’s sense of reality. This lack of contact with reality was strongly emphasized about casinos and other gambling environments:

It’s the same thing in places where you go play Rapido [instant lottery] or bet on horses; people are totally focused on the game and have no contact with reality. (40-year-old man, France)

In addition to creating isolating and deceptive environments, some respondents questioned the ethics of casino owners, who were described as indifferent to gamblers experiencing problems, or merely interested in “keeping the person put so that he’ll spend all his money” (21-year-old man, France). An interviewee proposed that casinos “should be obliged to recognize those [with problems] and to help them” (42-year-old man, France) by employing psychologists or coaches, for example. However, as a Finnish respondent pointed out, spotting someone with a gambling problem does not necessarily mean help will be at hand:

My friend who used to work as a dealer, he said that you can clearly tell who is a problem gambler ... if they come there each pay day and play the roulette for fifty Euros a round, hundreds of Euros in like half an hour. But he said that the personnel don’t really do anything about it. (29-year-old man, Finland)

Furthermore, the possibility of exclusion from casinos, although promoted as a solution to problem gambling, was regarded with scepticism by interviewees in both countries. The French respondents criticized the policy that someone has to personally request to be excluded. A casino will only do it “[if you] insult the bouncer, but never because you’re ruined” (42-year-old man, France). In Finland, exclusions initiated by gaming providers do exist, but the Finnish participants were concerned about their short durations: “If they give it, it’s like three months, if you ask for it yourself it’s one year maximum” (25-year-old woman, Finland). The French respondents were also unsure about how well such arrangements actually work, with examples given of acquaintances that had been able to enter casinos despite having self-excluded:

I know people who have self-excluded from casinos, but after a while they try another casino, either beyond the [French] borders or [in France], they can still get in. (59-year-old woman, France)

The mistrust among the French participants is obvious. It was even emphasized that if policies to restrict gambling were introduced in France they would probably have little influence due to negligence by gaming providers. Although the Finnish respondents also pointed to deficiencies in their gambling system, a similar lack of confidence was not evident. Rather, they expressed trust in the state’s ability to remedy the situation.

The Finnish and the French respondents did, however, share a common concern about the availability of online gambling. The Internet was described as an environment with “no control whatsoever” (28-year-old woman, France) and “available everywhere” (21-year-old woman, France). In the Finnish data, where trust in national providers was high, there was suspicion of online casinos because they operated beyond the sphere of government-instituted protective measures. The French respondents, on the other hand, had even more misgivings about online casinos than they did about their mistrusted national gambling providers. This

might be because the supranational character of online gambling poses new types of threats that national legislation is still unable to address:

You can also play on the Internet, that's even worse. There are no limits for your credit card. Or the limit must be much higher than in casinos, if it is limited. (50-year-old woman, France)

Concerns relating to culture. Not all concerns were related to the institutional level of the state or the providers; some also related to the cultural environment of gambling. These issues were quite pronounced among the French gamblers who criticized both the overly positive image of gambling presented in the media and the generally permissive attitudes toward gambling in contemporary societies. There was particular concern voiced for the young, as “more and more young players, with the current poker fashion, are at risk” (58-year-old woman, France). More generally, some aspects of the cultural values of western society were considered detrimental:

We're living in a materialistic society of consumption where everything is about money. People think that games are a quick way to get money. It's a trap people fall into. (21-year-old man, France)

The media was perceived as reinforcing these illusions of quick money. Interviewees often mentioned the media coverage given to successful poker players or lottery winners. “There are people who gamble because they've seen winners on TV” (26-year-old man, France). Indeed, several participants described seeing television features that could be seen as encouraging gambling:

I saw a story on TV about a Norwegian woman who had won at online poker. She had won a million Euros, I think, and she was picking up her check from Monaco. Some people will think that “because she won that much on the Internet, maybe I will too.” (27-year-old man, France)

Similar discourse pertaining to either the culture or the media was rare among the Finnish participants, who saw the Finnish culture as hardly encouraging of gambling, as discussed above. Television coverage of poker was also mentioned in the Finnish data, but rather as an exciting pastime activity, provided that the player exercises sufficient self-control. It must be noted, however, that in Finland more respondents played poker than in France, and the French mistrust of poker might be partly due to their relative unfamiliarity with the game.

Discussion

This study focused on consumer attitudes toward national gambling systems in two European countries, France and Finland. The results have shown that gambling and attitudes toward it are social phenomena and can vary between institutional and

cultural contexts. The institutional arrangements for gambling influence how gambling is experienced by consumers, while cultural understandings influence the underlying perceptions of it. The qualitative research methodology used also provided a new perspective on studying attitudes toward gambling by allowing a deeper understanding of the processes that either evoke confidence or mistrust in the national system. Discussing gambling freely in a group-interview situation enabled participants to voice culturally acceptable ideas of what is habitually considered acceptable in that context.

The analysis has shown that the French recreational gamblers who were interviewed tended to mistrust their national gambling institutions. Casino-type gambling in particular was distrusted because of its artificial ambience that isolates gamblers by eliminating clocks and windows, thereby erasing regular timing clues common to everyday life. More restrictions were called for to help gamblers remain level-headed and safe. French gambling researcher Franck Durand (2008) has taken a similar line in his account, advocating the right to be protected from gambling rather than the right to engage in it. In the Finnish interviews, the organization of gambling through national monopolies was regarded favourably and the national gambling system was generally considered preferable to the private market or to the policies found in other countries. Concern was mainly voiced about the wide availability of slot machines, but interviewees voiced trust in the government being capable to resolve the issue.

Indeed, the differing levels of trust in the national gambling systems could be considered the main finding of this study. Parallel sentiments can be found in public and academic discussions on gambling in the two countries. In Finland, discussion has mainly centred on the need to maintain the national monopolies in the face of global competition (Tammi, 2008), while in France academics and politicians have strongly criticized the national system and have demanded more government responsibility (Martignoni-Hutin, 2005; Trucy, 2006/2007).

These differences can, to an extent, be attributed to differences in the gambling regimes of the two countries. Slot machines are popular in both countries, but in France private casinos offer slot machine gambling while in Finland they are provided by a national monopoly. However, even similar types of gambling games can be viewed very differently and attitudes toward the national lottery are a good example of this. In the Finnish group discussions, the national lottery was well accepted, mainly because their proceeds were used for charitable purposes. Although lottery proceeds also have a long tradition of being used for public and charitable projects in France (Fèvre, 2008), French interviewees did not voice acceptance of even this form of gambling. Instead, they were suspicious of the state's financial interests in gambling.

The mistrust by French participants is not based on factual evidence; statistics show that while the overall European rate of problem gambling is estimated to be 1 percent, Finnish estimates reached 2.7 percent (Turja et al., 2012), and the

prevalence of problem gambling in France stands at 0.9 percent (INPES, 2011). Indeed, as argued above, attitudes are not necessarily reflections of social reality, but rather are habitual. Specific cultural understandings of trust and justice may explain these differences. France and Finland differ both culturally and institutionally in how well institutions are trusted and how just they are considered to be.

The issue of public trust as an underlying principle in different cultures was examined by Fukuyama (1995) and in his analysis he divided the world into low-trust and high-trust societies. While Fukuyama doesn't base this division on religious affiliation, nonetheless, in Europe the low-trust societies are largely Catholic, such as France, and the high trust societies Protestant, such as Finland. Trust here does not merely refer to an individual personality trait, but to how the social world is experienced. As Putnam (2000) has argued, trust is based on changing social circumstances, telling us more about social systems than the individuals who act in them. Although Fukuyama's theory offers a rough generalization of national characteristics, the results of this study do seem to support it.

The levels of trust felt toward institutions depend on how just and fair these institutions appear. Rawls (1972) has even argued that politics cannot be separated from morals because institutions must appear to be just in order to be acceptable. In regard to gambling, jurisdictions need to be able to justify policies if they are to be accepted. It would appear that while the Finnish gambling sector has been able to make gambling acceptable because of its monopoly provision, gamblers in France do not feel that the national system offers enough protection. The data do not extend to consider whether the French attitudes toward gambling would remain equally suspicious if France had the current Finnish system, but as the differences in how the National Lotteries of the two countries are respectively judged show us, the French attitudes remain more negative than the Finnish even toward similar gambling opportunities. These differences are in line with the political traditions of the two countries. Finland is a Nordic welfare state with a tradition of state welfare policies, which may account for the general trust that political institutions will protect citizens. France, although also having a strong state presence, is a highly centralized country where citizens might have more difficulty in directly relating to political decision making. Gambling, and attitudes toward it, should be seen as part of these social and institutional contexts. Hence, the results from studies conducted in one cultural context cannot automatically be generalized to other societies. Instead, more comparative research in this area, and extending beyond the European context, would be required. In addition, longitudinal studies to determine the relationships between cultural values and changing institutional environments are needed.

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For correspondence: Virve Pöysti, University of Helsinki Department of Social Research, P.O. Box 54, 00014 University of Helsinki. Fax: (+358) 9 1911 239 67, [Website: www.helsinki.fi/sosiaalitieteet](http://www.helsinki.fi/sosiaalitieteet). E-mail: virve.poysti@helsinki.fi

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Virve Pöysti is a researcher at the University of Helsinki, Faculty of Social Research and a visiting researcher at the Paris 5 Descartes University in Paris, France. She is conducting a Ph.D. study centering on the social, cultural, and legislative differences of the Finnish and French gambling contexts.

A monetary valuation of the quality of life loss associated with pathological gambling: an application using a health utility index

Dimitri Kohler

Swiss Health Observatory, Neuchâtel, Switzerland

Abstract

This study estimates the Health Related Quality of Life (HRQoL) costs of gambling addiction. Pathological gamblers were recruited from treatment centers in Western Switzerland. The difference in HRQoL between pathological gamblers ($n=52$) and a sample drawn from the general population ($n=93$) was measured through a multi-item instrument, the SF-6D. We used a tobit regression to estimate the effect of pathological gambling on HRQoL, controlling for comorbidities and age. Finally, to obtain a monetary value of the HRQoL loss attributable to gambling addiction, we applied an existing value of a life year estimate. Results showed that pathological gambling is significantly associated with a decrease in the quality of life by 0.076 quality adjusted life year (QALY). The resulting cost per pathological gambler and per year was estimated at CHF 3,830. This study suggests that ignoring quality of life costs results in an underestimation of the social burden of gambling addiction.

Résumé

Notre étude avait pour but d'évaluer les coûts de la dépendance au jeu en fonction de la qualité de vie liée à la santé (QVLS). Nous avons recruté des joueurs pathologiques dans des centres de traitement en Suisse occidentale. Nous avons mesuré l'écart de QVLS entre ces joueurs ($n=52$) et un échantillon issu de la population générale ($n=93$) au moyen d'un instrument à variables multiples appelé SF-6D. Nous avons eu recours à la régression Tobit pour évaluer l'effet du jeu pathologique sur la QVLS en contrôlant les variables de la comorbidité et de l'âge. Enfin, nous avons attribué une valeur monétaire à la perte de QVLS associée à la dépendance au jeu en nous fondant sur une estimation de la valeur actuelle d'une année de vie (VAV). Les résultats révèlent un lien significatif entre la dépendance au jeu et une diminution de la qualité de vie, soit 0,076 année de vie ajustée en fonction de la qualité (AVAQ). Le coût annuel par joueur pathologique est évalué à 3 830 francs suisses. Il ressort clairement de notre étude que le fait de ne pas tenir compte

des coûts liés à la qualité de vie conduit à une sous-estimation du fardeau social de la dépendance au jeu.

Introduction

The cost of gambling addiction to society is a fairly new subject in the health economics literature. Politzer, Morrow, and Leavey (1981, Fall/Winter) were, through a sample of pathological gamblers in treatment, among the first to assess the cost of this specific addiction. More recently, Thompson, Gazel, and Rickman (1996) in Wisconsin, Westphal, Johnson, and Stevens (1999) in Louisiana, Schwer, Thompson, and Nakamuro (2003, February) in Southern Nevada, and Fong, Fong, and Li (2011) in Macao all investigated the social cost of gambling addiction. On a nationwide level, a comprehensive study in the United States focused on the prevalence and social cost of this particular addiction (Gerstein et al., 1999). Generally, two types of cost are estimated: (1) the expenses of treating the consequences of gambling addiction—direct costs—and (2) the productivity lost because of the habits of the pathological gamblers—indirect costs. In fact, little meaningful focus has thus far been placed on the loss of quality of life suffered by the pathological gambler and his or her family.

A notable exception was the report on gambling industries conducted by the Productivity Commission in Australia (1999). The Commission produced the most comprehensive study thus far to explore all aspects of gambling, including the attendant social burden of gambling. It was the first study in which the Health Related Quality of Life (HRQoL) costs were taken into account. It is worth noting that these costs account for more than 90% of the total burden of gambling addiction. Indeed, for gambling addiction (unlike alcohol abuse or smoking) the treatment costs are relatively low. It can be argued that this cost must be considered when estimating this social burden. In fact, a social cost estimate must consider *all* the external consequences created by gambling addiction. It can be argued that the loss of the quality of life of the gambler is a private cost, as it is the result of his or her behaviour alone. This interpretation would however mean that, because the cost is internalized or individual, it should not be included in the social cost estimation. This latter assumption is based on the model of rational addiction suggested by Becker and Murphy (1988), one which assumes that the addict is fully informed of the potential consequences of their actions, and acts as a rational consumer. An alternative view is that the gambler is not fully informed, most notably concerning the potential addictive risks of gambling and the odds of winning, and is probably not completely rational in outlook and behaviour; the loss of quality of life of the gambler should therefore be considered a social cost. In this paper, we support the latter position and thus follow the classical model suggested in the health economics

literature (Collins & Lapsley, 2002; Productivity Commission, 1999; Single et al., 2001).

Gambling studies show consistently that pathological gambling is associated with poorer quality of life. Using the Short-Form 12 version 2 (SF-12v2) in a general population survey, Morasco and colleagues (2006a) demonstrated that pathological gambling was significantly associated with a lower quality of life. This conclusion has been corroborated by a number of other studies based on selected samples of pathological gamblers. Indeed, Black, Moyer, and Schlosser (2003) used the Short-Form 36 (SF-36) to assess successfully the quality of life of pathological gamblers. The three researchers determined that this population exhibited lower physical and mental health subscale scores. Using the SF-12v2 in a sample of older adults, Erickson, Molina, Ladd, Pietrzak, and Petry (2005), as well as Pietrzak, Molina, Ladd, Kerins, and Petry (2005), discovered a negative correlation between this disorder and quality of life (see also Scherrer et al., 2005, for similar results).

Two other studies used the SF-12v2 to assess the health related quality of life of pathological gamblers recruited at a dental clinic (Morasco & Petry, 2006), and at an urban primary care clinic (Morasco et al., 2006b), respectively. In both studies, gambling disorders were found to be negatively correlated with scores on the SF-12v2 subscales. Using a self-rated quality of life measure, Fong, Campos, et al. (2011) found a significant lower quality of life for pathological gamblers compared to non-problem gamblers. However, no differences were identified between at-risk, problem, and pathological gamblers. Finally, Lin et al. (2010) concluded that the loss to income ratio was a good measure of the quality of life, and corroborated these previous findings.

Taken together, these results demonstrate unambiguously that this particular disorder is significantly associated with impairment in well-being. To strengthen this association, it is well established that pathological and problem gamblers display high rates of comorbidity (Petry, 2005; Westphal & Johnson, 2007). For example, elevated rates of substance use disorders are commonly observed in this specific population, most notably alcohol abuse, tobacco consumption and drug use (Fong, Campos, et al., 2011; Gerstein et al., 1999; Johansson, Grant, Kim, Odlaug, & Götestam, 2009; Momper, Delva, Grogan-Kaylor, Sanchez, & Volberg, 2010; Petry, 2005; Petry, Stinson, & Grant, 2005; Tidwell, & Parker, 2001; Welte, Barnes, Wieczorek, Westphal & Johnson, 2007). The frequency of mood disorders, particularly depression, is also substantially higher in this population compared to the respective frequencies in non-gamblers and non-problem gamblers (Bland, Newman, Orn, & Stebelsky, 1993; Cunningham-Williams, Cottler, Compton, & Spitznagel, 1998; Johansson et al., 2009; Momper et al., 2010; Petry, 2005; Petry et al., 2005; Westphal & Johnson, 2007).

Nevertheless, the causal path linking these disorders to problem gambling remains rather unclear. On the one hand, gambling problems may precede the onset of

depression (McCormick, Russo, Ramirez, & Taber, 1984). On the other hand, mood and anxiety disorders have also been found to predate and predict the onset of pathological gambling (e.g., Kessler et al., 2008). However, to estimate accurately the social cost attributable to pathological gambling, it is necessary to know whether the comorbidity precedes the onset of gambling addiction or is a consequence of this addiction. If the comorbid condition appears first and is unrelated to the gambling addiction, its cost should not be included in the estimation of the social burden of gambling addiction. Conversely, if the comorbidity resulted from the gambling addiction, then its cost must be included in this estimation. Given this high comorbidity and the lack of clarity on causal sequence, we attempted, in the present analysis, to identify, characterize and control for the comorbidities to avoid attributing all of the HRQoL loss to gambling addiction. The assumption that none of these comorbid disorders resulted from gambling addiction served to keep HRQoL estimates conservative.

The objective of this study was to find the HRQoL costs of problem and pathological gambling in Switzerland. The first step of this valuation process was to estimate the quality of life of pathological gamblers as compared to that of a control group. For this purpose, we used a preference-weighted HRQoL questionnaire, the SF-12v2, to obtain a health utility index. Using regressions, we estimate the HRQoL loss attributable to gambling addiction, controlling for comorbidities. The second step was to express this loss in monetary terms using the value of a life year (VOLY) estimate. Our main hypothesis was that pathological gambling would be associated with significant HRQoL costs, costs that must be considered in studies of the social cost of gambling.

This study was conducted in Switzerland, where gambling issues are still partly unknown as it is a fairly new concern for policy makers. Only a few studies based on general population surveys have investigated the prevalence of gambling disorders in Switzerland. Using the South Oaks Gambling Screen (SOGS), two prevalence surveys have been performed, the first in 1998 (Bondolfi, Osiek, & Ferrero, 2000) and the second in 2005 (Bondolfi, Jermann, Ferrero, Zullino, & Osiek, 2008). The aim of these surveys was to analyze whether the opening of 19 casinos in Switzerland in 2002 increased the prevalence of pathological gambling. In 2005, the researchers estimated the past year prevalence rate of pathological gambling at 0.5% of the population over 18 years of age compared to 0.8% in 1998. Thus, they could not identify a significant increase in the prevalence of pathological gambling due to the opening of the casinos. In 2007, the Swiss Health Survey (SHS) included some of the DSM-IV criteria to screen for pathological gambling. Using a composite index, the Federal Gaming Board (Eidgenössische Spielbankenkommission, 2009) concluded that 0.5% of the population aged 15 and over could be considered pathological gamblers.

The social burden of this disorder was assessed in three different studies. The first study was mandated by the Federal Gaming Board (Künzi, Fritschi, & Egger, 2004).

The authors determined an annual cost of gambling addiction of CHF 100 million (1 CHF = 1.1 USD). However, they did not consider the HRQoL costs, so this figure was probably largely underestimated. Moreover, this study did not clearly distinguish real costs and transfers. In 2009, the direct and indirect costs of casino gambling in Switzerland were estimated at CHF 69.7 million (Künzi, Fritschi, Oesch, Gehring, & Julien, 2009). More recently, a report based on the present study estimated to direct, indirect and HRQoL costs of problem and pathological gambling, and discovered significantly higher costs (Jeanrenaud, Gay, Kohler, Besson & Simon, 2012). In this study, the social burden of problem and pathological gambling was estimated between CHF 550 million and CHF 650 million per year.

Method

Sample and Data Collection

Pathological gamblers were recruited from treatment centers in Western Switzerland. The survey was approved by the ethics committee for clinical research of the Centre Hospitalier Universitaire Vaudois (CHUV) in Lausanne, Switzerland. Five treatment centers collected 52 questionnaires over a one-year period. The questionnaires were completed at the centers according to a standardized protocol. Treatment center staff members were asked to administer the survey as early as possible in the treatment process. Originally, the gambler's relatives were also asked to complete the questionnaires, but the number of responses was too small to proceed with analyses. To obtain a control group, shorter questionnaires were sent to a sample of the Swiss population during the same time period. This sample (n=93) was representative of the Swiss population in terms of age, gender and educational level.

Gambling Behaviour Assessment

As problem gamblers were recruited in treatment centers, they were already screened for their gambling behaviour and identified as problem or pathological gamblers at an early stage of their treatment. However, to validate the treatment center's diagnosis, we included the Lie/Bet questionnaire (Johnson et al., 1997) in our survey. We favoured this instrument because of its brevity: this brevity works to avoid extensive non-responses. Indeed, the two questions of the Lie/Bet questionnaire have been previously shown to be valid in detecting problem or pathological gamblers (Götestam, Johansson, Wenzel, & Simonsen, 2004; Johnson, Hamer, & Nora, 1998). Thus, this questionnaire was implemented only to confirm the first screening conducted by the treatment centers.

Valuation Instrument

A widely used method for assessing quality of life is the "Quality-Adjusted Life Years" (QALY) concept, first introduced by Klarman, Francis, and Rosenthal

(1968) in a cost-effectiveness analysis of the treatment of chronic renal disease. This concept is based on the argument that an individual's well-being is a trade-off between the quantity of years he or she will live, balanced against the quality of those years (Drummond, Sculpher, Torrance, O'Brien, & Stoddart, 2005). In fact, one year lived in full health does not bring the same utility to an individual as one year lived with a given disability. Values of this utility index can range between 0 and 1, representing the worst possible health state (0), and perfect health (1). The interpretation of a QALY is straightforward: an individual with a life expectancy of ten years with a given disability could experience a utility index of 0.6. This weight means that he gives the same value to ten years lived with his disability and 6 QALY in perfect health. The difference between the health utility (the weight) and 1 (perfect health) represent the decrease of utility an individual experiences each year because of his or her disability. In this study, we aimed to estimate this index to show how the quality of life of pathological gamblers is reduced each year.

In economics two methods are commonly used, specifically the Standard Gamble (SG) and the Time-Trade Off (TTO). The first method is based on the expected utility theory developed by von Neumann and Morgenstern (1944). The second method was developed by Torrance et al. (1972), and can be seen as a simplified version of the Standard Gamble. Both methods present individuals with different choices using probabilities and life expectancy to obtain finally a utility index that is associated with a specific disability. Other methods are based on standard self-completed questionnaires that aim to describe on a scale how impaired an individual is in daily activities and social interaction. This is notably the case of the SF-6D (Short Form-6 dimensions), the HUI (Health Utility Index) or the EQ-5D (EuroQol-5 dimensions). With a specific algorithm it is now possible to assign a utility index value to an individual depending on his or her answers. The principal difference between these questionnaires and the TTO or SG is that they are descriptive, and do not therefore include choices to obtain the health utility index value.

In this study we favoured the second approach, based on standard questionnaires, because of their ease of use, and because no face-to-face contact with the pathological gamblers was needed. Moreover, these multi-item instruments generally contain specific questions regarding mental health. We focused our attention on two widely used questionnaires: the SF-6D (Brazier, Roberts, & Deverill, 2002; Brazier, Usherwood, Harper, & Thomas, 1998) and the EQ-5D (Dolan, Gudex, Kind, & Williams, 1996). Both questionnaires use an algorithm to obtain a single health utility index value for each participant. Although both the SF-6D and EQ-5D are able to discriminate between different health states, they also each contain unique, particular characteristics. The fact that each questionnaire includes unique characteristics has been a matter of interest in recent years (Ariza-Ariza et al., 2006; Barton et al., 2008; Brazier, Roberts, Tsuchiya, & Busschbach, 2004; Longworth & Bryan, 2003; Petrou & Hockley, 2005; Pickard, Johnson, & Feeny, 2005; Sobocki et al., 2007). Probably the most important differences lie in the

range of utility scores and the number of health states defined. The EQ-5D describes 243 different health states and can generate a range of utility values between -0.594 (worst health state) and 1 (best health state). The SF-6D can describe 18,000 potential health states and generates utility values from 0.296 (worst health state) to 1 (best health state) (Brazier et al., 2004). Another difference lies in the valuation method used to obtain the two scoring algorithms: whereas the algorithm of the EQ-5D is based on a TTO survey, the SF-6D uses a SG survey.

Because of these differences, the scores of the two instruments each display unique patterns relative to the other. First, EQ-5D scores show a ceiling effect, whereas SF-6D scores show a floor effect (Brazier et al., 2004; Kopec & Willison, 2003), resulting in greater utility scores with EQ-5D than with SF-6D for people in particularly good health. The inverse is true for individuals indicating particularly poor health (Longworth & Bryan, 2003; Petrou & Hockley, 2005). Moreover, the SF-6D mean score is higher than the score produced by the EQ-5D, and the latter exhibits a larger standard deviation (Brazier et al., 2004). Petrou and Hockley (2005) calculated the relative efficiencies of the EQ-5D and SF-6D in detecting minimally important differences in external indicators of health status. The relative efficiency is defined as the ratio of the square of the t-statistic of the comparator (the SF-6D in Petrou & Hockley, 2005) to the square of the t-statistic of the reference instrument (the EQ-5D). Using this measure, Petrou and Hockley (2005) concluded in favour of the SF-6D, which was found to be more efficient than the EQ-5D in detecting differences in self-reported health status. This result is important because it implies that the SF-6D requires a smaller sample size to detect minimally important differences in health outcomes. Moreover, the SF-6D includes more specific items focusing on mental health. Given these important advantages of the SF-6D over the EQ-5D, we chose the SF-6D despite its lower response rate (Barton et al., 2008; Brazier et al., 2004). The SF-6D scores were computed using the QualityMetric Health Outcomes™ Scoring Software 2.0. This instrument makes it possible to compare the HRQoL of pathological gamblers with that of the general population. Thus, using regression analysis, we could estimate the share of the total HRQoL loss attributable to pathological gambling after controlling for comorbidities.

Statistical Analysis

HRQoL as measured by the SF-6D is characterized by a significant floor effect. This means that the true variation among particularly disabled people is not captured, resulting in censored measures. Indeed, the health utility index is not sensitive enough to describe health states below a certain floor threshold. Given this pattern, the use of a tobit regression (Austin, Escobar, & Kopec, 2000; Tobin, 1958) provides unbiased and consistent estimates (Maddala, 1983). Tobin (1958) argues that we must take into account the concentration of observations at the limiting value to estimate the relationship between a limited variable and other explanatory variables. Thus, an independent variable may have an influence on the probability of limit responses and on the size of the non-limit responses. His idea is to combine a probit

analysis for the probability of the response being censored and a multiple regression for the value of the response variable by using maximum likelihood estimation. However, this is a parametric model that relies on strong assumptions regarding homoskedasticity and normality of the errors. It has been shown (Arabmazar & Schmidt, 1981) that this model should not be used if these assumptions are not met because inconsistent estimates may result accordingly. Instead, a more robust alternative can be used, such as the censored least absolute deviations estimator (CLAD). This model, introduced by Powell (1984), is an extension of the least absolute deviations (LAD) estimator applied to the censored regression model. Powell (1984) developed a consistent semi-parametric estimator that assumes a functional form only for the regression, but no assumptions are made on the distribution of the residuals. This property makes it superior to the tobit, especially when the errors are not normally distributed (Paarsch, 1984). Moreover, this estimator is also robust to heteroskedasticity.

Variables

Quality of life was measured through a reduced form of the SF-36 (Ware & Gandek, 1994) called the SF-12v2 (Ware, Kosinski, & Keller, 1995). This standardized questionnaire contains 12 items that collectively produce scores on eight dimensions, namely: (1) physical functioning, (2) role physical, (3) bodily pain, (4) general health, (5) vitality, (6) social functioning, (7) role emotional and (8) mental health. The quality of life is estimated through the SF-6D which consists in a combination of these scores into six dimensions—(1) physical functioning, (2) role limitations, (3) social functioning, (4) pain, (5) mental health and (6) vitality—to obtain a health utility index (Brazier et al., 1998; Brazier et al., 2002; Brazier & Roberts, 2004). With this instrument, the impact of various diseases on HRQoL has been estimated, including insomnia (Morgan, Dixon, Mathers, Thompson, & Tomeny, 2003), asthma (Szende, Svensson, Ståhl, Mészáros, & Berta, 2004), stroke (Pickard et al., 2005), obesity (Kortt & Clarke, 2005), age-related macular degeneration (Espallargues et al., 2005; Kortt & Clarke, 2005) and low back pain (Hollingworth et al., 2002). This index was used as the dependent variable in our regressions. Respondents were also asked to rate their health state on a visual analogue scale (VAS) to check the level of adequacy of our health utility index. The VAS adopted is similar to the EQ-5D VAS (Dolan et al., 1996).

To control the regression, we screened for the comorbidities commonly associated with pathological gambling. Alcohol abuse was identified using the CAGE questionnaire (Mayfield, McLeod, & Hall, 1974) with a cut-off point of two and over. Given the high rate of depression among pathological gamblers, we also screened for this particular mood disorder by using the Patient Health Questionnaire 2 items (PHQ-2) (Kroenke, Spitzer, & Williams, 2003; Whooley, Avins, Miranda, & Browner, 1997). We favoured this instrument because of its brevity and its efficacy in detecting depression. Drug abuse and tobacco consumption were assessed with closed questions. A dummy variable was created

for each of these comorbidities. To obtain some sense of the causal path between pathological gambling and these comorbidities, we asked respondents whether they had started to experience these disorders before or after the onset of their gambling addiction. The latter was considered auxiliary information that was not used in this research to make a definitive statement regarding causality.

Respondents were also screened for chronic diseases by asking if they were being treated or had ever been treated for a diverse set of chronic diseases, specifically, and as categorized, migraine, asthma, diabetes, osteoarthritis/arthritis, gastric/duodenal ulcers, osteoporosis, chronic bronchitis/emphysema, hypertension, myocardial infarction, heart attack, kidney disease/kidney stones, cancer/tumors, and hay fever/other allergies. As this list is not exhaustive, a field named “other” was added to determine the presence of other diseases. Finally, we asked an open-ended question about whether the respondent suffered from any chronic physical disability. Because of the sample size, we could not create a dummy variable for each of the chronic diseases. Instead, the chronic diseases and physical disability were grouped into one dummy variable indicating whether the individual had ever suffered from any of them. To control for age, we constructed three age groups representing individuals aged 18 to 35 years, 36 to 55 years, and over 55 years, respectively.

Results

Descriptive Statistics

In this analysis, we collected 52 questionnaires from pathological gamblers in treatment. All subjects were also identified as problem or pathological gamblers according to the Lie/Bet questionnaire. For the control group, 93 individuals from the general population were interviewed, resulting in a total of 145 questionnaires across the two samples combined. The health utility index is summarized in Table 1. As expected, this index shows a strong correlation of $r = 0.67$ with the VAS, attesting to its validity.

Table 1
Descriptive statistics of the health utility index

Dependent variable	Control group (n=93)		Pathological gamblers (n=52)		<i>F</i> (ANOVA)
	Mean	Std. deviation	Mean	Std. deviation	
Health Utility Index (SF-6D)	0.742	0.113	0.623	0.089	42.399**

*p< .05; ** p< .01

Table 1 shows a significantly lower quality of life among the pathological gamblers than among the control group. Indeed, pathological gamblers showed a mean quality of life 0.12 units lower than that of the control group. At this stage of the analysis, this difference was not surprising because pathological gamblers experience higher rates of comorbidity relative to the control group. Table 1 showed an average health utility index for the control group at 0.742. Interestingly, using EQ-5D, the health utility of the general population in the French-speaking part of Switzerland was somewhat higher and estimated at 0.83 (Perneger, Combescure, & Courvoisier, 2010). However, as we assessed our utility index with the same instrument (SF-6D) for our pathological gambler and control samples, this pattern would not influence the results. Indeed, if there was to be a bias, it would instead be observed for the two samples, and thus the differences between the two would not be influenced accordingly. At this stage, a more detailed analysis using regression methods is needed to estimate the amount of this group difference that is attributable to pathological gambling.

The descriptive statistics for the independent variables are presented in Table 2. According to the univariate analysis of the χ^2 statistics, all the categorical variables except age group exhibited some significant differences between the control group and the pathological gamblers. The pathological gamblers were more likely to suffer from any of the screened chronic diseases or from physical disability. Indeed, only 43.0% of the control group reported any health problems, compared to 63.3% of the pathological gamblers. The proportion of smokers among pathological gamblers was more than twice that of the control group. Moreover, 44.2% of the pathological gamblers were identified as suffering from depression, according to the PHQ-2 screening questionnaire. This proportion was about twice as high as the proportion

Table 2
Descriptive statistics of the variables

Variables	Control group (n=93) %	Pathological gamblers (n=52) %	χ^2
Age			
18–35	31.2	19.2	2.4
36–55	46.2	55.8	1.2
56 and over	22.6	25.0	0.1
Any chronic disease or physical disability	43.0	63.3	5.1*
Smoking status			
Smoker	33.3	76.9	
Non-smoker	66.7	23.1	25.4**
Depression (PHQ-2)	22.8	44.2	7.2**
CAGE			
< 2	87.1	56.9	
≥ 2	12.9	43.1	16.7**

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

identified among the control group. According to the CAGE screening questionnaire, pathological gamblers also exhibited a rate of alcohol abuse more than three times the rate reported by the control group.

HRQoL Loss Attributable to Gambling Addiction

To estimate the loss of quality of life attributable to gambling addiction, we ran three regressions: an ordinary least squares (OLS) regression, a tobit regression, and a CLAD. In our sample, no respondent had the worst possible health state detectable with the SF-6D. However, one individual had a health utility index of one, characterizing perfect health. Because of this pattern, we decided to use a right censoring for the tobit and the CLAD regression for this value. We controlled the regressions for age, tobacco and alcohol consumption and the screened comorbidities. The results of the regressions are presented in Table 3.

The coefficients of the three models showed the same patterns. Moreover, the models were shown to be valid according to either the F or the χ^2 fit statistic. No significant effect of age group was found on the health utility index. Problematic alcohol consumption, as screened by the CAGE, decreased quality of life significantly, by 0.043 for the OLS, 0.044 for the tobit model, and 0.047 for the CLAD. In these regressions, smoking status did not seem to have a significant influence on the health utility index. However, a depression diagnosis significantly affected quality of life across all respondents. This effect was the largest of the analysis, decreasing the QALY by 0.099 (OLS and tobit) to 0.102 (CLAD). Having any chronic disease or physical disability also negatively affected the health utility

Table 3

OLS, tobit and CLAD regressions modeling the impacts of demographics, gambling addiction and comorbidities on the health utility index

Variables	OLS		Tobit		CLAD	
	Coeff.	Std. dev.	Coeff.	Std. dev.	Coeff.	Std. dev.
Age (ref: 18–35)						
36–55	0.012	0.021	0.013	0.021	0.012	0.033
56 and over	0.010	0.027	0.012	0.026	0.003	0.041
Depression symptoms ^a	−0.099**	0.018	−0.099**	0.018	−0.102**	0.023
Any chronic disease or physical disability	−0.056**	0.020	−0.057**	0.019	−0.069*	0.031
CAGE	−0.043*	0.020	−0.044*	0.020	−0.047*	0.024
Smoker	−0.002	0.018	−0.002	0.018	−0.009	0.023
Pathological gambler	−0.081**	0.020	−0.081**	0.020	−0.071**	0.025
Constant	0.792**	0.018	0.793**	0.017	0.797**	0.025

^a Measured using the PHQ-2

* p < .05; ** p < .01;

index. Again, the impact was larger for the CLAD estimates than for the OLS and tobit regressions. Finally, being a pathological gambler had a significant negative impact on quality of life, decreasing the QALY by 0.081 (OLS and Tobit) to 0.071 (CLAD). The results of the three regressions were highly convergent. The explanation for this pattern lay in the censored values. Indeed, in our data, only one observation had health utility index of 1 and none reached the floor value.

Interestingly, the constant term was significant but not equal to 1. However, it would be reasonable to assume that an individual, who is between 18 and 35 years old, does not have any depression symptoms or problematic alcohol consumption, does not smoke, is not a pathological gambler and does not have any chronic disease or physical disability should have a health utility index of 1. Thus, a second set of OLS and tobit regressions was done, constraining the constant term to be equal to 1. The results are presented in Table 4.

Interestingly, adding this constraint increased the impacts of almost all variables on the health utility index. Moreover, increasing age as well as tobacco use, now significantly decreased quality of life. The impact of pathological gambling on HRQoL decreased slightly in these models, but the statistical effect remained highly significant. It is worth noting that the coefficients for pathological gambling remained very similar to the coefficients obtained in the unconstrained regressions. Again, the fit statistics showed that the models were valid.

In the two sets of regressions, we controlled for the influence of the different co-occurring health problems on HRQoL. Thus, to keep estimates conservative we assumed that none of these disorders resulted from gambling addiction. However,

Table 4

OLS and tobit regressions modeling the impacts of demographics, gambling addiction and comorbidities on the health utility index with the constant term equal to 1

Variables	OLS		Tobit	
	Coeff.	Std. dev.	Coeff.	Std. dev.
Age (ref:18–35)				
36–55	−0.132**	0.025	−0.131**	0.025
56 and over	−0.128**	0.034	−0.123**	0.034
Depression symptoms (PHQ-2)	−0.146**	0.026	−0.146**	0.025
Any chronic disease or physical disability	−0.068*	0.028	−0.070*	0.028
CAGE	−0.059*	0.029	−0.060*	0.028
Smoker	−0.081*	0.024	−0.082**	0.024
Pathological gambler	−0.076*	0.029	−0.076**	0.028
Constant	1.0	n.a	1.0	n.a

*p< .05; ** p< .01

the questions related to the relative order of onset of the different comorbid disorders reported by problem or pathological gamblers highlights some interesting patterns. Particularly among the depression diagnoses where 72.7% of the patients declared that these symptoms followed the onset of their gambling problems, suggesting that for many pathological gamblers comorbid depression should be considered when calculating the social costs of pathological gambling. Results were much less pronounced for alcohol and tobacco. Regarding alcohol consumption, only 14.3% reported an increase in their alcohol consumption since the onset of their excessive gambling behaviour with the same percentage, indicating that their alcohol consumption had decreased. For tobacco consumption, only 12.5% of the disordered gamblers began to smoke after their gambling problems appeared while 11.6% were smokers before their gambling problems and stopped after the onset of the latter.

Monetary Value of the HRQoL Loss

The statistical analysis allowed us to estimate the HRQoL loss suffered by the pathological gamblers. According to the constrained tobit coefficients, pathological gamblers' quality of life score was lowered by 0.076. The final step of this estimation was to obtain a monetary value for this loss.

Several studies have estimated the VOLY (Abelson, 2003; Chilton, Covey, Jeanrenaud, & Marti, 2007, July; Jones-Lee, Loomes, & Metcalf, 2004; National Public Health Partnership, 2003; Scapecchi, 2007; Soguel & van Griethuysen, 2000). VOLY represents the monetary value individuals attach to a year lived in full health. If we combine the loss of quality of life due to pathological gambling with the VOLY estimated for the Swiss population, we obtain the HRQoL costs resulting from pathological gambling.

Jeanrenaud and Marti (2007, July) estimated the VOLY for the Swiss population. They obtained one estimate of CHF 80,000 and another of CHF 50,400 as the value of a year lived in good health (1 CHF = 1.1 USD). To produce a conservative estimate, we used the lower value of 50,400 CHF. This value was in line with a European study that estimated the VOLY for air pollution at 40,000€ (Desaigues et al., 2011). To obtain the annual HRQoL costs for an addicted gambler, we multiplied the Swiss value by the constrained tobit coefficient (0.076), resulting in a cost of CHF 3,830 per pathological gambler per annum. Using a 95% confidence interval, we obtained a cost range between CHF 1,058 and CHF 6,653 per gambler, per annum (Table 5).

Discussion and Limitations

In this study, we assessed the HRQoL costs of pathological gambling using a health utility index. To our knowledge, this was the first time such a health utility index had been estimated for this specific population. Moreover, we were able to assess the net

Table 5
Annual HRQoL costs of pathological gambling

	Lower bound *	Reference estimate	Upper bound *
Tobit constrained coefficients	0.021	0.076	0.132
Value of a life year (VOLY)		CHF 50,400	
Annual HRQoL costs of pathological gambling (CHF) ^a	1,058.40	3,830.40	6,652.80

^a 1 CHF = 1.1 USD; * $\alpha=0.05$

impact of pathological gambling since we controlled for the impact of the different co-occurring disorders. In line with our initial hypothesis, pathological gambling was shown to be associated with a significant loss of quality of life. Furthermore, the different specifications of the regression models did not influence the HRQoL attributable to pathological gambling, suggesting that the findings are robust. Using the VOLY, we estimated the HRQoL costs to be between CHF 1,058 and CHF 6,653, with a reference estimate of CHF 3,830 per year per addicted gambler. Based on the present results, a recent study estimated the annual cost of gambling disorders (Jeanrenaud et al., 2012) in Switzerland. According to this report, the HRQoL costs represented between 20% and 30% of the total social cost. This proportion was lower than that presented by the Australian Government Productivity Commission study in its report (1999), which found that this cost accounted for more than 90% of the total social cost. However, both studies agree that a significant part of the total social costs of pathological gambling is attributable to the loss of quality of life associated with this disorder.

A secondary objective of this study was to test a simple tool for estimating a health utility index. As the SF-6D seems to be sensitive enough for this specific population, future estimates of the social cost of gambling addiction can be made more accurate by including the HRQoL costs. Thus, these standardized questionnaires may prove an interesting and more convenient alternative to such traditional economic tools as the Time Trade-Off or Standard Gamble.

In this paper, we endeavored to use conservative values for the VOLY to estimate the monetary value of the HRQoL loss. However, in our sample, 72.7% of the pathological gamblers who suffered from depression declared that their depressive symptoms were a consequence of their gambling addiction. This conclusion was consistent with the results of a study by McCormick et al. (1984). Therefore, it might be argued that to produce a more comprehensive estimation of the quality of life impact of pathological gambling, part of the utility loss due to depression (0.15) should be attributed to gambling addiction. Moreover, the regressions were controlled for all comorbidities. This fact implies that all comorbidities are treated as co-occurring health problems and thus not as a negative side-effect of gambling addiction. Using this process allowed us to obtain the most conservative estimates of

the HRQoL loss attributable to pathological gambling. However, further research based on longitudinal data should focus on the causal pathways between gambling addiction and the different comorbidities to enable a more precise estimation of the loss of quality of life created by pathological gambling. Finally, the relatives of the gamblers were not included in this analysis. However, as shown in the Productivity Commission study (1999), the relatives of pathological gamblers also suffer from a loss of quality of life, which should be taken into account to achieve a comprehensive estimate of the HRQoL costs of gambling addiction.

The results of this analysis should be considered with three main limitations in mind. First, because of the specificity of this analysis, pathological gamblers were not drawn from a random and representative sample. As the proportion of problem gamblers that turned to treatment centers was low, sampled individuals may not have been representative of the average problem gambler. We expected them to suffer from a larger loss of quality of life. However, as we used conservative estimates, this bias was partly mitigated accordingly. Second, the size of our sample was limited to 145 individuals. In fact, pathological gamblers are hard to reach. Indeed, between 1% and 2% of the population suffer from this disorder, and it has been shown that only about 1% of them present for treatment. As a matter of fact, only a particularly small number of consultations are registered for this specific disorder. Moreover, pathological gamblers may consult their own therapist and not turn to centers specifically dedicated to the treatment of gambling problems. Thus, only 52 questionnaires were gathered from pathological gamblers during the investigation period among the treatment centers. Finally, we investigated the most commonly accepted comorbidities and did not screen for more specific mood or anxiety disorders such as hypomania or posttraumatic stress disorder as the associations with pathological disorder are mixed.

Despite these few limitations, the interesting conclusions of this first study should encourage a larger survey investigating this topic based on a large and representative sample of the population.

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Dimitri Kohler works at the Swiss Health Observatory as a project manager. His responsibilities include determination of the trends and characteristics of the Swiss health care system. Dr. Kohler obtained a PhD degree in health economics at the University of Neuchâtel, then earned both a postgraduate degree in statistics at the University of Neuchâtel and a master's degree in economics at the University of Fribourg. He continues to collaborate in his research with those institutions in Switzerland responsible for preventing gambling addiction.

The mediating effect of depression between superstitious beliefs and problem gambling: a cross-cultural study of Chinese and Caucasians residing in the United States

Jungsun Kim,¹ Mikael Ahlgren,² & Bo Bernhard³

¹William F. Harrah College of Hotel Administration, University of Nevada, Las Vegas, Nevada, USA

²School of Hospitality Management, Pennsylvania State University, University Park, Pennsylvania, USA

³Departments of Sociology and William F. Harrah College of Hotel Administration, University of Nevada, Las Vegas, Nevada, USA

Abstract

The purpose of this study was to address the mediational role of depression in the association between superstitions and problem gambling and to test whether this mediating process is significantly different between Chinese and Caucasian Americans. Eight items assessing superstitious beliefs, the 21-item Beck Depression Inventory-II, and the 20-item South Oaks Gambling Screen (SOGS) were completed by 115 Chinese gamblers and 187 Caucasian gamblers residing in the United States, and the responses between tests and between groups compared. Path analysis results showed that superstitious beliefs had a significant effect on both Chinese and Caucasian gamblers' SOGS scores (i.e., problem gambling symptoms). In both groups, depression played a significant mediating role between the superstitious beliefs variable and the problem gambling variable. Future clinical research might use the findings of this study to develop specific prevention and treatment approaches focusing on a gambler's cognitive bias and negative mood.

Résumé

Notre projet avait pour but d'étudier le rôle médiateur de la dépression dans la relation entre superstitions et jeu problématique et de déterminer si des différences existent entre les Américains d'origine chinoise et ceux d'origine européenne. Nous avons comparé les réponses données par 115 joueurs d'origine chinoise et de 187 joueurs d'origine européenne résidant aux États-Unis à huit questions sur les croyances superstitieuses, au Beck Depression Inventory II (21 questions) et au South Oaks Gambling Screen (SOGS) (20 questions). Les résultats de l'analyse des

pistes causales révèlent que les croyances superstitieuses ont eu une incidence notable sur les résultats au SOGS dans les deux groupes (c.-à-d. symptômes attestant de problèmes de jeu). Dans l'un comme dans l'autre, la dépression a joué un rôle médiateur important entre la variable liée aux croyances superstitieuses et la variable liée aux problèmes de jeu. Les conclusions de notre étude pourraient servir à orienter les recherches vers la conception de méthodes de prévention et de traitement axées sur la distorsion cognitive et l'humeur négative.

Introduction

With the global rise in access to gambling, interest in pathological gambling (PG) and related disorders has also increased markedly. In the United States, the prevalence of PG and problem gambling has been reported as being 1% to 2% and 2% to 5%, respectively (American Gambling Association, 2012; Petry, 2005), a finding that has been reasonably consistent internationally (Stucki & Rihs-Middel, 2007). Although the concepts are inextricable, problem gambling is commonly characterized as describing those gamblers who meet less than the number of criteria for a diagnosis of PG (Lesieur & Rosenthal, 1998). Problem gamblers are also described as in-transition gamblers who are moving either toward or away from pathological states (National Research Council Staff, 1999). In the increasingly important China-Hong Kong-Macau nexus, Fong and Ozorio (2005) found 2.5% of Macau respondents could be classified as PGs. Wherever the location, the consequences of PG include both economic (D. M. Walker, 2007) and psychological factors (Linden, Pope, & Jonas, 1986; McCormick, Russo, Ramirez, & Taber, 1984) and extend to social problems (Frost, Meagher, & Riskind, 2001; Ibanez et al., 2001; Johansson, Grant, Kim, Odlaug, & Götestam, 2009). PG has emerged as a significant global public health issue. With the continuing domestic and international proliferation of legalized commercial gaming, it becomes especially critical to gain a better understanding of underlying factors that might contribute to PG in diverse locales and cultures.

Previous studies have suggested that the two main influences on PG and related disorders are culture and cognitive biases. In his pioneering work on this topic, M. B. Walker (1992) posited that the opportunity to gamble clearly depends on the culture in which the individual lives. For example, many PGs believe that a variety of superstitious behaviors can influence outcomes—a belief that is particularly powerful in China, where the domestic film industry glorifies gambler-heroes who do just that. Appropriately, Raylu and Oei (2004) expressed concern that most previous studies of problem gambling are based on Western samples, but that the results have been generalized to other cultural groups without direct testing of the latter. They also stressed that generalization of the current literature to all cultural groups is inappropriate, given the different ways that gamblers from different

cultures experience gambling. Henrich, Heine, and Norenzayan (2010) criticized the tendency of human behavioral and psychological researchers to generalize their results without including pertinent cautionary notes. As an example, Arnett (2008) found that the substantial majority of study subjects (96%) in the top psychology journals were from Western industrialized countries. Henrich et al. (2010) stressed differences in basic cognitive and motivational processes across populations. For instance, Westerners characteristically rely on analytical reasoning and prefer to separate objects from their context. In contrast, non-Westerners such as Asians tend to reason holistically by considering people's behavior within the framework of the related situation.

A recent study by Loo, Raylu, and Oei (2008) reviewed 25 previous studies with a total sample of 12,848 Chinese community participants and 3,397 clinical participants. The authors concluded that Chinese gamblers are generally more inclined to possess erroneous beliefs and to commit cognitive errors, which in turn perpetuated gambling problems. Furthermore, the authors noted that the main differences between the Chinese and other groups seem to be related to distorted beliefs and cognitions that stemmed from superstitions. However, they criticized these studies on the basis of a variety of issues, including theoretical foundations, methods, and analytical rigor. For instance, only a single study (i.e., Papineau, 2005) of 25 specifically tested the influence of superstitious beliefs on problem gambling behavior.

Rationale of This Study

The need for further work in this area is apparent in order to assist researchers and clinicians with diagnoses, interventions, and treatment plans. Of importance, aspects of Chinese culture may preclude certain gambling behaviors from being viewed as problematic, as they represent part of their cultural belief system (Papineau, 2005). The current study focuses on a particularly neglected aspect of PG and related disorders: potential cultural differences between Asian and Western cultures. Despite the global growth of the gaming industry, a lack of information remains concerning the gambling cognitions of specific cultural groups who may be at particularly high risk for developing gambling problems or related disorders such as depression. This lack of knowledge may be partially attributable to a lack of adequate measures for assessing gambling cognitions (e.g., gambling superstitious beliefs) that may influence people's gambling behavior to varying degrees, depending on cultural effect. Thus, the specific aims of this study are (a) to address the mediational role of depression in the association between superstitions and problem gambling and to test any overarching differences in these relationships between Chinese and Caucasian Americans and (b) to explore differences between Chinese and Caucasian Americans in gambling behavioral variables (i.e., types of games, level of gambling loss, and gambling frequency). In addition, the mediating effect of depression on the path from superstitious beliefs to problem gambling relies on the presence of several sets of relationships (Baron & Kenny, 1986). First,

superstitious beliefs (i.e., the antecedent predictor) should have a direct effect on depression (i.e., the mediator). Second, there must be a direct effect of depression on problem gambling (i.e., the dependent variable). Third, there must be a direct effect of superstitious beliefs on problem gambling. In the following section, we discuss the literature and theory that supports each of the requisite sets.

Theoretical Foundations and Development of Hypotheses

Superstitious Beliefs and Problem Gambling

Previous studies suggest that culture and related cognitive biases have a marked impact on PG and related disorders such as depression. For example, previous research has suggested that gamblers are generally influenced by (a) the extent to which different types of gambling are available within their culture (historically and currently); and (b) the attitudes and customs of their given cultures (including cognitive and superstitious customs) that encourage or discourage involvement in gambling behavior (M. B. Walker, 1992). Several studies have also suggested that cognitive biases and distortions contribute to the development of PG. For example, gamblers often have false superstitious beliefs that they are able to influence the outcome of a chance event by using lucky charms or rituals. Lotto players tend to believe in hot and cold numbers despite possessing knowledge as to the actual probability of winning (Ariyabuddhiphongs & Chanchalernporn, 2007; Carroll & Huxley, 1994; Rogers, 1998; Toneatto, 1999; M. B. Walker, 1992).

Previous studies also suggest that these illusions of control and unrealistic outcome perceptions are more prevalent among problem gamblers (Dragonetti & Tsanos, 1997; Gupta & Derevensky, 1998a; Toneatto et al., 1997). A previous study found that electronic gaming machine problem gamblers showed a significantly higher rate of superstitious beliefs than non-problem gamblers did (Joukhador, Blaszczynski, & Maccallum, 2004). The authors recommended further replication of their study because of the limited game type (i.e., electronic gaming machine, a low-skill game), the lack of ethnic diversity, and the relatively small sample size (56 problem gamblers and 22 non-problem gamblers). A recent study by Zheng, Walker, and Blaszczynski (2010) focused on the role of superstitious beliefs related to Mahjong, a popular game in Chinese communities all over the world. Some participants reported that they play this game to earn quick money, as it permits a quick exchange of money, with hands lasting an average of 5.5 min (Bell, 1976), while others reported that they play this game primarily for the opportunity to socialize. The authors found that players who used Mahjong for non-leisure purposes (i.e., winning money, chasing losses, or escaping life problems) were more superstitious than were those who played for leisure.

Over the past 5,000 years, Chinese culture has accumulated many distinctive superstitious traditions (Huang & Teng, 2009). Many Chinese believe the position of a building and the interior arrangement of furniture (i.e., *feng-shui*) can influence

events inside that building, for example, whether those inside the structure will become rich and prosperous (Tsang, 2004). Furthermore, numbers play an important role in Chinese culture. For instance, many Chinese executives prefer product prices that use the number 8 and avoid using the number 4. This is because in the Chinese language, the pronunciation of “four” sounds similar to the word for “death,” and “eight” sounds similar to the word for “prosperity” (Huang & Teng 2009; Simmons & Schindler, 2003). Likewise, hotels or apartments in China and Taiwan usually do not have a fourth floor (Huang & Teng, 2009). Finally, a recent study by Huang and Teng (2009) with Taiwanese gamblers found other superstitious beliefs related to gambling: (a) not drinking “Supau” (a popular drink in Taiwan) before gambling because “Su” sounds like the word for “losing” in Chinese; (b) not having sex before gambling because of the possibility of losing positive energy (*chi*); and (c) not reading books before gambling because “Su” also sounds like the word for losing (*shu*) in Chinese. Given these previous research findings, the present study predicts that problematic gambling behavior in both Chinese and Caucasian gamblers will be influenced by their level of superstitious beliefs. In particular, Chinese American gamblers are expected to be more strongly affected by superstitious beliefs when compared with Caucasian American gamblers. This reasoning leads to the following hypotheses:

H1: Gamblers with higher levels of gambling superstitious beliefs will score higher on the problem gambling scale in both Caucasian and Chinese groups.

H2: Superstitious beliefs will have a stronger impact on Chinese gamblers’ problem gambling than on that of Caucasian gamblers.

Superstitious Beliefs and Depression

Fate control, including superstitious beliefs, has been identified as an example of gambling-related cognitive distortions (Toneatto, 1999). A study by Leung and Bond (2004) suggests that fate control refers to the general belief in the existence of external forces, including destiny, fate, and luck, that affect life events. Furthermore, fate control also describes the ability to influence or shape outcomes by engaging in certain culture-specific activities. When examined, the cognitive thinking of gamblers has been frequently shown to contain elements of this belief in cause-and-effect relationships; gamblers subscribe to the notion that they are somehow able to predict or impact the outcome of future events (Ladouceur & Walker, 1996; Raylu & Oei, 2002; Sharpe, 2002; Steenbergh, Meyers, May, & Whelan, 2002; Tang & Wu, 2010; Toneatto & Sobell, 1990). According to Tang and Wu (2010), fate control belief has a direct effect on negative mood, while showing only an indirect effect on problem gambling. This finding suggests that a gambler’s accurate understanding of the probabilistic parameters related to casino games can be undermined by their notions of fate control. Operationally, gamblers who adopt fate control beliefs were found to be more likely to partake in behaviors such as persisting in gambling despite mounting losses, and therefore were eventually left

depressed when the expected fate of winning failed to materialize (Getty, Watson, & Frisch, 2000; Morasco, Weinstock, Ledgerwood, & Petry, 2007; Oei, Lin, & Raylu, 2008; Scherrer et al., 2005; Tang & Wu, 2010). On the basis of these previous studies, this study suggests the following hypothesis:

H3: Gamblers with higher levels of gambling superstitious beliefs will score higher on the depression scale in both Caucasian and Chinese groups.

Gambling Addiction and Depression

Previous studies demonstrated a positive relationship between problem gambling and depression, suggesting depression as one of the major comorbid mental health disorders in problem gambling (e.g., Chang, 2007; Shek, 1991). According to Getty et al. (2000), Gamblers Anonymous members reported higher levels of depression on the Beck Depression Inventory (BDI) than non-members did. Furthermore, it has been suggested that depression and other mood disorders may often exist before gambling problems develop (Feigelman, Wallisch, & Lesieur, 1998; Kessler et al., 2008). From a review of 80 studies relevant to mood disorders and problem gambling (Martin, 2004), it appears that mood disorders predate the onset of PG and may play a causative role as gamblers seek relief from depression, but gambling does not appear to relieve depression. Instead, gambling may worsen depression because of the negative effects of gambling (e.g., financial losses, strained relationships). Researchers Gupta and Derevensky (1998b) used path analysis to demonstrate that among adolescents, depression was a predictor of problem gaming and not vice versa. Most research in this area supports the hypothesis that a depressed individual may engage in gambling as a means of relieving chronic depression (Clarke, 2006; Griffiths, 1995; Gupta and Derevensky, 1998b; Raviv, 1993). Thus, in the present study, we expect problem gambling symptoms to be elevated when the depression level increases in both Caucasian and Chinese groups, which leads to the following hypothesis:

H4: There will be a positive direct effect of depression on problem gambling in both Caucasian and Chinese groups.

An interesting finding by Raylu and Oei (2002) is that estimations measuring the prevalence of depression were unusually low not only in Hong Kong, but also in mainland China. Researchers have made various assumptions about this low prevalence and have suggested that traditional Chinese values (e.g., pertaining to family cohesiveness and a cultural trait of enduring hardship) protect Chinese people from depression (Hwu, Yeh, & Chang, 1989; Lee & Kleinman, 2003). In addition, a marked fear of stigma is also thought to lead Chinese to consciously hide their feelings and depression during face-to-face psychiatric surveys or consultations (Lee & Kleinman, 2003). Furthermore, Chinese people with depression typically initiate somatic distress (e.g., headache, breathing difficulties) before describing psychological symptoms (Kleinman, 2004). Since most diagnostic interviews

obligatorily focus on core psychological symptoms first (e.g., persistently depressed mood), the interview may not be able to associate depression with the corresponding somatic presentation of problems by Chinese people (Kleinman, 1986; Parker, Cheah, & Roy, 2001). From previous studies using Western samples and the low estimate of prevalence of depression found in the Chinese community, in the present study, we expect Caucasian gamblers to demonstrate a stronger association between their problem gambling scores and their depression levels. Therefore, we propose the following hypothesis:

H5: There will be a stronger relationship between problem gambling and depression for Caucasian gamblers than for Chinese gamblers.

Depression: Mediating Effect

As conceptualized in Figure 1 and developed in the previous discussion, the research model indicates that the depression variable mediates the relationship between superstitious beliefs and problem gambling. That is, the depression variable can explain why the effect of the predictor (i.e., superstitious beliefs) on problem gambling occurs. On the basis of the conceptualization of this model, the literature reviewed, and the previous discussion, we propose the following mediating hypothesis:

H6: The depression level will have a mediating effect on the relationship between the level of superstitious beliefs and problem gambling for both Caucasian and Chinese gamblers.

Methods

Survey Instrument

To measure the participants' superstitious beliefs, eight items were adapted from the key set of cognitive gambling beliefs elucidated by Toneatto (1999) and Toneatto, Blitz-Miller, Calderwood, Dragonetti, and Tsanos (1997) (Table 1). In the present

Figure 1. Research framework.

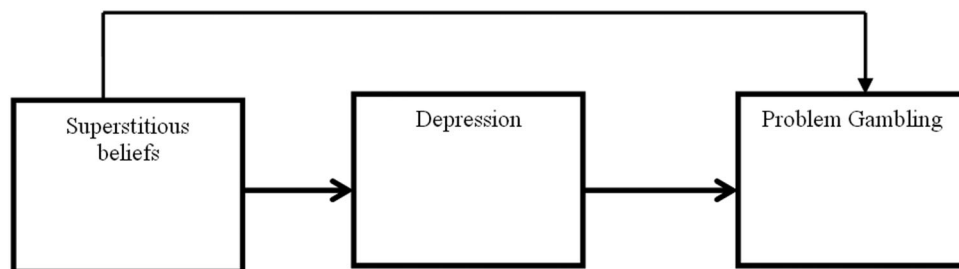


Table 1
Superstitious Beliefs (SB) Items

SB1: My hunches have a big influence on my winning.
SB2: Sometimes I get spiritual help when gambling.
SB3: When I'm feeling down I just know that my luck will be bad.
SB4: If someone is sitting or standing next to me that I feel is giving me "bad vibes" then I need to change or I don't win.
SB5: I often get hunches which I must follow.
SB6: I think I have the psychic ability to predict a winner.
SB7: I'm superstitious about the way I gamble.
SB8: I have a ritual which I must carry out when I'm gambling.

Note. A 5-point Likert scale ranging from 1(*strongly disagree*) to 5 (*strongly agree*) was used to measure the respondents' levels of agreement with these statements.

study, we used the diagnostic criteria from the South Oaks Gambling Screen (SOGS) to identify the level of a participant's problem gambling. The SOGS scale was selected not only because it has been widely used in numerous epidemiological studies (Shaffer, Hall, & Bilt, 1997), but also because its validity has been tested with Chinese gamblers (Tang & Wu, 2009). In particular, a study by Tang and Wu (2009) found that the Chinese version of the SOGS (C-SOGS) demonstrated satisfactory internal consistency and convergent validity with the criteria of the *Diagnostic and Statistical Manual of Mental Disorders-IV*, one of the commonly used PG screening instruments (American Psychiatric Association, 1994), and suggested the C-SOGS as a valid screening instrument for probable PG. A cut score of 5 or more (out of 20) was used to consider the respondents as probable pathological gamblers (PPGs) on both the SOGS and the C-SOGS (Lesieur & Blume, 1987; Tang & Wu, 2009). The aim of these screening tools is to identify the possible presence of the target gambling problem rather than to diagnose it. Thus, the SOGS term of "probable pathological gambling" is designed to guard against the mistake of claiming "no gambling problem" when in fact one exists—a Type 2 error (National Research Council Staff, 1999).

Respondents' depression levels were assessed through the use of the BDI-II (Beck, Steer, & Brown, 1996). The Chinese version of the BDI-II (C-BDI-II) was adapted from the study of Chang (2007). The BDI-II is scored by summing the ratings for the 21 items. Each item, a list of four statements arranged in increasing severity about a particular depression symptom, was rated on a 4-point scale ranging from 0 (*not at all*) to 3 (*severely*), the maximum total score being 63. Two doctoral students in a hospitality program, who were bilingual in English and Chinese, assisted with obtaining the original C-SOGS and C-BDI-II survey questions and translating the English version of the survey into a Chinese version: One was translated from English to Mandarin, and then the other was back-translated from Mandarin into English to check for consistency of words. The face validity and accuracy of the

survey were checked by three Chinese graduate students, one Chinese professor, and three Chinese employees of U.S. gaming companies.

Participants

The online survey link was posted on the Nevada Gaming Council on Problem Gambling website between October 21, 2010, and December 31, 2010, and 138 respondents opened the link. Among those who opened it, 46 partially completed questions or were not of the targeted ethnic backgrounds. As a result, the total complete and usable response set was 90 (five Chinese American gamblers and 85 Caucasian American gamblers). To increase the sample diversity and size, the researchers also collected data between January 10, 2011, and January 31, 2011, from the panel members of Qualtrics, an online survey company. The company's representative sent out the survey link to approximately 7,400 panel members, and 1,745 attempted the survey. Among those participants, 102 Caucasian American respondents and 110 Chinese American respondents satisfactorily answered two critical screening questions (indicating that they gambled more than four times per month and that they were of the targeted ethnic backgrounds) and completed the remaining survey questions. In summary, the sample used in the study comprised 115 Chinese American gamblers and 187 Caucasian American gamblers.

Results

Profile of Participants

Among the 302 participants of this study, 38% of them were Chinese Americans, and the rest (62%) were Caucasian Americans. About 50% reported that they gambled five to eight times per month, and about 40% reported playing nine times or more per month. A slightly higher number of participants reported that they often played games that depend mostly on luck (e.g., bingo, lottery, and slot machines) rather than those requiring skill and concentration such as blackjack and poker (42.7% and 30.8%, respectively), and about 39% of the participants reported incurring a weekly gambling loss of \$500 or more (all monetary figures herein are expressed in US dollars). Their ages ranged from 21 to 79 years: 59% represented the younger generations, 21–45 years old (Gen-X and Gen-Y) and about 40% represented the older generations, over 46 years old (baby boomer and World War 2 generations). The respondents reported living in various regions of the United States, including California (11%), Nevada (10%), New York (7%), Texas (6%), New Jersey (6%), and Florida (5%). According to the BDI-II rating, 51% of the participants were estimated to have minimal depression symptoms (score 0–13), and 43% had either moderate or severe depression. With a threshold of five or more positive responses on the SOGS (Lesieur & Blume, 1987), 48% were categorized as PPGs. In particular, 52.9% of Caucasian American respondents and 40.0% of Chinese American respondents were identified as PPGs.

Comparisons Among Chinese and Caucasian Non-Problem and Problem Gamblers

Cross-tabulation analysis was used to compare the mean SOGS, BDI-II, and superstitious beliefs scores among Chinese American non-problem gamblers, Chinese American problem gamblers, Caucasian American non-problem gamblers, and Caucasian American problem gamblers, as well as to evaluate associations with their ages, gambling frequencies, losses, and favorite games. Table 2 summarizes the various gambling-related characteristics of the participants and categorizes the groups on the basis of their ethnic background, as well as by their status as a PPG or a non-problem gambler. More specifically, the results indicate that Caucasians characterized as PPGs tend to gamble much more frequently than non-problem gamblers do. In addition, both Chinese gamblers and Caucasian gamblers who fell into the category of PPGs had larger losses than the non-problem gamblers did. The Chinese PPGs did not appear to lose as much in a week as did the Caucasian PPGs. In fact, only 2.2% of Chinese PPGs lost over \$1,500, as compared with the 29.3% of American PPGs who admitted to losing over \$1,500 per week. Both Chinese PPGs and non-problem gamblers gravitated toward skillful games at approximately the same frequencies. Chinese gamblers tended to favor games of skill to a greater degree than Caucasian gamblers did. We find it interesting that both Caucasian and Chinese PPGs tended to be younger than their non-problem gambler counterparts. Finally, the mean SOGS, BDI, and superstitious beliefs scores for Caucasian and Chinese PPGs were higher than those for Caucasian and Chinese non-problem gamblers.

Path Analysis

If a mediating effect is present, then a path analysis should be conducted to estimate the direct and indirect effect of superstitious beliefs, with depression as the mediating variable (Pedhazur, 1997). For this study, EQS for Windows, a leading path analysis software program, was used to analyze the relationships among the variables in the proposed model (Figure 1). One independent variable (superstitious beliefs scores), one mediating variable (depression level: BDI scores), and one dependent variable (level of PG: SOGS scores) were included in the model. One moderator variable was also included and represented cultural differences (i.e., Chinese vs. Caucasian gamblers). As a measure of internal consistency, Cronbach's alpha for each variable was calculated for both groups: superstitious beliefs score ($\alpha = .89$ in the Chinese group; $\alpha = .90$ in the Caucasian group), the SOGS score ($\alpha = .94$ in Chinese; $\alpha = .95$ in Caucasians), and the BDI score ($\alpha = .97$ in Chinese; $\alpha = .97$ in Caucasians). All were higher than the acceptable level, $\alpha > .6$ (Hair, Anderson, Tatham, & Black, 1998). Table 3 depicts the intercorrelations, means, and standard deviations for the variables. All of the variables are significantly related to one another. The results of the path analysis predicting problem gambling as a function of superstitious beliefs, mediated by depression, appear in Table 4.

Chinese American model. The standardized parameter estimates (beta, β) in Table 4 show that the superstitious beliefs variable for the Chinese respondents had

Table 2
Demographics and Gambling Characteristics

Characteristic	Chinese (<i>n</i> = 115)		Caucasians (<i>n</i> = 187)	
	Non-problem gambler (<i>n</i> = 69)	Probable pathological gamblers (<i>n</i> = 46)	Non-problem gamblers (<i>n</i> = 88)	Probable pathological gamblers (<i>n</i> = 99)
Gambling frequency (times per month)				
0–4	4.3%	2.2%	14.8%	14.1%
5–8	58.0%	63.0%	56.8%	33.3%
9–12	17.4%	23.9%	5.7%	20.2%
13 or more	20.3%	10.9%	22.7%	32.3%
Average gambling loss (per week)				
Less than US\$500	81.2%	34.8%	93.2%	31.3%
US\$501 to US\$1,000	13.0%	43.5%	4.5%	25.3%
US\$1,001 to US\$1,500	5.8%	19.6%	0%	14.1%
More than US\$1,500	0%	2.2%	2.3%	29.3%
Favorite games				
Skillful games	37.7%	37.0%	25.0%	28.3%
Unskillful games	34.8%	34.8%	47.7%	47.5%
Both types	27.5%	28.3%	27.3%	24.2%
Mean age	39.7 (<i>SD</i> = 12.9)	33.0 (<i>SD</i> = 10.0)	49.2 (<i>SD</i> = 12.8)	42.9 (<i>SD</i> = 12.5)
Mean SOGS score	2.5 (<i>SD</i> = 1.9)	12.3 (<i>SD</i> = 4.1)	2.5 (<i>SD</i> = 2.0)	13.9 (<i>SD</i> = 3.5)
Mean BDI score	6.2 (<i>SD</i> = 8.9)	25.6 (<i>SD</i> = 13.0)	10.0 (<i>SD</i> = 12.4)	29.4 (<i>SD</i> = 15.9)
Mean superstitious beliefs score	20.1 (<i>SD</i> = 7.2)	25.4 (<i>SD</i> = 6.3)	20.0 (<i>SD</i> = 7.0)	25.2 (<i>SD</i> = 7.8)

Note: BDI = Beck Depression Inventory; SOGS = South Oaks Gambling Screen.

Table 3
Means, Standard Deviations, and Intercorrelations for Key Variables

Variable	Chinese Americans (<i>n</i> = 115)					Caucasian Americans (<i>n</i> = 187)				
	<i>M</i>	<i>SD</i>	1	2	3	<i>M</i>	<i>SD</i>	1	2	3
1. Superstitious beliefs	22.3	7.3	1			22.7	7.8	1		
2. Depression	13.9	14.3	.35	1		20.3	17.3	.34	1	
3. Problem gambling	6.4	5.7	.48	.65	1	8.5	6.4	.37	.66	1

Table 4
Parameter Estimates in Model

Parameter	Direct effect (β)		Indirect effect (β)		Total effect (β)	
	Chinese	Caucasians	Chinese	Caucasians	Chinese	Caucasians
Effect of superstitious beliefs on problem gambling	.29*	.17*	.19*	.20*	.48*	.37*
Effect of depression on problem gambling	.55*	.60*				
Effect of superstitious beliefs on depression	.35*	.34*				
R^2	.50	.46				

Note. * $p < .05$, two tailed.

a significant positive effect on their problem gambling symptoms (i.e., SOGS score; $\beta = .29, p < .05$). The beta indices in Table 4 also show a significantly positive direct effect of depression on the SOGS score ($\beta = .55, p < .05$), as well as a positive effect of superstitious beliefs on depression ($\beta = .35, p < .05$) in the Chinese group. The statistically significant indirect effect indicates that depression mediates the relationship between superstitious beliefs and problem gambling ($\beta = .19, p > .05$). The total effect ($\beta = .48$) of superstitious beliefs on problem gambling symptoms consists of a direct effect ($\beta = .29$) and an indirect effect ($\beta = .19$) through depression. Therefore, as a mediator, depression accounted for 40% of the total effect of superstitious beliefs on problem gambling. Overall, the pattern of results supports the conclusion that Chinese American gamblers with higher levels of superstitious beliefs and depression are likely to become problem gamblers, and 50% of the variance (R^2) in the Chinese SOGS score was explained by these two variables.

Caucasian American model estimation. The standardized parameter estimates from the path analysis with the Caucasian group are shown in Table 4. The results show that both superstitious beliefs and depression had significant direct effects on problem gambling (i.e., the SOGS score) ($\beta = .17$ and $\beta = .60$, respectively, $p < .05$) in the Caucasian group. Similar to the findings from the Chinese group, superstitious beliefs positively influenced depression ($\beta = .34, p > .05$). The beta index for the indirect effect in Table 4 also indicates that depression played a significant role as a mediator between the level of superstitious beliefs and the level of problem gambling ($\beta = .20, p < .05$). As shown in Table 4, the total effect ($\beta = .37$) of superstitious beliefs on problem gambling symptoms is the combination of a direct effect ($\beta = .17$) and an indirect effect through depression ($\beta = .20$). Therefore, as a mediator, depression accounted for 54% of the total effect of superstitious beliefs on problem gambling. The findings indicate that a Caucasian American gambler with higher levels of superstitious beliefs and depression may be more likely

to become a problem gambler. Overall, 46% of the variance (R^2) in the Caucasian SOGS score was explained by these two variables.

Model fit by ethnicity

To explore the possibility that the level of significance in the paths differs between the two groups (Chinese American gamblers and Caucasian American gamblers), we conducted a multiple-group analysis. Three constraints were set up to test for potential group differences. The multi-group analysis assumed that the level of significance in the relationship among the three variables (i.e., superstitious belief, depression, and problem gambling) would be the same across both groups. If there were any differences, the Lagrange Multiplier (LM) test would suggest releasing some constraints (Byrne, 2006). The configured model fits the data well: $\chi^2 (3, N = 302) = 1.69, p > .05$, Comparative Fit Index = 1.00, standardized root mean square residual = .025, root mean square error of approximation = .00. The path coefficients for each of the subsamples were measured so that the magnitude of any differences between Caucasian and Chinese paths could be shown. Although all coefficients were slightly different, the LM test suggested not releasing any constraints.

The result indicates that both Caucasian American and Chinese American gamblers with a higher level of superstitious beliefs and depression are more likely to be problem gamblers (i.e., scoring higher on their SOGS), *supporting H1 and H4*. However, no statistically significant ethnicity differences were found in the effects of a gambler's superstitious beliefs and depression level on his or her problem gambling symptoms, hence *not supporting H2 and H5*. The depression variable was found to have a significantly positive effect on both Chinese and Caucasian gamblers' problem gambling symptoms, *supporting H3*. Specifically, the depression variable had a stronger direct effect on problem gambling in both Chinese American and Caucasian American groups than the superstitious belief variable did.

Discussion

The results of this study indicate that Caucasian gamblers living in the United States scored higher on the problem gambling scale (SOGS) ($M = 8.5, SD = 6.4$) than Chinese gamblers living in the United States did ($M = 6.4, SD = 5.7$). Caucasian gamblers also scored higher on the depression scale (BDI-II) ($M = 20.3, SD = 17.3$) than Chinese gamblers did ($M = 13.9, SD = 14.3$). The lower depression mean score in the Chinese group may be explained by findings from previous studies suggesting that traditional Chinese values (e.g., enduring hardship and pertaining to family cohesiveness) protect them from depression (Hwu et al., 1989; Lee & Kleinman, 2003). Another potential explanation of the lower depression score reported by Chinese is that Chinese tend not to directly express their emotional distress. For instance, if Chinese patients express having "heartache," it may mean they are experiencing "sadness," and being "tired" can indicate they are "depressed"

(Chang, 2007). Furthermore, the average age of Chinese PPGs was younger than that of non-problem gamblers. This result supports the findings of Welte, Barnes, Wieczorek, Tidwell, and Parker (2002), who reported that gambling rates in the year reviewed declined significantly with age. It is possible that Chinese gamblers who have lived longer in the United States have an increased chance of achieving a cultural shift, which helps them to handle unrealistic expectations of making money from gambling (Raylu & Oei, 2004; Victorian Casino and Gaming Authority, 2000).

As summarized in Table 5, the result of testing the first hypothesis supported the general consensus of previous studies (e.g., Joukhador et al., 2004; Zheng et al., 2010) and showed that superstitious beliefs are positively correlated with problem gambling behavior. The results of cross-tabulation analysis indicates that the type of game played (one requiring skills vs. one depending mostly on luck) was not related to problem gambling in either group. In addition, no group differences were detected with respect to the impact of playing games requiring problem gambling skills. The result of comparing gambling loss among Chinese and Caucasian non-problem and problem gamblers indicated that the problem gamblers (in both ethnic groups) tend to report a higher level of gambling loss, but that the gambling frequency variable did not seem to be correlated with problem gambling symptoms. For example, 20.3% of Chinese non-problem gamblers reported that they gamble 13 times or more per week, whereas only 10% of Chinese PGs did. Thus, having high gambling losses can be a risk factor for problem gambling for both Caucasian and Chinese players, whereas gambling frequency may not have a significant influence on problem gambling.

Table 5
Results of Testing the Hypotheses

Hypothesis	Description	Results
H1	Gamblers with higher levels of gambling superstitious beliefs will score higher on the problem gambling scale in both Caucasian and Chinese groups.	Supported
H2	Superstitious beliefs will have a stronger impact on Chinese gamblers' problem gambling than Caucasian gamblers.	Not supported
H3	Gamblers with higher levels of gambling superstitious beliefs will score higher on the depression scale in both Caucasian and Chinese groups.	Supported
H4	There will be a positive direct effect of depression on problem gambling in both Caucasian and Chinese groups	Supported
H5	There will be a stronger relationship between problem gambling and depression for Caucasian gamblers than for Chinese gamblers.	Not supported
H6	The depression variable is a mediator between the superstitious beliefs and problem gambling variables.	Supported

Although there was no group difference detected, the results of this study support the notion that the presence of depression may increase the risk for problem gambling in both ethnic groups. This finding supports previous studies showing that those with other mental health issues are more likely to become PPGs or PGs (Bondolfi, Osiek, & Ferrero, 2000; Petry & Armentano, 1999; Potenza, Kosten, & Rounsaville, 2001). The current study also found depression to be influenced by superstitious beliefs in both groups. A previous study by Beck (1967) suggested that cognitive problems related to depression are dysfunctional thoughts and that this selective attention may operate at the schema level. For instance, a depressed gambler will dwell on negative thoughts, but will blame this on dysfunctional schemas. In particular, the person will emulate negative thoughts, which potentially results in tangible negative consequences for the person. Therefore, gamblers may use superstitious beliefs to shift their focus away from this loop of negative thoughts. One strategy, via cognitive therapy, would be to highlight this problem and teach gamblers how to focus on neutral information such as negative winning expectancies and independence of gambling outcomes.

Previous studies have proposed that for those who possess chronic inner need states (e.g., depression), the diversion or narrowing of attention associated with gambling can alleviate negative mood. However, the rebound state of depression, which has greater intensity than the original need state, can lead to increasingly higher levels of gambling (Getty et al., 2000) and likely higher gambling losses. Accordingly, gamblers who seek sensation to improve their mood will likely become even more depressed again when they realize the substantial amount of money lost from gambling. Thus, therapies might be designed to increase gamblers' tolerance of depression and manage their ability to engage in activities other than gambling when depression levels rise.

Most problem gambling studies have been conducted with Western samples (i.e., generally Caucasians) and the results generalized to other ethnic groups (Raylu & Oei, 2002). A few recent gambling studies have collected their samples from other ethnic groups such as Thai and Chinese, but they were not cross-cultural studies. For example, Zheng et al. (2010) studied the impact of acculturation on PG for Chinese residing in Australia. In addition, Ariyabuddhiphongs and Chanchalermporn (2007) measured the relationships among hope, superstitious belief, environmental factors, and gambling behavior for Thai people living in Bangkok and 12 contiguous provinces. Thus, the current study fills the gap in the problem gambling research by examining superstitious beliefs, gambling behavioral factors, depression, and PG behavior of Chinese gamblers residing in the United States compared with Caucasian American gamblers.

Limitations and Future Studies

The findings reported in this study have some methodological limitations. Using an online survey can potentially produce a biased estimate, as it excludes gamblers who

do not have access to the Internet. Furthermore, the self-administered survey method allows participants to under- or overreport their gambling behaviors and depression symptoms. While creating a more anonymous environment, the online survey may lead to decreased accountability. In addition, it is critical not to overlook the relatively low response rate, because generalizing responses from the particular group to the intended population may be risky. By reviewing previous studies that compared response rates of mail and email surveys, we found that an email survey generally displayed a lower response rate than a mail survey (e.g., Bachmann, Elfrink, & Vazzana, 1996; Schaefer & Dillman, 1998; Tse et al., 1995). A study by Groves, Cialdini, and Courier (1992) explained that the U.S. population is being oversurveyed because of the growth in the number of studies using survey instruments. Non-respondent bias (i.e., the likelihood that those who received the survey link but did not respond to the survey would differ from those who responded) was addressed by comparing the answers from the early respondents (those who responded within 2 weeks of the survey distribution) to those offered by the later respondents (those who responded after 2 weeks). The results of the *t*-test analysis showed no significant difference in their answers to the key questions (i.e., superstitious beliefs, BDI, SOGS) in both Chinese and Caucasian groups.

However, the potential for self-selection bias is sufficiently serious that the contribution of this work is limited to demonstrating a potentially interesting mediational role of depression that could be explored further. Therefore, future research is needed to use different approaches such as face-to-face interviews or paper-based surveys. In addition, future studies should identify subjects who have a family history of depression or a personal history of depression prior to when they engaged in gambling as an activity, as compared with those who have neither family nor personal depression histories.

Although this study used the validated C-BDI, it is reasonable to argue that validated instruments designed for Chinese individuals and depression are lacking. If new measures are developed in future studies, they can be used to assess depression with different terms and categories specifically for the Chinese. For example, a somatic distress category should be considered because the Chinese tend to report headache and breathing difficulties before describing their psychological symptoms (Kleinman, 2004). In addition, different terms should be tested to address the tendency of Chinese individuals to express their depressed feelings indirectly, such as by using the term “heartache” instead of “sadness” and “tired” instead of “depressed” (Chang, 2007).

As an extension of the theoretical framework tested in this study, future studies could explore other variables such as help-seeking behavior and treatment receptiveness. Such future studies will assist in understanding how the correlates among cognitive bias, depression, and PG found in this study eventually affect the outcomes of preventive or intervention programs developed for gamblers. Furthermore, the ubiquitous growth of the mobile phone provides a potential

opportunity for gambling treatment clinics or institutes that could use this technology to provide advanced self-monitoring, instant feedback, exercise programs, and other features designed to inhibit gambling tendencies and to reduce depression levels. The undeniable impact of the mobile phone is illustrated by the 200 million Facebook users who log-in from their mobile device every day. The impact of these technologies is not restricted to the younger demographic categories, as the use of social networking sites among baby boomers grew from 9% to 43% in 2010 (Peter, 2011). One program, for example, by the UNLV International Gaming Institute, provides Health-E Gambling, an integrated web and SMS system that offers mobile learning and intervention by sending text messages related to gambling.

The decision to focus this study on Chinese and Caucasians living in the United States reflects both academic and practical reasoning. Academically, this research extends a prior inquiry concerning these two ethnic groups in Australia. Oei (2010) examined gambling-related behaviors and motivations using a cross-cultural approach that limited its scope to Chinese and Caucasians living in Australia. Furthermore, the impracticality of including all potential ethnic groups, combined with the current commercial casino growth in the United States and Macau, supports limiting this particular inquiry to the two chosen groups. It should be noted that previous studies investigated ethno-racial disparities in gambling motivations and prevalence of PG. For instance, Volberg, Toce, and Gerstein (1999) found that Latinos were more likely to report socializing as a motivation for gambling, whereas African Americans were more likely to gamble for the purpose of winning money. Another study (Volberg & Wray, 2007) showed that African Americans were nearly three times more likely than Caucasians to acknowledge symptoms of PG such as preoccupation with gambling, increased tolerance to achieve the same level of excitement, and lying. Furthermore, African Americans were two times more likely to chase after lost money and to use gambling as a means to escape problems. Similar to other previous research that limited the scope to a finite set of variations across racial and ethnic boundaries, the current study limited the target population to Caucasian and Chinese living in the United States. Clearly, future research into a more diverse collection of ethnic backgrounds is of great interest.

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For correspondence: Jungsun (Sunny) Kim, Ph.D., Assistant Professor; William F. Harrah College of Hotel Administration, University of Nevada, Las Vegas, 4505 Maryland Parkway, Box 45602, Las Vegas, Nevada, 89154. Tel: (702)895-3643. Fax: (702) 895-4872. E-mail: sunny.kim@unlv.edu

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Dr. Jungsun (Sunny) Kim received her Ph.D. in Hospitality Administration from the University of Nevada, Las Vegas (UNLV). She received her M.S. in Hotel Administration from UNLV and a B.S. in Hotel and Tourism Management from Kyunghee University, South Korea. She worked in the area of operations for restaurants in Australia, hotels in Korea, and the Information Technology department in US casino hotels. She is an active member of the American Hotel and Lodging Association, serving on the Technology Committee. After serving on the faculty of Texas Tech University, she now currently serves on the faculty at UNLV, teaching hospitality industry computer applications and hospitality managerial accounting. Dr. Kim has worked on the development of theoretical models to better understand perceptions and behaviour of consumers, employees, and managers pertaining to hospitality technology and gambling. She has published more than 15 peer-reviewed articles in academic journals.

Dr. Ahlgren is responsible for teaching and designing the gaming and casino management program at The Pennsylvania State University. Prior to his current position, he obtained both his Master’s Degree and his Doctoral Degree from the University of Nevada, Las Vegas. In conjunction with his doctoral work, he was named the Manager of Operations for the Harrah’s Research Center at UNLV. Before beginning his graduate studies, Dr. Ahlgren served as a researcher for the American Gaming Association (AGA). Along with varied research related efforts, he collected and summarized information supporting the organization’s annual State of the States publication.

Dr. Bernhard began his research career at Harvard University, where as an undergraduate he completed a double major (sociology and psychology) magna cum

laude thesis on the community impacts of the gaming industry in Nevada. The foundations of this analysis have since been extended worldwide, and by the age of 30, Dr. Bernhard had lectured on his research on six continents. He was named the inaugural Research Director at the UNLV International Gaming Institute (IGI), and was awarded a dual professorship in hotel management and sociology. In 2011, he was named Executive Director at the IGI, where he now oversees all research and academic functions. He has delivered over 200 keynote addresses in clinical, regulatory, government, and policy settings, has published in the top journals in both the business sciences and the social sciences, and currently serves as executive editor for a leading peer-reviewed academic journal, *Gaming Research and Review*.

Gaming machine density is correlated with rates of help-seeking for problem gambling: a local area analysis in Victoria, Australia

Monica J. Barratt,¹ Michael Livingston,^{2,3} Sharon Matthews,^{4,5} & Susan L. Clemens⁶

¹National Drug Research Institute, Faculty of Health Sciences, Curtin University, Melbourne, Australia

²Drug Policy Modelling Program, National Drug and Alcohol Research Centre, University of New South Wales, Sydney, Australia

³Centre for Alcohol Policy Research, Turning Point Alcohol and Drug Centre, Melbourne, Australia

⁴Population Health Research, Turning Point Alcohol and Drug Centre, Melbourne, Australia

⁵Eastern Health Clinical School, Monash University, Melbourne, Australia

⁶Preventive Health Unit, Health Services and Clinical Innovation, Department of Health, Queensland Government, Brisbane, Australia

Abstract

Local environment plays an important role in understanding gambling as a public health issue. This study uses help-seeking as an outcome measure for a local area analysis of problem gambling in Victoria, Australia. We used a cross-sectional ecological design to investigate the extent to which gaming industry and demographic, economic, and social factors are associated with rates of telephone and face-to-face counselling for problem gambling at the local government area level. Electronic gaming machine density was independently correlated with both types of help-seeking, with a range of local factors controlled. This study supports previous research that has consistently found an association between gaming machine density and problem gambling, using gaming machine expenditure as a proxy measure of harm. We build on previous work by confirming that this relationship exists when gambling harm is measured through two types of help-seeking.

Résumé

L'environnement local joue un rôle important pour comprendre le jeu en tant que problème de santé publique. La présente étude se sert de la demande d'aide comme

mesure de résultats pour une analyse locale du jeu compulsif à Victoria, en Australie. Cette étude écologique transversale vise à étudier dans quelle mesure l'industrie du jeu et les facteurs démographiques, économiques et sociaux sont associés aux taux de consultations par téléphone et en tête-à-tête pour des problèmes de jeu compulsif à l'échelle des zones d'administration locale (LGA) [*local government area*]. La concentration d'appareils de jeu électroniques a été corrélée indépendamment avec les deux types de demandes d'aide et divers facteurs locaux ont été contrôlés. L'étude vient appuyer les recherches antérieures qui ont invariablement démontré une association entre la concentration d'appareils de jeu et le jeu compulsif en utilisant les sommes dépensées comme mesure de substitution des préjudices causés. Nous nous appuyons sur les travaux antérieurs pour confirmer l'existence de cette relation lorsque les méfaits associés au jeu sont mesurés à l'aide des deux types de recherche d'aide.

Introduction

Gambling is a significant industry in Australia, with an estimated 15% of adults regularly gambling (excluding Lotto and scratch tickets) and 5% of adults playing electronic gaming machines (EGMs) weekly or more often (Productivity Commission, 2010). In 2006–07, nearly 3% of the disposable income of Australian households was spent on gambling, totalling AU\$17.6 billion. Most of this money was spent playing EGMs (Office of Economic and Statistical Research, 2007, as cited in Storer, Abbott, & Stubbs, 2009). Between 0.5% and 1.0% of Australian adults experience “significant problems” and between 1.4% and 2.1% are at moderate risk of experiencing problems from their gambling in any year. Problem gamblers make up a small proportion of all gambling adults, yet they account for a disproportionately high share of total gaming spending (about 40%, with estimates ranging from 20% to 60%; Productivity Commission, 2010). Significant problems were defined by the Productivity Commission as occurring when a person experienced any of the following as a result of gambling: always felt he or she had a problem, often or always experienced adverse health effects, always experienced financial difficulties, always felt guilty, always adversely affected job performance, self-rated their problems as 5 or more on a scale of 1 to 10, had self-excluded, tried to get help, or experienced suicidal ideation. A person did not need to have all of these present, but must have had at least one to be rated as harmed (p. 4.18).

Victoria is the second largest state in Australia in terms of population, accounting for about a quarter of the nation's total, though it is the second smallest in area. EGMs were introduced into the state only in 1992, and in 1994 a large casino was opened in Melbourne, the state capital. Prior to this, these types of gambling activity were not permissible in the state. In 2008, 1% of the adult population in Victoria

were estimated to be problem gamblers, 2% moderate-risk gamblers, 6% low-risk gamblers, 64% non-problem gamblers, and 27% non-gamblers (Hare, 2009). The average gambling expenditure per annum for Victorian problem gamblers has been estimated at AU\$12,356, compared with AU\$2,676 for moderate-risk, AU\$1,078 for low-risk, and AU\$322 for non-problem gamblers (Productivity Commission, 2010, p. B20). It has been shown that 91% of problem gamblers had played EGMs in the last 12 months, compared with only 21% of the total adult population (Hare, 2009).

As a consequence of the risk profile of EGMs, they have become the focus of most research and policy responses in the area of gambling in Australia. In 1995, laws were passed to limit the total number of EGMs in Victoria to 27,500, excluding Melbourne's only casino (Marshall & Baker, 2002). In 2001, the density of EGMs was capped at 10 per 1,000 adults in regions of Victoria identified as the most vulnerable to problem gambling (Victoria Government Gazette, 2001). In 2006, the EGM density cap of 10 per 1,000 adults was extended to include 19 regions of the state of Victoria (Victoria Government Gazette, 2006), and in 2009, density caps applicable to each region were reduced (Victoria Government Gazette, 2009). In 2010, gaming machine density was capped at 10 per 1,000 adults across all local government areas (LGAs) except the central business district of Melbourne.

Local environment and circumstances play a critical role in understanding gambling as a public health issue. Local characteristics create the conditions or context of problem gambling; influence the type, extent, and severity of gambling problems; and affect the response capacity of the affected community (Marshall, 2009). In this paper, we use a cross-sectional ecological design to investigate the extent to which local area characteristics are associated with rates of telephone and face-to-face counselling for problem gambling.

Defining and Measuring Problem Gambling for Area Analyses

Defining and measuring problem gambling is complex, especially within local area gambling research. From a public health perspective, the focus is on the harms people experience as a consequence of gambling behaviour. A more formal definition has been adopted by many Australian institutes and researchers: "Problem gambling is characterised by difficulties in limiting money and/or time spent on gambling which leads to adverse consequences for the gambler, others, or for the community" (Neal, Delfabbro, & O'Neil, 2005, p. i). In individual-level research, the Canadian Problem Gambling Index is considered to be the preferred instrument for measuring problem gambling (Neal et al., 2005). In local area research, prevalence surveys of problem gamblers are impractical, as very large sample sizes would be required to achieve an adequate estimate of problem gambling at the LGA level. For example, in a probability sample of 15,000 with a prevalence of 0.7% problem gambling (e.g., in Victoria; Hare, 2009), only 105 people would have been identified as problem gamblers. Dividing this subsample by the 79

Victorian LGAs would result in an average of 1.3 problem gamblers per LGA. It would not be statistically viable to subject a sample that is this small to analysis.

The large sample sizes required for individual-level analyses of conditions with a low population prevalence has resulted in the use of proxy measures of problem gambling. For example, the net expenditure on EGMs is automatically collected by gaming venues and is available at the LGA level in Victoria and other parts of Australia. Gaming machine expenditure has, therefore, been used as a proxy measure of gambling harm in local area research; however, it is inaccurate to assume that more expenditure necessarily represents more problems within a specific local area (Marshall, McMillen, Niemeyer, & Doran, 2004; McMillen & Doran, 2006). An increase in expenditure may indicate that a larger number of people are gambling in a non-problematic way or that a smaller number of people are gambling in a more problematic way. Furthermore, venue expenditure may not arise from local residents. Although it has been shown that most gamblers play EGMs within 5 km of their residence (Delfabbro, 2008; Hare, 2009), many people also travel long distances to gamble. Location is not the only characteristic of a gaming venue that attracts consumers. Other attractions of specific venues include the types and combinations of machines, the presence of other community facilities, and venue marketing strategies (Marshall et al., 2004).

Another measure of gambling at the local level is the residence of individuals seeking treatment for problem gambling. Although this measure has rarely been used, one exception is the work by Delfabbro (2002, as cited in Delfabbro, 2008) in South Australia. Delfabbro reported a moderate positive bivariate relationship between the density of problem gambling service clients and gaming machines when analysed at the smaller statistical local area level ($r = .49$) and a larger positive bivariate relationship when analysed at the larger LGA level ($r = .78$).

Although researchers acknowledge this work, the lack of alternative measures of problem gambling at a local area level is still commonly mentioned as a limitation of studies in this field (Marshall et al., 2004; McMillen & Doran, 2006). Our study is the first to investigate the local distribution of two measures of help-seeking (telephone and face-to-face counselling) as proxy measures of gambling-related harm and the first to do so by controlling for other local area social indicators. To our knowledge, no analyses using gambling helpline data have been published to date.

Correlates of Problem Gambling

Problem gambling is one of a group of health conditions in which etiology is associated with lifestyle/behavioural practices, which are in turn correlated with local area characteristics. Other such conditions include obesity (e.g., King, Kavanagh, Jolley, Turrell, & Crawford, 2006), alcohol-related harm (e.g., M. Livingston, Chikritzhs, & Room, 2007), sexually transmitted infections (e.g., Cohen et al., 2000), and a variety of other health and social behaviours (e.g., see Adams et

al., 2009). The main findings from this body of work are that local areas with higher availability (i.e., of fast food, alcohol outlets, etc.) and lower socio-economic status tend to have worse health and social outcomes. Further, studies where both area-level and individual-level data were available demonstrated that these community characteristics are mediated by characteristics of the individual (e.g., Adams et al., 2009; M. Livingston, Laslett, & Dietze, 2008).

Unsurprisingly then, the expenditure per gaming machine increases with higher densities of EGMs. This is true at the state (Productivity Commission, 2010), LGA (Delfabbro, 2002; Diamond, 2009; Stubbs & Storer, 2003), and census district levels (Marshall et al., 2004), although detailed census-district-level research in Victoria failed to replicate these findings (McMillen & Doran, 2006). At the macro level, using Australian states as geographical units, the Productivity Commission found that the number of EGMs per adult accounted for 69% of the variance in EGM expenditure in 1998–99 and 60% in 2006–07 (Productivity Commission, 2010). A recent meta-analysis of 34 surveys of problem gambling from Australia and New Zealand supported a linear relationship between machine density and prevalence of problem gambling (Storer et al., 2009). Unfortunately, because of the problems already discussed regarding the local measurement of problem gambling, most of the studies reviewed by Storer and colleagues (2009) used large area units, usually states or regions. The present study adds to this research by modelling two different measures of local rates of self-identified problem gamblers at the LGA level.

Socio-economic disadvantage has also been associated with higher machine density and higher per capita gaming expenditure. This relationship is consistent at the LGA level in Victoria (Diamond, 2009; Doughney, 2002; C. Livingstone, 2001; Marshall & Baker, 2002) and the Canadian city of Montreal (Gilliland & Ross, 2005; Robitaille & Herjean, 2008), although similar research in New South Wales found only weak correlations between gaming machine density and socio-economic disadvantage (Stubbs & Storer, 2003). The present study also tests the extent to which rates of self-identified problem gamblers are associated with socio-economic disadvantage at the LGA level.

Aim

Our aim was to determine the extent to which local area characteristics are associated with self-identified problem gambling, as assessed through rates of telephone and face-to-face gambling counselling, by controlling for a range of local area social indicators.

Method

A cross-sectional ecological design was used to explore the extent to which area-level factors are correlated with help-seeking for problem gambling across Victoria. The measures and analyses used are outlined below.

Measures

Geographic units. Data were analysed at the LGA level. LGAs were selected as the geographic unit because the smallest level of government in Victoria is organised around LGA boundaries, and these local governments are also the most likely to develop and implement community interventions and policies to respond to local issues such as problem gambling (Dietze et al., 2009; McMillen & Doran, 2006). Data for some small LGAs were merged for confidentiality reasons by the auspicing agency and were therefore analysed in aggregate groupings for some LGAs. The LGAs of Melbourne and Indigo were also omitted from the regression analyses for the following reasons. The Melbourne LGA, which includes the main commercial, tourist, and entertainment precinct of Victoria, was excluded because this area is qualitatively different from other LGAs in this data set, with much of the activity in the central business district arising from non-residents, leading to inflated rate values. The Shire of Indigo was also excluded when it was found to have one of the highest rates of gambling service clients in Victoria, yet no gaming venues appeared to be licensed within the LGA. Indigo is located on the border of Victoria and New South Wales; thus we assumed that residents of Indigo travelled across the border to access gaming venues and machines. Thus, the final models used 70 LGAs and combined LGAs from 77 possible LGAs (after the exclusion of two LGAs).

Help-seeking for problem gambling.

Gambler's Helpline. Gambler's Helpline provides telephone counselling services to problem gamblers and their families across the state of Victoria. There were 2,001 counselling calls to Gambler's Helpline Victoria in 2007. Calls from those living interstate, with no known postcode, or from family members or relatives (as opposed to calls from the individual who was engaging in problem gambling behaviours) were excluded. After Melbourne and Indigo were removed, the final number of calls was reduced to 1,908.

Gambler's Help. Gambler's Help provides face-to-face personal and financial counselling services to problem gamblers and their families from approximately 100 sites across the state of Victoria. There were 3,741 clients of Gambler's Help between July 2006 and June 2007 who sought counselling for their own gambling. After excluding non-Victorian clients, those with missing location information, and residents of the LGAs of Melbourne and Indigo, the final number of Gambler's Help clients was reduced to 3,529.

Gaming industry indicators. Data on the number of EGMs, gaming venues, and EGM expenditure in each LGA for 2006–07 were sourced from the Victorian Commission for Gambling Regulation. The number of gaming machines per LGA was divided by the number of gaming venues in that LGA to measure the extent to which LGAs have large venues with many machines or small venues with lower numbers of EGMs. Expenditure was defined as the net amount lost through using EGMs, that is, the amount spent minus any winnings.

Demographic, social, and economic indicators. A wide range of social indicators were included in the analyses. Although the inclusion of indicators of social disadvantage followed from prior research, other variables were included as an exploration of potential local area factors that may be associated with problem gambling help-seeking rates.

Remoteness. The remoteness measure was based on the Accessibility Remoteness Index of Australia (ARIA; Australian Bureau of Statistics [ABS], 2005). ARIA values are based on road distances to various service centres. Remoteness values for populated localities are derived from the road distance to service centres and then interpolated to a 1-km grid representing the whole of Australia. LGAs were divided into three categories: major city (ARIA between 0 and 0.2), inner-regional (ARIA between 0.2 and 2.4), and regional and remote (ARIA greater than 2.4).

Demographic indicators from the census. For each LGA, the following indicators were extracted from the 2006 census data: median age, percentage male, proportion of the population of each LGA aged 25 or over who have obtained at least one non-school qualification (including university degrees, technical qualifications, and trade certificates), median equivalised household income, proportion of households with housing costs equal to 30% or more of their gross household income, percentage of residents who speak a language other than English at home, unemployment rate, and labour force participation rate (ABS, 2008a).

Socio-economic disadvantage. The Index of Relative Socio-Economic Disadvantage from the ABS Socio-Economic Indexes for Areas (SEIFA) was used to measure the relative advantage of the LGAs in the study (ABS, 2008b). LGAs were assigned scores from deciles of the index of relative disadvantage. These deciles divide Victoria's LGAs into 10 groups of roughly equal population sizes on the basis of characteristics of census collection districts, such as income level, education level, and unemployment rate. LGA SEIFA scores are population-weighted averages of the scores of the collection districts within them. Lower deciles represent greater disadvantage. These data were extracted from the 2006 census (ABS, 2008a).

Demographic indicators from the Community Indicators Victoria. The Community Indicators Victoria population survey sampled 23,700 adults in 2007, with a response rate of 40%. Data were weighted at the LGA level by age and sex. For each LGA, financial stress, community satisfaction, perceptions of safety, self-reported health, and personal wellbeing were extracted from the Community Indicators Victoria. The measure of financial stress used was the proportion of adults in each LGA who could not definitely raise \$2,000 in 2 days in an emergency. Community satisfaction was assessed by respondents' ratings of how satisfied they were with feeling part of their community. Perception of safety was defined as the

percentage of people who felt safe or very safe when walking alone in their local area at night. Self-reported health was the percentage who reported their health as excellent or very good. The Personal Wellbeing Index (PWI) is a validated measure of subjective wellbeing (Cummins, Eckersley, Pallant, van Vugt, & Misajon, 2003; Cummins et al., 2008). The PWI is a 7-item scale, resulting in a score between 0 (*lowest wellbeing*) and 100 (*highest wellbeing*).

Social support. Social support was measured by using an indicator that assesses how easily people in each LGA can get help quickly. The proportion of the adult population who said that they could “definitely” get help from friends, family, or neighbours when needed was used. The data were collected as part of a survey conducted by the Department of Planning and Community Development between 2004 and 2006.

Assaults and domestic violence. Data on assaults and domestic violence were sourced from the Victoria Police Law Enforcement Assistance Program (LEAP) database, which captures information on crime reported to police. Instances of assault and domestic violence were assigned to LGAs by location of incidence.

Drug and property crime. Data on the number of drug-related offences (including possession, manufacturing, cultivating, trafficking, and use) and property offences (including aggravated, residential, and other burglary; theft from motor vehicle; shop-steal; and theft of motor vehicle, bicycle, or other) during 2006–07 were provided by Victoria Police.

Alcohol and other drug treatment episodes. Courses of treatment where either alcohol or other illicit drugs were identified as the primary drugs of concern during 2006–07 were extracted from the Alcohol and Drug Information System (ADIS), a mandated database contributed to by government-funded alcohol and drug treatment services. Clients may receive more than one course of treatment in any one year.

Liquor licences. The numbers of on-premise, packaged, and general liquor licences in 2006 were provided by Responsible Alcohol Victoria. On-premise liquor licences encompass all outlets that sell alcohol for on-premise consumption only (e.g., nightclubs, bars, cafes, restaurants). Packaged liquor licences allow the sale of alcohol for off-premise consumption only (e.g., bottle shops). General liquor licences are for hotels and taverns and allow alcohol to be sold both for on- and off-premise consumption.

Analyses

Rates were calculated by using the estimated residential population aged 18 and over at June 30, 2006 (ABS, 2007a). Where necessary, postcode level data were aggregated into LGAs by using the ABS 2006 concordance data (ABS, 2007b). This approach

assigns proportions of postcodes to LGAs from the distribution of population within postcodes. In other words, where a postcode had 75% of its population in one LGA and 25% in another, we assigned 75% of calls to Gambler's Helpline to the first LGA and 25% to the other. All rates were per 1,000 adult residents.

Statistical analyses were undertaken with the R software package (R Development Core Team, 2006). The spdep package was used for all of the spatial analyses (Bivand, 2006). Geographic data specifying the neighbour relationships between the LGAs in the study were produced with the spatial statistics program Geoda (Anselin, 2003).

Initial descriptive statistics were used to assess the suitability of variables for inclusion in the models. This assessment focused upon the relationships between independent variables, the aim being to remove variables highly correlated with other variables to keep the models as simple as possible. Furthermore, highly correlated independent variables in a linear regression model produce problems with multicollinearity. Such models may fail to find significant effects (StataCorp, 2005). Therefore, the variables were assessed to determine which should be excluded.

The gaming industry indicators were examined first. As expected, the rate of EGMs and gaming venues were highly correlated ($r = .78$). Since rates of EGMs provide a better measure of availability and are used in most studies, the rate of gambling venues was dropped from the analysis. Unsurprisingly, per capita gaming expenditure and the rate of EGMs were also highly correlated ($r = .87$). Furthermore, per capita gaming expenditure has often been used as a proxy measure of gambling-related harm. Indeed, both measures of gambling problems in this study showed high correlations with per capita expenditure. In multivariate analyses, it is important to ensure that independent variables are not so similar to the dependent variable as to explain almost all of its variance. Thus, per capita expenditure was dropped from the analysis. The positive association between density of EGMs and the average number of EGMs per venue was medium-to-high ($r = .61$). Strong negative associations were also found between EGMs per venue and measures of community and safety, as well as rates of off-premise liquor licences. Because of this collinearity, EGMs per venue was also omitted from the regression analyses.

Correlations between the remaining 25 demographic, social, and economic variables were inspected to identify variables that were highly correlated with each other and would be good candidates to drop from the regression analyses. Variables with correlation coefficients of .75 or above (or $-.75$ and below) were considered highly correlated. Perceptions of community ($r = .90$) and safety ($r = .81$) were highly correlated with the PWI, and the proportion of non-English speaking background residents was strongly negatively correlated with the PWI ($r = -.78$). As the PWI is a well-established scale, it is likely to be more reliable than single item measures; thus the PWI was retained and the community, safety, and non-English speaking background measures were removed. Income ($r = .80$) and education ($r = .82$) were

highly correlated with the SEIFA index of socio-economic disadvantage. This composite measure, which is based upon income and education among other measures, was retained and income and education were omitted. Financial housing stress was highly correlated with median age ($r = -.82$), such that areas with an older median age were less likely to experience housing stress. Financial housing stress was also strongly related to community ($r = .78$) and safety ($r = .81$) measures and was also removed from the regression analyses. Rates of assaults and domestic violence were highly correlated ($r = .80$). As these two rates measured similar constructs, they were combined into an aggregate measure of violence. Packaged liquor and general licence rates were also highly correlated ($r = .76$), and so they were combined into a measure of off-premises liquor licences. Of the 29 independent variables, 13 were rejected and 16 were retained, but two composite variables were added, giving a total of 18 independent variables (see Table 1).

The initial models examined the impact that gambling accessibility and locality remoteness had on rates of problem gambling without controlling for confounders. These models were then expanded to incorporate economic, demographic, and social variables. Variables for the expanded model were included in stepwise linear regressions, with the final models selected by repeatedly excluding the least important independent variables until all of the variables in the final model were significant (at $p < .05$). The models were examined for evidence of spatial autocorrelation by using the Lagrange Multiplier diagnostics for spatial dependence (see Anselin, Bera, Florax, & Yoon, 1996). Spatial autocorrelation was marginally significant for the model of calls to Gamblers Helpline. A corrected model was run; however, it was not meaningfully different from the standard linear regression model, and so only the standard model is shown. All variables included in the extended models were assessed for multicollinearity by using the variance inflation factor (VIF) diagnostic. None of the independent variables in the extended models had VIFs above 3. The occurrence of VIFs above 10 indicates severe multicollinearity (Neter, Kutner, Nachtsheim, & Wasserman, 1996). Visual diagnostic checks were also undertaken (data not shown).

The bivariate relationships between all gaming industry variables and both measures of problem gambling were further explored by using scatterplots (data not shown). There was no evidence of non-linear relationships between problem gambling measures and gaming industry measures. Quadratic and cubic terms were, therefore, not included in the subsequent regression models.

Results

Bivariate Correlations

The two help-seeking indicators were weakly positively correlated ($r = .276$, $CI = 0.044-0.480$, $p = .021$). Table 1 displays correlation coefficients for both problem gambling indicators for each independent variable.

Table 1
Simple Bivariate Correlations With Help-Seeking Indicators (N = 70)

Variable/Indicator	Gambler's Helpline Calls	Gambler's Help Clients
<i>Gaming industry indicators</i>		
EGMs, rate ^a	0.46**	0.70**
Gaming venues, rate	0.04	0.59**
Average number of EGMs per venue	0.70**	0.40**
Gaming expenditure per capita (\$)	0.71**	0.65**
<i>Demographic, social, & economic indicators</i>		
ARIA (remoteness) ^a	-0.68**	-0.20
Age (median) ^a	-0.60**	0.41**
Male (%) ^a	-0.36**	-0.19
Education (% with post-school qualification)	0.37**	-0.01
Equivalised household income (median, \$)	0.45**	-0.01
Financial stress (%) ^a	0.38**	0.23
Financial housing stress (%)	0.69**	0.45**
Index of relative socio-economic disadvantage (SEIFA) ^a	0.22	-0.15
Non-English speaking background (%)	0.73**	0.22
Unemployment (%) ^a	0.37**	0.37**
Participation in labour force (%) ^a	0.16*	-0.03
Personal Wellbeing Index ^a	-0.77**	-0.35**
Community	-0.79**	-0.32**
Social support (%) ^a	-0.51**	-0.12
Perceptions of safety (%)	-0.72**	-0.49**
Self-rated health (%) ^a	-0.16	-0.21
Assaults, rate ^b	0.12	0.61**
Domestic violence, rate ^b	0.14	0.34**
Drug-related crime, rate ^a	0.22	0.43**
Property crime, rate ^a	0.66**	0.37**
Alcohol-related episodes of care, rate ^a	-0.13	0.39**
Other drug-related episodes of care, rate ^a	0.13	0.18
On-premises liquor licences, rate ^a	-0.01	0.05
Packaged liquor licences, rate ^b	-0.52**	-0.28*
General liquor licences, rate ^b	-0.61**	-0.42**

Note. Pearson's product moment correlation coefficient. ARIA = Accessibility Remoteness Index of Australia; EGMs = electronic gaming machines; SEIFA = Socio-Economic Indexes for Areas.

^a These variables were included in regression models.

^b Variables included in the models as composites: assaults and domestic violence aggregated into a composite variable representing "violence"; packaged and general liquor licences aggregated into a composite variable representing "off-premise liquor licences."

* $p < .05$. ** $p < .01$.

A range of the factors under consideration were related to rates of problem gambling. General trends across both variables include a strong positive relationship between gaming industry penetration and problem gambling rates; positive relationships between financial housing stress, unemployment rates, and rates of crime with problem gambling rates; negative relationships between median age, community, safety, and personal wellbeing indicators and problem gambling rates;

and negative relationships between off-premises liquor licensing rates and problem gambling. Gamblers in LGAs with larger gambling venues (with a higher than average number of machines) were more likely to seek help and treatment for gambling problems, especially using Gambler's Helpline.

Stronger relationships were found between most demographic, social, and economic variables and rates of calls to Gambler's Helpline compared with the rate of Gambler's Help services. The exceptions to this trend were unemployment and rates for assault, domestic violence, drug-related crime, and alcohol-related episodes of care. The rate of calls to Gambler's Helpline was positively associated with education, median income, and labour force participation. The rate of alcohol-related treatment episodes was positively associated with the rate of Gambler's Help clients, but unrelated to the rate of calls to Gambler's Helpline. All types of crime rates showed medium-strength positive correlations with rates of clients using Gambler's Help services, whereas property crime rate was the only crime variable strongly correlated with rate of calls to Gambler's Helpline (see Table 1).

Telephone Counselling Models

The first model was constructed to test which local area variables were correlated with the rate of telephone counselling conducted through the Gambler's Helpline. The initial linear model included only the rate of EGMs and the remoteness measure as correlates of the rate of Gambler's Helpline counselling calls in Victorian LGAs (see Table 2). The model estimates that for each extra machine per 1,000 adult residents in an LGA, the rate of calls to Gambler's Helpline will increase by 0.02 per 1,000 adult residents. The initial model also finds that the farther from Melbourne an LGA is, the lower the rate of calls to Gambler's Helpline. This may represent a reduced level of problem gambling, but it may also relate to gamblers' knowledge of the service or preference to use it.

Table 2
Initial Model: Gambler's Helpline Calls

Variable/Indicator	Estimate	Confidence Interval	Standardised Coefficient (beta)
Intercept	0.42***	(0.32, 0.52)	n.a.
EGMs, rate	0.02***	(0.01, 0.04)	0.32
Remoteness (reference – urban)			
Regional	–0.25***	(–0.34, –0.17)	–0.86
Remote	–0.35***	(–0.45, –0.26)	–4.77
Adjusted R-squared = .55			

Note. EGMs = electronic gaming machines; n.a. = not applicable.

*** $p < .001$.

An expanded model was created by incorporating the variables identified in Table 1. Stepwise regression as described above produced a final model with three independent variables (see Table 3). According to this model, the rate of EGMs in a local area is still independently associated with the rate of calls to Gambler's Helpline, despite the inclusion of other local area social indicators. Two other social indicators were significantly associated with unique variance in the rate of calls to Gambler's Helpline: Lower rates of calls to Gambler's Helpline were associated with higher levels of personal wellbeing, and rates of calls were lower in regional and remote areas compared with urban areas. The expanded linear model explained 65% of the variance in the rate of calls to Gambler's Helpline, a substantial improvement on the initial model.

Face-to-face Counselling Models

The second model tested which local area variables were associated with the rate of clients receiving face-to-face problem gambling counselling. The initial linear model included only the rate of EGMs and the remoteness measure as correlates of the rate of Gambler's Help clients in Victorian LGAs (see Table 4). The model estimates that for each extra machine per 1,000 adult residents in an LGA, the rate of clients using Gambler's Help will increase by 0.1 per 1,000 adult residents. The initial model found no relationship between remoteness of the LGA and rate of problem gambling clients.

An expanded model was created by incorporating the variables identified in Table 1. Variables were excluded from the regression models until a final model with two independent variables was identified (see Table 5). According to this model, the rate of EGMs in a local area is still independently correlated with the rate of clients using Gambler's Help, despite the inclusion of other significant social indicators. The rate of violence was associated with unique variance in the rate of problem gambling clients at a statistically significant level in the final model, but the inclusion of this

Table 3
Expanded Model: Gambler's Helpline Calls

Variable/Indicator	Estimate	Confidence Interval	Standardised Coefficient (beta)
Intercept	4.38***	(2.47, 6.29)	n.a.
EGMs, rate	0.02**	(0.01, 0.03)	0.21
Personal Wellbeing Index	-0.05***	(-0.08, -0.03)	-0.46
Remoteness (reference – urban)			
Regional	-0.14**	(-0.23, -0.04)	-0.46
Remote	-0.16*	(-0.29, -0.04)	-2.22
Adjusted R-squared = .65			

Note. EGMs = electronic gaming machines; n.a. = not applicable.

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

Table 4
Initial Model: Gambler's Help Clients

Variable/Indicator	Estimate	Confidence Interval	Standardised Coefficient (beta)
Intercept	0.18	(−0.04, 0.40)	n.a.
EGMs, rate	0.10***	(0.08, 0.13)	0.69
Remoteness (reference – urban)			
Regional	0.11	(−0.08, 0.28)	0.17
Remote	−0.05	(−0.25, 0.16)	−0.33
Adjusted <i>R</i> -squared = .49			

Note. EGMs = electronic gaming machines; n.a. = not applicable.
*** $p < .001$.

variable had little impact on the EGM rate effect size. Somewhat surprisingly, neither socio-economic disadvantage nor rurality was significantly associated with Gambler's Help use. The expanded linear model explained 55% of the variance in the rate of clients using Gambler's Help. The explanatory power of the expanded model increased by 6% compared with the initial model.

Discussion

This study is the first to use two help-seeking measures as outcomes for a local area analysis of problem gambling. Gaming machine density was associated with rates of both telephone and face-to-face counselling for problem gambling in Victorian LGAs. Lower socio-economic status was significantly associated with higher rates of face-to-face help-seeking, whereas lower rates of personal wellbeing were significantly associated with higher rates of telephone counselling. The only common significant correlate of both forms of problem gambling help-seeking was gaming machine density. The relationships between machine density, expenditure, and rates of self-identified problem gamblers were all positive and medium to large in size. These results support the exposure model of gambling problems, which

Table 5
Expanded Model: Gambler's Help Clients

Variable/Indicator	Estimate	Confidence Interval	Standardised Coefficient (beta)
Intercept	0.02	(−0.22, 0.18)	n.a.
EGMs, rate	0.08***	(0.05, 0.10)	0.53
Violence, rate	0.03**	(0.01, 0.04)	0.32
Adjusted <i>R</i> -squared = .55			

Note. EGMs = electronic gaming machines; n.a. = not applicable.
** $p < .01$. *** $p < .001$.

predicts that increased access results in increased problems (Storer et al., 2009). The magnitude of the effects found here is not small. At mean levels, our final models predict that a 10% increase in the number of EGMs per capita in a region would result in increases of 6.0% in rates of problem gamblers seeking face-to-face counselling and 3.3% seeking telephone counselling. Given that only a small proportion of problem gamblers seek treatment (Productivity Commission, 2010, p. 7.1), these effect sizes are likely to be underestimates of the actual effect on problem gambling rates.

The two measures of problem gambling help-seeking were only weakly positively correlated. Face-to-face and telephone counselling may access different populations of problem gamblers. It is also likely that knowledge of specific services, and the attraction of telephone or face-to-face counselling, varies across localities. Either of these reasons may explain why gamblers in urban areas were much more likely to utilise telephone counselling services. These differences may also be partially accounted for by the helpline data representing call numbers, but the Gambler's Help data being based on clients. Given all of these factors, it is not surprising that the models built on these two measures of gambling help-seeking were different. Indeed, it adds more robustness to our results that we have found a strong association between help-seeking and gaming machine density by using two weakly correlated measures. Research specifically designed to explore the extent to which different populations access face-to-face versus telephone counselling for problem gambling would be worthwhile to better understand these results.

This study supports previous research that has found a strong link between gaming machine density and problem gambling using gaming machine expenditure as a proxy measure of harm (Delfabbro, 2002; Diamond, 2009; Stubbs & Storer, 2003). This study confirms that this relationship exists when gambling harm is measured through two types of help-seeking.

These findings should be viewed alongside the limitations of cross-sectional, ecological designs. The relationships between variables measured in this study are likely to be multi-directional and complex. The relationship between gaming machine density and rates of help-seeking for gambling problems could have resulted from three causal mechanisms: (1) Increased gaming machine density may cause increased rates of help-seeking; (2) increased rates of help-seeking may cause increased gaming machine density (e.g., more EGMs are placed in areas where people have a higher propensity to gamble); or (3) a third variable (e.g., social deprivation) may be the cause of both. All of these mechanisms may be operating to produce this association, although in this analysis, we have controlled for a range of social indicators and still find a unique association between gaming machine density and rates of help-seeking. Nevertheless, cross-sectional studies are unable to tease out the direction of these relationships. Better access to more refined data across time would allow the performance of time series analyses, which would be better able to detect temporal associations and causal pathways (Livingston, 2008).

This study also used LGAs as the unit of analysis. Changing the size of the local area of analysis has also been shown to influence relationships between variables because of individual effects being masked through aggregation (McMillen & Doran, 2006; Young & Tyler, 2008). Multi-level analysis, in which local area factors are included alongside data about the habits and practices of individual problem gamblers, has the potential to produce a more accurate picture of a complex situation (Doran & Young, 2010; McMillen & Doran, 2006; Young & Tyler, 2008). It may also be beneficial to use smaller local units to enable neighbourhood agencies to use the findings to develop appropriate services in specific localities. Applying findings to local situations on the basis of aggregate data can miss the mark when the variation within LGAs is large.

Although service use approximates gambling harm, it is likely to vastly underestimate the prevalence of problem gambling. The Productivity Commission (2010) reports that about 13,500 people attended gambling counselling and treatment services for their own gambling in 2007–08, or between 8% and 15% of problem gamblers in Australia. Rates of treatment seeking are similarly low internationally (Slutske, 2006; Suurvali, Cordingley, Hodgins, & Cunningham, 2009). Rates of treatment may indicate different levels of treatment access, exposure to service promotion, and cultural differences in defining problematic gambling and in the appropriateness of seeking treatment, as well as the underlying prevalence of problem gambling in a local area. By using helpline data in these analyses, it is expected that some of the bias resulting from treatment service availability may be ameliorated.

While acknowledging the limitations just discussed, we suggest that these findings support the Victorian government's ongoing efforts to cap EGM density at the local level. Not only is EGM density associated with gaming machine expenditure, but it is also associated with two measures of help-seeking for gambling problems. The simple implication of this work is that further reductions in EGM density are likely to be associated with further reductions of gambling problems at a local area level. Although research designed with the capacity to reveal temporal associations is required to test this premise, in the meantime, our research suggests that governments should aim to reduce gaming machine density in areas most affected by problem gambling.

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For correspondence: Monica J. Barratt, PhD, National Drug Research Institute, Curtin University, 54-62 Gertrude Street, Fitzroy Victoria 3065, Australia. E-mail: m.barratt@curtin.edu.au

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Contributors: Monica Barratt is a Research Fellow at the National Drug Research Institute, Curtin University. Her primary research program involves examining the intersections between illicit drugs and digital technologies. In her previous role at Turning Point Alcohol and Drug Centre, she conducted local area analyses and data linkage of drug trends and gambling-related harms using large administrative datasets.

Michael Livingston is a post-doctoral research fellow at the Drug Policy Modelling Program at the University of New South Wales and a research fellow at the Centre for Alcohol Policy Research, Turning Point Alcohol and Drug Centre. His research is focussed on the impacts of alcohol availability on drinking behaviours and alcohol-related problems, with a particular interest in the local-level implications of changes in policy.

Sharon Matthews is a Research Fellow in the Population Health Research team at Turning Point Alcohol and Drug Centre. Areas of research include secondary analysis of large administrative and survey data; alcohol and other drug harms and trends at a local, state, and national level; social determinants; data linkage; and gambling-related harms.

Susan Clemens was a Research Fellow at Turning Point Alcohol and Drug Centre during the design and implementation phases of this study. She currently works for Queensland Health conducting state-wide population health surveys of chronic disease and behavioural risk factors.

The influence of background music tempo and genre on virtual roulette

Stephanie Bramley, Nicola Dibben, & Richard Rowe

The University of Sheffield, Sheffield, United Kingdom

Abstract

Background music can influence everyday behaviour. We examined the influence of music tempo and genre on roulette. Fast tempo and popular music resulted in quicker betting with no effect on expenditure. Subjective arousal did not mediate music tempo's effects. Alternative mechanisms underlying music's influence on gambling and directions for future research are considered.

Résumé

La musique de fond a parfois un effet sur notre comportement habituel. Nous avons étudié l'incidence des genres musicaux et du tempo sur la pratique de la roulette. Selon nos observations, un tempo rapide ainsi que la musique populaire accélèrent le rythme du jeu sans effet sur le montant dépensé. L'excitation n'a pas modifié les effets du tempo. Les auteurs proposent une réflexion sur les autres mécanismes susceptibles d'expliquer l'incidence de la musique sur le jeu et sur les thèmes de recherche à explorer.

Introduction

Many studies demonstrate music's effects on the performance of everyday tasks (North, Hargreaves & Hargreaves, 2004). A meta-analysis found that fast tempo was consistently related to faster behaviour (Kämpfe, Sedlmeier, & Renkewitz, 2011). Fast tempo music leads to quicker drinking (McElrea & Standing, 1992) and faster running speeds (Edworthy & Waring, 2006); slow tempo increases time spent in a supermarket (Milliman, 1982) and restaurants (Caldwell, & Hibbert, 2002; Milliman, 1986). Music genre influences expenditure and spending intentions in retail environments (North & Hargreaves, 1998; North, Shilcock, & Hargreaves,

2003). For example, classical music increases expenditure in a wine cellar (Areni & Kim, 1993).

Music is often present within real and virtual gambling environments, and can potentially influence the initiation, maintenance and reinforcement of gambling behaviour (Griffiths & Parke, 2003; 2005). Adolescent gamblers have reported music as an attractive feature of fruit machines (Griffiths, 1990), and an observational study illustrated how music can be utilised within an amusement arcade (Griffiths & Parke, 2005). Gambling operators tend to control the background music in amusement arcades, and their choice of music can be informed by gamblers' respective ages, genders, and by which fruit machines they play (Griffiths & Parke, 2005). That differing music genres are played in different areas of an arcade illustrates this fact (Griffiths & Parke, 2005). However, some gamblers may request certain specific music to be played, and gambling operators have reported that this feature can help to please gamblers, possibly maintaining their gambling behaviour (Griffiths & Parke, 2005). Music is also included within the design of fruit machines, and similarly to background music may initiate, maintain and reinforce gambling behaviour (Griffiths & Parke, 2005). For example, familiar music played by fruit machines can create a sense of familiarity with the machines, thereby aiding gamblers' choice of machine (Griffiths & Parke, 2005). Furthermore, the music emitted by fruit machines can signal winning, a signal which may in turn both help to raise gamblers' self-esteem and encourage further gambling (Griffiths & Parke, 2005). These studies suggest that music has the potential to influence decisions regarding choice of gambling activity. They also show that music can be tailored to gamblers' needs and musical preferences, thereby maintaining gambling behaviour (Griffiths & Parke, 2005; Parke & Griffiths, 2007).

The studies discussed above investigate the presence of music in gambling environments and its potential effects on gamblers' behaviour. In the present study, we seek to extend the knowledge of how background music may influence gambling behaviour by examining the effects of manipulating two musical parameters (tempo and genre) on virtual roulette gambling behaviour. Internet gambling may be potentially more problematic and addictive compared to other forms of gambling (Griffiths & Barnes, 2008). Compared to in-situ gambling, gambling in virtual environments is characterised by increased event frequency, 24-hour availability, smaller intervals between gambles, instant reinforcements, and less time to contemplate losses before gambling again (Griffiths & Barnes, 2008). A recent survey found a relatively high proportion of gamblers chose to play casino games online opposed to offline (Wardle et al., 2011). Therefore, it is important to determine whether online gambling behaviour can be influenced by background music, and the mechanisms through which any effect occurs.

Fast tempo leads to faster betting speeds in virtual roulette (Dixon, Trigg, & Griffiths, 2007; Spenwyn, Barrett, & Griffiths, 2010). Arousal is a psychological mechanism which has been proposed as a possible explanation for why music tempo

influences behaviour (Berlyne, 1971). Evidence supports the notion that higher subjective arousal ratings are associated with increased gambling in both regular players (Leary & Dickerson, 1985) and pathological gamblers (Diskin & Hodgins, 2003). Heart rate (Anderson & Brown, 1984; Coulombe et al., 1992; Coventry & Hudson, 2001; Diskin, Hodgins, & Skitch, 2003; Leary & Dickerson, 1985) and skin conductance level (Diskin et al., 2003) have also been found to increase during periods of gambling. However, to date, gamblers' actual arousal responses when listening to music while gambling have not been recorded. Therefore it has not been established whether arousal mediates tempo's effect on betting speed.

It is unknown whether effects of music genre in commercial environments (e.g., Areni & Kim, 1993) transfer to gambling behaviour. Classical music may prime consumers' thoughts of affluence (North & Hargreaves, 2008). However, Griffiths and Parke (2003) suggested that popular music may be the most effective in initiating gambling and stimulating individuals' desire to gamble. Popular music may provide a better fit with gambling, priming thoughts congruent with fun, thereby resulting in less time and attention being allocated to gambling decisions, relative to classical music.

We examine whether tempo and genre influence betting speed and expenditure in virtual roulette. We aimed to replicate the finding that fast tempo leads in turn to quicker betting (Dixon et al., 2007; Spenwyn et al., 2010), and establish whether subjective arousal mediated tempo's effects on gambling. Secondly, we predicted that popular music would better "fit" gambling, thereby increasing expenditure relative to classical music.

Method

Design

A 2×2 (tempo x genre) between-participant design was employed. Participants were randomly assigned to one of four conditions: (1) fast classical, (2) slow classical, (3) fast popular and (4) slow popular. Two primary dependent variables were measured: betting speed and expenditure (amount of credits bet).

Participants

An opportunity sample of 32 undergraduate students (16 male, 16 female; aged 18–61 years; $\bar{x}$ = 24 years) took part in this study. A 2×2 ANOVA (between-participants) found no main effects of genre ($F(1,28) = 1.6, p > .05$), tempo ($F(1,28) = 1.37, p > .05$), or their interaction ($F(1,28) = .46, p > .05$) on age. Log-linear analyses were performed to examine whether either of the independent variables were associated with participants' gender or prior gambling experience. Gender was not associated with genre or tempo; the 3-way ($\chi^2(1) = .08, p > .05$) and 2-way interactions $\chi^2(4) = .79, p > .05$ could be removed without significant loss of fit.

Therefore gender ratios did not differ between conditions. Fifty-nine percent of participants had gambled prior to this experiment and prior gambling experience was not associated with gender or tempo. The 3-way $\chi^2(1) = .34, p > .05$ or 2-way $\chi^2(4) = .9, p > .05$ interactions could be removed without significant loss of fit; prior gambling experience ratios did not therefore differ between conditions.

Apparatus and Materials

Musical stimuli (Table 1) were categorised as fast or slow tempo. To match these tempos, alterations of $\leq 10\%$ were made using time stretching, without altering the pitch.

Playback was via a stereo system in a soundproofed room. The volume remained constant between participants but dynamic changes were retained (42.2 to 79.6 decibels).

Participants played virtual roulette using a desktop computer; the monitor was videotaped to assist with coding of variables. Questionnaires were used to collect demographic and gambling habits data. Participants completed the Affect-Arousal Scale (Aarts & Dijksterhuis, 2003); three participants' responses were excluded due to incorrect completion. The Affect-Arousal Scale (Aarts & Dijksterhuis, 2003) comprised six items, each of which was rated using a seven-point scale. Internal consistency of the scale was good ($\alpha = .75$). To measure "fit," participants indicated respectively their agreement with the statement "I would choose to listen to this music whilst gambling" using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Table 1
Description of musical stimuli

Condition	Composer/Artist	Title of music	Duration	Tempo (bpm) ^a
Fast Classical	Beethoven	Symphony No. 5 in C minor Op. 67, 1st Movement: Allegro con brio	7 min 20 s	120
Slow Classical	Beethoven	Symphony No. 7 in A major Op. 92, 2nd Movement: Allegretto	9 min 57 s	72
Fast Popular	Christina Aguilera	Ain't No Other Man	3 min 50 s	120
	Robbie Williams	Let Me Entertain You	4 min 25 s	
	Enrique Inglesias	Escape	3 min 29 s	
Slow Popular	Leona Lewis	Run	5 min 53 s	72
	Robbie Williams	She's the One	4 min 58 s	
	Enrique Inglesias	Hero	4 min 50 s	

^a Milliman (1982) classified fast tempo music as ≥ 94 beats per minute (bpm) and slow tempo as ≤ 72 bpm.

Procedure

Participants sat at the computer and the experimenter sat behind. Participants practiced and could ask questions before playing ten experimental games of roulette. Betting began when “Place your bets” appeared on the screen and concluded when “No More Bets” appeared. Betting speed was measured using a stopwatch, one which was started once “Place Your Bets” was displayed and was stopped when the participant indicated they had finished betting.

Results

Table 2 shows the condition means, and Table 3 shows the results of a two-way ANOVA (between-participants), which reveals the effects of tempo and genre on betting speed and expenditure.

Betting was quicker when listening to fast tempo music than it was to slow tempo music ($n = 30$, after two outliers, defined as being greater than two standard deviations from the mean, were removed from the analyses). Listening to popular music led to quicker betting compared to classical music. No interaction was found between genre and tempo on betting speed.

As shown in Table 3, a two-way ANOVA (between-participants) found no significant main effects of music tempo, genre or their interaction on expenditure ($n = 31$, after one outlier was removed from the analysis).

We found no evidence that tempo’s effect on betting speed was mediated by subjective arousal: tempo did not influence arousal ($F(1,27) = 1.06, p > .05$), and arousal and betting speed were unrelated ($n = 27, r = .08, p > .05$). Neither was genre’s effect on betting speed mediated by “fit”: genre did not influence “fit” ($F(1,30) = .01, p > .05$), and “fit” and betting speed were unrelated ($n = 30, r = -.08, p > .05$).

Table 2
Mean scores and standard deviations by condition

Dependent variable	Condition			
	Fast Classical	Fast Popular	Slow Classical	Slow Popular
Expenditure ^a	67.43 (52.58)	74.66 (27.37)	67.11 (51.55)	67.89 (34.50)
Betting Speed ^b	22.18 (4.67)	17.84 (2.98)	26.78 (5.82)	21.59 (7.00)

Note. All figures calculated with outliers removed.

^aTotal expenditure (credits) divided by number of games (ten)

^bTotal time taken (seconds) to place bets divided by number of games (ten)

Table 3

Two-way ANOVA examining the effects of tempo and genre on betting speed and expenditure

	Betting speed			Expenditure		
	<i>df</i>	<i>F</i>	<i>p</i>	<i>df</i>	<i>F</i>	<i>p</i>
Tempo	1	4.63	.04*	1	.05	.82
Genre	1	6.03	.02*	1	.07	.8
Tempo x Genre	1	.05	.826	1	.04	.84

* significant at the .05 level

Discussion

This study showed that genre influences betting speed and has confirmed reported effects of tempo on betting speed (Dixon et al., 2007; Spenwyn et al., 2010). In addition, this study tested whether subjective arousal and “fit” were mechanisms underlying the effects of genre and tempo on betting speed.

We found no evidence that tempo influenced behaviour via subjective arousal. Other mechanisms may explain tempo’s effects: fast tempo music may reduce attention (Cassidy & MacDonald, 2009) thereby resulting in quicker bet placement. Popular music led to quicker betting. One difference between the stimuli utilised in this study was the presence of lyrics. The popular music contained lyrics as opposed to the classical music, which was instrumental. Salamé and Baddeley (1989) suggested that vocal music may disrupt behaviour and cognitive tasks—such as reading, counting, calculating and reasoning—as its presence can, through interference with the phonological store’s ability to retain information, impair working memory. Further research could investigate whether vocal music influences gambling behaviour by employing the same piece of music as stimuli—one version with lyrics and the other instrumental.

Unexpectedly, music genre did not influence expenditure, which suggests that the previously observed effects of music genre (Areni & Kim, 1993) on expenditure in other retail and commercial environments may not transfer to online virtual roulette gambling. Three explanations have been proposed for why music genre leads to increased spending, for example, in a restaurant (North et al., 2003), with individuals being prepared to pay more for items in a cafeteria (North & Hargreaves, 1998). First, it has been speculated that music genre influences individuals’ perceptions of an environment, and if music causes the environment to be perceived as sophisticated or upmarket, then this primes contextually appropriate, congruent behaviour leading to increased spending or purchasing intentions (North et al., 2003; North & Hargreaves, 1998). Second, North et al. (2003) suggested that music can synergise with other aspects of a commercial environment, and this synergy consequently promotes spending. Third, consumers’

music preferences may lead to them preferring one music genre over another, and liking for the music correspondingly increases spending (North et al., 2003). However, given the findings of the present study and those obtained in other studies (Dixon et al., 2007; Spenwyn et al., 2010), it appears that, to date, a consistent lack of influence of music tempo or genre on expenditure in laboratory gambling environments has been shown. We do not know, however, whether background music influences expenditure in real-life gambling situations; further research is therefore needed.

These results must be considered in the context of a number of limitations. First, a larger sample size would be desirable to quantify with precision the influence of music on performance. However, this sample size was sufficient to confirm the findings of prior research (Dixon et al., 2007; Spenwyn et al., 2010), and identify that popular music leads to faster betting. Second, participants were observed by the experimenter to collect data. It is therefore possible that social facilitation may have occurred. Previous research suggests that gamblers exhibit riskier behaviour when playing online roulette with another person, in comparison to when gambling offline and alone (Cole, Barrett, & Griffiths, 2011). Nonetheless, a protective effect of gambling with others has also been observed—smaller bets were placed when gamblers believed that they were being watched by an audience of 26 people (Rockloff & Greer, 2011). Given the solitary nature of Internet gambling and the potential for presence of others to influence gambling behaviour, future research should permit participants to gamble alone so that the experiment reflects a more realistic gambling session. Third, participants gambled with credits, as opposed to real money. Griffiths (2003) has suggested that the psychological value of electronic money such as chips is less than real money (Griffiths, 2003), as shown by individuals gambling more with poker chips than real money (Lapuz & Griffiths, 2010). Future research may wish to explore whether music influences gambling expenditure differently during a real-life gambling situation where real money is gambled. Fourth, in the present study a stopwatch was used to measure betting speed, but this technique did not control for the potential for the experimenter to be influenced by the music, and the experimenter was not hypothesis-blind. Future research should therefore adopt a more precise and objective measurement of betting speed, such as via an automated timer. Finally, our sample consisted of undergraduate students, which may limit the extent that our findings can be extrapolated to problem or pathological gamblers.

Despite these limitations, our study does provide new knowledge, specifically the effect of genre on betting speed, and the absence of evidence for mediation of effects of tempo by subjective arousal, thereby offering potential avenues for further large-scale empirical research. Furthermore, this research highlights the lack of explanatory evidence regarding the mechanisms underlying music's effects on gambling behaviour and everyday life (Kämpfe et al., 2011). Future research should therefore examine to what extent background music affects objective indices of both physiological arousal, and attention, when gambling.

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For correspondence: Stephanie Bramley, MA, BA (Hons.), The University of Sheffield, Department of Music, Jessop Building, 34 Leavygreave Road, Sheffield, South Yorkshire, S3 7RD. Tel: +44 114 222 0470. Fax: +44 114 222 0469. E-mail: mup09sb@sheffield.ac.uk

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and Dr. Richard Rowe were involved with data analysis, interpretation of the data, writing and editing the final version of the article.

Stephanie Bramley holds a BA in Music from the University of Leeds and an MA in Psychology of Music from The University of Sheffield. She is a doctoral student at The University of Sheffield, currently investigating the presence, experience and influence of music in gambling situations. Her research interests include the social and applied psychology of music, music and emotion, and examining which psychological mechanisms underlie the effects of music on behaviour.

Nicola Dibben is Professor in Music at The University of Sheffield, where she lectures and researches within the fields of psychology of music and popular music studies. Her work on music, mind and culture has been published in over 25 peer-reviewed articles and book chapters. She has also co-written the book *Music, Mind and Everyday Life* (Oxford University Press, 2010) and written *Bjork* (Equinox Publishing, 2009).

Richard Rowe is Senior Lecturer in Psychology at The University of Sheffield. Richard's research addresses risk-taking and antisocial behaviour in young people, and has been published in a range of peer-reviewed journals. Dr. Rowe's teaching focuses on developmental psychology and quantitative research methods.

Trends in Gambling Behavior among College Student-Athletes: A Comparison of 2004 and 2008 NCAA Survey Data

N.Will Shead,¹ Jeffrey L. Derevensky,² & Thomas S. Paskus³

¹Mount Saint Vincent University

²International Centre for Youth Gambling Problems, McGill University

³National Collegiate Athletics Association

Abstract

Two large samples of National Collegiate Athletic Association (NCAA) student-athletes in 2004 ($N = 18,916$) and 2008 ($N = 17,675$) were surveyed about their gambling behavior. A cross-comparison highlighted gambling trends among college-student athletes across the four-year span. Overall, past-year and weekly gambling rates were lower in 2008 compared to 2004. There were no within-gender differences in the proportion of individuals at-risk or meeting criteria for a gambling problem between 2004 (4.0% males, 0.3% females) and 2008 (3.8% males, 0.4% females). Participation rates were higher in 2004 for all gambling activities, except for past-year Internet gambling and sports wagering, which increased in 2008 among males. Across sports, gambling participation was notably highest among golfers of both genders. Collectively, the results suggest that gambling activity among student-athletes is on a downward trend in spite of ongoing expansion of gambling opportunities.

Résumé

Deux échantillons importants d'étudiants-athlètes de la National Collegiate Athletic Association (NCAA) tirés de la cohorte de 2004 ($N = 18\ 916$) et de la cohorte de 2008 ($N = 17\ 675$) ont été sondés concernant leurs comportements de jeu compulsif. Une étude intercomparative a révélé les tendances de jeu compulsif chez les étudiants-athlètes de niveau collégial, sur une période de quatre ans. Dans l'ensemble, les taux de jeu compulsif relevés au cours de l'année écoulée et sur une base hebdomadaire étaient inférieurs en 2008 à ceux relevés en 2004. Il n'existait aucune différence sexospécifique quant aux taux d'individus à risque ou d'individus répondant aux critères indiquant la présence d'un problème de jeu compulsif entre 2004 (4,0 % d'hommes, 0,3 % de femmes) et 2008 (3,8 % d'hommes, 0,4 % de femmes). Les taux de participation étaient supérieurs en 2004 pour ce qui est de toutes les activités de jeu de hasard, à l'exception des activités de jeu en ligne et des

paris sportifs, qui ont augmenté en 2008 chez les hommes. Dans tous les sports, les activités de jeu les plus intensives ont notamment été relevées chez les golfeurs des deux sexes. Collectivement, les résultats suggèrent que les activités de jeu chez les étudiants-athlètes sont à la baisse, malgré le fait que les jeux de hasard sont de plus en plus accessibles.

Trends in Gambling Behavior among College Student-Athletes: A Comparison of 2004 and 2008 NCAA Survey Data

With the gambling industry continuing to expand on a global scale, there are currently more opportunities to gamble than ever before (American Gaming Association, 2012; Volberg, 2004). Much of this expansion has been the result of more relaxed attitudes among governmental bodies towards gambling, and general public acceptance of gambling as a socially acceptable recreational activity (Suissa, 2008). The omnipresence of gambling, along with an increasingly pro-gambling stance in society, have raised significant concern in the world of college and professional athletics (Huang, Jacobs, Derevensky, Gupta, & Paskus, 2007a, 2007b; Kerber, 2005; McCarthy, 2007). Despite ongoing efforts to address the inherent difficulties of mixing sports with gambling, the gambling activities of college student-athletes continue to present several challenges.

As evidenced by a 2004 national survey conducted by the NCAA, gambling is a common activity among college student-athletes (Ellenbogen, Jacobs, Derevensky, Gupta, & Paskus, 2008; Huang et al., 2007a, 2007b; Petr, Paskus, & Dunkle, 2004). The NCAA survey was groundbreaking in scope, polling student-athletes about their gambling activities on a national scale. Previous smaller-scale surveys, conducted regionally or at individual schools, yielded a range of estimates of gambling behavior and gambling-related problems among student-athletes (e.g., Butts, 2006; Cross, Basten, Hendrick, Kristofic, & Schaffer, 1998; Cross & Vollano, 1999; Cullen & Latessa, 1996; Engwall, Hunter, & Steinberg, 2004; Kerber, 2005; Rockey, Beason, & Gilbert, 2002). Surveys have shown that 25–37% of male student-athletes and 15% of female student-athletes admit to betting on sports (Cross & Vollano, 1999; Cross et al., 1998; Cullen & Latessa, 1996). Studies of problem gambling prevalence among student athletes have yielded estimates between approximately 17–26% among males and 5–14% among females (Butts, 2006; Engwall et al., 2004; Kerber, 2005; Rockey et al., 2002).

The 2004 NCAA survey aimed to gauge gambling activities among student-athletes on a national level while addressing methodological problems associated with earlier studies (e.g., small sample sizes, low response rates, and poor generalizability to other regions). The results revealed that a large proportion of student-athletes regularly participated in a wide range of gambling activities. Overall, 62.4% of males

and 42.8% of females reported gambling in some form of gambling during the past year, while 13.0% of males and 3.3% of females gambled weekly (Ellenbogen et al., 2008). With respect to problem and pathological gambling, 3.9% of males and 0.4% of females reported significant gambling problems. A significant proportion of student-athletes reported wagering on college and professional sports despite the NCAA's prohibition (e.g., almost 5% of males reported gambling on college sports using a bookie).

Sports wagering is among the most popular forms of gambling (e.g., LaPlante et al., 2009; Nelson et al., 2007) and remains a particular concern with regard to the gambling activity of college student-athletes given the potential for this type of activity to compromise the integrity of sporting events. Making this issue more complicated is a long history of sports and gambling being intrinsically connected. The competitive nature of sports promotes wagering, and punters can bet, either legally or illegally, on the outcome of virtually any sports contest in the world. In the United States (U.S.), bookmaker revenues have reportedly climbed steadily since the 1980s (Claussen & Miller, 2001). During 2009, gamblers wagered \$2.6 billion on sporting events in Nevada alone, the only U.S. state in which sports books can legally accept bets on collegiate and professional sports (American Gaming Association, 2010). Two sports accounted for 74% of this wagering: football (43%) and basketball (31%). Not coincidentally, football and basketball are generally considered the centerpiece of most college athletic programs in the U.S.

While the NFL championship game garners more bets than any other single-day sporting event (\$94 million was wagered on the 2012 Super Bowl in Nevada sports books; AGA, 2012), the NCAA Division I men's basketball tournament (i.e., "March Madness") generates the most gambling involvement among the public than any other sporting event when both legal and illegal wagers are accounted for. Although Nevada sports books take in between \$80 and \$90 million in legal wagers on March Madness each year, the Federal Bureau of Investigation (FBI) estimates that \$2.5 billion is illegally wagered annually on the tournament (Simon, 2010). Most of these illegal wagers take the form of office pools while a significant portion of March Madness bets are made via online sports books.

The advent of Internet-based gambling in the late 1990s and the subsequent growth of online sports books throughout the early part of the twenty-first century has made sports wagering accessible to millions of people outside of Nevada. Hundreds of offshore gambling sites accept wagers on collegiate and professional sports contests. Christiansen Capital Advisors (2007), which monitors Internet gambling, estimated that more than \$4.2 billion in online sports wagers were made in 2005, more than double the amount wagered in 2001. This expansion of the online sports wagering industry has made gambling in general and sports wagering in particular more accessible and easier than ever before (Lowry, 1999). Recently, the U.S. Department of Justice indicted several online gambling sites, including a few prominent online sports books (Richtel, 2011). While these indictments put the

legality of online sports wagering into question, betting on sports over the Internet continues unabated on many websites (“USA Friendly Online Betting Sites,” n.d.).

Athletes who gamble on the outcome of sports contests are at greater risk of compromising the integrity of their own sport (Udovicic, 1998). At the college level, athletes are particularly vulnerable as they are not paid for their participation, which gives them more incentive to profit from their situation. Although many college athletes receive compensation in the form of scholarships, fee waivers, meal plans, money for books, and coverage of a number of additional academic costs, they do not receive a salary, and gambling may be viewed as a convenient route to monetary gain. Athletes may use “inside information” to make educated bets and, in severe cases, they may try to influence the outcomes of their own games (Ellenbogen et al., 2008). There have been numerous instances of “point shaving” scandals in which players have intentionally played worse so that an opposing team would be more likely to cover a point spread (i.e., the handicap towards an underdog). In 1994, for example, Arizona State University student Benny Silman bribed two athletes to play poorly in several NCAA basketball games to bet against the point spreads of those games (Associated Press, 1998). More recently, allegations of point-shaving were levied against a player from Auburn University’s men’s basketball program for games played in early 2012 (Robinson, 2012). Because favoured teams can lose the point spread without losing the game, athletes can attempt to alter the outcome of a game without letting their teammates and coaches down. Student-athletes with financial difficulties are considered prime targets by organized gambling groups to affect the outcome of a game (McCarthy, 2007).

A secondary issue with sports wagering among college athletes involves its potential for participation in other forms of gambling. It is possible that an individual whose initial gambling experiences involve sports wagering may in turn become engaged in other forms of gambling, a shift which can escalate into serious problems. In some instances, growing gambling debts may lead student-athletes to become involved in illegal activities, some of which may undermine their sport. There have been numerous instances of student-athletes convicted of sports wagering offenses (e.g., accepting bribes to tamper with the outcome of a game) who have then served lengthy prison sentences (McCarthy, 2007). In this respect, sports wagering may serve as a gateway to heavier gambling involvement among student athletes, a change that can put their personal lives, academic progress, prospective athletic careers, and even freedom at risk.

While gambling on the outcome of NCAA competitions is legal in Nevada, the NCAA rules strictly prohibit all illegal forms of wagering on college sports. Even seemingly harmless low-stakes office pools (e.g., March Madness brackets) are frowned upon. Such illegal wagering is viewed as contributing to youth gambling and as encouraging gambling among student-athletes. To address the problem of student-athlete gambling, the NCAA has a strict policy that prohibits all forms of legal and illegal wagering on college sports among student-athletes, coaches, and

NCAA employees (www.ncaa.org). The NCAA's rules and regulations state that any student-athlete found to be involved in any college or professional sports wagering activity is ineligible to participate in NCAA competition for at least one year. Furthermore, student-athletes found to be involved in sports wagering involving their own institution are permanently banned from NCAA competition.

In addition, the NCAA implemented campus-level awareness programs and an enforcement group responsible for investigating cases of student-athlete gambling. An interactive website (www.dontbetonit.org) was created by the NCAA where student-athletes, coaches, and administrators can find educational materials about sports wagering. The website provides information about the NCAA's official position on sports wagering; data on the prevalence of sports wagering in intercollegiate athletics, as well as the potential risks and downsides; and resources for combating gambling-related problems within a sports program.

Despite longstanding efforts by the NCAA to curb sports wagering among college student-athletes, studies conducted over the past two decades suggest there remain significant concerns (e.g., Cross et al., 1998). In a sample of 648 male student-athletes playing Division I football or basketball, 25% admitted to betting on sports (Cullen & Latessa, 1996). In a similar sample of male football and basketball players, 37% reported betting on sports (Cross et al., 1998). Significant proportions of female student-athletes (15.1%) have also reported high rates of sports wagering (Cross & Vollano, 1999). Given these findings, it is crucial to continually monitor the prevalence of all gambling activities among student-athletes. Examining the extent of gambling involvement among student-athletes on an ongoing basis allows stakeholders to discern trends in gambling involvement—especially sports wagering—and identify which subgroups across the broad range of student-athletes require more attention.

Given the changing landscape of gambling since the NCAA's 2004 study (e.g., increasing number of casinos, expansion of Internet gambling), a follow-up study was conducted in 2008 to examine changes in the gambling behaviors among student-athletes. The purpose of the current study is to compare results of the 2004 and 2008 NCAA national surveys. Particular attention was paid towards shifts in overall gambling participation, sports wagering, and problem gambling rates. In addition, because of the rapidly changing face of Internet gambling between 2004 and 2008 and its connection to sports wagering, changes in Internet gambling activities as well as sports wagering were also examined closely.

Methods

Participants

Data were drawn from surveys administered by the NCAA to U.S. college student-athletes in 2004 and 2008. The NCAA consists of 1281 colleges and universities in

the U.S. Ethics approval was obtained from ethics review committees of respective institutions where the surveys were administered.

A total of 20,587 surveys were administered in 2004 and 19,942 were administered in 2008. Approximately 62% of participants were male in both the 2004 and 2008 samples, which marginally overrepresented the proportion of males in the two samples compared to gender proportions in the student-athlete population reported by the NCAA (58% males) (NCAA, 2009). Among respondents in 2004 who reported their race/ethnicity, 75% identified themselves as White, 15% as Black, and the remaining 10% as another racial/ethnic group. In the 2008 survey, 72% identified themselves as White, 17% as Black, and 11% as another racial/ethnic group. For both samples, ethnic/racial group proportions approximated those observed in the overall population of student-athletes. In 2004, approximately 33% of the respondents were freshmen, 26% were sophomores, 23% were juniors, and 19% were seniors. In 2005, approximately 35% were freshmen, 27% were sophomores, 23% were juniors, and 15% were seniors.

Survey Administration

A multi-stage cluster sampling design was incorporated in both the 2004 and 2008 studies. Faculty Athletics Representatives (FARs) of all NCAA member colleges were approached to participate. Each school was informed that all members of between one and three teams would be surveyed. Teams were selected based on a stratified random sampling procedure to ensure that all sports in each of the three NCAA divisions would be represented in the total sample. All students and FARs were assured that participation would remain anonymous at the student and institution level. Student-athletes from each team were surveyed at the same time without coaches or other team personnel present. Completed surveys were not handled by FARs. Rather, one student-athlete assumed responsibility for collecting the completed surveys, placing them into a sealed package, and mailing the package to an independent third-party vendor that compiled and entered the data.

As survey responses were submitted anonymously, institutional response rates could not be calculated absolutely. The response rate was estimated to be greater than 60% based upon previous surveys conducted in this manner and the total number of completed surveys received.

Survey Content

The 2004 and 2008 surveys differed somewhat in content (Paskus, Petr, Vicente, & Derevensky, 2009). The 2004 survey collected information on multiple health-risk behaviors (e.g., substance use, sexual activity, and criminal activity) in addition to gambling behavior and demographic information. The 2008 survey was significantly modified and streamlined with most items related to health-risk behaviors removed and with a focus on gambling behaviors. In both the 2004 and 2008 surveys, athletes

provided demographic information, details about the college sport they played, and experiences with gambling, including extensive questions related to sports wagering. All gambling questions referred to participants' behavior during the previous 12 months. Participants were initially categorized as non-gamblers or gamblers based on their responses to the Gambling Activities Questionnaire (GAQ) (Gupta & Derevensky, 1996) portion of the survey which queries frequency of participation for 14 gambling activities over the past 12 months (“daily”, “at least once a week”, “at least once a month”, “less than once a month”, and “not at all”). All individuals who reported not gambling in any form in the past year were categorized as non-gamblers.

Those who reported having gambled at least once on any of the activities in the previous year (i.e., gamblers) were further divided into three categories based upon their responses to a questionnaire format of the DSM-IV-TR (American Psychiatric Association, 2000) criteria for pathological gambling. This instrument contains 10 items that query the presence of various symptoms and diagnostic criteria associated with pathological gambling, including: preoccupation with gambling; need to increase the amount of gambling to achieve the same level of excitement (tolerance); loss of control; withdrawal symptoms; escape; chasing of losses; lying to family; engaging in illegal activities to pay for gambling; disruptions to family or job; and borrowing money to pay for gambling debts. Standard cut-off scores for problem gambling categorization were used to form three DSM categories of problem gambling. Participants who reported 0–2 symptoms were categorized as Social Gamblers, those who endorsed 3–4 symptoms were categorized as At-Risk Gamblers, and those who endorsed 5 or more symptoms were categorized as Probable Pathological Gamblers (PPGs). A similar system of categorization has been used in other studies (e.g., Gupta, Derevensky, & Nower, 2009; Shead, Derevensky, Fong, & Gupta, 2012; Temcheff, Derevensky, & Paskus, 2011). This questionnaire format has been shown to have strong internal consistency (.92) and a good agreement rate (87%) with another measure of problem gambling severity (Stinchfield, Govoni, & Frisch, 2005).

Data Preparation

Rigorous data cleaning procedures were implemented to eliminate, as much as possible, invalid data resulting from dubious responses to the surveys. Included in these cleaning procedures were a series of validity checks and Item Response Theory techniques to identify questionable patterns of responding. Cases revealing strong evidence of insincere responses (e.g., statistically unlikely combination of responses, inconsistent responding, responses in some portions of the survey that contradict responses elsewhere) were excluded from analyses. These cleaning procedures were applied to both the 2004 and 2008 survey data to enhance comparability. Because these cleaning procedures were applied retroactively to the 2004 survey data, the results reported in this paper are not identical to those previously reported for the same 2004 data (e.g., Ellenbogen et al., 2008).

After data cleaning procedures were applied to exclude insincere respondents, a series of steps were applied to account for differences in sampling strategies and survey content between the 2004 and 2008 surveys. These procedures were aimed at making more accurate comparisons across samples. To account for differences in sampling strategies, a filter was applied to both samples such that respondents participating in one of 22 sports (11 men's sports; 11 women's sports) were adequately sampled in each of the three NCAA divisions in 2004 and 2008. Furthermore, these data were weighted to the NCAA's estimate of 2008 participation rates within the 22 sports to account for differences in sampling proportions within each cohort and to scale the results from both years in relation to current national participation figures.

To account for differences in survey content, an additional set of filters was applied to both samples. Given the present study's main goal of examining changes in problem gambling severity rates in the four-year span, the basis for filtering was implemented to ensure that problem gambling severity rates were comparable. Participants in both samples were categorized as either (1) non-gamblers, (2) social gamblers, (3) at-risk gamblers, or (4) probable pathological gamblers, based on responses to the GAQ and DSM-IV-TR questionnaire. However, differences in formatting of the surveys necessitated survey-specific methods of filtering out certain participants with missing data. In the 2004 survey, the GAQ immediately preceded the DSM-IV-TR. The DSM-IV-TR contained the instruction, "If you have not gambled, bet or wagered in any way during the past 12 months, please skip [this section]." Despite this instruction, certain of those participants who reported gambling on the GAQ skipped the DSM-IV-TR, ostensibly because they did not believe themselves to have gambling problems suggesting they should be categorized as "social gamblers." Accordingly, the following four guidelines were employed to filter out and categorize respondents: (1) those who missed the GAQ and DSM-IV-TR were categorized as "missing" and excluded from further analyses (1.5%), (2) those who indicated "no gambling" in the past year on the GAQ were categorized as "non-gamblers" whether or not they completed or skipped the DSM-IV-TR, (3) those who indicated any gambling participation on the GAQ in the past year but skipped the DSM-IV-TR were categorized as "social gamblers," and (4) all others who indicated gambling participation on the GAQ and who completed the DSM-IV-TR were categorized according to their scores on the DSM-IV-TR.

Whereas the 2004 survey placed the DSM-IV-TR immediately following the GAQ, the 2008 survey placed the DSM-IV-TR several sections after the GAQ. This gap between the GAQ and DSM-IV-TR in the 2008 survey raises the possibility that some participants might be incorrectly categorized if the 2004 guidelines were applied. For example, a participant might have endorsed gambling in the past year on the GAQ but then stopped completing the survey before reaching the DSM-IV-TR. In such a case, the participant would be categorized as a "social gambler" according to 2004 survey guidelines; however, they would be more appropriately filtered out given the possibility that they are actually an at-risk or pathological

gambler. Alternatively, a participant might have endorsed gambling on the GAQ but validly skipped the DSM-IV-TR, believing that questions about problem gambling do not apply to him or her. Therefore, the section preceding the DSM-IV-TR was examined to determine if individuals who missed the DSM-IV-TR had done so purposely or had terminated the survey by that point. The following guidelines were employed to filter out and categorize participants in the 2008 sample: (1) those participants who missed the GAQ and DSM-IV-TR were categorized as “missing” and excluded from further analyses (0.4%), (2) those who missed the section preceding the DSM-IV-TR and did not complete the DSM-IV-TR were categorized as “missing” and excluded from further analysis (8.0%), (3) those identified as non-gamblers on the GAQ, did not skip the section preceding the DSM-IV-TR, but skipped the DSM-IV-TR were categorized as “non-gamblers,” (4) those who indicated any gambling participation on the GAQ in the past year but skipped the DSM-IV-TR, were categorized as “social gamblers,” and (5) all others who indicated any gambling participation on the GAQ and who completed the DSM-IV-TR were categorized according to their scores on the DSM-IV-TR.

After applying all data cleaning and filtering procedures, comparative data were available for 18,916 student-athletes from the 2004 survey and 17,675 student-athletes from the 2008 survey. Participants excluded from further analysis represent 8.1% of the total surveys received in 2004 and 11.4% of the total surveys from 2008.

Data Analysis

The large sample sizes and number of statistical analyses employed greatly increased the possibility of spurious findings. Accordingly, the threshold probability for reporting statistical significance was set at .0005 rather than the conventional .05. Pearson chi-square tests were conducted using SPSS software. The Phi coefficient, a simplified calculation of the Pearson correlation between two dichotomous variables (Calkins, 2005), was provided as an index of the strength of association between variables.

Results

In 2004, 62.8% (70.7% males, 48.9% females) of the sample reported some form of gambling in the past year. Participation rates were relatively lower in 2008 with 54.8% (65.6% males, 38.5% females) of the sample reporting past year gambling. Within gender comparisons revealed that the associations between survey and past year gambling participation were significant (males, $\chi^2(1, 22709) = 67.8, p < .0005$; females $\chi^2(1, 13913) = 155.06, p < .0005$). Weekly gambling rates also decreased across samples. In 2004, 17.6% of males and 4.3% of females reported gambling on a weekly basis whereas in 2008, 11.1% of males and 1.5% of females were weekly gamblers (males, $\chi^2(1, 22681) = 192.6, p < .0005$; females $\chi^2(1, 13910) = 101.1, p < .0005$).

Overall, 37.9% of the 2004 respondents were categorized as non-gamblers versus 45.2% categorized as non-gamblers in 2008; 59.5% were categorized as social gamblers in 2004 versus 52.4% social gamblers in 2008, 1.9% were at-risk gamblers in 2004 versus 1.2% at-risk gamblers in 2008, and 0.7% were PPGs in 2004 versus 1.3% PPGs in 2008. When at-risk and PPGs were combined into a single group (i.e., at-risk/PPGs) and compared to a group composed of non-gamblers and social gamblers (i.e., non/social gamblers), there were no appreciable differences across years as 2.6% in 2004 were at-risk/PPGs and 2.5% in 2008 were at-risk/PPGs, $\chi^2(1, 36591) = 1.80, p = .180$. Table 1 presents rates of problem gambling severity across the two samples, separated by gender.

Differences between the 2004 and 2008 samples in terms of past year and weekly participation rates with respect to different types of gambling among males are presented in Table 2. Differences among females are presented in Table 3. Among males, the 2004 sample generally reported higher rates of past year and weekly gambling participation in different activities with a few exceptions. There were no differences in past year or weekly participation in horse/dog race wagering, playing the stock market, or bingo. There was also no difference in past year participation in card games (e.g., poker); however, weekly poker playing in 2008 (3.9%) was less than half the weekly participation rate in 2004 (8.4%). The only two activities that showed an increase in past year participation across the four-year span were Internet gambling, which was almost doubled from 6.8% in 2004 to 12.1% in 2008 (12.1%), and sports wagering, which increased from 23.5% in 2004 to 29.3% in 2008. Despite these increases in past year participation, weekly participation in Internet gambling did not differ between years, and weekly participation in sports wagering was actually higher in 2004 (4.7%) compared to 2008 (2.4%).

Table 1
Differences in Problem Gambling Severity between 2004 and 2008 Separated by Gender

DSM-IV-TR Category	Males			Females		
	2004	2008	Phi	2004	2008	Phi
Non-gambler	29.3	33.7	.048*	51.1	61.4	.105*
Social gambler	66.7	62.5	.044*	48.6	38.2	.105*
At-risk gambler	2.9	1.8	.036*	0.3	0.2	.013
Probable pathological gambler	1.1	2.0	.035*	0	0.2	.022
At-risk / PPG (combined)	4.0	3.8	.006	0.3	0.4	.003

Note. Weighted percentages are presented. 2x2 Pearson chi-square tests ($df = 1$) compared the 2004 and 2008 sampling distributions of respondents in a given DSM-IV-TR category (row) versus those in all other categories. The Phi statistic provides an estimate of effect size.

* $p < .0005$.

Table 2

Differences in Male Participation in Different Gambling Activities between 2004 and 2008

Gambling activity	Gambling in past year			Weekly gambling		
	2004	2008	Phi	2004	2008	Phi
Lottery tickets	36.2	31.4	.051*	3.0	2.0	.034*
Card games (e.g., poker)	46.8	46.1	.007	8.4	3.9	.094*
Bet on games of personal skill	39.7	32.7	.072*	5.8	4.1	.038*
Horse/dog races	9.8	8.5	.022	0.5	0.4	.010
Played the stock market	10.2	9.3	.015	2.2	2.1	.004
Bingo	6.5	6.9	.006	0.3	0.4	.008
Internet gambling	6.8	12.1	−.092*	1.4	2.0	−.022
Shot dice	13.4	10.8	.039*	1.5	0.9	.024*
Slot machines	19.8	15.3	.059*	0.9	0.3	.037*
Sports wagering	23.5	29.3	−.066*	4.7	2.4	.060*

Note. Weighted percentages are presented. 2x2 Pearson chi-square tests ($df = 1$) compared the 2004 and 2008 sampling distributions of respondents in a given DSM-IV-TR category (row) versus those in all other categories. The Phi statistic provides an estimate of effect size.

* $p < .0005$.

Among females, the pattern of differences between samples for different gambling activities was more consistent. Past year participation rates were higher in 2004 for all activities except bingo, Internet gambling, and sports wagering for which there

Table 3

Differences in Female Participation in Different Gambling Activities between 2004 and 2008

Gambling activity	Gambling in past year			Weekly gambling		
	2004	2008	Phi	2004	2008	Phi
Lottery tickets	29.7	24.0	.065*	1.2	0.6	.030*
Card games (e.g., poker)	19.0	10.7	.117*	1.3	0.3	.058*
Bet on games of personal skill	14.0	7.1	.113*	0.7	0.1	.042*
Horse/dog races	4.8	3.1	.042*	0.1	0	.018
Played the stock market	3.5	2.0	.045*	0.6	0.2	.026
Bingo	7.3	6.9	.008	0.2	0.1	.014
Internet gambling	2.1	1.8	.012	0.4	0	.028
Shot dice	3.5	2.2	.039*	0.3	0	.034*
Slot machines	14.3	9.9	.068*	0.2	0.1	.028
Sports wagering	6.7	6.5	.003	0.6	0.1	.040*

Note. Weighted percentages are presented. 2x2 Pearson chi-square tests ($df = 1$) compared the 2004 and 2008 sampling distributions of respondents in a given DSM-IV-TR category (row) versus those in all other categories. The Phi statistic provides an estimate of effect size.

* $p < .0005$.

were no differences observed. The prevalence of weekly participation in all activities was low overall (1.3% or less) and generally higher in 2004 compared to 2008.

Within each sport, past year and weekly gambling rates were generally lower in 2008 compared to 2004. As shown in Figure 1, among males, past year and weekly gambling rates were higher in 2004 within every sport, except for past year gambling among baseball players, in which it was higher in 2008, albeit not significantly higher ($\chi^2(1, 3550) = 4.90, p = .03$). The relative prevalence of gambling across sports indicated the highest past year and weekly gambling rates among golfers for both years. In 2008, weekly gambling among golfers (31.7%) was more than twice as prevalent as the next highest sport (baseball, 14.3%). Basketball players reported the lowest past year gambling rates in 2008 and the second lowest in 2004; wrestlers reported the lowest weekly gambling rates in 2008 and track athletes reported the lowest weekly rates in 2004.

Prevalence rates for at-risk/PPGs across men's sports also suggested higher problem severity among male golfers (Figure 2). In 2008, golfers consisted of the highest proportion of at-risk/PPGs (7.1%) compared to other sports; albeit, the proportion within golfers dropped off from 2004 (11.1%) when golfers consisted of, by far, the highest proportion of at-risk/PPGs across sports. There were slight decreases across years in the proportion of at-risk/PPGs within hockey (2004: 7.8%; 2008: 5.9%) and tennis (2004: 5.4%; 2008: 3.6%). Meanwhile, slight increases took place in the proportion of at-risk/PPGs within lacrosse (2004: 3.0%; 2008: 4.6%), swimming (2004: 2.3%; 2005: 3.5%), and wrestling (2004: 3.3%; 2008: 4.6%). Proportions within all other sports stayed relatively stable.

Among females (Figure 3), there were also generally lower rates of past year and weekly gambling in 2008 versus 2004 across sports. Only softball players reported

Figure 1. Past year and weekly gambling participation rates among male student-athletes across different sports

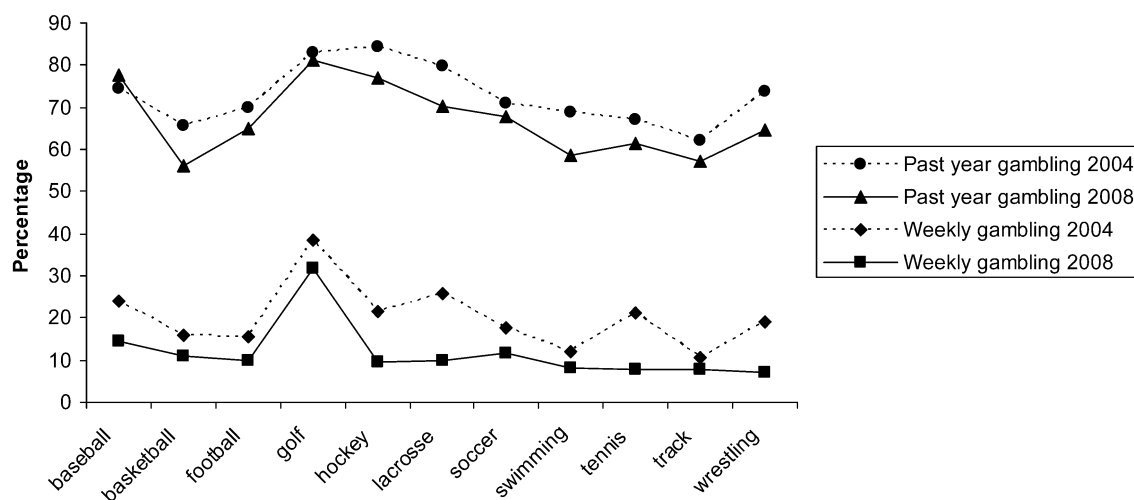
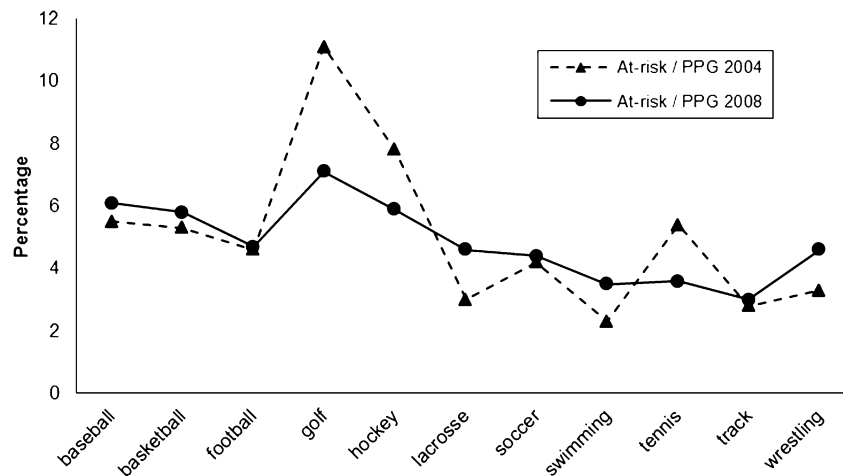
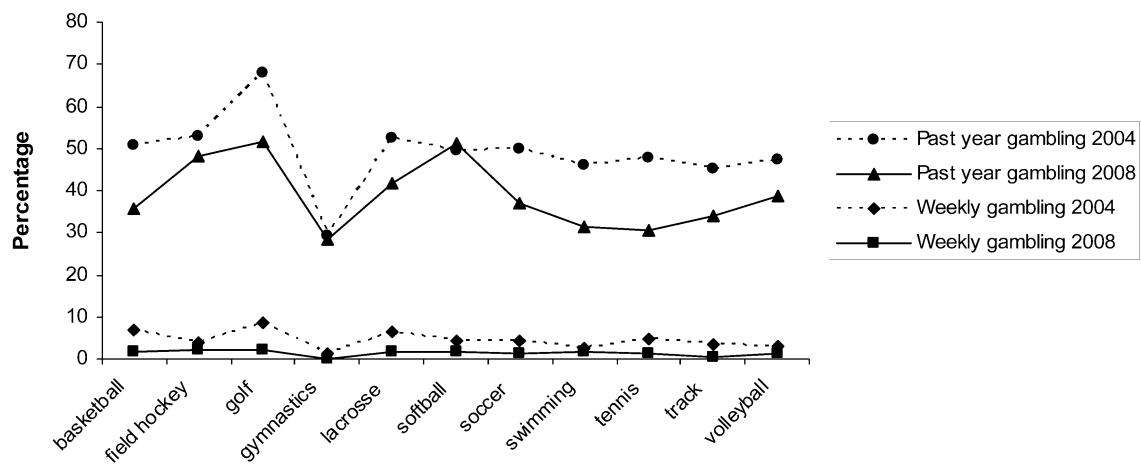


Figure 2. Proportion of at-risk gamblers and probable pathological gamblers (PPGs) among male student-athletes across different sports



higher past year gambling rates in 2008 compared to 2004, but again this difference was not significant ($\chi^2(1, 1826) = 0.55, p = .46$). Consistent with the observation among males, female golfers in both years reported the highest rates of past year and weekly gambling. The lowest past year and weekly gambling rates were reported by gymnasts. Whereas among males there was a general decline in gambling participation between years, such a clear pattern did not emerge with females. In 2004, past year gambling rates among women ranged between 45% and 53% across sports except for golf (68.0%) and gymnastics (29.3%). In 2008 there were noticeably sharper drops in past year gambling in several sports (basketball, golf, lacrosse, soccer, swimming, tennis, track, volleyball) but not in others (field hockey, gymnastics, softball). Relative to males, the proportion of at-risk/PPGs among

Figure 3. Past year and weekly gambling participation rates among female student-athletes across different sports



females was extremely low which prevented statistically reliable comparisons within sports between 2004 and 2008.

Discussion

As mentioned earlier, the NCAA has made concerted efforts to address gambling among its athletes through awareness programs, enforcement groups, and a website aimed specifically at disseminating relevant information on gambling. Although the current method precludes a direct examination of the effects of these initiatives, several findings in the current study suggest the NCAA may be moving in the right direction towards helping curb gambling activity among student-athletes. Overall, past year and weekly gambling rates were lower in 2008 compared to 2004 among males and females. Changes in gambling severity categorization between 2004 and 2008 indicated an overall increase in the proportion of non-gamblers along with a corresponding drop in the proportion of social gamblers. Meanwhile, the 2008 survey revealed fewer at-risk gamblers and more probable pathological gamblers compared to 2004. However, when at-risk gamblers and probable pathological gamblers were collapsed into a single group and compared to non-gamblers and social gamblers, no differences were found between samples in the proportion of individuals at-risk of having a gambling problem or meeting criteria for a gambling problem. Taken together, these findings suggest a promising trend in gambling activity among college student-athletes with lower gambling participation overall in 2008 compared to 2004. However, college athletics departments still need to be vigilant, as the rate of problem gambling among student-athletes has remained unchanged.

When participation rates in various gambling activities were compared between 2004 and 2008, the 2004 sample reported higher rates of past year and weekly gambling participation in almost all activities. The only two activities that the 2008 sample as a whole reported higher past year participation rates were Internet gambling and sports wagering. Higher rates of Internet gambling involvement was expected given the expansion and increasing popularity of Internet-based gambling since 2004. However, weekly Internet gambling participation rates did not differ between the samples, suggesting that more student-athletes are likely trying out Internet gambling but not necessarily becoming overly involved. In addition, Internet gambling participation rates (8.1% past year, 1.3% weekly in 2008, genders combined) are still relatively low compared to other forms of gambling such as card games (32.1% past year, 2.5% weekly in 2008, genders combined). At first glance these findings do not seem to support the notion that the growth of Internet gambling poses a significant risk to student-athletes in terms of leading to more gambling involvement. Whereas some researchers have postulated that college students are particularly prone to problems related to Internet gambling (Shead et al., 2012), this does not appear to be the current case among student-athletes. Perhaps involvement in their sporting pursuits (e.g., training, practice, traveling to games, fear of losing eligibility) buffers them from becoming too involved in Internet

gambling. Alternatively, it may be that implementation of awareness programs and stricter NCAA policies are moderating the risk posed by Internet gambling expansion.

Meanwhile, similar factors may contribute to more involvement in other forms of gambling that have higher prevalence rates among student-athletes, such as betting on games of personal skill, sports wagering, and card games. The athlete culture of competitiveness and camaraderie is likely to foster participation in these activities, particularly among teammates. Among males, weekly poker playing dropped by more than half from 2004 (8.4%) to 2008 (3.9%). This decline in frequent poker participation is likely explained by the flattening out of poker's popularity since the peak of the poker boom in 2005 (American Gaming Association, 2010).

Among males, despite the fact that the 2008 sample reported higher rates of overall past year sports wagering (29.3%) compared to the 2004 sample (23.5%), weekly sports wagering was almost twice as high in the 2004 sample (4.7% versus 2.4%). This conflicting finding suggests that more student-athletes may be willing to try their hand at sports wagering but are actually doing so less frequently than they were several years ago.

Across sports, gambling participation and problem severity was notably highest among golfers of both genders. Strikingly, weekly gambling rates in 2008 among male golfers (31.7%) were more than double the weekly gambling rates observed in all other sports. Meanwhile, female gymnasts reported the lowest rates of gambling participation, suggesting that involvement in gymnastics is related to a lack of gambling involvement. The finding that gambling participation and problem severity is most prevalent among golfers is perhaps unsurprising given the strong connection between gambling and golf (LeCompte, 2005). A long history exists of money being wagered on golf, which is highly amenable to gambling action. Golf typically involves a round of 18 holes in which four players spend several hours with each other. The inherent competition among a foursome encourages players to place wagers to "make things more interesting." Whereas most other sports involve a continuous flow of action that precludes in-game wagering, golf is characterized by long pauses between shots during which players have ample time to bet on the outcome of an entire round, nine holes, a single hole, or even a single shot. Because gambling is entrenched in the culture of golf, gambling on the golf course has the potential to easily carry over into other gambling activities off the course. Golfers who view gambling as a regular activity during practices and competitions may be more likely to seek other gambling opportunities when they are not golfing. A question that remains is whether individuals who have an affinity for gambling are more likely to become golfers or whether the culture of gambling in golf leads golfers to be more likely to participate in gambling activities.

The current study is subject to limitations associated with using self-report data without corroboration. In both the 2004 and 2008 surveys, student-athletes were

assured that all responses were confidential. However, given the seriousness of some of the questions asked (e.g., items pertaining to serious violations of NCAA rules that could result in loss of eligibility and, in some cases, criminal charges), some participants might have been wary of reporting their actual gambling activities. Although data cleaning procedures were implemented to try to eliminate dubious responses, such methods are more effective in identifying and removing anomalies of commission whereas purposefully omitted data would remain undetected. We are also uncertain regarding the comparability of responses across the two samples given the change in survey format, the general cohort shifts, and the educational efforts by the NCAA since the 2004 survey.

Despite the limitations in making comparison across surveys, the results strongly suggest a drop in gambling rates among student-athletes from 2004 to 2008. Gambling participation within gender, gambling activities, and sports generally remained steady or decreased across the four-year span despite a general expansion of gambling opportunities during that time period. Although it is plausible that prevention initiatives implemented by the NCAA task force are responsible for the observed decrease in gambling participation and problem gambling severity rates, other factors must be taken into consideration. For example, there may be a cohort effect in which certain forms of gambling typically enjoyed by younger people have simply declined in popularity between 2004 and 2008, a trend that is evidenced by the leveling out of the poker boom since its peak in 2005. Also, campus-wide initiatives that are not specific to student-athletes may have been effective in raising awareness about gambling among college students. Follow-up research is needed to examine the impact of specific intervention strategies implemented by the NCAA to address gambling among student-athletes.

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For correspondence: N. Will Shead, Ph.D., Mount Saint Vincent University, Department of Psychology, Mount Saint Vincent University, 166 Bedford Highway, Halifax, NS, Canada B3M 2J6. Tel: 902-457-6159. Fax: 902-457-6134. E-mail: will.shead@msvu.ca

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Will Shead is an Assistant Professor in the Department of Psychology at Mount Saint Vincent University in Halifax, NS. Dr. Shead holds a PhD in Clinical Psychology from the University of Calgary. He completed a predoctoral clinical internship at the University of Manitoba, Department of Clinical Health Psychology, followed by a two-year postdoctoral fellowship at McGill University at the International Centre for Youth Gambling Problems and High-Risk Behaviors. Dr. Shead’s past and current research on gambling has examined a range of topics, including cognitive mechanisms underlying problem gambling, affect-regulation expectancies, and motives related to gambling, delay and probability discounting, Internet gambling, sports wagering, and poker. Dr. Shead’s research has been supported by the Social Sciences and Humanities Research Council, the Natural Sciences and Engineering Research Council, the Alberta Heritage Foundation for Medical Research, the Alberta Gaming Research Institute, the Ontario Problem Gambling Research Centre, and the Manitoba Gambling Research Program.

Jeffrey L. Derevensky, PhD, is a Professor in School/Applied Child Psychology at McGill University, is Co-Director of the International Centre for Youth Gambling Problems and High-Risk Behaviors, and holds multiple adjunct appointments at several universities. Dr. Derevensky is an internationally-recognized scholar in the area of adolescent risky behaviours and gambling. He has been the author or co-author of three books, over 40 book chapters, in excess of 100 peer-reviewed scientific papers, and has been the keynote speaker and has presented over 200 presentations at national and international conferences. Dr. Derevensky has been invited to testify before numerous legislative committees in the U.S., Canada, Europe, South Korea, Singapore, Australia and New Zealand. As well, Dr. Derevensky and his research team have developed multiple award-winning prevention programs which are currently being used internationally.

Tom Paskus is the Principal Research Scientist for the National Collegiate Athletic Association (NCAA). In this role, Dr. Paskus directs the NCAA’s national portfolio

of studies on the academic trajectories of college student-athletes and oversees the NCAA's data collections and research initiatives pertaining to the academic, athletic, social, and personal well-being of current and former student-athletes. Tom received his Ph.D. and M.A. in quantitative psychology from the University of Virginia, and an A.B. in psychology from Dartmouth College.

Debate Series

Applying the codependency concept to concerned significant others of problem gamblers: Words of caution

By Kimberly A. Calderwood¹ & Anne Rajesparam²

¹University of Windsor, Windsor, Ontario, Canada

²Toronto, Ontario, Canada

Abstract

Two competing models of understanding concerned significant others (CSOs) of people with addictions have emerged: codependency (CD) and stress-coping. In the context of CSOs of problem gamblers, some research has begun to examine the effectiveness of the stress-coping model, but no research to date has examined the utility of incorporating the CD concept into treatment planning. The purpose of this paper is to: critique the CD concept while highlighting possible differences between problem gambling and substance abuse (i.e., financial issues, the ability to hide the problem, cognitive distortions, and societal attitudes); identify important considerations when working with CSOs of problem gamblers; make recommendations for program managers regarding hiring and training practices; and recommend directions for research and in-depth program evaluations to assess what is actually occurring in existing practice.

Two models for conceptualizing the experience of concerned significant others (CSOs) of substance abusers that have emerged over the past few decades are a) codependency (CD) and b) stress-coping (Hurcom, Copello, & Orford, 2000). Both models continue to be popular today. Details of how the CD concept was first established remain unknown (Miller, 1994), but consensus in the literature indicates that the concept was developed in the 1970's within the substance abuse field (Knudson & Terrell, 2012; Wright & Wright, 1995).

CD is considered to be influenced by family systems theory (Krestan & Bepko, 1992; Miller, 1994) and disturbed personality theory (Kalashian, 1959). Although definitions vary, CD generally includes: "external focusing, self-sacrificing, attempting to control other people, and suppressing one's emotions" (Dear, Roberts, & Lange, 2005, p. 189). CD primarily evolved through the Al-Anon

self-help movement, which “advocates loving detachment, acceptance of the CSO’s helplessness to control the alcoholic, and group support for the CSO” (Miller, Meyers, & Tonigan, 1999, p. 688). CD can be applicable to men and women but, typically, women are the target of the label (Collins, 1993) to the point where some historical treatment program and Al-Anon materials exclusively refer to “wives” (Harper & Capdevilla, 1990).

Soon after the development of the CD approach, the stress-coping model emerged as part of a shift away from pathologizing, victimizing, and stigmatizing partners of substance abusers (Watts, Bush, & Wilson, 1994). With the stress-coping model, CSOs are considered “normal people placed in an abnormal situation and having to cope with the stress arising from this” (Hurcom, Copello, & Orford, 2000, p. 496). Unlike a CD approach that was supported only by the speculations and anecdotes of spouses of substance abusers (Miller, 1994), the stress-coping model has been, and continues to be, supported by empirical evidence for CSOs of substance abusers (O’Farrell & Clements, 2012; Orford, Copello, Velleman, & Templeton, 2010; Rychtarik & McGillicuddy, 2005) and CSOs of problem gamblers (Makarchuk, Hodgins, & Peden, 2002; Rychtarik & McGillicuddy, 2006).

The motivation for writing this article stemmed from one of the authors’ experiences observing a hospital-sponsored psycho-educational group (not a twelve-step group) for gamblers and family members of problem gamblers. On four separate occasions with four different family members, the lead facilitator’s first question to the CSO was “What is *your* problem?” At least three times across a span of six weekly meetings, the facilitator told the group that family members rarely come to more than one session because they will not admit that they have a problem. While the word *codependent* was never used, the facilitator’s questions to the CSOs repeatedly focused on what Dear, Roberts, and Lange (2005) describe as characteristics of CD: “external focusing, self-sacrificing, attempting to control other people, and suppressing one’s emotions” (p. 189).

The psycho-educational group facilitator’s approach was also reflective of the family systems theory considered to have influenced the conception of CD. In the much-cited and classic work on structural family therapy by Minuchin (1974), the first words uttered by Minuchin in his first example of a therapeutic intervention were “What is the problem?” (p. 1). Aligned with Minuchin and Fishman’s (1981) technical approach, the facilitator of the problem gambling group described above presented as “expert” and was confrontational and accusatory, with no acknowledgement of the more recent therapeutic trends such as a strengths perspective, solution-focused therapy, and a stress-coping model of understanding CSOs. This facilitator repeatedly indicated knowing about the process because of personal experience as “a recovered addict” and being “a family member of an addict.” Not surprisingly, three of the four CSOs (all women) did not complete the program. The fourth CSO was already divorced from the gambler, having little contact and concern about him, and voiced disagreement about the facilitator’s accusation that

she needed to discover “her problem” – she attended the group to get ideas for explaining to her young children her ex-husband’s lack of availability and financial support.

The impact of problem gambling on CSOs has only begun to receive attention in the literature (e.g., Calderwood & Wellington, 2014; Copello, Templeton, & Powell, 2010; Darbyshire, Oster, & Carrig, 2001; Grant Kalischuk, Nowatzki, Cardwell, Klein, & Solowoniuk, 2006; Mathews & Volberg, 2013; Tepperman & Korn, 2003). Only a few researchers have studied CSO’s coping strategies and interventions for addressing their coping in the context of problem gambling (Krishnan & Orford, 2002; Makarchuk, Hodgins, & Peden, 2002; Rychtarik & McGillicuddy, 2006). When evidence is lacking in the context of problem gambling, typically, workers in the gambling field have adopted or adapted treatment strategies used in the substance abuse field (e.g., Petry, 2005). However, given that we know so little about how the experience of a CSO of a problem gambler differs from the experience of a CSO of a substance abuser, these adoptions or adaptations of substance abuse programs risk making assumptions that do not suit the gambling experience. We applaud Makarchuk, Hodgins, and Peden (2002) for holding focus groups with CSOs of problem gamblers before developing their adapted version of the Community Reinforcement and Family Training (CRAFT) program, but even more research is needed to explore the differences and to improve programming that addresses the unique needs of CSOs of problem gamblers.

In this article, we critique the use of the CD concept as it relates to CSOs of problem gamblers, and highlight important considerations in clinical practice. We encourage administrators to be cautious in their hiring and training practices to ensure that best practices are being utilized. We also advocate for researchers and program managers to develop evidence-based programs, and to conduct in-depth program evaluations that assess what actually occurs in treatment programs, rather than rely on what programs claim to do.

Critique of Codependency as it Relates to Problem Gambling

There are many criticisms of the CD concept, mostly from a feminist perspective (e.g., Babcock & McKay, 1995; Calderwood & Rajesparam, in press). A complete review of the criticisms is beyond the scope of this paper, but we highlight the major ones most relevant to the context of problem gambling and the scenario presented above. First and foremost, the CD concept lacks an empirical basis and lacks consensus about a definition (Dear, Roberts, & Lange, 2005; Peled & Sacks, 2008; Rotunda, West, & O’Farrell, 2004; Stafford, 2001; Wright & Wright, 1995). The criteria for CD are so extensive and inclusive (e.g., Beattie’s [1992] bestseller provides 200 characteristics of the concept) that almost everyone in any relationship might be considered to be codependent (Miller, 1994). While some measures to assess CD have been attempted (e.g., Dear & Roberts, 2005), to date there has been limited scientific research focused on examining measures to assess CD (Marks,

Blore, Hine, & Dear, 2012) and no consensus or evidence of reliable and valid measures (Dear, Roberts, & Lange, 2005). CD has never been included in any version of the *Diagnostic and Statistical Manual of Mental Disorders*.

Another criticism of CD is that it is yet another “label”. Often, without intent, the terms within the medical model (e.g., “disease” and “illness”) hold negative connotations and can affect the manner in which people, including educated professionals, treat people with an addiction (White & Kelly, 2011). The term *addict*, for example, has been found to elicit negative, often stigmatizing and shameful feelings within clients (Gray, 2010). Miller (1994) notes that even though framing an addiction within the medical model has helped remove some of the stigma associated with alcohol abuse, the CD terminology victimizes, blames, and internalizes the “problem” faced by CSOs. Labeling people, mostly women, as “codependent” increases their grief and guilt (Collins, 1993; Harper & Capdevila, 1990), particularly since codependents are often “accused” of having chosen their spouse because they “needed to be needed”. Unless frontline workers familiarize themselves with the literature, they would not know that the belief that CSOs of problem gamblers need to be needed is a myth: Lorenz and Shuttlesworth (1983) found that only 10% of respondents “were aware that their spouse was a compulsive gambler at the time they were married (p. 71), and 25% “did not recognize that a problem existed until nine or more years after the start of the marriage” (p. 69). This lack of awareness that a problem exists may be a fundamental difference between spouses of problem gamblers and spouses of substance abusers.

Another risk of the CD label, indicating that the CSO has a disease, is that it provides the addicted person with “a partner in crime”: normalizing “sickness” and giving the addict a vehicle for shirking responsibility for the behaviour and its consequences (Krestan & Bepko, 1992). This shirking of responsibility is an important consideration, perhaps more so with gambling than with substance abuse, since cognitive distortions are considered to play a greater role in gambling disorders: In the *DSM-5*, a gambling disorder is the only disorder listed in the “Substance-related and addictive disorders” chapter that indicates “distortions in thinking” as an associated feature (American Psychiatric Association [APA], 2013, p. 587). No one has researched the impact that cognitive distortions have on family members who may attempt to “rationalize” with the gambler, and who are in a position to attempt to manage family dynamics, a home, and the upbringing of the children, in the context of a family member who may be irrational and unrealistic about finances and other family issues. Efforts to cope with the problem gambler’s irrational behaviour(s) may even occur while the CSO is still unaware that there is a gambling problem.

One example of a cognitive distortion relates to the cultural norm in any given community, particularly in some communities where the media “glamorizes” and “normalizes” gambling (Tepperman & Wanner, 2012). As indicated in the *DSM-5* (APA, 2013), a “gambling disorder must be distinguished from professional and

social gambling” (p. 589). It can be difficult for a layperson, not educated in the symptoms of a gambling disorder (e.g., a CSO) to discern when the gambler has crossed the line from acceptable “professional” and “social” gambling, to behaviour that is unacceptable and considered to be a “disorder”. This lack of clarity about “acceptable” levels of gambling facilitates gamblers’ normalization of their behaviour, and may be confusing for CSOs, leading to additional stress, struggles about how to best cope, and reducing the amount of understanding and support received at a societal level.

Also related to culture, few authors highlight that the CD concept stems from male, Anglo-centric values of individuality and autonomy, often overlooking cultural and collectivistic perspectives, including interdependence and a commitment to the family unit (Granello & Beamish, 1998; Inclan & Hernandez, 1992; Kwon, 2001). Across the globe, many of the symptoms of CD are simply a description of the expectations of women within that society. For example, Noriega, Ramos, Medina-Mora, and Villa (2008) found that in Mexico, “women with a submissive cultural script were nearly eight times more likely to develop codependence than those without this programming” (p. 199). Many of the Eastern and South Asian communities continue to value the collectivistic and “traditional” family values of caring for one another; where a woman may be considered “overly” responsible in a Western community, this same woman may be viewed as quite “normal” in an Asian community.

Except for Calderwood and Rajesparam (in press), the CD concept has not been critiqued in the context of changing gender roles in Western society. When CD was first conceptualized, women were assumed to be submissive, dependent, and if employed at all, only employed in caregiving roles; today, women in Western societies are more independent, both financially and emotionally (Calderwood & Rajesparam, in press). Contrary to the focus of family systems theory, women also are a part of other systems outside of the immediate family system, such as employment, volunteer work, hobbies, friendships, and new marriages; women gain self-esteem and strengths from their involvement in these other systems (Calderwood & Rajesparam, in press). Typically, the wives in early studies in the gambling field were housewives (e.g., Boyd & Bolen, 1970). As Ferentzy, Skinner, and Antze (2007) indicate, more research on the impact that changes in women’s roles in society has on recovery for problem gamblers is necessary, particularly since it seems that spouses’ support for problem gamblers has diminished due to women’s increased levels of independence.

Also related to societal influences, few authors highlight the role that community or society plays in enabling addictive behaviour. For example, gambling venues entice patrons to attend their facility through free transportation, free accommodation, free meals, and gambling coupons. Gambling venues also encourage patrons to stay longer by providing bank machines on-site and only offering free transportation home after a certain hour. If we must lay blame on someone for facilitating the

gambling behaviour, as the CD concept suggests, we should expand the blame to include a much broader system than the immediate family unit. More advocacy efforts need to occur, to raise awareness about how little the broader societal system does to prevent the development of, and to arrest, problem gambling.

The spouse of a gambler often is unaware of the debt being accrued, the house being re-mortgaged, and bills not being paid until the consequences are so severe that bankruptcy is inevitable. More so than substance abusers, gamblers can keep their compulsive behaviour hidden from those close to them for quite some period of time (Borch, 2012; Lorenz & Yaffee, 1989; McComb, Lee, & Sprenkle, 2009), typically, going unnoticed until a significant amount of money is lost. Unlike substance abusers, gamblers will not be caught gambling and driving (although that time may arrive once Internet gambling is increasingly available on cell phones), they do not smell like gambling, and their behaviour and physical appearance can be consistent, despite great financial losses. In fact, economic consequences of gambling is one area that has been identified as being different from substance abuse to the point where Gambler's Anonymous places more emphasis on finances, and does so earlier in the recovery process than substance-related anonymous groups (Ferentzy, Skinner, & Antze, 2009). Relevant to family members is that the consequences of bankruptcy often are long-lasting and may lead to CSOs being legally responsible for the financial debts of their partner. As supported by many who subscribe to the CD concept, a quick solution for a spouse of a substance abuser may be to leave the relationship. However, for the spouse of a problem gambler who has exhausted all monetary savings, leaving will not resolve the financial burden caused by the gambling behaviour. In fact, leaving might even put the spouse in a deeper economic crisis.

Recommendations for Working with CSOs

Given that there is evidence to support a stress-coping model for CSOs, our first recommendation is that service providers (regardless of their past personal or training experiences) align their philosophy with evidence-based approaches. We also recommend that all service providers be knowledgeable about the CD concept and its limitations, as we know that clients often present to treatment already having adopted the CD identity (Frank & Bland, 1992), and possibly finding this identity to be helpful. In terms of definition, since there is no consensus in the literature, we recommend that if a client presents having already adopted the CD identity, the service provider inquire about the client's definition and support the client in what works for him or her. In addition, it is important to recognize that the literature has identified two types of CD: those whose symptoms are a reaction to a stressful circumstance (Whitfield, 1984) and those who seem to have a personality where they seek partners who "need" them (Wright & Wright, 1991). We suggest that this distinction be considered along a continuum rather than two opposing options.

We recommend that for instances when a client has already adopted the CD identity, frontline workers (such as the lead facilitator described above) take the time to learn about where the client sees him or herself along this continuum. It is important not to assume that a spouse who has had a healthy upbringing, healthy relationships, strong self-esteem, and many life successes, has a “needy personality”, is “codependent”, and intentionally chose to marry “a bad boy”. Similarly, we cannot assume that a spouse knew about the gambling problem and intentionally contributed to the problem by giving money and lying for their spouse. As discussed above, problem gamblers often are successful at hiding the problem for extended periods of time. Thus, the spouse may not have been aware of the problem until recently.

We recommend that service providers be aware of the power and influence of self-help materials, support groups, and online information. During the time of writing this manuscript, one of the authors was in a very remote small town gift shop carrying Beattie’s (1992) bestseller: *Codependent no more: How to stop controlling others and start caring for yourself*. Without any prompting, a local woman who noticed the book commented “Oh isn’t that a great book? It is so true that we women in our society give too much of ourselves. I can’t tell you how helpful that book has been for me”. As she spoke, it was clear that she had uncritically adopted everything in the book with no knowledge of competing approaches, such as a stress-coping model of understanding. We believe it is incumbent on service providers to be knowledgeable about the range of perspectives available and be able to educate clients, using sound clinical judgement.

We recommend that counsellors explore the reasons as to why a CSO has sought treatment. For example, given that financial devastation has long-term and possibly life-long consequences, a spouse may seek help for a number of reasons, including: how to deal with bailiffs and creditors, explaining to the children why there is no money, and explaining to the children why the other parent may not be spending time with them. These are valid reasons for seeking treatment that are not necessarily related to CD. Further, the financial devastation, accompanied by lying and deceit, often leads to a lack of trust and betrayal (Dickson-Swift, James, & Kippen, 2005). Spouses or ex-spouses of problem gamblers may attend treatment to find ways to trust their spouse, a future partner, or others. Again, this may not be attributable to CD.

Provided that problem gamblers are known for their cognitive distortions (APA, 2013), a spouse may be seeking guidance about how to manage a household and raise children in the context of a family member who may often be irrational. This could be considered comparable to a spouse who attends counselling after their significant other has been diagnosed with Alzheimer’s disease. Would a spouse of someone with Alzheimer’s automatically be deemed codependent? In some instances, the spouse may have already separated from, or be divorced from, the problem gambler and legally may be required to have continued contact with the

problem gambler, due to child custody and access agreements. As such, strategies to cope with irrational thinking and behaviour are crucial, and would be more related to practical necessity than to symptoms of CD.

When spouses repeatedly talk about their partner with a gambling problem, it is important not to assume that this is “external focusing” or “attempting to control other people”, indicators of CD as defined above. Instead, the CSO may be striving to simply understand the gambler, or his or her choices to be with the gambler prior to knowing there was a gambling problem. If the CSO was unaware of the problem for an extended period of time, he or she may question how the signs may have been missed and question the choices he or she made. Seeking to make sense of it all is typical in any kind of loss. Lorenz and Shuttlesworth (1983) found that 99% of 250 spouses indicated an increased “understanding of the compulsive gambler” (p. 70) contributed most in their coping.

We also recommend that frontline workers pay particular attention to recruitment and retention. Although we do not know the percentage of CSOs that seek treatment, we do know that in general, only 1% to 2% of problem gamblers seek treatment in any given year (Rush, Shaw Moxam, & Urbanoski, 2002), and only 7% to 12% of people with a lifetime history of problem gambling have ever sought treatment or attended a self-help group for their gambling (Slutske, 2006). There are also some indications that admission rates for gambling issues are declining in treatment programs (Abbott, 2007; Calderwood & Wellington, 2014) and in GamAnon (Ferentzy, Skinner, & Antze, 2010). This may be because more spouses are separating from the gambler as Ferentzy, Skinner, and Antze (2010) suggest, or it may be for other reasons such as our ineffective treatment strategies and failure to appropriately engage clients. Clearly, in the case scenario described above, the facilitator failed to engage the CSOs. Given that loss theories have repeatedly shown that a first reaction to receiving a diagnosis is denial (e.g., Kubler-Ross, 1969), informing CSOs in the first few sessions of treatment that they are codependent and/or “have a problem” is likely to lead to denial and increase the risk of the CSO not completing the program, as was the case in the scenario described above.

Recommendations for Program Managers and Researchers

Krishnan and Orford (2002) are among the few authors who have written specifically about coping strategies for family members of problem gamblers. Using an adapted version of the Coping Questionnaire (Orford et al., 1975), Krishnan and Orford found that family members of gamblers were more likely than family members of substance abusers to use “engaging” ways to cope: “controlling, assertive, emotional and supportive” [p.67]). Participants in this study were not as likely to use strategies such as tolerance (“inactive, tolerant and supportive” [p. 67]) or withdrawal (“inactive, independent and avoidance” [p. 67]). These findings suggest that spouses of problem gamblers exhibit fewer CD traits than spouses of substance abusers, as the tolerance form of coping is the one most aligned with CD.

These findings highlight the importance of continuing research on the differences in needs and coping strategies between CSOs of substance abusers and those of problem gamblers. The findings also reinforce our position that those working in the problem gambling field should not blindly adopt what is thought to be effective in the substance abuse system.

We recommend that research in this area not be limited to the stress-coping model. Several authors who critique the CD concept suggest alternative ways to focus the treatment of family members including: communication and problem-solving (Miller, 1994); the issue of being over- and under-responsible (Krestan & Bepko, 1992); the CSO's sense of entitlement in preparation for reducing their level of responsibility (Lederer & Brown, 1991); how CSOs relate to others (Wright & Wright, 1991); immaturity presented not as a disease but as "a stage that we must all pass through" (Larsen & Goodstein, p. 50); growth (Malloy & Berkery, 1993); empowerment (Collins, 1982; Frank & Bland, 1992); and larger societal issues such as "fair and equal relationships, devoid of power games, where real intimacy can develop through a loving and respectful partnership" (Noriega, Ramos, Medina-Mora, & Villa, 2008, p. 200). We suggest that each of these be considered in the development of interventions appropriate for CSOs of problem gamblers.

As stated above, self-help materials, including online resources, influence frontline workers. Although family systems theory seems to have influenced the conception of CD (Krestan & Bepko, 1992; Miller, 1994), it is important to note that, typically, service providers in the addictions field are not family therapists (Harper & Capdevila, 1990). In fact, self-help groups have been the ones to address the issues of CSOs much more so than government supported/funded services (Barber & Gilbertson, 1996; O'Farrell & Fals-Stewart, 2001; Rychtarik & McGillicuddy, 2006). Recent years have seen a bridging of traditional twelve-step approaches and evidence-based approaches, particularly since budget constraints make no-fee self-help groups a more viable option for individuals and for treatment system planning. We acknowledge the value of peer support and peer-led treatment programs but caution against counsellors being hired solely for their twelve-step and personal experience without any formal academic training that might introduce them to evidence-based approaches. This seems to have been the case in the scenario described above.

As stated above, recruitment and retention is another important issue for problem gambling services, with some concern about admission numbers declining. Only a few studies have been conducted to determine what leads CSOs to seek, and not seek, help from formal treatment. Pulford et al. (2009a; 2009b) for example, investigated reasons for seeking help and barriers to seeking help for a gambling problem, primarily focusing on pre-determined "person-centred" categories about problems that may have arisen for the gambler because of the gambling. We applaud the authors for including open-ended questions but encourage others to specifically ask about "service-centred" factors such as the reputation of the

program, quality of service received, and alignment between program approach/techniques with CSO's learning and life styles. We recommend more research, particularly qualitative research, with CSOs of problem gamblers who have dropped out of programs, to determine what they found and did not find useful in the treatment approach, so that we may develop more appropriate program approaches to better meet their needs.

Conclusion

CD was a term developed in the substance abuse field, with no empirical basis and no reliable or valid identified criteria. There are many critiques of the CD concept, mostly from a feminist perspective. This paper highlights some of those critiques relevant to the context of CSOs of problem gamblers. In addition, this paper emphasizes the importance of identifying where the experience of CSOs of substance abusers may differ from that of CSOs of problem gamblers, particularly as the differences are relevant for clinical practice. More research is required to further identify the differences and to determine best practices for providing services to CSOs of problem gamblers. We agree with Krishnan and Orford (2008) that a stress-coping-support perspective “offers an appropriate framework for understanding problem gambling and the family” (p. 62), and encourage others to further study how CSOs of problem gamblers cope, the effectiveness of the coping strategies, and the impact those strategies have on all involved. However, we also present suggestions for other topics to include in treatment with CSOs and encourage researchers, program managers, and frontline workers to not limit their interest to one perspective.

Some authors believe that since no causality between CD and the presence of an addiction has been identified, professionals who continue to automatically assume a CSO is codependent are doing more harm than good (Cox Jr., Ketner, & Blow, 2013; Granello & Beamish, 1998). We do not critique CD to this extreme, recognizing that many clients may present to treatment already subscribing to the CD identity (Frank & Bland, 1992) and recognizing that many people find CD to be useful. Instead, we advocate that service providers strive to use evidence-based approaches and be knowledgeable and respectful of other approaches, educating clients as clinically appropriate.

Ferentzy, Skinner, and Antze (2009) found that GA members “would not have achieved and maintained abstinence if not for the presence of their wives in GamAnon, ... others even held the (startling) view that recovery from pathological gambling is impossible without a spouse in that fellowship” (p. 44). This finding supports other authors' views (including ourselves), who emphasize the important role of family support in treatment (e.g., Han, Kim, Lee, & Renshaw, 2012). As such, we advocate for service providers, program managers, and researchers to be cognizant of and study issues relating to recruitment and retention of CSOs of problem gamblers. We also recommend that program managers and researchers

recognize the factors that affect attrition, and be cautious about whom they hire, what training is provided, and how program evaluations are conducted (examining fidelity to agency philosophy and treatment approaches).

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Commentary on Calderwood and Rajesparam (2014)

Where Codependency Takes Us: A Commentary

Bonnie K. Lee

University of Lethbridge, Lethbridge, Alberta, Canada

In their article “Applying the codependency concept to significant others of problem gamblers: Words of caution”, Calderwood and Rajesparam critique the codependency concept and highlight its problems when applied to problem gambling treatment. In this commentary I will show how codependency falls short of true family systems thinking and raise some questions concerning clinical work that includes concerned significant others (CSOs).

Language Matters

Once a concept such as codependency has gained traction through wide circulation in popular and addiction recovery culture, it acquires a taken-for-granted meaning that seldom gets scrutinized. It is to the authors’ credit that they take up this concept for examination. They suggest that codependency has become short-hand for connoting that CSOs are problematic, and characterized as “external focusing,” “self-sacrificing,” “attempting to control,” “suppressors of their own emotions,” “needing to be needed,” “victims” and “partners-in-crime.” Cast in this negative light, partners are stigmatized and accusatorily treated by professionals.

Language shapes perception. Because of these ingrained negative connotations, it is best that the terms codependent and codependency be avoided. Further, codependency as a concept needs to be deconstructed.

The authors suggest that codependency is influenced by *family systems theory*. They equated the “expert,” “confrontational and accusatory” style of a therapist they observed with the family systems approach of Minuchin. In reality, codependency that assigns blame to the partner falls short of systems thinking. Rather than ascribing pathology to an individual in the family, family systems therapists look for the patterns of interaction that are circular and recursive and thereby result in symptom development. Moreover, there are many schools of family therapy, and family therapists are among the first in the mental health field to raise sensitivity to how language is used – notable are the contributions of Michael White in narrative therapy, of Jay Haley in the Ericksonian tradition (which later gave rise to

solution-focused therapy), and of Virginia Satir in her deeply humanistic approach (and who avoided the “dirty language” that labels and pathologizes).

In family therapy, the description of patterns is preferred over the labeling of individual pathologies and the use of psychiatric diagnosis. Narratives of exceptional positive outcomes that foreground strengths and resources are privileged in therapeutic conversations by many family therapists. In the second wave of family therapy, the therapist is seen as a co-constructor rather than an expert in the therapeutic process. The authors need to be careful not to paint the diverse and evolving field of family therapy with a broad brush. The negative assignment of blame and neediness to the partners in “codependency” is a bastardization of family therapy’s way of conceptualization and problem formulation.

End the Relationship or End the Problem?

Calderwood and Rajesparam display an individualistic bias to helping partners of addicted individuals, and they espouse a stress-coping model for spouses. They view spouses as a family support in treatment, implying their secondary role in the addiction picture. Viewing and treating the spouse and addicted individual as independent of each other risks polarizing the partners in a relationship and creates a tendency to assign blame to one or the other. The authors defend the CSO while obscuring the role of the addicted individual and the couple’s dynamics. A complete picture of the relationship issues in addiction is therefore missing.

A phenomenological study of partners of substance abusers (Naylor & Lee, 2011) revealed that a shift from controlling a substance abuser’s behaviour to a focus on their own life with emotional and social outlets is conducive to their partner’s healing process. However, the effect of a partner’s change has mixed effects on the substance abuser and does not necessarily lead to their concomitant recovery. When undertaken individually, the journeys of the women partners with substance abusing men are arduous and lonely (Naylor & Lee, 2011). A partner’s recovery does not necessarily entail the substance abuser’s recovery, nor does it mean that the relationship will endure. An individualistic framework could lead to the outcome of terminating the relationship to end the problem because both partners do not progress in tandem.

Individual work with partners of addicted individuals apart from the couple relationship is potentially a lost opportunity for concurrent growth and healing for both partners and the couple relationship. The primary couple relational context plays a crucial role in sustained recovery in addiction. The relational resilience afforded by positive couplehood is a strong protective factor against relapse, according to empirical findings from several studies (Lee, 2002, 2012a, 2012b; Lee & Awosoga, 2014; Lee & Rovers, 2008). Findings indicate that these couples learnt to balance bonding with differentiation, empathy with autonomy, and honouring of

self with honouring of other. Ending the problem through terminating the relationship is only a partial solution. Couple therapy offers the possibility of stopping the problem but keeping the couple relationship in a more supportive dynamic. Couple work puts both partners' recoveries in synchrony. Working with couples within a systems paradigm helps preserve the asset of a regenerated relationship and eases the strains of a recovery journey undertaken alone and independently.

Framing the Addiction Story

The authors of the codependency critique bring to the fore how insidiously a notion such as codependency can shape perception, identity, languaging, meaning-making and interventions in the culture of addiction recovery. Despite the empirical advances we have made in problem gambling research in the last decade, we are short on discussions of how to frame the addiction story that we use with our clients, and to what effect. If the codependency narrative is inadequate and potentially damaging, then what are the alternatives?

Recent research has borne out the significance of childhood trauma in the background of problem gamblers (Hodgins et al., 2010; Petry & Steinberg, 2005). Nowhere is the impact of childhood trauma played out more prominently than in couple relationships, in the form of emotional dysregulation, communication breakdowns, distorted perceptions, and the replication of trauma within the intensity of interaction in that relationship (Lee, 2012a).

Compared to problem gamblers, the clinical profiles and histories of their partners have been an under-examined area in substance abuse and problem gambling research. Preliminary evidence suggests a high incidence of traumatic childhood history among partners of problem gamblers (Lee, 2002, Lee & Awosoga, 2014). The disclosure and discovery of a partner's problem gambling and its aftermath may in itself be traumatic for the CSO (McComb, Lee & Sprenkle, 2009). Reactions to this trauma could be also amplified by unresolved earlier life trauma (Lee, 2012a). CSOs likely need more in-depth healing than learning stress-coping skills. It is also important to note the dynamic interplay of their reactions with those of problem gamblers in systemic fashion, without assigning blame to either but simply exposing the entrenched, recursive and destructive patterns.

Calderwood and Rajesparam rightly recommended that the needs of CSOs seeking formal treatment be further studied. The crisis of addiction could well provide a prime opportunity to disrupt trauma patterns established inter-generationally. The merits of a systemic relational framework that includes inter-generational patterns of trauma for framing addiction is worth investigating because it acknowledges the role of trauma in the development of addiction (McComb et al., 2009; Lee, 2012a; Lee 2012b). Assessing the impact of various ways of framing addiction, with codependency being one example, and how they are internalized and appropriated

by clients and professionals, and with what effects, would make intriguing future studies.

Training of Addiction Professionals

Calderwood and Rajesparam also caution against hiring addiction service-providers “solely for their 12-step and personal experience without any formal academic training that might introduce them to evidence-based approaches.” They also note that “typically, service providers in the addictions field are not family therapists.” Further, they quoted from other research “that recovery from pathological gambling is impossible without a spouse in that fellowship [GamAnon].”

Language and framing are important when it comes to problem formulation and treatment interventions. The problem with the codependency concept is that it has individualized and pathologized the CSO in addiction, instead of situating the CSO within the systemic interplay of couple and inter-generational patterns. Couple patterns can be descriptively presented without blame, undergirded by a belief in the partner’s potential for change and growth. Addiction can then be viewed as an opportunity and signal to instigate growth and healing. Utilizing a couples format for CSOs and the identified client creates a platform to address their entanglements. Calderwood and Rajesparam recommend that research and training “not be limited to the stress-coping model.” Couple therapy – as an under-utilized and under-examined modality in addiction conceptualization and treatment – could well be a critical missing component to the addiction provider’s toolkit.

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Commentary on Calderwood and Rajesparam (2014)

Commentary on “Applying the codependency concept to concerned significant others of problem gamblers: Words of caution”

Daniel Harkness

Boise State University, Boise, Idaho, USA

I was asked for comments on this opinion paper only because I have conducted and published research on codependency. I know virtually nothing about those who treat gambling disorder, and I am probably not alone (Gallon, Gabriel, & Knudsen, 2003; Kaplan, 2003; Mulvey, Hubbard, & Hayashi, 2003).

The focus of Calderwood and Rajesparam’s “Words of Caution” is the treatment and mistreatment of concerned significant others (CSOs) affiliated with problem gamblers. A cautionary tale, it was prompted by the negative experience of one of Calderwood or Rajesparam, who observed an “expert” facilitator, self-described as a recovering addict, browbeat the participants of a hospital-sponsored psycho-educational group for problem gamblers and CSOs. On four separate occasions with four different family members, the lead facilitator’s first question to the CSO asked: “What is your problem?” Then, like a broken record, the expert proceeded to badger group participants about the putative characteristics of codependency for six weeks, albeit without actually ever uttering the offensive c-word. Noting that three of the four CSOs enrolled in the group became drop-outs, the authors became worried that other CSOs might also be at risk, because “workers in the gambling field have adopted or adapted treatment strategies used in the substance abuse field,” by which they mean problem-focused family systems theory, a codependency disease model of human behavior, and in-your-face confrontation. As an antidote, Calderwood and Rajesparam prescribe “more recent therapeutic trends such as a strengths perspective, solution-focused therapy, and a stress-coping model of understanding CSOs.”

I have to agree that badgering and browbeating clients doesn’t sound very helpful, but I would like to tell a tale of my own. I received my clinical training in the early 1970s, and the National Institute on Drug Abuse funded the first of the fellowships that put me through school. My second fellowship was funded by the National Institute on Mental Health, with a service obligation to provide mental health care in an era when the treatment of substance use and mental disorders were in two

different worlds. Ten years later, I returned to school for additional training in evidence-based practice and research. As it happened, three of the people who trained me were the pioneers of the *strengths perspective* movement, an alternative to the prevailing medical model of clinical practice (i.e., the diagnosis and treatment of what's wrong).

When I was asked to develop a graduate course on the evaluation and treatment of substance use disorders in the early 1990s, my practice experience in mental health clinics and training in research shaped the assumptions and content of my teaching. I viewed addiction counsellors as paraprofessionals, and I was privately dismissive of their models of human behavior, confrontational methods of treatment, and practice traditions. My assumptions and attitudes became a point of contention when a certified addiction counsellor enrolled in our graduate program used the term codependency in class, and apparently I responded by smirking, rolling my eyes, and looking to the walls and the ceiling.

After class, the student came to my office with a challenge to extend him the courtesy of the strengths perspective I championed in the classroom, to partner with him in a systematic study of codependency, and help him acquire some hands-on experience with evidence-based methods and standards. Although he was a talented student, I had other pressing interests – but I had to agree because I'd boxed myself in.

Our study began with a systematic review of the literature. Our reading list included the extant works cited in Calderwood and Rajesparam's "Words of Caution" – and many others as well, although some (Dear, Roberts, and Lange [2005], for example) had yet to be published. But unlike Dear, Roberts, and Lange (2005), whose goal was "to define the core-defining features of codependency that are contained within the most influential published definitions of codependency" (p. 192) in "the major books on the self-help best-seller lists ... cited by researchers and reviewers" (p. 193), our review emphasized scientific disputes, as illustrated in the following example:

On one hand, Fischer, Spann, and Crawford (1991) [sic]; Fischer and Crawford (1992); and Fischer, Wampler, Lyness, and Thomas (1992) have defined co-dependency as a dysfunctional pattern of relating to others with "an extreme focus outside oneself, lack of open expression of feelings, and attempts to derive a sense of purpose [exclusively] through relationships" with others. The investigators developed a self-rating scale to operationalize that definition and used it to examine the association among co-dependency, family substance abuse, family functioning, risk taking, parent-child relationships, and offspring alcoholism in samples drawn from self-help groups and university students. Thus defined, the phenomenon of co-dependency was gender-free, and associated with neither chemical dependency nor dysfunctional family patterns.

On the other hand, Lyon and Greenberg (1991) have operationalized co-dependency as women finding exploitive men attractive and offering them help. Their experiment drew daughters of persons with alcoholism or sober parents from a sample of university students and exposed them to requests for help by a male confederate under exploitive and neutral conditions. Daughters of parents with alcoholism found the exploitive man significantly more attractive, and offered him help at twice the rate of their counterparts from sober families. Thus defined, co-dependency has gender and signals family dysfunction. (Harkness & Cotrell, 1997, p. 474)

Our review of the multiple meanings of co-dependency in the literature led us to suspect that codependency was largely a social construction, as much perceiver as perceived, a conclusion with which Lee might well agree. Noting how little seemed to be known about the counsellors who treat substance use disorders, we began planning, conducting, and reporting a series of studies designed to unravel their social construction of codependency in clinical practice – where constructed meaning shapes the treatment that consumers receive. Although our work was not cited in Lee’s rebuttal, what we sought to observe was what actually occurred in practice, as its authors recommend.

I was asked to provide a comment on Lee’s piece titled “Words of Caution”, and not to provide a lengthy description of our own research (e.g., Harkness, 2001; Harkness, 2003; Harkness & Cotrell, 1997; Harkness, Hale, Swenson, & Madsen-Hampton, 2001; Harkness, Manhire, Blanchard, & Darling, 2007; Harkness & Piela, 2009), so I’ve summarized our findings here only briefly. Although we remain decidedly non-partisan on the question of what codependency is, the substance use counsellors we have studied were able to describe, operationalize, and assess it with impressive reliability in clinical practice, and with promising evidence of concurrent, convergent, discriminant, and predictive validity. Faced with the evidence, to finish my story, I had no choice but to swallow my pride, and eat my own words.

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Commentary on Calderwood and Rajesparam (2014)

A response to Calderwood and Rajesparam's ideas on codependence

Jim Orford

University of Birmingham, Birmingham, UK

I welcome this opinion paper by Calderwood and Rajesparam in this issue and largely agree with what they say. However, I believe they could have gone yet further in their criticisms of the codependency idea in two ways: By recognising that the concept is part of a more general and insidious view of the causes of human adversity, and by recognising that such a model is a very inadequate basis for developing a more effective and comprehensive service for family members harmed by others' substance misuse.

The two models that the authors refer to go back a long way, at least to the early 1950s when Joan Jackson (1954) wrote of wives coping with the stress of their husbands' excessive drinking. She was reacting to the assumptions contained in the dominant models of the time which pictured women married to alcoholic husbands as motivated to choose and remain with them, and even to undermine the husbands' attempts at sobriety, on account of their own pathological needs. Although such overtly prejudiced views are now clearly seen as outdated, more subtle prejudice and more ambiguously pathological models remain. Codependency theory is an obvious example; as the authors say, there is some ambiguity as to whether it refers to a reaction or a personality type, but the very term codependency implies that what is being described is more than a reaction to an imposed set of stressful circumstances.

But codependency is not the only perspective which is ambiguous in this respect. Any approach which implies that the fault lies at least partly with a partner, parent or other close family member (and it is more often women who are implicated) runs the risks which the authors allude to – of labelling, stigmatising and blaming the victim. The example given of witnessing a family member being asked “What’s your problem?” is very telling because in my experience this assumption that a family member affected by addiction must have a problem beyond simply being the victim of someone else’s addiction is very widespread. At worst, the family member may have been abusive (an assumption more likely if the family member is a parent or is male) or pathologically vulnerable or over-controlling (an assumption more likely in the case of women partners), but at the very least the assumption is that the family

member has been drawn into some kind of complementary transaction or maladaptive way of coping; she should therefore be prepared to talk about herself and not just about her husband's behaviour and the impact that it has had on her. In fact, this contrast between ways of explaining adversity runs through the health and social sciences and relevant policy debates, extending far beyond the topic of addiction and the family. One thinks, for example, of assumptions about rape which implicate victims, or of poverty which implicate the personal shortcomings of the poor, or of the communities in which they live.

As well as being a pathological, or at best ambiguous, model, codependency also shares with other perspectives favoured by the psychological and health sciences a focus on individuals or at most the interiority of families. In the process it neglects, as the authors point out, all that goes on externally to the family which helps to promote and maintain addiction, whether that be the concentration of gambling venues in relatively deprived areas, the development and marketing of technologically more advanced and more dangerous products, intense advertising and lobbying by the industry, or the co-option of scientists in diverse ways (Adams, 2008; Babor, 2009). This can be conceptualised as the exercise of power in its various, more or less hidden, ways (Orford, 2013). Seen in those terms, family members affected by their relatives' gambling or other kinds of addiction, are comparatively powerless and progressively disempowered by addiction.

Whilst Calderwood and Rajesparam recognise the limitations and dangers of codependency theory, they seem to say that it should not be dismissed if family members find it useful. This reminds me of once debating on the BBC radio program *Women's Hour* with a woman who was convinced that the most helpful thing for her had been to recognise the contribution that her codependency had made to her husband's alcohol dependence. Who was I, I thought afterwards, to have argued with her experience? On further reflection, however, I am convinced that I was right to argue that codependency is no basis for the development of a public service that would be sensitive to the position of the large numbers of family members who are affected by addictions, including gambling, and which would be able to offer them what they need. The authors make an appropriate analogy with Alzheimer's disease, to which one could add any number of disabling conditions or sets of adverse circumstances: If we were to design an ideal health and social care system which included family members in as effective and respectful a way as possible, we would surely not base it on codependency or other family pathology model. Meanwhile, sadly, providers of health and social services, who come across many family members affected by their relatives' addictions, albeit often unknowingly, have often heard little in their training other than some variety of codependency theory or similar.

I very much agree with the authors that family members and service providers should be much more aware of stress-coping alternatives. Our group has focused on the development and testing of a 5-Step Method (Copello, Templeton, Orford, &

Velleman, 2010a,b) which is based on the stress-strain-coping-support model (Orford, Copello, Velleman, & Templeton, 2010), and which is designed specifically to meet the needs of affected family members in their own right. It aims to be sufficiently flexible to be delivered in a variety of different formats (including group, self-help handbook and web-based). Those who deliver the intervention need not be specialists in addiction or mental health but they do require a brief period of induction/training (6 to 12 hours ideally). The method has been used with promising results in a variety of countries and sociocultural groups and has been adapted for work with family members affected by gambling (see the Addiction and the Family International Network, AFINet, website at www.afinetwork.info).

Finally, I would like to comment on some of the interesting things that Calderwood and Rajesparam say about the possible differences between the family experience when a relative has a gambling problem compared to the experience when the problem is that of alcohol or drug misuse. I agree with much but not all of what they say here. My own and my colleagues' conclusions are that these experiences are on the whole the same, with some differences of emphasis (Velleman, Cousins, & Orford, in press). I do agree that the centrality of money means that family financial harms are particularly prominent in the case of gambling. I also agree that it is more possible to keep excessive gambling hidden from members of the family for a long time. But of course these features figure in the case of alcohol and drug problems also, and I am doubtful whether the lack of clarity about when a line is crossed from acceptable to problematic gambling, or the importance of helping a family member understand excessive gambling and the gambler, which the authors refer to, are any different from their parallels for substance problems.

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Commentary on Calderwood and Rajesparam (2014)

Response to the commentaries by Lee, Harkness, and Orford

Kimberly A. Calderwood¹ & Anne Rajesparam²

¹University of Windsor, Windsor, Ontario, Canada

²Toronto, Ontario, Canada

We would like to begin by thanking the reviewers, editors, and authors of the commentaries, for their enthusiasm for this topic and their support for our agenda to re-open the debate about the codependency (CD) concept. Our primary goal is to initiate sufficient critical discussion for service providers to be more cautious about using the CD tenets while at the same time reflecting on its origins, strengths, and limitations. While we recognize that the concept has had some utility for a large number of people around the globe, we are concerned about the societal messages that the concept conveys, such as women being responsible for others' addictive behaviour, and the devaluing of caregiver roles. Our motivation in the original opinion paper came from the experience of witnessing a service provider's first words to concerned significant others (CSOs) of problem gamblers be "What is your problem?" Orford's indication that this example is very widespread confirms for us the importance of initiating this debate.

We thank Lee for providing the family theory perspective. We are both too young to have been directly involved with, or knowledgeable about, the emergence of the CD concept. So our statement that the conceptualization of CD was influenced by family systems theory was solely based on what we found in the literature (e.g., Krestan & Bepko, 1992; Miller, 1994). We welcome Lee's clarifications pertaining to family systems therapists like White, Haley, and Satir, and their call to "raise sensitivity to how language is used", and her clarifications pertaining to the fact that "in the second wave of family therapy, the therapist is seen as a co-constructor rather than an expert in the therapeutic process." These points from Lee contribute further to our argument that the CD concept has failed to evolve in a way that is aligned with the direction of other supportive interventions. As Lee indicates, "the negative assignment of blame and neediness to the partners in 'codependency' is a bastardization of family therapy's way of conceptualization and problem formulation."

Neither of us is a family therapist, hence our individualistic bias. We agree that the CD literature focuses too much on the individual, and we support Lee's argument for the

importance of providing, and researching, couple therapy in the addiction context. Further, the CD literature does not include the possible impacts that subscribing to CD tenets may have on the children of the family. In the past several decades, in areas of family interventions such as custody and access, Western society has shifted to decision-making in the *best interests of the child(ren)* (BIC). To date, the CD literature has not addressed the BIC (Calderwood & Rajesparam, in press). Considering the children, as well as the adults in the family system, might serve as an effective preventive approach to address the intergenerational patterns referred to by Lee.

We also thank Lee for introducing the following two points: “The disclosure and discovery of a partner’s problem gambling and its aftermath may in itself be traumatic for the CSO”; and “CSOs likely need more in-depth healing than learning stress coping skills.” Upon further reflection, we agree. From what we know of the stress-strain-coping-support model presented by Orford, Copello, Velleman, and Templeton (2010), its focus is very practical: addressing “stress,” “strain,” “coping,” and “support.” The focus is on the here-and-now, and on the “addiction problem” (Copello, Templeton, Orford, & Velleman, 2010, p. 91). Advantages of this model, as indicated by the authors, include the relative ease with which service providers can be trained on its use, and the fact that it does not use oppressive labelling, which could lead to the stigma seen with the CD approach. However, we wonder if its simplicity risks failing to validate, explore, and address the trauma and loss experienced by the CSO. We do not yet know whether the trauma and loss experienced by CSOs of problem gamblers differs from that of the CSOs of substance abusers. Orford appropriately challenges us about whether there are meaningful differences between the substance use and the problem gambling experience. We acknowledge that Orford may be correct, but we were unable to locate research that has explored this question specifically for the experiences of CSOs. For example, a trauma from unexpectedly and suddenly learning about the gambling behaviour, and the major loss of the spouse you thought you had (or home, or finances) may be more likely for CSOs of problem gamblers.

Regarding the conceptualization of CD, we agree with Harkness that it is a social construction. We want to clarify that when we recommended that researchers “assess what is ‘actually’ occurring in existing practice,” our intent was to indicate that a program (such as the one referred to in the original “Words of Caution” article) may present itself as evidence-based, and then behind closed doors with clients, counsellors may actually be using techniques that are not evidence-based. We recommend even more scrutiny than what Harkness and colleagues have done to date, although their work is a good start. In his commentary, Harkness states that “the substance use counsellors we have studied were able to describe, operationalize and assess it with impressive reliability in clinical practice, and with promising evidence of concurrent, convergent, discriminant, and predictive validity.” It is noteworthy, however, that the Harkness and Cortell (1997) study that demonstrated these findings was limited to a 22% response rate for substance abuse counsellors, and likely limited to counsellors who subscribed to the CD concept (otherwise they

would not have been able to appropriately complete the survey). The study did not reflect the views of counsellors who do not subscribe to the CD concept, nor did it articulate what criteria the respondents used to determine the degree of CD among case scenarios. While the findings showed reliable rankings for the degree to which sample cases were codependent, we argue that CD may not have been a unique construct that respondents were measuring; we suggest that if respondents had been asked to rank order the exact same cases based on the degree of “stress” or “coping skills” or “problem-severity”, the rankings would have been the same.

Surveying substance abuse counsellors and clients who do not buy into the CD concept would provide additional insight into the flaws of the concept. For example, as counsellors who do not subscribe to the concept, we find it disturbing to see what the counsellors in Harkness and Cotrell’s (1997) study considered to be “Low Codependency.” The example in that article to us is not CD at all, but a mother trying to be the best parent she can be. This “Low-Codependency” case is similar to the presentation of the four CSOs described in our original “Words of Caution” article who were asked “What is your problem?” Based on the information available to us, we assert that none of the four believed they had a problem or considered themselves to be codependent. We too did not consider them to be codependent. However, we have no doubt that most counsellors who subscribe to the CD concept, including the respondents in Harkness and Cotrell’s study, would have considered the four CSOs to be codependent simply for the reason that they were, or had been, in a relationship with someone with an addiction. Similarly, the bottom three scenarios in the Idaho Codependency Scale (Harkness, Swenson, Madwen-Hampton, & Hale, 2001), to us, are not examples of CD but of individuals trying to do the best they can with their current high-stress environment. We suggest that the remaining scenarios in the Idaho Codependency Scale all seem to fit one or more diagnoses in the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2013), such as dependent personality disorder and depression. As such, we argue that having a separate category called CD does nothing to contribute to the criteria, and diagnoses, that already are widely supported, and evidence-based.

We thank Orford for questioning our recommendation to not dismiss the CD concept if a client finds it useful. This recommendation was made in the context of treatment, not in the context of raising public awareness. Aligned with Orford’s concern about promoting CD on a BBC program, we argue that in the interests of advocating for more empowering approaches to treatment, the CD concept should never be promoted, or glamorized, in prevention and other awareness raising initiatives. At the same time, we appreciate Harkness’ account of a student who challenged him on his dismissal of CD. The first author of the “Words of Caution” article has had several similar experiences, finding that the CD principles are so entrenched for some people that to critique the concept in their presence risks insulting and alienating them. In the treatment context, a negative attitude toward the CD concept risks an increase in attrition rates for clients who do take on the CD identity, and find it to be useful.

Having said all this, we feel that we are preaching to the converted, as it seems that our views are generally supported by the views of others who read and publish scholarly literature. The challenge lies in how to inform and open the debate among those who do not use an evidence-based approach and who religiously subscribe to the CD tenets. It would have been useful to have a commentary by a strong supporter of the CD concept, to reflect on their perspective. As Lee indicates: “Once a concept such as codependency has gained traction through wide circulation in popular and addiction recovery culture, it acquires a taken-for-granted meaning that seldom gets scrutinized.” Also, Lee questions, “if the codependency narrative is inadequate and potentially damaging, then what are the alternatives?” We recommend that future research examine both the utility and risks of employing the concept. From this research, we hope that an alternative is developed that addresses the needs of CSOs, while eliminating the oppression that currently occurs with the CD concept. The next step will be to find ways to educate those who advocate for the use of the CD concept so that they recognize its oppressive nature, and consider the alternatives.

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