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Gambling and Video Game Playing Among Youth

Jessica McBride¹ & Jeffrey Derevensky¹

¹International Center for Youth Gambling Problems and High-Risk Behaviors
McGill University, Montreal, Quebec, Canada

Abstract

Gambling and video game playing represent two leisure activities in which adolescents and young adults participate. There are psychological and behavioural parallels between some forms of gambling (e.g., slot machines, video lottery terminals, electronic gambling machines) and some types of video games (e.g., arcade games). Both activities operate on behavioural principles of variable reinforcement schedules in order to reward and prolong play and use exciting and stimulating sound and light effects within game play. Additionally, both activities have similar negative effects associated with excessive play (e.g., poor academic performance, moodiness, loss of interest in activities previously enjoyed, and interpersonal conflict). Thus, there is concern that children and adolescents who are attracted to video games, for both psychological rewards and the challenge, may be at greater risk to gamble. We examined the gambling and video game playing behaviour among 1,229 adolescents and young adults. Results indicate that gamblers, relative to non-gamblers, were more likely to play video games. Video game players were more likely than non-players to gamble. Both social and problem gamblers had higher rates of video game playing than did non-gamblers, and addicted gamers had higher rates of gambling than did social and non-gamers. Results from the current study suggest significant overlap in youth participation in both gambling activities and video game playing. These results have implications for future research and the treatment of problem gambling and video game addiction.

Keywords: gambling, video game playing, problem gambling, gaming addiction

Résumé

Les jeux de hasard et les jeux vidéo sont deux loisirs auxquels s'adonnent les adolescents et les jeunes adultes. Il existe des parallèles psychologiques et comportementaux entre certaines formes des jeux de hasard (p. ex., les appareils à sous, les appareils de loterie vidéo, les machines de jeux électroniques) et certains jeux vidéo (p. ex., les jeux d'arcade). Ces deux types de jeux exploitent les principes comportementaux du programme

variable de renforcement pour récompenser le joueur et l'amener à jouer plus longtemps et utilisent des effets lumineux et sonores stimulants et excitants pour accroître l'attrait de l'expérience de jeu. De plus, ces deux activités entraînent des effets négatifs similaires chez les joueurs excessifs (p. ex., mauvais résultats scolaires, instabilité émotionnelle, perte d'intérêt pour des activités qui autrefois procuraient du plaisir, conflits interpersonnels). On craint donc que les enfants et les adolescents qui sont attirés par les jeux vidéo, en raison des défis qu'ils proposent et des récompenses psychologiques qu'ils procurent, soient plus à risque de s'adonner aux jeux de hasard. La présente recherche a examiné les comportements de jeu de 1229 adolescents et jeunes adultes relativement aux jeux de hasard et aux jeux vidéo. Les résultats indiquent que les joueurs de jeux de hasard, par rapport aux non-joueurs, étaient plus susceptibles de jouer à des jeux vidéo, et que les joueurs de jeux vidéo étaient pareillement plus susceptibles de s'adonner aux jeux de hasard que les sujets ne jouant pas aux jeux vidéo. Le groupe des joueurs sociaux et celui des joueurs à problèmes présentaient tous deux un taux plus élevé de pratique des jeux vidéo que celui des non-joueurs, et les sujets ayant une dépendance aux jeux vidéo s'adonnaient également en plus forte proportion aux jeux de hasard que les sujets ne pratiquant par les jeux vidéo ou les pratiquant de manière sociale uniquement. Les résultats de la présente étude donnent à croire qu'il y a un chevauchement important entre la pratique des jeux de hasard et celle des jeux vidéo chez les jeunes. Ces résultats ont des incidences sur les futures recherches et le traitement de la dépendance aux jeux de hasard et aux jeux vidéo.

Introduction

Young people are currently living in a digital age and their recreational activities increasingly consist of activities that interact with technology. Video game playing and, to a lesser extent, gambling represent two activities in which adolescents and young adults routinely participate. Although on the surface these two activities may seem distinct, researchers have increasingly recognized that gambling and gaming activities share many common features at a structural and aesthetic level (King, Gainsbury, Delfabbro, Hing, & Abarbanel, 2015). For example, psychological and behavioural parallels have been proposed between electronic machine gambling (e.g., slots, video lottery terminals, pokies) and video arcade game playing (Fisher & Griffiths, 1995; Griffiths, 1991, 2005b; Griffiths & Wood, 2000, 2004; Gupta & Derevensky, 1996; Ladouceur & Dubé, 1995; Wood, Gupta, Derevensky, & Griffiths, 2004). Both activities operate on behavioural principles of variable reinforcement schedules in order to reward and prolong play, use exciting and stimulating sound and light effects within game play to promote physiological arousal, require a response to predictable stimuli, involve eye-hand coordination, and necessitate varying degrees of concentration and focus. Additionally, both activities have similar negative effects associated with excessive play (e.g., poor academic performance, moodiness, loss of interest in activities previously enjoyed, interpersonal

conflict, depression, and mental health issues; Griffiths & Wood, 2004). The distinction between them is two-fold: Video games are most often played for points and/or status, whereas electronic gambling machines are played for money, and the outcome of video games is determined by skill, whereas with gambling the outcome is random (Griffiths, 2005b). However, it has been argued that the playing philosophy is similar for both. For some slot machine gamblers, the potential for winning money is less important than staying on the machine as long as possible, similar to the goal of video game players (Griffiths & Wood, 2004). This observation has clinicians concerned about “media convergence” (Griffiths, 2008b; King, Delfabbro, & Griffiths, 2010), the idea that traditional lines of demarcation between different media become blurred because of the growing use and influence of technology (Griffiths, 2008b). Adolescents’ involvement in gambling may stem from the similarity between gambling (in particular, slot machine gambling) and other technology-based games with which they are familiar (Delfabbro, King, Lambos, & Puglies, 2009).

In attempting to explain why young people begin to gamble before they are of legal age to do so, researchers have examined factors that may contribute to early gambling behaviour (Delfabbro et al., 2009). One view is that young people’s interest and involvement in gambling stems from their greater familiarity with technology (Griffiths, 1995). Young people may be more open to particular forms of gambling (e.g., electronic gaming machines) because of their similarity to some types of video games, and youths who enjoy the psychological rewards and the challenge of video game play may seek similar situations through gambling (Brown, 1989). Playing video games may provide experience with a type of entertainment (i.e., watching graphics, using controls/buttons, obtaining outcomes) that could be readily transferred to gambling machines (Delfabbro et al., 2009). Of concern is that it then becomes increasingly difficult to separate the two activities (King et al., 2015; Wood, Gupta, et al., 2004).

Early exploratory research among video game-playing adolescents suggests higher levels of both gambling and problem gambling in this group (Griffiths, 1991; Gupta & Derevensky, 1996; Ladouceur & Dubé, 1995; Wood, Gupta, et al., 2004). Beyond these early initial studies, more recent research provides evidence for regular video game playing among gamblers and heavier involvement in video game play for adolescents at risk for gambling-related problems (Wood, Gupta, et al., 2004). Along with reported correlations between problem video game playing and gambling, individuals who self-reportedly excel at video gaming also self-report as being skilled at gambling (Delfabbro et al., 2009; Walther, Morgenstern, & Hanewinkel, 2012). Experimental studies have demonstrated that frequent video game players ($N = 104$, ages 9–14 years), in addition to reporting weekly gambling, wagered significantly greater amounts of money on an experimental blackjack task compared with those who did not play regularly (Gupta & Derevensky, 1996).

However, the research is not unequivocal. Although Delfabbro et al. (2009) reported that adolescents ($N = 2,669$, ages 12–17, $M = 14.63$) at risk for gambling-related problems were more likely to have heavier involvement in video game play, particularly hand-held and arcade games, this association was small and became negligible

when the investigators controlled for gender. Similarly, recent research failed to find a significant association between the frequency of video gaming and gambling for money or for credits or points online in Australian gamers ($N = 485$, ages 16–68, $M = 25.8$; Forrest, King, & Delfabbro, 2016). However, the researchers did find a small but significant relationship between problem video gaming scores and frequency of gambling for money. The discrepant findings highlight the importance of further exploring this area of research to identify any potential relationships.

Video game technology has become not only incredibly sophisticated, but has become an important part of the delivery of gambling activities as well (Gainsbury, Russell, & Hing, 2014; King, Delfabbro, Kaptis, & Zwaans, 2014). Portable game consoles have clear, cinematic-like graphics and enable playing anywhere and at any time. The Internet is playing a crucial role in changing the way young people gamble and play video games. Although playing for money once clearly differentiated slot-machine gambling and video arcade games, this differentiation is disappearing as gambling and gaming move online. Increasing overlaps between online gambling and gaming practices and technologies are given as a strong example of media convergence (de Freitas & Griffiths, 2008; Griffiths, 2008a, 2008b; King et al., 2010, 2014, 2015). A large number of online video games incorporate gambling situations and games of chance within the game itself (e.g., *Grand Theft Auto*, *Red Dead Redemption*, *Pokémon*, *Runescape*, *Fallout: New Vegas*; King et al., 2014; King, Ejova, & Delfabbro, 2012; Walther et al., 2012). Some online video games (e.g., first-person shooter games) pay players for every “kill” made, creating a potential to earn money (Harper, 2007). Online gambling companies routinely offer free gambling games and “demo” features of traditional money games—often played for virtual (“free”) currency—that bring them into the realm of video games. The popularity of digital technology in young people’s leisure and entertainment pursuits and the blurring of previously distinct lines between some types of gambling and video games may ultimately lead certain individuals to develop an interest in gambling at a young age. The concern is that children and adolescents who frequently play video games may begin to believe gambling activities operate under the principle that specific skills and practice are responsible for success and that their acquired skills can influence the outcome of a game of chance (Wood, Gupta, et al., 2004). Youth may become convinced that they can eventually master skills that will make them successful gamblers, despite the randomness of the outcomes, not unlike the way they master skills to become successful video game players. For instance, among regular gamblers who also play video games, game playing is significantly related to statements that reflect control over an experimental gambling task, as well as to overall ratings of direct control over outcomes of the gambling task (King et al., 2012). Video game playing may influence some gambling cognitions among gamblers, including illusion of control over the outcome of the game, superstitious thoughts about gambling, overestimating the amount of skill involved in a gambling task, and belief that video game playing experience results in gambling wins (King et al., 2012).

Activities that have the capacity to be either arousing or relaxing, allowing individuals to be distracted from their normal lives, have been shown to be highly

desirable and to have the potential for excessive participation by some individuals (Griffiths & Wood, 2004). The belief is that individuals with poorly regulated emotions may engage in maladaptive behaviours, such as gambling and/or video game playing, to escape from or regulate their emotions (see Jacobs, 1986). Some research has found specific deficits of emotion regulation in pathological gamblers and that using gambling as an escape is related to emotion regulation both at a neurological and a cognitive level (Weatherly & Miller, 2013; Williams, Grisham, Erskine, & Cassedy, 2012). Research into the role of video games as coping mechanisms is just beginning (Lobel, Granic, & Engels, 2014), though some studies have suggested that video games may provide a safe platform for experiencing emotions such as anger or fear (Jansz, 2005).

The pace at which technology has facilitated the convergence of online gambling and gaming has been much more rapid than that of the research examining this phenomenon. As previously noted, early research that found parallels between gambling and video game playing mainly examined arcade-type games and slot machine gambling among adolescents (Griffiths, 1991; Gupta & Derevensky, 1996; Ladouceur & Dubé, 1995; Wood, Gupta, et al., 2004). More recent research among adolescents has not replicated such an association (e.g., Delfabbro et al., 2009; Forrest et al., 2016). As gambling enters the digital age and converges with other digital media, including video games, clear-cut distinctions between the two activities begin to disappear (King et al., 2015). One of the biggest changes in the division between gambling and video game playing is the existence of social media games, that is, games played via social networking sites such as *Facebook* (Derevensky & Gainsbury, in press; Kim, Wohl, Salmon, Gupta, & Derevensky, 2015). Among adolescents, one quarter have engaged in simulated gambling in a video game (either as a bonus feature or as a virtual gambling experience; King et al., 2014). Exposure to past involvement with simulated gambling has been shown to be a significant predictor of problem gambling in young people (King et al., 2014).

A growing body of research has examined gambling via social networking sites such as *Facebook* and how this normalization of gambling may contribute to addictive behaviour in young people (Derevensky & Gainsbury, 2016; Griffiths, 2013, 2014; Kim et al., in press). Gambling early on has been linked to problem gambling later in life, and young people are being socially conditioned to view gambling as a legitimate social activity freely available to them (King et al., 2010). In an interesting study of video game genre and its relationship to problematic video game play, Elliott, Golub, Ream, and Dunlap (2012) recruited adults who played one or more hours of video games a week and discovered that one of the 15 genres of games respondents played was gambling (defined as simulations of poker, blackjack, and slot machine gambling) and that gambling was one of the video game genres most strongly associated with problematic video game play.

Strong empirical and clinical evidence shows an identifiable number of youth who display a gambling disorder or a gaming problem. This evidence, along with the fact that gambling and gaming share features that might be appealing to certain individuals,

raises the question of whether or not individuals with gambling problems also experience gaming problems. Conflicting research findings with respect to the overlap between gambling and video game playing also call attention to a need to explore any potential relationships. The primary goal of the current study was to examine commonalities between gambling behaviour and problem gambling among video game players and between video game playing and addicted playing among gamblers. We hypothesized that gamblers, relative to non-gamblers, would be more likely to play video games and that video game players would be more likely to gamble than non-players. We also hypothesized that problem gamblers would have higher rates of video game playing than non-gamblers and that problem gamers would have higher rates of gambling than non-gamers. Another goal of the study was to obtain overall prevalence rates for gambling, video game playing, problem gambling, and problem video game playing, as well as to examine gender differences.

Method

Participants

In total, 1,276 CEGEP¹ students completed the questionnaires. Fourteen participants were excluded because of inconsistent responding or missing information, one was excluded because he or she did not indicate gender, and a further 32 participants were excluded because they were older. The final sample included 1,229 individuals (534 males, 695 females), aged 16 to 24 years ($M = 18.69$, $SD = 1.41$). To facilitate categorical analyses, we divided participants into three age groups: under 18 years ($n = 150$), 18–20 years ($n = 944$), and 21–24 years ($n = 131$; four respondents did not indicate their age and were excluded from age analyses). Participants represented a convenience sample and were recruited from four local CEGEPs and one university in Montreal, Canada.

Instruments

Demographic questionnaire. Several items assessed participants' gender, age, cultural/ethnic background, and marital status.

Gambling Activities Questionnaire (GAQ; Byrne, 2004; McBride & Derevensky, 2009, 2012). A series of 12 items was administered to assess gambling behaviour (i.e., poker, lotteries [draw and scratch], sports betting, electronic gaming machines, betting on games of skill, etc.; Byrne, 2004). Respondents were asked to indicate if they had ever gambled for money and, if so, the frequency with which they engaged in the gambling activities during the previous 12 months on a 5-point Likert scale (*never, less than once a month, 1-3 times a month, once a week or more, or daily*).

¹CEGEPs (Collèges d'enseignement général et professionnel) are public, post-secondary education collegiate institutions exclusive to the education system in the province of Quebec. Most, but not all, CEGEPs offer two types of programs: pre-university (2-year) and technical (3-year).

All questions were asked directly and this instrument has been found to have good face validity (Ellenbogen, Gupta, & Derevensky, 2007).

Video game activities questionnaire (VAQ). This scale, developed on the basis of the GAQ, asked respondents to indicate if they had ever played video games or massively multiplayer online role-playing games (not reported in this study) and, if so, the frequency with which they played a variety of games during the previous 12 months (i.e., *Grand Theft Auto*, *Call of Duty*, *Halo*, *Mario & Luigi*, *NHL/NBA/FIFA*, *Rock Band/Guitar Hero/Dance Dance Revolution*, etc.). Frequency of play was reported on a 5-point Likert scale (*never, less than once a month, 1-3 times a month, once a week or more, or daily*).

Problem gambling. Respondents over 18 years of age completed the standardized checklist of the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000) designed to assess problem or disordered gambling. The use of the *DSM-IV* as an index for problem gambling has been well established in research (Derevensky, 2012; Derevensky & Gupta, 2000; Petry, 2005). Respondents were identified as social gamblers if they had gambled in the past year and endorsed zero to two items on the *DSM-IV*, as at-risk for developing a gambling problem if they endorsed three or four items, and as probable pathological gamblers (PPGs; currently viewed as disordered gamblers) if they endorsed five or more items (American Psychiatric Association, 2000). Participants under the age of 18 completed the *DSM-IV-MR-J* (Fisher, 2000). This 12-item, nine-category instrument, a screen for severity of gambling problems during adolescence, was modelled after the *DSM-IV* and revised from the *DSM-IV-J* (Fisher, 1992). It has been widely used to assess youth problem and pathological gambling (Derevensky, 2012; Gillespie, Derevensky, & Gupta, 2007; Nower, Gupta, Blaszczynski, & Derevensky, 2004). Respondents were identified as social gamblers if they had gambled in the past year and endorsed zero to two items on the *DSM-IV-MR-J*, as at-risk for developing a gambling problem if they endorsed three items, and as PPGs if they endorsed four or more items (Fisher, 2000).

Game Addiction Scale (GAS; Lemmens, Valkenburg, & Peter, 2009). This 21-item scale was modelled on the *DSM-IV* criteria for pathological gambling and taps into criteria proposed by Griffiths (2005a), the components of which are salience, tolerance, mood modification, withdrawal, relapse, conflict, and related problems. The scale, based on research with two adolescent samples, had a Cronbach's alpha of .92 and .94 in two studies. It has been shown to have strong convergent and criterion validity (King, Haagsma, Delfabbro, Gradisar, & Griffiths, 2013). For the purposes of data analysis, gaming addiction was measured by the seven-item short version of this scale. Per Lemmens et al. (2009), seven items on the GAS were used to identify a gaming addiction. As the cut-off on the GAS for video game addiction can be established in a number of different ways, the current study used a procedure whereby each item was considered met when a person answered "often" or "very often" of seven possible choices (Lemmens et al., 2009). This is a conservative estimate of problematic gaming, as some studies include "sometimes" in their criteria (Collins & Freeman, 2013).

A polythetic format was adopted and a person was considered an “addicted gamer” when he or she endorsed four or more items on the seven-item scale.

Procedure

Participants were recruited through each participating college. Ethical approval was also obtained from each respective college’s research ethics board, and individual professors were contacted for permission to administer questionnaires to participants. For students under 18, permission was also provided by their parents.

The data were collected within individual classrooms by the researcher, doctoral students, and/or research coordinator. Students completed questionnaires independently, but any questions that arose were answered by the researcher or research assistants. Data were collected over a 7-month period beginning in November 2010 and ending in May 2011.

All participants completed a consent form, were informed that their participation was voluntary, were assured anonymity and confidentiality, and were free to withdraw from the study without penalty. If they wished, participants were entered into a draw for one of 20 movie tickets. The total time to complete the survey varied from 30 to 60 min, with most students finishing within 45 min.

Data Analyses

Frequency data for gambling and video game playing were examined to determine proportion rates for each activity in the sample. Non-parametric tests (e.g., chi-square, cross-tabulations) were used to examine the association between prevalence rates and demographic variables (e.g., gender, age), as well as problem gambling and problem gaming classification. Because of the numerous unplanned comparisons, Bonferroni correction was used and the probability level was set at $p = .005$; however, all p values are reported precisely.

Results

A total of 642 (52.2%) students reported some form of offline gambling during the past 12 months. The participation differences between males ($n = 364$, 68.2%) and females ($n = 278$, 40.0%) were statistically significant, $\chi^2(1, N = 1,229) = 96.01$, $p < .001$. There were also statistically significant differences among the age groups: under 18 ($n = 51$, 34.0%), 18–20 ($n = 504$, 53.4%), and 21–24 ($n = 85$, 64.9%), $\chi^2(2, N = 1,225) = 28.90$, $p < .001$.

On the basis of both *DSM-IV-MR-J* and *DSM-IV* criteria, and accounting for past-year gambling participation, 47.6% ($n = 585$) of the sample were identified as non-gamblers, 49.6% ($n = 609$) as social gamblers, 2.35% ($n = 29$) as at-risk gamblers, and 0.48% ($n = 6$) as PPGs. Because of the small number of PPGs in the present sample, this group was merged with the at-risk gambling category to form a single category labelled problem gamblers ($n = 35$, 2.8%), and those who endorsed zero to two items

and who had gambled in the past year were categorized as social gamblers. Previous research has suggested that individuals with a minimum of three gambling-related problems on these scales share similar characteristics to those meeting criteria for probable pathological gambling (Gupta & Derevensky, 1998). The differences between males ($n = 30$, 5.6%) and females ($n = 5$, 0.7%) for problem gambling severity was statistically significant, $\chi^2(2, N = 1,229) = 111.18, p < .001$. There were no significant age differences among non-gamblers and problem gamblers, or among social and problem gamblers. However, a comparison of non-gamblers and social gamblers revealed that a greater proportion of non-gamblers were under the age of 18 years ($n = 99$, 66.0%), whereas a significantly greater proportion of social gamblers were 21–24 years ($n = 82$, 62.6%), $\chi^2(1, N = 276) = 26.38, p < .001$.

A total of 1,107 (90.1%) students reported playing video games during the previous year. Males ($n = 524$, 98.1%) were more likely than females ($n = 583$, 83.9%) to have played, $\chi^2(1, N = 1,229) = 68.51, p < .001$. Interestingly, no differences were found on the basis of age group.

From gaming performance and the GAS, 9.5% ($n = 117$) respondents were identified as non-gamers, 87.6% ($n = 1,077$) as social gamers, and 2.8% ($n = 35$) as addicted gamers. There were significant differences in GAS identification of gaming addiction among males ($n = 29$, 5.4%) and females ($n = 6$, 0.9%), $\chi^2(2, N = 1,229) = 85.98, p < .001$. Gaming addiction by age group was not analysed because of the small cell sizes (only three addicted gamers in the 21–24 age group).

Gambling and Gaming

According to responses on the GAQ and the VAQ, 604 respondents reported both gambling and video game playing. Significantly more gamblers (94.1%) than non-gamblers (85.7%) played video games. Similarly, significantly more video game players (54.6%) than non-players (31.1%) gambled, $\chi^2(1,1229) = 24.15, p < .001$. A greater proportion of gamblers reported playing video games (94.1%) compared with video game players who reported gambling (54.6%), $\chi^2(1,1229) = 24.15, p < .001$.

As shown in Table 1, there were statistically significant differences in gambling severity for past-year video game playing, $\chi^2(2, N = 1,229) = 24.82, p < .001$. Although participation rates were relatively similar for problem and social gamblers, both groups had greater rates of past-year video game playing than did non-gamblers.

There was a significant difference in gaming addiction classification for past-year gambling, $\chi^2(2,1229) = 24.90, p < .001$ (Table 2). Addicted gamers were found to have the highest rates of gambling participation, and both addicted gamers and social gamers reported greater past-year gambling than did non-gamers.

A principle aim of the study was to examine how pathological gambling and gaming may intersect and whether the same individuals experience problems with both activities. In Table 3, one can see a significant difference among addicted gamers for

Table 1
Gambling Severity and Past-Year Video Game Playing

Gambling severity	<i>N</i>	Video game participation during the past year % (<i>n</i>)
Non-gambler ^a	585	85.6 (501)
Social gambler ^b	609	94.3 (574)
Problem gambler ^c	35	91.4 (32)
Total	1,229	90.1 (1,107)

Note.

^a DSM-IV score = 0, no gambling activity during the past 12 months.

^b DSM-IV score = 0–2.

^c DSM-IV score \geq 3.

Table 2
Gaming Addiction and Past-Year Gambling

Gaming addiction	<i>N</i>	Past-year gambling participation % (<i>n</i>)
Non-gamer ^a	117	30.8 (36)
Social gamer ^b	1,077	54.2 (584)
Addicted gamer ^c	35	62.9 (22)
Total	1,229	52.2 (642)

Note.

^a GAS score = 0, no gaming activity during the past 12 months.

^b GAS score = 0–3.

^c GAS score \geq 4.

Table 3
Gambling Severity and Gaming Addiction

Gaming addiction	<i>N</i>	Gambling severity % (<i>n</i>)		
		Non-gambler ^a	Social gambler ^b	Problem gambler ^c
Non-gamer ^d	117	69.2 (81)	28.2 (33)	2.6 (3)
Social gamer ^e	1,077	45.6 (491)	51.8 (558)	2.6 (28)
Addicted gamer ^f	35	37.1 (13)	51.4 (18)	11.4 (4)
Total	1,229	47.6 (585)	49.6 (609)	2.8 (35)

Gambling severity χ^2 (4, 1229) = 34.43, $p < .001$

Note.

^a DSM-IV score = 0, no gambling activity during the past 12 months.

^b DSM-IV score = 0–2.

^c DSM-IV score \geq 3.

^d GAS score = 0, no gaming activity during the past 12 months.

^e GAS score = 0–3.

^f GAS score \geq 4.

gambling severity classification. Proportionally, significantly more addicted gamers than social or non-gamers were identified as problem gamblers. However, because of the small numbers of problem gamblers and addicted gamers, no reliable conclusions can be reached, as only four addicted gamers were also identified as problem gamblers. Although no clear association was found, the overlap between gambling and gaming problems deserves further investigation.

Discussion

This study compared gambling behaviours among video game players and non-players and video game playing behaviours among gamblers and non-gamblers and found that a plausible association does exist. On the basis of earlier findings of high levels of both gambling and problem gambling among video game-playing adolescents, as well as regular video game playing among gamblers (Delfabbro et al., 2009; Griffiths, 1991; Gupta & Derevensky, 1996; Ladouceur & Dubé, 1995; Walther et al., 2012; Wood, Gupta, et al., 2004), we predicted that gamblers, relative to non-gamblers, would be more likely to play video games and that video game players would be more likely than non-players to gamble. The results suggest that gamblers were more likely than non-gamblers to play video games and that video game players were more likely than non-players to gamble. These results are in line with previous findings that correlate problematic video game playing with gambling (Walther et al., 2012), but contradict other findings (Forrest et al., 2016; King et al., 2012). Although Forrest et al. (2016) found that video gaming frequency did not correlate significantly with the frequency of gambling for money, they studied a population of video game players, whereas we investigated the gambling and video game habits among a general sample of college students. The present study did find that a greater number of social gamblers reported playing video games compared with video gamers who reported gambling, which supports Forrest et al.'s (2016) conclusions that gambling may not be an appealing activity to regular video game players, who prefer different experiences than those provided by chance-based gambling (e.g., high skill level, strategy and planning, progress reward cycles). This explanation suggests that video game players, who choose to play games that rely on skill, may be less interested in gambling experiences that do not require skill. Gamblers may have false beliefs with respect to the extent that skill affects the outcome of their gambling, and playing video games, especially games that contain gambling opportunities, would reinforce these beliefs. For example, King et al. (2012) reported that regular video game playing among gamers was not a significant predictor of illusion of control or superstitious thoughts about gambling on an experimental gambling task, although it was such a predictor among gamblers. In fact, among gamblers, video game playing was positively correlated with overestimating the amount of skill involved in an experimental gambling task and the belief that video game experience helped to produce gambling wins in that task (King et al., 2012). The relationship between video games and gambling may also be related to specific types of gambling and specific types of video games. Poker, for example, may provide opportunities for skill, strategy, and reward cycles not found in other gambling activities and may be more attractive to video game players.

Delfabbro et al. (2009) found that adolescents played a greater variety of video games if they gambled on non-electronic gaming machine types, including gambling activities involving skill (cards, sports, racing). Although this study is cross-sectional and therefore cannot demonstrate that playing video games leads to gambling, the finding that video game players were more likely than non-players to gamble and gamblers were more likely than non-gamblers to play video games warrants further inquiry in this area to clearly establish whether a causal link exists. Video game playing may not be directly related to gambling behaviour; rather, it may influence some gambling cognitions among those who both gamble and play video games. It would be of interest to determine the extent to which individuals distinguish between gambling and video game playing with respect to skill in determining the outcome.

Problem Gambling and Addicted Gaming

It is noteworthy that the rates of problem gambling in the current study are lower than those typically cited (3% to 32%; see Nowak & Aloe, 2013), but are not inconsistent with those of other studies (Kessler et al., 2008; McBride & Derevensky, 2012). Gambling behaviour of college-age students experiencing gambling problems has been observed to fluctuate, and some previously identified gamblers experiencing problems have been found to be no longer experiencing any problems at a later date (Martin, Usdan, Cremeens, & Vail-Smith, 2012). Problem gambling may not necessarily be a progressive disorder, as has been previously assumed, and some researchers are noting that individuals move in and out of gambling problems during their lifetime (LaPlante, Nelson, LaBrie, & Shaffer, 2008; Slutske, 2006). It is also possible that problem gamblers were not found in the current population because of the demands of school; those currently experiencing problems may have already dropped out of school, missed class, or not attended CEGEP in the first place (CEGEP is not mandatory; it is attended following a high school diploma and comprises two streams: vocational programs and pre-university programs). The students who participated in the current study attended non-vocational programs; perhaps the rigour of academics engulfed the students' leisure time. There is some indication that gambling is higher among young people not attending college than among those enrolled in college (Barnes, Welte, Hoffman, & Tidwell, 2010). Research with individuals in this age group, often difficult to obtain in large numbers, who are not in school, would provide valuable insight into the gambling behaviour of young adults in general.

A small percentage of the current sample also self-reported a gaming problem. From the GAS, nearly 3% of participants were identified as addicted gamers. Although there is no single "gold standard" measure in identifying pathological video game playing, the current results are consistent with that of other research (Johansson & Götestam, 2004). Among the sample, only four individuals were identified as both problem gamblers and addicted gamers. We hypothesized that problem gamblers would have higher rates of video game playing than would non-gamblers and that problem gamers would have higher rates of gambling than would non-gamers. We found that gamblers in the current study, both problem and social, were somewhat

more likely than non-gamblers to play video games and that gamers, both social and addicted, were more likely than non-gamers to report past-year offline gambling. The fact the participation was not higher for problem gamblers or addicted gamers was surprising, but might be a reflection of the size of the sample of the respective groups. These results are consistent with the findings of Delfabbro et al. (2009), who reported that frequent video game playing was only a minor risk factor for the development of pathological gambling during adolescence. Overall, a better understanding is needed on how gambling and video game playing might converge (see Kim et al., in press). Future research is needed to determine what makes problem gamblers and addicted gamers similar, or different, and how the two activities do or do not influence the thoughts and behaviours of their respective players.

The possibilities offered by rapid technological development are expanding exponentially. This is an area of concern and full of possibility for future research because children begin interacting with technology earlier and earlier and the lines between gambling and gaming become increasingly blurred (King et al., 2015).

Gender Differences

Although the association between gambling and video game playing was the primary consideration of this study, the results further emphasized the over-representation of males in both activities, although the number of females involved in video gaming was larger than the number involved in gambling. Consistent with the findings of the majority of gambling research, significantly more males than females had gambled (Bakken, Gotestam, Grawe, Wenzel, & Oren, 2009; Barnes et al., 2010; Bhullar, Simons, & Joshi, 2012; Derevensky & Gupta, 2000b; Engwall, Hunter, & Steinberg, 2004; LaBrie, Shaffer, LaPlante, & Wechsler, 2003; Stuhldreher, Stuhldreher, & Forrest, 2007). Gambling may be more normalized for males than for females, especially during childhood and adolescence, whereas it may be seen less as a way to socialize and more as a risky activity by young females. Speculation for this difference includes a proclivity on the part of males for risky behaviour (Bradley & Wildman, 2002), adherence to social norms (Hing & Breen, 2001), and issues related to escape versus competition motivations (Wenzel & Dahl, 2009).

In the current study, significantly more males than females were identified as problem gamblers. Males are consistently reported to have higher rates of problem gambling than females are (Bakken et al., 2009; Barnes et al., 2010; Blinn-Pike, Worthy, & Jonkman, 2007; Burger, Dahlgren, & MacDonald, 2006; Engwall et al., 2004; Goudriaan, Slutske, Krull, & Sher, 2009; LaBrie et al., 2003; Platz, Knapp, & Crossman, 2005; Stinchfield, Hanson, & Olson, 2006). Although females are not exempt from developing gambling problems, they tend to develop problems later in life, and this was reflected in the current sample. Nevertheless, prevention programs should include gender-specific strategies and messages, including public service announcements from prominent female gamblers on the potential dangers of excessive gambling, especially for those females who are gambling online.

Males are also more likely than females to play video games and to score more highly on addicted gaming screens (Dauriat et al., 2011; Griffiths, Davies, & Chappell, 2004a, 2004b; Lemmens, Valkenburg, & Peter, 2011; Mentzoni et al., 2011; Padilla-Walker, Nelson, Carroll, & Jensen, 2010). Desai, Krishnan-Sarin, Cavallo, & Potenza (2010) reported gender differences between gamers and non-gamers. Among girls, gaming was associated with a lower risk of depression but increases in serious fights and carrying a weapon, whereas there were no significant negative health correlates of gaming in boys. The authors posited that their results were suggestive of a gender-specific self-selection process in that, whereas gaming may be more appealing to boys in general, it may be particularly attractive to girls with certain characteristics. However, this assumes that males and females are choosing to play the same kinds of games, something Desai et al. (2010) did not examine. Wood, Griffiths, Chappell, and Davies (2004) found that males and females differed in regard to what game characteristics they rated as important; males preferred sophisticated artificial intelligence, skill development, shooting, and surviving against the odds, whereas females preferred cartoon-style graphics, use of humour, solving puzzles, avoiding things (i.e., dangerous places, spells), finding/collecting things, and finding bonuses. Males chose competitive games that they would play in real life—replicating gender stereotypical behaviour—and females chose make-believe games that accumulated points, suggesting a preference for competition with themselves (Wood, Griffiths, et al., 2004). In the current study, significantly more males than females were identified as addicted gamers and social gamers, and significantly more females than males were identified as non-gamers, a pattern that has also been widely reported with problem gambling. This gender divide has been reported elsewhere (Desai et al., 2010; Gentile, Choo, Liau, Sim, Fung, & Koo, 2011; Griffiths et al., 2004b; Lemmens et al., 2009, 2011; Mentzoni et al., 2011; Padilla-Walker et al., 2010; Wood, Griffiths, et al., 2004). Whether or not game choice affected these results is beyond the scope of this paper but, as with gambling, video game manufacturers are becoming aware of the market potential of women gamers and these numbers may change as game designers create and promote games geared toward women and girls. Further research is needed to determine how structural characteristics might lead to an increase in behaviour and whether this differs on the basis of gender.

Limitations

Several limitations need to be acknowledged. Cross-sectional designs do not permit conclusions to be drawn about causality. In order to determine whether video game playing leads to gambling, longitudinal studies need to be carried out. A second limitation reflects the potential self-selection bias for sampling. It is possible that individuals who have a particular interest in gambling and/or gaming would preferentially elect to participate. The data were obtained by self-report, which in and of itself has implications for reliability, as it is possible that individuals may want to portray themselves in more positive ways. However, the anonymity of the questionnaires should be sufficient to counter, or at least limit, this concern.

Because of the length of the survey, it was not possible to include further detailed questions about other common or antecedent factors (i.e., other addictive behaviours) that might contribute to a greater involvement in both activities, and so we cannot make a conclusion about whether observed results are due to similarities between these specific activities or to a common disposition for addictive behaviours in general.

Although over 1,000 students were surveyed, in the end, relatively few of them were pathological gamblers and addicted gamers. Although this has positive mental health implications for young people, it makes statistical analyses difficult and caution should be exercised in generalizing results to a larger population. In addition, generalizability is not possible because of the convenience sampling strategy used in this study.

Recommendations

An important aspect of education must address the similar risk factors inherent in gambling and gaming (Derevensky & Gainsbury, in press). Although the leisure and positive aspects of gambling are highlighted, marketed, and understood, the downside must also be emphasized, especially regarding gambling disguised as video or social games.

The educational community needs to develop and implement strategic secondary prevention efforts, awareness, information, and education about gambling in general and the possible links with video game playing. This should include the signs and symptoms of problematic gambling and gaming. Particular emphasis should be placed on game playing, as this leisure activity is much more pervasive than gambling.

Social gaming operators must be more socially responsible in how they market their games and how they encourage in-game purchasing (Griffiths, 2014). Stricter age verification measures should be in place for social games, especially where such games allow young people to play games with gambling-related content (often with exaggerated payout rates), even if real money is not used. Video games that have alcohol and cigarette use, graphic violence, sexual references, and coarse language are more restricted, whereas video game versions of simulated gambling activities are rated for “everyone” or “teen” audiences by the Entertainment Software Rating Board (King et al., 2010).

The gender differences in gambling and gaming found in the present study have implications for gender-specific treatments. Young males, who may prefer gambling and video games that stress competition and risk-taking, would benefit from interventions that channel those drives in more healthy, active ways, whereas young females, who may gamble or game for escape, would benefit from emotion-focused coping strategies. Further research into motivations for playing on the basis of gender would help to inform treatment strategies.

Parents also need to assume responsibility when allowing their children to play social games or download gaming apps. Griffiths (2014) has articulated a number of suggestions for parents to work with their children to prevent them from buying in-game items for real money, including overseeing all apps they download, not providing online store passwords, deleting stored credit and debit card information from online accounts, and discussing buying in-game extras with their children. Video games have dramatically changed from the initial *Pong* and *Pac-Man*. Today's games are readily available via social media outlets. They are much more exciting, incorporate more sophisticated graphics, and can easily be downloaded on smartphones and tablets. From a public health perspective, carefully monitoring the behaviour of youth is highly recommended.

References

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC: Author.

Bakken, I. J., Gotestam, K., Grawe, R. W., Wenzel, H. G., & Oren, A. (2009). Gambling behavior and gambling problems in Norway 2007. *Scandinavian Journal of Psychology*, *50*, 333-339. doi: <http://dx.doi.org/10.1111/j.1467-9450.2009.00713.x>

Barnes, G. M., Welte, J. W., Hoffman, J. H., & Tidwell, M.-C. O. (2010). Comparisons of gambling and alcohol use among college students and noncollege young people in the United States. *Journal of American College Health*, *58*, 443-452.

Bhullar, N., Simons, L., & Joshi, K. (2012). The significance of gender and ethnicity in collegiate gambling and drinking. *Addictive Disorders & Their Treatment*, *11*, 154-164.

Blinn-Pike, L., Worthy, S. L., & Jonkman, J. N. (2007). Disordered gambling among college students: A meta-analytic synthesis. *Journal of Gambling Studies*, *23*, 175-183.

Bradley, G., & Wildman, K. (2002). Psychosocial predictors of emerging adults' risk and reckless behaviors. *Journal of Youth and Adolescence*, *31*, 253-265. doi: 10.1023/a:1015441300026

Brown, R. I. F. (1989). Gambling, gaming, risk-taking, addictions and a developmental model of a pathology of man-machine relationships. In J. Klabberg, D. Croowell, H. de Jong & W. Scheper (Eds.), *Simulation gaming*. Oxford, United Kingdom: Pergamon Press.

Burger, T. D., Dahlgren, D., & MacDonald, C. D. (2006). College students and gambling: An examination of gender differences in motivation for participation. *College Student Journal*, *40*, 704-714.

- Byrne, A. (2004). *An exploratory study of Internet gambling among youth* (Unpublished master's thesis). McGill University, Montreal, QC.
- Collins, E., & Freeman, J. (2013). Do problematic and non-problematic video game players differ in extraversion, trait empathy, social capital and prosocial tendencies? *Computers in Human Behavior*, *29*, 1933–1940.
- Dauriat, F. Z., Zermatten, A., Billieux, J., Thorens, G., Bondolfi, G., Zullino, D., & Khazaal, Y. (2011). Motivations to play specifically predict excessive involvement in Massively Multiplayer Online Role-Playing Games: Evidence from an online survey. *European Addiction Research*, *17*, 185-189.
- de Freitas, S., & Griffiths, M. (2008). The convergence of gaming practices with other media forms: What potential for learning? A review of the literature. *Learning, Media and Technology*, *33*, 11–20. doi:10.1080/17439880701868796
- Delfabbro, P., King, D., Lambos, C., & Puglies, S. (2009). Is video-game playing a risk factor for pathological gambling in Australian adolescents? *Journal of Gambling Studies*, *25*, 391–405. doi:10.1007/s10899-009-9138-8
- Derevensky, J. L. (2012). *Teen gambling: Understanding a growing epidemic*. Lanham, MD: Rowman & Littlefield.
- Derevensky, J. L., & Gainsbury, S. (2016). Social casino gaming and adolescents: Should we be concerned and is regulation in sight? *International Journal of Law and Psychology*, *44*, 1–6.
- Derevensky, J. L., & Gupta, R. (2000). Youth gambling: A clinical and research perspective. *Journal of Gambling Issues*, *2*. doi:10.4309/jgi.2000.2.3
- Desai, R. A., Krishnan-Sarin, S., Cavallo, D., & Potenza, M. N. (2010). Video-gaming among high school students: Health correlates, gender differences, and problematic gaming. *Pediatrics*, *126*, e1414-e1424. doi: 10.1542/peds.2009-2706
- Ellenbogen, S., Gupta, R., & Derevensky, J. L. (2007). A cross-cultural study of gambling behaviour among adolescents. *Journal of Gambling Studies*, *23*, 25–39. doi:10.1007/s10899-006-9044-2
- Elliott, L., Golub, A., Ream, G., & Dunlap, E. (2012). Video game genre as a predictor of problem use. *Cyberpsychology, Behavior, and Social Networking*, *15*, 155–161. doi:10.1089/cyber.2011.0387
- Engwall, D., Hunter, R., & Steinberg, M. (2004). Gambling and other risk behaviors on university campuses. *Journal of American College Health*, *52*, 245-255.

- Fisher, S. E. (1992). Measuring pathological gambling in children: The case of fruit machines in the U.K. *Journal of Gambling Studies*, *8*, 263–285.
- Fisher, S. (2000). Developing the DSM-IV criteria to identify adolescent problem gambling in non-clinical populations. *Journal of Gambling Studies*, *16*, 253–273.
- Fisher, S., & Griffiths, M. (1995). Current trends in slot machine gambling: Research and policy issues. *Journal of Gambling Studies*, *11*, 239–247. doi:10.1007/BF02104791
- Forrest, C. J., King, D. L., & Delfabbro, P. H. (2016). The gambling preferences and behaviors of a community sample of Australian regular video game players. *Journal of Gambling Studies*, *32*, 409–420. doi:10.1007/s10899-015-9535-0
- Gainsbury, S. M., Russell, A., & Hing, N. (2014). An investigation of social casino gaming among land-based and Internet gamblers: A comparison of socio-demographic characteristics, gambling and co-morbidities. *Computers in Human Behavior*, *33*, 126–135.
- Gentile, D. A., Choo, H., Liau, A., Sim, T., Li, D., Fung, D., & Khoo, A. (2011). Pathological video game use among youths: A two-year longitudinal study. *Pediatrics*, *127*, e319-e329.
- Gillespie, M. A. M., Derevensky, J., & Gupta, R. (2007). II. The utility of outcome expectancies in the prediction of adolescent gambling behaviour. *Journal of Gambling Issues*, *19*, 69–85.
- Goudriaan, A. E., Slutske, W. S., Krull, J. L., & Sher, K. J. (2009). Longitudinal patterns of gambling activities and associated risk factors in college students. *Addiction*, *104*, 1219-1232. doi: 10.1111/j.1360-0443.2009.02573.x
- Griffiths, M. (1995). *Adolescent gambling*. London: Routledge.
- Griffiths, M. D. (1991). Amusement machine playing in childhood and adolescence: A comparative analysis of video games and fruit machines. *Journal of Adolescence*, *14*, 53–73. doi:10.1016/0140-1971(91)90045-S
- Griffiths, M. (2005a). A 'components' model of addiction within a biopsychosocial framework. *Journal of Substance Use*, *10*, 191–197.
- Griffiths, M. (2005b). Relationship between gambling and video-game playing: A response to Johansson and Göttestam. *Psychological Reports*, *96*, 644–646.
- Griffiths, M. D. (2008a). Convergence of gambling and computer game playing: Implications. *E-Commerce Law Policy* *10*, 12–13.

- Griffiths, M. D. (2008b). Digital impact, crossover technologies and gambling practices. *Casino & Gaming International*, 4, 37–42.
- Griffiths, M. D. (2013). Adolescent gambling via social networking sites: A brief overview. *Education and Health*, 31, 84–87.
- Griffiths, M. D. (2014). Child and adolescent social gaming: What are the issues of concern? *Education and Health*, 32, 9–12.
- Griffiths, M., & Wood, R. T. A. (2000). Risk factors in adolescence: The case of gambling, videogame playing, and the Internet. *Journal of Gambling Studies*, 16, 199–225.
- Griffiths, M., & Wood, R. T. A. (2004). Youth and technology: The case of gambling, video-game playing, and the Internet. In J. L. Derevensky & R. Gupta (Eds.), *Gambling problems in youth: Theoretical and applied perspectives* (pp. 101–120). New York, NY: Kluwer Academic/Plenum.
- Griffiths, M. D., Davies, M. N. O., & Chappell, D. (2004a). Demographic factors and playing variables in online computer gaming. *CyberPsychology & Behavior*, 7, 479–487. doi: doi:10.1089/cpb.2004.7.479
- Griffiths, M. D., Davies, M. N. O., & Chappell, D. (2004b). Online computer gaming: a comparison of adolescent and adult gamers. *Journal of Adolescence*, 27, 87–96. doi: 10.1016/j.adolescence.2003.10.007
- Gupta, R., & Derevensky, J. L. (1996). The relationship between gambling and video-game playing behavior in children and adolescents. *Journal of Gambling Studies*, 12, 375–394.
- Gupta, R., & Derevensky, J. L. (1998). An empirical examination of Jacob's General Theory of Addictions: Do adolescent gamblers fit the theory? *Journal of Gambling Studies*, 14, 17–49.
- Harper, A. (2007, November 22). Technology: Pay-per-kill shooters combine online gambling with gaming. *The Guardian (Technology Supplement)*. Retrieved from <http://www.lexisnexis.com/hottopic/lnacademic/?verb=sr&csi=138620>
- Hing, N., & Breen, H. (2001). Profiling lady luck: An empirical study of gambling and problem gambling amongst female club members. *Journal of Gambling Studies*, 17, 47–69. doi: 10.1023/A:1016640332005
- Jacobs, D. (1986). A general theory of addictions: A new theoretical model. *Journal of Gambling Behavior*, 2, 15–31.

- Jansz, J. (2005, August). The emotional appeal of violent video games for adolescent males. *Communication Theory*, *15*, 219–241. doi:10.1111/j.1468-2885.2005.tb00334.x
- Johansson, A., & Götestam, K. G. (2004). Problems with computer games without monetary reward: Similarity to pathological gambling. *Psychological Reports*, *95*, 641–650. doi:10.2466/pr0.95.2.641-650
- Kessler, R. C., Hwang, I., LaBrie, R., Petukhova, M., Sampson, N. A., Winters, K. C., & Shaffer, H. J. (2008). DSM-IV pathological gambling in the National Comorbidity Survey Replication. *Psychological Medicine*, *38*, 1351–1360. doi:10.1017/s0033291708002900
- Kim, H. S., Wohl, M. J. A., Salmon, M. M., Gupta, R., & Derevensky, J. (2015). Do social casino gamers migrate to online gambling? An assessment of migration rate and potential predictors. *Journal of Gambling Studies*, *31*, 1819-1831. doi:10.1007/s10899-014-9511-0
- King, D., Delfabbro, P., & Griffiths, M. (2010). The convergence of gambling and digital media: Implications for gambling in young people. *Journal of Gambling Studies*, *26*, 175–187.
- King, D. L., Delfabbro, P. H., Kaptsis, D., & Zwaans, T. (2014). Adolescent simulated gambling via digital and social media: An emerging problem. *Computers in Human Behavior*, *31*, 305–313.
- King, D. L., Ejova, A., & Delfabbro, P. H. (2012). Illusory control, gambling, and video gaming: An investigation of regular gamblers and video game players. *Journal of Gambling Studies*, *28*, 421–435. doi:10.1007/s10899-011-9271-z
- King, D. L., Gainsbury, S. M., Delfabbro, P. H., Hing, N., & Arabanel, B. (2015). Distinguishing between gaming and gambling activities in addiction research. *Journal of Behavioral Addictions*, *4*, 215–220.
- King, D. L., Haagsma, M. C., Delfabbro, P. H., Gradisar, M., & Griffiths, M. D. (2013). Toward a consensus definition of pathological video-gaming: A systematic review of psychometric assessment tools. *Clinical Psychology Review*, *33*, 331–342. doi:10.1016/j.cpr.2013.01.002
- LaBrie, R. A., Shaffer, H. J., LaPlante, D. A., & Wechsler, H. (2003). Correlates of college student gambling in the United States. *Journal of American College Health*, *52*, 53-62.
- Ladouceur, R., & Dubé, D. (1995). Prevalence of pathological gambling and associated problems in individuals who visit non-gambling video arcades. *Journal of Gambling Studies*, *11*, 361–365. doi:10.1007/BF02108614

- LaPlante, D. A., Nelson, S. E., LaBrie, R. A., & Shaffer, H. J. (2006). Men & women playing games: Gender and the gambling preferences of Iowa gambling treatment program participants. *Journal of Gambling Studies*, *22*, 65-80. doi: 10.1007/s10899-005-9003-3
- Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2009). Development and validation of a game addiction scale for adolescents. *Media Psychology*, *12*, 77–95. doi:10.180/152132608026694580
- Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2011). Psychosocial causes and consequences of pathological gaming. *Computers in Human Behavior*, *27*, 144-152. doi: <http://dx.doi.org/10.1016/j.chb.2010.07.015>
- Lobel, A., Granic, I., & Engels, R. C. M. E. (2014). Stressful gaming, interoceptive awareness, and emotion regulation tendencies: A novel approach. *Cyberpsychology, Behavior, and Social Networking*, *17*, 222–227. doi:10.1089/cyber.2013.0296
- Martin, R. J., Usdan, S., Cremeens, J., & Vail-Smith, K. (2014). Disordered gambling and co-morbidity of psychiatric disorders among college students: An examination of problem drinking, anxiety and depression. *Journal of Gambling Studies*, *30*, 321-333. doi: 10.1007/s10899-013-9367-8
- McBride, J., & Derevensky, J. (2009). Internet gambling behavior in a sample of online gamblers. *International Journal of Mental Health and Addiction*, *7*, 149–167. doi:10.1007/s11469-008-9169-x
- McBride, J., & Derevensky, J. (2012). Internet gambling and risk-taking among students: An exploratory study. *Journal of Behavioral Addictions*, *1*, 50–58. doi:10.1556/jba.1.2012.2.2
- Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Skouveroe, K. J. M., Hetland, J., & Pallesen, S. (2011). Problematic video game use: Estimated prevalence and associations with mental and physical health. *Cyberpsychology, Behavior, and Social Networking*, *14*), 591-596. doi: 10.1089/cyber.2010.0260
- Nowak, D. E., & Aloe, A. M. (2013). The prevalence of pathological gambling among college students: A meta-analytic synthesis, 2005–2013. *Journal of Gambling Studies*, *30*, 819–843. doi:10.1007/s10899-013-9399-0
- Nower, L., Gupta, R., Blaszczynski, A., & Derevensky, J. (2004). Suicidality and depression among youth gamblers: A preliminary examination of three studies. *International Gambling Studies*, *4*, 69–80. doi:10.1080/1445979042000224412
- Padilla-Walker, L. M., Nelson, L.J., Carroll, J. S., & Jensen, A. C. (2010). More than a just a game: Video game and internet use during emerging adulthood. *Journal of Youth and Adolescence*, *39*, 103-113.

- Petry, N. M. (2005). *Pathological gambling: Etiology, comorbidity, and treatment*. Washington, DC: American Psychological Association.
- Platz, L., Knapp, T., & Crossman, E. (2005). Gambling by underage college students: Preferences and pathology. *College Student Journal, 39*, 3-6.
- Slutske, W. S. (2006). Natural recovery and treatment-seeking in pathological gambling: Results of two U.S. national surveys. *American Journal of Psychiatry, 163*, 297-302. doi: 10.1176/appi.ajp.163.2.297
- Stinchfield, R., Hanson, W. E., & Olson, D. H. (2006). Problem and pathological gambling among college students. *New Directions for Student Services, 2006*, 63-72. doi: 10.1002/ss.196
- Stuhldreher, W. L., Stuhldreher, T. J., & Forrest, K. Y. Z. (2007). Gambling as an emerging health problem on campus. *Journal of American College Health, 56*, 75-88.
- Walther, B., Morgenstern, M., & Hanewinkel, R. (2012). Co-occurrence of addictive behaviours: Personality factors related to substance use, gambling and computer gaming. *European Addiction Research, 18*, 167-174. doi:10.1159/000335662
- Weatherly, J. N., & Miller, K. B. (2013). Exploring the factors related to endorsing gambling as an escape. *International Gambling Studies, 13*, 52-64.
- Wenzel, H. G., & Dahl, A. A. (2009). Female pathological gamblers—A critical review of the clinical findings. *International Journal of Mental Health and Addiction, 7*, 190-202. doi: 10.1007/s11469-008-9174-0
- Williams, A. D., Grisham, J. R., Erskine, A., & Cassidy, E. (2012). Deficits in emotion regulation associated with pathological gambling. *British Journal of Clinical Psychology, 51*, 223-238. doi:10.1111/j.2044-8260.2011.02022.x
- Wood, R. T. A., Griffiths, M. D., Chappell, D., & Davies, M. N. O. (2004). The structural characteristics of video games: A psycho-structural analysis. *CyberPsychology & Behavior, 7*, 1-10. doi:10.1089/109493104322820057
- Wood, R. T. A., Gupta, R., Derevensky, J. L., & Griffiths, M. (2004). Video game playing and gambling in adolescents: Common risk factors. *Journal of Child & Adolescent Substance Abuse, 14*, 77-100. doi:10.1300/J029v14n01_05

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For Correspondence: Jessica McBride, Ph.D., International Centre for Youth Gambling and High-Risk Behaviors, McGill University, 3724 McTavish, Montreal, Quebec, H3A 1Y2, Canada. E-mail: jessica.mcbride@mail.mcgill.ca

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