

# **The Relationship among Drinking Games, Binge Drinking and Gambling Activities in College Students**

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## **ABSTRACT**

*A total of 293 college students completed a survey about binge drinking and gambling activities. Students who played the lottery once a week had lower binge drinking scores compared to students who played the lottery more than once a week and those students who never played the lottery. Similar patterns were also detected for students who engaged in sports-betting, card-playing, and games of skill. Students who met the criteria for binge drinking were likely to engage in sports-betting, video and regular poker, internet, office pools, and other games of skill compared to students who did not meet the criteria for binge drinking.*

*Implications for collegiate prevention programs are discussed.*

**Key Words:** *Drinking Games, Binge Drinking, Problem and Pathological Gambling*

The co-occurrence of alcohol use and gambling activities has been well documented in college students (Ladouceur, Dube, & Bujold, 1994; Martens et al., 2009) and the general population (Walker, Clark, & Folk, 2010). Both alcohol use and gambling behavior is a source of great concern for the college population because of the potential health risks involved. Compared to college students without gambling problems, students with gambling problems are more likely to engage in unsafe behavior including greater use of alcohol, tobacco, marijuana, driving under the influence, and unsafe sex after drinking (Engall, Hunter, & Steinberg, 2004; LaBrie, Shaffer, LaPlante, & Weschler, 2003; Stuhldreher, Stuhldreher, & Forrest, 2007). The relationship between specific behaviors related to alcohol use, including drinking games and binge drinking, and the different types of gambling activities in a college population was investigated in the present study.

Drinking games (DG) are popular on college campuses as self-reported participation in these games has been observed to be as high as 63% in at least one study (Borsari, Bergen-Cico, & Carey, 2003). DG often involve activities with rules governing the consumption of alcohol. College students who participate in these games tend to drink more often than students who do not participate in these games (Johnson, Hamilton, & Sheets, 1999). The adverse impact of DG includes heightened aggression, vandalism and driving under the influence (Borsari, 2004). Different possible motives for undergraduate engagement in DG have been described. It is believed that participation in these games has a social advantage for the college students as it helps in reducing shyness or inhibitions and facilitates friendships (Pederson, 1990). However, some studies have shown a negative correlation between social anxiety and participation in DG, with socially anxious individuals less likely to be involved in these games as they might avoid social situations altogether (Ham & Hope, 2006; Johnson, Wendell, & Hamilton, 1998). Other specific motives include playing for competition and thrills, fun and celebration, sexual manipulation and coping (Johnson & Sheets, 2004).

Binge drinking (also known as HED or heavy episodic drinking) has been defined by the National Institute of Alcohol Abuse and Alcoholism (NIAAA) as a pattern of alcohol consumption which brings the blood alcohol concentration (BAC) to 0.08 gram percent and above. This BAC typically corresponds to con-

sumption of five or more drinks in two hours for males and four or more drinks in two hours for females. Young adults showing signs of problem gambling behavior were found to be more likely to indulge in binge drinking (Walker, Clark & Folk, 2010). The prevalence of binge drinking has been reported to be as high as 40% in the college population (Wechsler, Lee, Nelson, & Kuo, 2002). College-age binge drinkers were more likely to engage in unprotected sex, suffer physical injuries and cognitive impairment and experience employment and inter-personal problems (Hanson & Engs, 1992; Wechsler & Isaac, 1992).

Even though the term *binge* has been traditionally associated with drinking among clinicians, it can be used to describe a wide variety of behaviors including eating and shopping. The concept of binge gambling has been described by Nower & Blaszczynski (2003) as participation in intermittent binge episodes of gambling during which there is a loss of control that results in acute harmful consequences. Certain common features are believed to underlie the different kinds of bingeing behaviors including loss of control, urges to engage in the behavior, and persistence despite adverse consequences. This common behavior signals an underlying common theme of poor impulse control and it is one of the most common hypotheses used to explain addiction to drinking and gambling.

Individuals who drink alcohol tend to gamble, too. There is evidence to suggest that individuals who are classified as problem gamblers are much more likely to abuse alcohol than the average person in the general population (e.g. Welte, Barnes, Wieczorek, Tidwell & Parker, 2001) and gambling disorders are more likely to co-occur with substance use disorder (Potenza, Steinberg, & Wu, 2005). A literature review by Crockford and el-Guebaly (1998) found the highest co-morbidity of pathological gambling with substance use disorders and they hypothesized that the similarity in the settings of alcohol, drugs and gambling was one of the possible reasons. Simultaneous drinking and gambling has been investigated in a few studies as it was believed that individuals would gamble more under the influence of alcohol as they are likely to feel less inhibited (Kyingdon & Dickerson, 1999). Simultaneous drinking and gambling was seen specifically more with video keno, pulling tab and casino gambling than any other form of gambling in one of the studies (Welte et al., 2004).

Problem gamblers were more likely to drink while gambling than non-problem gamblers in the above-mentioned study.

This co-morbidity of addictive behavior has been explained by several hypotheses. One of them emphasizes a general predisposition towards addictive behavior whether it is alcohol, tobacco, drugs or gambling (Ducci & Goldman, 2008). This predisposition has a neurobiological basis with frontal lobes of the brain, which are responsible for providing inhibitory control over impulsiveness, not exerting the same control for individuals demonstrating addictive behavior (Dawe, Gullo, & Loxton, 2004). A greater degree of impulsivity has been observed in alcohol-dependent individuals and problem gamblers (Lawrence, Luty, Bogdan, Sahakian, & Clark, 2009). Another common motive for engagement in gambling and substance use is a desire for mood alteration in terms of reduction of negative affect or enhancement of excitement (Sharpe, 2004; Wulfert, Roland, Hartley, Wang, & Franco, 2005). One study showed a heightened arousal on gambling in both social and problem gamblers, with the former showing increase in arousal levels on winning only, whereas problem gamblers were aroused whether they were winning or losing (Sharpe, 2004). BAS (Behavioral Approach System) and BIS (Behavioral Inhibition System) are two types of motivational systems proposed by Gray (1975). These two systems are believed to underlie different kinds of behavior including alcohol consumption and gambling. BAS involves greater sensitivity to potential reward which could be related to euphoria associated with alcohol consumption (Marlatt, 1987) or a potential win (Wulfert et al., 2005). Hence, BAS is associated with positive reinforcement as individuals tend to seek out alcohol or gambling activities as they view it as a fun activity. A study by O'Connor, Stewart and Watt (2009) found BAS to be a risk factor for drinking and smoking but not for gambling. However, a strong drive (motivation to pursue rewarding goals), which is one of the sub-components of BAS, was related to increased risk for frequent gambling and heavy spending. Therefore, additional research is warranted to understand the co-occurrence of drinking and gambling. The goal of the present study is to add to the literature on binge drinking and gambling behaviors. Specifically, we sought to answer three research questions:

- (1). Do differences exist in the rates of binge drinking, problem gambling, and pathological gambling for students who

engage and those students who do not engage in gambling activities?

- (2). Do differences exist in gambling activities for students who engage in drinking games and binge drinking?
- (3). How is binge drinking directly and indirectly related to probable pathological gambling?

## METHOD

### *Participants*

A total of 293 (31% male, 69% female) undergraduate students enrolled in introductory to psychology courses at a private metropolitan university in a northern metropolitan area participated in a survey study to fulfill a research credit requirement during the 2009-2010 and 2010-2011 academic years (i.e., the Psychology Department requires the research participation credit as part of the introductory to psychology course as a way to teach students about psychological research). The University's Institutional Review Board approves all experiments that are offered to students as a way to fulfill the research credit requirement (i.e., IRB approved this study).

Most students identified themselves as White (81%), while the remaining group of students identified themselves as Black (10%), Latino (2%), Asian (5%), and Multiracial (1%). Few students did not wish to report their race (1%). The mean age of students was 18.61 years ( $SD = 1.08$ ) and the mean GPA reported by students was in the "B" range. Sixty-one percent of students were enrolled in majors (i.e., Business, Education) in professional schools and 39% were enrolled in majors (i.e., Psychology, Biology) in the Colleges of Arts and Sciences. Seventy-four percent of students reported taking part in drinking games, 39% met the criteria for binge drinking, 17% met the criteria for problem gambling, and 42% met the criteria for probable pathological gambling.

### *Measures*

A total of nine measures were included in the pretest and post-test. It was more parsimonious to include multiple measures with a significant number of items rather one or two questionnaires with a few items in the survey, in order to conduct a comprehen-

sive assessment on binge drinking and gambling activities in this sample of college students.

A **Demographic Questionnaire**, developed by the researchers, gathers information on gender, race, age, and year in school.

An **Alcohol and Drug Measure** assesses the amount, type, and frequency of alcohol and drug use. Items were abstracted from the drug and alcohol section of the Addiction Severity Index (ASI), 5<sup>th</sup> Edition (McLellan, Urshel, and Blair, 1997) and incorporated into a self-report survey. This scale measured the frequency and amount of alcohol use, during the past 30 days and 12 months (i.e., "how often did you use/ drink alcohol in the past 30-days). Participants rated their frequency of drinking on a ranking scale ranging from "0" none to "9" daily usage. Responses also were coded by multiplying frequencies and quantities to produce a full score of heavy drinking (four or more drinks per sitting). This score was recoded into a dichotomized variable with scores of "0" indicating no binge (less than 5 drinks per sitting) and "1" indicating binge (5 or more drinks per sitting) which is consistent with previous investigations on binge drinking (Wechsler & Nelson, 2001).

**Drinking Games**, a questionnaire developed by Wood, Johnson and Sher (1992) measured the frequency of drinking game participation. Subjects rated their frequency of playing drinking games and typical quantity of playing drinking games. Items were recoded to produce a dichotomized variable for either "1" drinking game participation or "0" no participation. This dichotomized variable was used in the analyses presented in this paper. Twenty-six percent of participants reported engaging in game-playing during the past month, consistent with previous research (1992).

The **Gambling Activities Questionnaire (GAQ)**, developed by Gupta and Dervensky (1996), is a 17-item questionnaire that assesses problem gambling activities (i.e., bingo, lottery tickets, wagering on sports, and Internet gambling) during the past 12-months. Participants indicate the degree to which they engaged in gambling activities on a four-point scale ranging from "1" never to "4" once a week or more. Items are analyzed separately and have a strong level of reliability ( $\alpha = .81$ ) among participants in this study.

The **Gamblers' Beliefs Questionnaire (GBQ)**, developed by Steenbergh, Meyers, May, and Whelan (2002), is a 20-item questionnaire that measures luck and illusion of control cognitive distortions about gambling. The luck/perseverance subscale measures participants' beliefs about their ability to win money back and the illusion of control subscale measures their beliefs about gambling fallacies associated with gambling skills. Participants indicate the degree to which they agree to each statement on a seven-point Likert scale ranging from "1" strongly agree to "7" strongly disagree and then items are added together to produce two subscale scores, with lower scores indicating a greater degree of luck and control associated with gambling. This scale has a strong level of reliability ( $\alpha = .96$ ) among participants in this study.

The **Gambling Readiness to Change (GRTC) Scale** developed by Neighbors, Lostutter, Larimer, and Takushi (2002), is comprised of a 9-item scale that measures the precontemplation, contemplation, and action stages of change. This scale is modeled after the *Stages of Change* questionnaire. Participants indicate the extent to which they agree with each statement on a Likert-scale ranging from "1" (strongly disagree) to "5" (strongly agree). Each item is added together and then divided by the mean number of items to produce three subscale scores with higher scores indicating a greater degree of change for each stage. This scale has a strong level of reliability ( $\alpha = .84$ ) among participants in this study.

The **Gambling Problem Index (GPI)** developed by Neighbors et al., (2002,) measures gambling problems. The GPI was modeled after the *Rutgers Alcohol Problem Index*. Participants indicate how many times they experienced a negative consequence as a result from gambling during the past six months on a five-point scale ranging from "0" none to "5" more than ten. Items were added together to produce a full scale score and the higher number indicates a greater degree of problem gambling. In this study, the median was calculated and used to divide the scores into problem and nonproblem gambling categories. This scale has a moderate level of reliability ( $\alpha = .82$ ) among participants in this study. The mean score 20.62 (SD = 2.41) and 17% of participants met the criteria for problem gambling on this scale.

The **Gambling Quantity and Perceived Norms Scale (GQPN)** developed by Neighbors et al., (2002), assesses money spent on gambling and perceived norms about gambling. Participants indicate the amount of which they have won and lost money from gambling over the past month and year on a 10-point scale ranging from less than \$5.00 to more than \$1,000. The quantity scale is scored as the mean of six expenditure items and an adequate level of reliability ( $\alpha = .73$ ) among participants in this study.

The **South Oaks Gambling Screen (SOGS)**, developed by Leiseur and Blume (1987), is a 20-item questionnaire that is used to identify probable pathological gambling. Participants respond to questions about the extent to which they have engaged in gambling activities during their lifetime on a three-point scale ranging from "1" not at all to "3" once a week or more and they indicate the extent to which they have experienced problems from gambling on a dichotomous (yes/no) scale. Items are added together to produce a total scale score and the higher score indicates the greater degree of probable pathological gambling. The median was calculated and used to divide scores into two categories of probable problem and nonproblem pathological gambling in this study. The SOGS has adequate reliability for gambling activities ( $\alpha = .79$ ) and gambling problems ( $\alpha = .63$ ) among participants in this study. The mean score was 27.56 (SD = 2.14) and 42% met the criteria for probable pathological gambling.

#### *Design and Procedure*

A passive research survey design was used to explore binge drinking and pathological gambling among undergraduate students. Students enrolled in introductory psychology courses between the fall of 2009 through the spring of 2011 volunteered to participate in this study to fulfill research participation credit. A sign-up sheet that included a description of the study and the University's IRB approval number was made available to students in the Social Science office. Students signed-up to take part in this study and then met with the research assistant in the Psychology Lab. The research assistant explained the purpose of, and answered their questions about the study. Then the research assistant administered and collected informed consent forms, provided each participant with a copy of the informed consent form, and administered the survey to the students. Students completed

the survey at their own pace, placed it in an envelope, and gave it directly to the research assistant. Surveys took approximately 20 minutes to complete. The research assistant debriefed students about the purpose and rationale of the study.

## RESULTS

### *Gambling Activities*

Forty-eight percent of the college sample took part in gambling activities with lottery, sports-betting, card playing, and golf or other games of skill being reported as the most common activities as shown in Table 1. A one-way analysis of variance with Tukey post-hoc comparisons were conducted to measure differences in drinking games, binge drinking and problem gambling according to the frequency of lottery, sports-betting, card playing, and games of skill, because students engaged in these activities more often compared to other gambling activities. There were no observed differences in drinking games for students who did and did not take part in gambling activities. However, there were observed differences in the rates of problem gambling, pathological gambling, and binge drinking. As indicated in Tables 2 and 3, students who played the lottery once a week had lower binge drinking scores compared to students who played one to three times per week, students who played at least once a month, and students who never played the lottery. Similar patterns were also detected for students who engaged in sports-betting, card-playing, and games of skill. Students who reported gambling more than they intended ( $\chi = 3.65$ ) had lower binge drinking scores ( $t(290) = -3.92, p < .05$ ) compared to students who reported not gambling more than they intended ( $\chi = 3.95$ ).

### *Drinking Games and Binge Drinking*

Two independent t-tests were conducted to measure differences in gambling activities, problem gambling, and probable pathological gambling for students who met the criteria for binge drinking and those students who took part in drinking games. There were no observed differences in problem and pathological gambling for students who did and did not participate in binge drinking and drinking games. However, there were observed differences in gambling activities. As shown in Table 4, there was a statistically significant difference between binge drinkers and non-binge drinkers as the former group reported engaging in six

out of the seventeen gambling activities - sports betting, video and regular poker, internet, office pools, golf and other games of skills - more than the latter group. Also, students who reported participating in drinking games were significantly more engaged in three out of the seventeen gambling activities (i.e., lottery, slot machines and casino gambling activities), compared to the students who did not report participating in the drinking games.

#### *Binge Drinking and Pathological Gambling*

A hierarchical regression analysis was conducted to examine the relationship between binge drinking and probable pathological gambling in an undergraduate student population. In this model, binge drinking was entered as the primary predictor variable, gambling quantity index and gambling beliefs were entered as secondary predictors, and gambling readiness to change was entered as a tertiary predictor for the criterion variable, probable pathological gambling (i.e., SOGS scores). These variables were selected to replicate previous correlation research on gambling (Neighbors et al., 2002), but only accounted for a small portion (7%) of the variance in probable pathological gambling.

Binge drinking ( $\beta = .35$ ,  $t [195] = 2.76$ ,  $p < .01$ ) was directly and positively related to gambling quantity (i.e., the frequency & severity of gambling). Binge drinking was not related to gambling beliefs or readiness to change. However, luck or perseverance gambling beliefs was negatively ( $\beta = -.36$ ,  $t [263] = -6.18$ ,  $p < .001$ ) related to gambling quantity.

Luck, or perseverance gambling beliefs, was directly related to illusion of control gambling beliefs ( $\beta = .82$ ,  $t [261] = 23.30$ ,  $p < .001$ ) and the illusion of control gambling beliefs were also indirectly related to gambling through the action stage of readiness to change. Illusion of control gambling beliefs ( $\beta = -.30$ ,  $t [258] = -2.85$ ,  $p < .01$ ) were directly and negatively related to the action stage of the readiness to change scale and the action stage was directly and negatively ( $\beta = -.1.99$ ,  $t [218] = -2.00$ ,  $p < .05$ ) related to probable pathological gambling. The action stage was also directly and positively ( $\beta = .72$ ,  $t [285] = 17.65$ ,  $p < .001$ ) related to the contemplation stage. The contemplation stage was directly and positively related to gambling ( $\beta = .28$ ,  $t [218] = 3.06$ ,  $p < .01$ ).

## DISCUSSION

The goal of this study was to examine the relationship between binge drinking and probable pathological gambling. Slightly less than half of the college sample took part in gambling activities. In terms of gambling activities, lottery, sports-betting, card playing, and golf or other games of skill were the most popular activities for students. A similar pattern has been observed with adults of the general population in Canada with at least lottery, sports betting and bingo (Holtgraves, 2009). Card playing and games involving skill were not common in the above-mentioned study. Hence, it seems that the current sample of undergraduate college students is distinct in terms of the gambling activities of cards and games involving skill. These findings are similar to a recent study comparing gambling activities popular in college and non-college students between the ages of 18 and 21 years, and lottery, card games, sports betting, office pools and games of skill were found to be the most popular with both populations (Barnes, Welte, Hoffman, & Tidwell, 2010).

The impact of the types of gambling activities on incidence of problem or pathological gambling has received relatively less attention barring a few exceptions (e.g. Holtgraves, 2009; Petry, 2003). It is believed that the type of gambling activity is possibly influenced by the individual traits. Gamblers high on the impulsiveness trait were more likely to seek the fast paced casino games (Slowo, 1998). Simple and solitary gambling activities (e.g. lottery, slots) are more likely to reduce arousal and social games (e.g. craps) are more likely to augment arousal levels in individuals (Blaszczynski & Nower, 2002). Hence, different individual choices of gambling activities might provide clues about the underlying motivation and personality traits of problem gamblers.

In the present study, there was no significant difference observed in problem and pathological gambling between individuals who engaged in drinking games compared to those who did not participate in these games. On the other hand, binge drinking was related to differences in rates of problem or pathological gambling. An inverse relationship was observed between rates of lottery and binge drinking with lower binge drinking observed in students who played lottery more often (i.e. at least once a week). This finding may not be surprising since playing lottery

is more likely to be a solitary activity. Hence, students who seek these solitary activities might not be interested in socializing with other students for consumption of alcohol. In contrast, playing cards is a social activity and a similar relationship was observed between playing cards and rates of binge drinking with lower binge drinking scores in students who played cards at least once a week. Students who engaged in sports betting or games involving skills at least once a week also had lower binge drinking scores, and these findings are incongruent with previous research. Petry (2003) found a pattern with greater incidence of alcohol abuse among individuals who engaged in sports betting. This co-morbidity might be a function of sensation-seeking behavior that is observed in non-college rather than in college students. Also, students seeking augmentation of their arousal levels might seek sports betting as a form of positive reinforcement. Students who reported gambling more than they intended had lower binge drinking scores than students who did not gamble at all. These findings illustrate the significance of taking into account the type of gambling activity while studying its correlates, including substance use and abuse.

Overall, binge drinkers were more likely to engage in sports betting, video and regular poker and office pools than non-binge drinkers. There seems to be an underlying social theme to all of these gambling activities where students are more likely to be in a social situation compared to solitary activities like slots. Binge drinking has been linked to greater degrees of social interaction in college students, with individuals reporting greater intimacy and social disclosure with binge drinking episodes compared to individuals with no episodes (Nezlek, Pilkington, & Bilbro, 1994). In another study, socialization with friends was the strongest predictor of binge drinking in Brazilian high school students and this finding emphasizes the role of social learning (Sanchez et al., 2011). Students engage in these drinking games to facilitate socialization and for competition (Newman, Crawford, & Nellis, 1991; West, 2001). In the current study, however, students who participated in drinking games were more likely to engage in the solitary gambling activity like slot machines and lottery. This disparate finding might be attributed to homogeneity effects associated with the sample of college students. Most students were White females who were of legal age to participate in solitary (i.e., lottery) but not social gambling activities (i.e., casino) in the State of Pennsylvania (World Casino Directory, 2011).

In a recent study, heavy alcohol consumption was associated with problem gambling but the activities associated with alcohol consumption were varied including football pools, slot machines, horse races, online and casino gambling (Griffiths, Wardle, Orford, Sproston, & Erens, 2010). These activities were not believed to be related in any specific way and a lack of association between these gambling activities and alcohol consumption was proposed by the authors.

In the current study, binge drinking was directly related to gambling quantity in terms of the frequency and severity of gambling with greater degree of binge drinking related to greater frequency and severity of gambling. There has been evidence to suggest that alcohol might be preceding gambling behavior as alcohol abuse often precedes the development of gambling problems (Kausch, 2003). Alcohol intoxication is associated with impulsiveness (Fillmore & Vogel-Sprott, 2000) and deficits in the processing of information including faulty appreciation of risk (Cooper, 2006; Welte et al., 2004). There is an ongoing debate whether risk takers are more likely to consume alcohol (Cherpitel, 1999) or that taking alcohol leads to increase in faulty risk taking (Cooper, 2006). In an experimental study, participants engaged in a game of Blackjack with varying amounts of risk before and after consumption of alcohol (Phillips & Ogeil, 2007). After consumption of alcohol, individuals indulged in greater risks than before, illustrating the disinhibition effects. They also responded more quickly during placement of bets after consumption of alcohol indicating greater impulsiveness. Similar mechanisms of disinhibition, impulsiveness and faulty appreciation of risks might be involved in the current study, as well, as the students who reported a greater degree of binge drinking also reported gambling more often.

Luck, or perseverance gambling beliefs, was directly related to gambling quantity, while illusion of control was indirectly associated with problem gambling. Cognitive distortions, including elevated perceptions of personal luck, have been associated with disordered gambling (Wohl, Young, & Hart, 2007). For gambling, illusion of control is used to describe the persistence of gamblers even after they lose money (Langer, 1975). The perseverance, often observed in problem gamblers in the face of continual loss, has been a puzzling phenomenon for researchers studying gambling since it is contrary to the learning theory. According to the traditional learning theory, gamblers should decrease their

expenditure as they face losses since they are getting punished for their gambling behavior, but data suggests the opposite, as these individuals actually increase the frequency of gambling (Wohl et al., 2007). This perseverative inability to stop gambling in problem gamblers has been viewed as a possible working memory deficit with the problem gamblers performing worse on working memory tasks than the matched controls (Leiserson & Pihl, 2007). A deficit in working memory might involve impaired, disorganized or perseverative behavior (Kane & Engle, 2002). A similar phenomenon has been observed with binge drinking studies that measure cognitive function. Binge drinkers produced more errors than non-binge drinkers on different working memory tasks (Townshend & Duka, 2005). Animal model studies on alcohol binge exposure have demonstrated neurodegeneration in parts of the brain linked to learning and spatial memory (Jarrard, 1993). Even though it would be difficult to generalize these findings from animal studies to humans, it offers a note of caution to individuals who engage in binge drinking and gambling. The co-occurrence of binge drinking and gambling might result in increased likelihood of progression from recreational gambling, to problem or pathological gambling, due to impaired working memory and executive functioning resulting from excessive alcohol consumption. Impulsivity and risky decision making has been observed in both problem gamblers and alcohol-dependent subjects (Lawrence et al., 2009).

At the same time, it is important to stress differences between individuals engaged in problem gambling and problem drinking. A recent study showed greater procrastination or avoidance and lower vigilance in their decision making in problem drinkers, whereas problem gamblers showed less confidence and more vigilance in their decisions (Phillips & Ogeil, 2011). Still, the co-occurrence of drinking and gambling shows some underlying similarities including sensation seeking related to frequency of gambling and drinking (Fischer & Smith, 2008). Behavioral decision making, as measured by the IGT (Iowa Gambling Task), was found to be impaired in high binge drinkers (Goudriaan, Grekin, & Sher, 2007). IGT is a well-known neuropsychological decision-making task of executive function designed to predict real-life decision deficits (Bechara, Damasio, Tranel, & Damasio, 1997). Some aspects of IGT, specifically the myopic focus on rewards, have been found to predict gambling related pathology in college students (Lakey, Goodie, & Campbell, 2007). Problem gamblers

in the above-mentioned study showed deficits in learning as they did not adapt their responses after their losses.

Based on the findings from the current study, where both binge drinking and drinking games were linked to at least some of the gambling activities among college students, it is vital for the prevention programs in colleges to focus on these populations and not view binge drinking and alcohol consumption as a relatively normal phase of college life, as some surveys from young individuals have demonstrated (Coleman & Cater, 2005). The possible impact of drinking on gambling behavior and vice-versa points to one of the many possible long-term negative consequences on both the individual, and the family, as well as the community.

*Directions for Future Research and Collegiate Prevention*

While this study adds to the literature on binge drinking and problem gambling, the results should be viewed in light of a few key limitations. The student population is demographically homogeneous. Student participants were predominantly White females who came from middle-class backgrounds and usually were the first-generation to attend a four-year college. Homogeneity and sample selection limitations prevent us from generalizing the findings of this study beyond the current sample of White, female undergraduates. Students self-reported on game-playing, alcohol consumption, and gambling behaviors with a survey. Students may not have answered all of the questions honestly; they may have over- or under-reported drinking and gambling behaviors. Binge drinking only accounted for a small portion (7%) of the variance in probable pathological gambling. More research is needed on simultaneous drinking and gambling behavior in college students, as well as assessment of which one of the two behaviors is likely to occur first. Qualitative feedback from college students on the progression from one behavior to the other could be obtained. Working memory and executive functioning of college students, who demonstrate binge drinking and problem gambling, needs to be measured on different days of the week, including days when they drink and when they do not drink. The relationship between involvement in specific gambling activities and working memory functioning also needs to be investigated. This would make an interesting future study.

Despite the mentioned limitations, there are a few important implications that can be made from this study. Primary prevention programs should be designed to identify students at risk for recreational, problem, and pathological gambling. These programs should target students who engage in heavy or binge drinking because they are likely to engage in formal (i.e., lottery) and informal (i.e., games of skill) gambling activities on a monthly basis. Educational workshops should be offered to students, faculty, and staff, so individuals are aware and knowledgeable about the frequency and severity of student participation in gambling, particularly among those students who meet the criteria for binge drinking. The dissemination of gambling information campus-wide may lead to collaborations between Student Affairs (i.e., Residence Life, Counseling Center) and faculty in promoting greater gambling awareness. For instance, faculty could include information on the relationship between binge drinking and gambling activities in courses that focus on addictive disorders (i.e., Psychology, Social Work) (Engwall et al., 2004). Conrad (2008) found that the implementation of gaming education in a college curriculum is associated with increased knowledge about gambling problems among undergraduate students. Gaming education may assist faculty in the recognition of gambling problems, thus contributing to their ability to make referrals to the counseling center when they suspect a student has a gambling problem (McComb & Hanson, 2009). Faculty and staff may also collaborate to develop and implement university-wide policies and prevention programs. Students who participate in drinking games are likely to engage in lottery, slot machine, and casino gambling activities, while those students who meet the criteria for binge drinking are likely to engage in sports-betting, video and regular poker, internet, office pools, and other games of skill. It is probable that these student groups are more likely to seek counseling for heavy drinking than for problem gambling. For this reason, collegiate prevention programs for alcohol and drug use should be extended to include gambling activities. Secondary prevention programs should incorporate behavior modification techniques to reinforce and support student intentions to discontinue their participation in gambling activities (i.e., contemplation stage), while tertiary programs should aim to teach students how to reformulate gambling beliefs (i.e., action stage) (Prochaska & DiClemente, 1992). The relationship between binge drinking and pathological gambling appears to be mediated by students' gambling beliefs and their readiness to change; therefore, interventions such as

motivational interviewing, cognitive-behavior therapy, and gambler anonymous may be effective in preventing probable gambling problems in college students, but only if strategies are matched with their readiness to make behavioral change (Miller & Rollnick, 1991; Marlatt & VandenBos, 1997).

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**TABLE 1**  
*Frequency of Gambling Activities during the Past 12 Months for College Students (N = 293)*

| Gambling Activities                                    | Never<br>% | Less than Once a<br>Month<br>% | 1-3 Times per Month<br>% | Once a Week<br>% |
|--|------------|--------------------------------|--------------------------|------------------|
| Lottery  | 49         | 41                             | 8                        | 2                |
| Horse racing   | 96         | 4                              | 0                        | 0                |
| Sports betting   | 74         | 17                             | 5                        | 4                |
| Bingo  | 79         | 19                             | 2                        | 0                |
| Slot machines  | 89         | 9                              | 2                        | 0                |
| Electronic gaming machines (video poker, VLT)          | 91         | 6                              | 3                        | 0                |
| Casino   | 94         | 5                              | 1                        | 0                |
| Poker  | 81         | 13                             | 4                        | 2                |
| Cards  | 74         | 17                             | 7                        | 2                |
| Internet gambling                                      | 94         | 4                              | 2                        | 0                |
| Stock market   | 97         | 2                              | 0                        | 1                |
| Office pools   | 90         | 8                              | 0                        | 2                |
| Pull tabs  | 98         | 1                              | 1                        | 0                |
| Video keno   | 99         | 1                              | 0                        | 0                |
| Dice games   | 94         | 4                              | 1                        | 1                |
| Sports cards   | 94         | 4                              | 1                        | 1                |
| Bowled, shot pool, played golf, or other game of skill | 80         | 16                             | 3                        | 1                |

**TABLE 2**  
*One-Way Analyses of Variance for Effects of Gambling Activities on Binge Drinking, Problem Gambling, and Pathological Gambling*

| Variables                     | ANOVA   |                     |         |                       |         |                            |
|-------------------------------|---------|---------------------|---------|-----------------------|---------|----------------------------|
|                               | df      | Binge Drinking<br>F | df      | Problem Gambling<br>F | df      | Pathological Gambling<br>F |
| Lottery                       | (3,292) | 11.22***            | (3,283) | 42.62***              | (3,240) | 14.16***                   |
| Cards                         | (3,292) | 8.02***             | (3,282) | 40.51***              | (3,240) | 13.09***                   |
| Sports betting                | (3,290) | 8.13***             | (3,281) | 18.59***              | (3,240) | 12.51***                   |
| Golf and other skill<br>games | (3,284) | 12.63***            | (3,274) | 23.98***              | (3,233) | 10.78***                   |

Note. \*\*\*p<.001.

**TABLE 3**  
*Mean Scores on Binge Drinking, Problem Gambling, and Pathological Gambling as a Function of Frequency of Gambling Activities*

| Measures                     | Frequency of Gambling Activities |     |      |     |      |     |      |      |             |   |    |            |
|------------------------------|----------------------------------|-----|------|-----|------|-----|------|------|-------------|---|----|------------|
|                              | (1)                              |     | (2)  |     | (3)  |     | (4)  |      |             |   |    |            |
|                              | M                                | SD  | M    | SD  | M    | SD  | M    | SD   | Once a Week | M | SD | Post hoc   |
| <b>Binge Drinking</b>        |                                  |     |      |     |      |     |      |      |             |   |    |            |
| Lottery                      | 3.93                             | .42 | 3.93 | .36 | 3.80 | .60 | 2.80 | 1.09 | 1.09        |   |    | 4< 3, 2, 1 |
| Cards                        | 3.95                             | .30 | 3.87 | .48 | 3.65 | .87 | 3.28 | 1.25 | 1.25        |   |    | 4< 2, 1    |
| Sports                       | 3.95                             | .30 | 3.78 | .67 | 4.00 | .01 | 3.36 | 1.12 | 1.12        |   |    | 4< 3, 2, 1 |
| Skill Games                  | 3.93                             | .38 | 3.91 | .41 | 3.42 | .97 | 2.75 | 1.50 | 1.50        |   |    | 4< 2, 1    |
| <b>Problem Gambling</b>      |                                  |     |      |     |      |     |      |      |             |   |    |            |
| Lottery                      | 1.00                             | .03 | 1.02 | .08 | 1.09 | .14 | 1.56 | .68  | .68         |   |    | 4> 3, 2, 1 |
| Cards                        | 1.00                             | .04 | 1.07 | .12 | 1.06 | .09 | 1.41 | .53  | .53         |   |    | 4> 3, 2, 1 |
| Sports                       | 1.01                             | .05 | 1.04 | .10 | 1.10 | .11 | 1.27 | .50  | .50         |   |    | 4> 3, 2, 1 |
| Skill Games                  | 1.00                             | .03 | 1.09 | .14 | 1.25 | .55 | 1.31 | .29  | .29         |   |    | 4> 2, 1    |
| <b>Pathological Gambling</b> |                                  |     |      |     |      |     |      |      |             |   |    |            |
| Lottery                      | 1.59                             | .11 | 1.63 | .11 | 1.68 | .14 | 1.92 | .23  | .23         |   |    | 4> 3, 2, 1 |
| Cards                        | 1.59                             | .10 | 1.64 | .12 | 1.76 | .14 | 1.74 | .12  | .12         |   |    | 4=3> 2, 1  |
| Sports                       | 1.60                             | .11 | 1.65 | .08 | 1.66 | .16 | 1.82 | .23  | .23         |   |    | 4> 3, 2, 1 |
| Skill Games                  | 1.60                             | .11 | 1.96 | .12 | 1.78 | .24 | 1.77 | .14  | .14         |   |    | 4=3> 1< 2  |

Note. The number in parentheses in column heads refer to the numbers used for illustrating significant differences in the last column titled "Post hoc." Post hoc comparisons were significant at  $p < .05$ .

**TABLE 4**  
*Differences in Gambling Activities as a Function of Drinking Game Participation and Binge Drinking*

|                                | Participation |      |   | Drinking Games |     |        | Binge Drinking |      |      |     |         |
|--------------------------------|---------------|------|---|----------------|-----|--------|----------------|------|------|-----|---------|
|                                | M             | SD   | t | M              | SD  | t      | M              | SD   | t    |     |         |
| Lottery                        | 1.68          | .74  |   | 1.48           | .57 | -2.12* | 1.18           | .83  | 1.61 | .69 | -1.88   |
| Horse racing                   | 1.03          | .20  |   | 1.06           | .25 | 1.19   | 1.06           | .28  | 1.01 | .28 | -1.59   |
| Sports-betting                 | 1.40          | .76  |   | 1.28           | .64 | -1.21  | 1.61           | .91  | 1.29 | .65 | -2.90** |
| Bingo                          | 1.32          | 1.05 |   | 1.17           | .38 | -2.04  | 1.45           | 1.60 | 1.25 | .50 | -1.32   |
| Slot machines                  | 1.14          | .41  |   | 1.04           | .19 | -2.15* | 1.17           | .46  | 1.14 | .39 | -.42    |
| Electronic (i.e., video poker) | 1.13          | .41  |   | 1.09           | .47 | -.70   | 1.20           | .51  | 1.09 | .34 | -1.97*  |
| Casino                         | 1.11          | .40  |   | 1.01           | .11 | -2.05* | 1.13           | .49  | 1.10 | .35 | -.60    |
| Poker                          | 1.29          | .64  |   | 1.18           | .56 | -1.23  | 1.44           | .72  | 1.22 | .61 | -2.34*  |
| Cards                          | 1.38          | .72  |   | 1.30           | .67 | -.84   | 1.46           | .75  | 1.37 | .72 | -.92    |
| Internet                       | 1.09          | .39  |   | 1.06           | .37 | -.57   | 1.18           | .57  | 1.03 | .19 | -2.67** |
| Stock market                   | 1.04          | .26  |   | 1.01           | .11 | -.84   | 1.06           | .36  | 1.03 | .21 | -.76    |
| Office pools                   | 1.15          | .49  |   | 1.05           | .22 | -1.65  | 1.26           | .66  | 1.06 | .33 | -2.67** |
| Pull tabs                      | 1.04          | .26  |   | 1.01           | .11 | -.91   | 1.08           | .39  | 1.01 | .12 | -1.90   |
| Video keno                     | 1.00          | .00  |   | 1.01           | .16 | -.95   | 1.03           | .24  | 1.00 | .08 | -1.22   |
| Dice games                     | 1.01          | .11  |   | 1.10           | .40 | -1.84  | 1.09           | .37  | 1.12 | .46 | .41     |
| Sports cards                   | 1.02          | .16  |   | 1.06           | .30 | -.90   | 1.10           | .43  | 1.04 | .21 | -1.17   |
| Golf or other games of skills  | 1.12          | .61  |   | 1.19           | .39 | -1.07  | 1.38           | .66  | 1.20 | .58 | -2.72** |

Note. \*\* $p < .01$ , \* $p < .05$ .

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