

# Differences in the Gambling Behavior of Online and Non-Online Student Gamblers in a Controlled Laboratory Environment

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**Abstract** Although research suggests that approximately 1 in 4 college students report having gambled online, few laboratory-based studies have been conducted enlisting online student gamblers. Moreover, it is unclear the extent to which differences in gambling behavior exist between online and non-online student gamblers. The current study examined if online gamblers would play more hands, commit more errors, and wager more credits than non-online student gamblers in a controlled, laboratory environment. Online ( $n = 19$ ) and non-online ( $n = 26$ ) student gamblers played video poker in three separate sessions and the number of hands played, errors committed, and credits wagered were recorded. Results showed that online student gamblers played more hands and committed more errors playing video poker than non-online student gamblers. The results from the current study extend previous research by suggesting that online gamblers engage in potentially more deleterious gambling behavior (e.g., playing more hands and committing more errors) than non-online gamblers. Additional research is needed to examine differences in the gambling behavior of online and non-online gamblers in a controlled, laboratory environment.

**Keywords** Online gamblers · Non-online gamblers · Video poker · Problem gambling

## Introduction

Gambling, or the wagering of money on an uncertain outcome, is an activity commonly engaged in by college students. Approximately 67–97 % of college students have gambled in their lifetime (Ladd and Petry 2002), most without experiencing negative outcomes.

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However, an important subset of college students experience problems associated with gambling (e.g., financial, emotional, health), with an estimated 6–14 % meeting the criteria for disordered gambling (i.e., problem, probable pathological, or pathological gambling; Blinn-Pike et al. 2007). With respect to college student online gambling (i.e., gambling via the Internet; Gainsbury et al. 2012), few studies have been conducted due to the recent emergence of this burgeoning and viable alternative to non-online gambling (e.g., land-based casinos) but initial reports indicate that approximately 1 in 4 college students have gambled online (Petry and Weinstock 2007). Moreover, a recent study suggests that student online gamblers experience a range of negative gambling-related consequences, with 23 % of infrequent, and 61 % of frequent, online gamblers meeting the criteria for probable pathological gambling (Petry and Weinstock 2007). Although differences in frequency of gambling involvement and negative gambling-related outcomes appear to exist between online and non-online student gamblers (Kairouz et al. 2012), no study to the authors' knowledge has attempted to recruit actual online and non-online student gamblers to gamble in a laboratory in order to examine differences between these two groups. The current study aimed to fill this gap in the literature.

### Online and Non-Online Student Gamblers

In terms of general demographic characteristics, differences exist between online and non-online gamblers. In a study which compared the demographic profiles of online and non-online gamblers in Australia using an online survey methodology, online gamblers were more likely to be male, have higher incomes, work full-time, and be married or cohabitating (Gainsbury et al. 2012). In reflecting the heterogeneity of online gamblers, being unemployed and a college student were also found to be predictive of being an online gambler. In a study conducted in the United Kingdom using an online survey methodology, online student gamblers were significantly more likely to be male (Griffiths and Barnes 2008), which was consistent with findings from the 2007 British Gambling Prevalence Survey that reported that online gamblers were more likely to be male, single, and well educated (Griffiths et al. 2009). In another study which evaluated Internet gambling among patients seeking free dental and health care in the US using paper-and-pencil questionnaires, online gamblers were more likely to be younger and non-Caucasian compared to non-online gamblers, with 62 % of respondents reporting having some form of college education (Ladd and Petry 2002). Taken together, evidence from the existing literature suggests that the typical online student gambler is male, non-Caucasian, and younger than the typical non-online student gambler.

Individuals generally transition from gambling in land-based casinos to online gambling, and it has been largely assumed that online gamblers report more gambling-related problems than non-online gamblers (Kairouz et al. 2012; McBride and Derevensky 2009). For example, in a study that explored differences in the gambling behavior of college students in Canada, online gamblers were at significantly greater risk of developing a gambling problem compared to non-online gamblers (McBride and Derevensky 2009). Specifically, online student gamblers were six times more likely to be classified as a problem gambler than students who did not gamble online, with other studies reporting similar trends (Gainsbury et al. 2013; Griffiths and Barnes 2008; Ladd and Petry 2002). However, findings from the first epidemiological study of actual online gambling behavior appear to contradict these past research findings by reporting that online gambling was not associated with gambling problems (LaPlante et al. 2009). These discrepant findings augment claims that additional research is clearly needed to better understand the transition

from non-online gambling to online gambling, and the extent to which online gambling is associated with gambling problems among college students (McBride and Derevensky 2012). Beyond examining differences between online and non-online student gamblers with respect to demographic characteristics and problem gambling prevalence rates, even fewer studies have provided a more fine-grained assessment of actual gambling behavior among online and offline gamblers. One such study conducted by Griffiths and Barnes (2008) reported that online student gamblers gambled more and spent more money on gambling per week than non-online student gamblers. In addition, online student gamblers were more likely to gamble in land-based casinos and place bets on horses, sports, and privately among friends compared to non-online student gamblers.

### Methodological Approaches to Online Gambling Research

The methodological approaches applied to the study of online gambling have increased in rigor since the inception of online gambling in the mid-1990s (Gainsbury and Wood 2011). In the study of online gambling behavior, the first studies conducted were descriptive and focused on the prevalence of problem gambling among online gamblers (Griffiths 2001; King and Barak 1999; McMillen and Grabosky 1998; Petry and Weinstock 2007). Shortly thereafter, comparative studies between online and offline student gamblers were conducted (e.g., Gainsbury et al. 2012; Griffiths and Barnes 2008). These studies were limited to the examination of gamblers' self-reported gambling behavior, the validity and reliability of which has been called into question due to bias in responding (e.g., self-presentation) and cognitive limitations (e.g., faulty memory; LaPlante et al. 2009).

Recently, researchers have gained access to data from Internet betting service providers such as Bwin Interactive Entertainment (e.g., Braverman et al. 2014; Broda et al. 2008; LaBrie et al. 2007) and GTECH G2 (Dragicevic et al. 2011), thus allowing for the examination of actual online gambling behavior. There are many advantages of using data collected from Internet betting service providers. For example, data collected from these service providers do not rely on individuals to report on their own gambling behavior, reducing biases associated with the use of self-report data. Moreover, these Internet betting service providers are in possession of copious amounts of data, providing researchers with new opportunities to utilize advance statistical techniques that require large sample sizes (Griffiths and Whitty 2010). There are also notable disadvantages to using data collected from these Internet service providers, including lack of experimental control which makes it difficult to identify behaviors that online gamblers engage in concurrently with gambling (Griffiths and Whitty 2010). For example, in a survey of 563 online gamblers, 45 % of participants reported using alcohol while gambling online, 9 % reported using marijuana, and 4 % reported using other illicit drugs (McBride and Derevensky 2009). Although these percentages provide an estimate of alcohol and illicit substance use when individuals gamble online, the prevalence of these behaviors may be underreported by online gamblers which could greatly hinder the ability to control for these extraneous variables when examining differences in the gambling behavior of online and non-online gamblers (Momper et al. 2010). Gambling studies conducted in a controlled laboratory setting would ensure that participants were not using substances that could influence how they gamble.

In a seminal study examining online and non-online gambling in a controlled laboratory environment, Cole et al. (2011) recruited 38 student gamblers to play roulette online and offline. Students placed higher bets and engaged in riskier betting behavior when playing roulette online compared to playing roulette offline. This study lends support to the idea

that online gambling technology itself may engender greater risk-taking. Interestingly, information pertaining to the gambling status of participants (i.e., whether they were online or offline gamblers) was not provided. Thus, generalizations pertaining to how *actual* online gamblers differ from *actual* non-online gamblers with respect to playing roulette could not be made, although the study adds greatly to the paucity of experimental studies that have attempted to elucidate differences between online and non-online gamblers.

To further the advancement of the methodological approaches applied to the study of online gambling (Braverman et al. 2014; Cole et al. 2011; Dragicevic et al. 2011), an examination of the gambling behavior of self-reported online and non-online student gamblers in a controlled laboratory environment is greatly needed. Such a study would produce data that are not reliant on the self-report of individuals' gambling behavior and would assuage the influence of extraneous factors (e.g., alcohol and illicit substance use) that could potentially influence interpretations regarding the extent to which differences exist in the gambling behavior of online and non-online student gamblers.

## Current Study

The current study was conducted to examine the actual gambling behavior (e.g., hands played, errors committed, amount wagered) of college students who have gambled both online and offline, henceforth referred to as “online gamblers”, and non-online student gamblers (i.e., gamblers who have never gambled online) in a controlled, laboratory environment. Based on previous research (Cole et al. 2011; Gainsbury et al. 2013; Griffiths and Barnes 2008; Ladd and Petry 2002), we hypothesized that online student gamblers would engage in potentially more deleterious forms of gambling behavior than non-online student gamblers after controlling for the effects of constructs that may influence how students gamble (e.g., gambling experience, problem gambling, and behavioral impulsivity; Gainsbury et al. 2013; Griffiths and Barnes 2008; Ladd and Petry 2002; Mottram and Fleming 2009). Specifically, we predicted that online student gamblers would play more hands, commit more errors, and wager significantly more credits when playing video poker compared to non-online student gamblers. The study aimed to fill three gaps in the literature: (1) conduct the first study comparing the gambling behavior of *actual* online and non-online gamblers in a controlled, laboratory environment, (2) contribute knowledge to the literature on a vulnerable sub-group of gamblers (Wood et al. 2007), and (3) add to the dearth of online gambling research conducted in the US.

## Method

### Participants

A total of 45 (27 males; 18 females) participants were recruited from an undergraduate subject pool at a university in the Midwest. All procedures were approved by the university's Institutional Review Board. Participants were compensated in the form of one hour's worth of research credit if they completed the online portion of the study. Participants who participated in the laboratory portion of the study received an additional 1.5 hour's worth of research credit and were also given a chance to win one of four \$25 gift cards.

## Materials

### *Demographics*

All participants completed a demographics form which contained questions pertaining to participants': gender, ethnicity, marital status, and hours spent gambling per session both online and offline.

### *Gambling Behavior*

The WinPoker 6.0 software (see Jackson 2007) recorded all gambling behavior for each session. The number of hands played, errors committed (i.e., accuracy), and credits wagered were aggregated across three gambling sessions.

### *Gambling Experience*

Participants were asked how many hours they spent gambling online and offline in the past year. Total hours spent gambling online and offline were aggregated to represent the total number of hours spent gambling in the past year.

### *Problem Gambling*

The South Oaks Gambling Screen (SOGS) is a 16-item self-report measure of gambling behavior which was used in the current study to screen for probable pathological gambling (Lesieur and Blume 1987). A participant's SOGS score can range from 0 to 20. The response options on the SOGS include both dichotomous (e.g., yes or no) response options as well as options that allow for more variability in responding (e.g., never, some of the time I lost, most of the time I lost, and every time I lost). Questions on the SOGS include: (1) have people criticized your betting or told you that you had a problem, regardless of whether or not you thought it was true, and (2) have you ever lost time from work (or school) due to betting money or gambling. The SOGS has been shown to be both a reliable and valid measure of problem gambling (Stinchfield 2002).

### *Behavioral Impulsivity*

A delay-discounting measure was constructed in the current study to measure behavioral impulsivity, or the extent to which participants would discount a hypothetical monetary commodity (e.g., \$100,000) across five time intervals (1 week, 1 month, 6 months, 1 year, and 10 years). Specifically, participants were asked, "If you won \$100,000 and were not going to get the money for *X time*, what is the smallest amount of money you would accept today rather than having to wait *X time*?" A fill-in-the-blank method was used to collect responses (Chapman 1996), and the discounting data were modeled using the area-under-the-curve function to summarize the indifference points (Myerson et al. 2001).

## Procedure

A total of 420 participants completed a series of measures online through SONA (SONA Systems Ltd., Version 2.72; Tallinn, Estonia), a cloud-based participant management

system, to establish their eligibility to participate in the current study. To be eligible to participate, participants were required to complete an informed-consent process and to have either gambled online or offline at least once in their lifetime. Participants were categorized as online gamblers ( $n = 19$ ) if they gambled at least once online in their lifetime and non-online gamblers ( $n = 26$ ) if they had gambled once in their lifetime but never online. For participants who had gambled both online and offline, these participants were classified as online gamblers. In addition, participants who had experience gambling online in “free-play” mode were also considered online gamblers. Participants were excluded from participation in the study if they were probable pathological gamblers (e.g., score of 5 or more on the SOGS). Do to the exploratory nature of the current study, we did not want to expose students who were probable pathological gamblers to a gambling task that could potentially exacerbate their addiction to gambling. Eligible participants were contacted to schedule an appointment to complete the laboratory-based portion of the study. The study was conducted in a laboratory measuring approximately 1.5 by 4.0 m that contained a table, a chair, and a file cabinet. A personal computer, equipped with two monitors, was located on the table.

Before the study began in the laboratory, participants completed a second informed-consent process and were screened again to ensure that they were not probable pathological gamblers. Participants were then guided to a computer with WinPoker to play Loose Deuces, a five-card poker variant in which “2’s” are wild. Before the participant gambled, the researcher oriented the participant to the rules of the game and how to perform basic gambling functions (e.g., holding cards, how to increase the size of the bet, and dealing a round of cards). All participants played video poker for a total of 30 min across three separate sessions (10 min per session). Participants completed the tasks in three, 10 min session because the current study was part of a larger study which examined the effect of a mood manipulation procedure on participants’ gambling behavior. The mood manipulation was found to not have an effect on participants’ gambling behavior; thus, gambling behavior measured across the three sessions was aggregated. In each session, participants were given 100 credits that held no monetary value. For each hand, participants were given the option of betting a range of 25¢–\$1.25 (in 25¢ increments). Participants were then told that they would be piloting the newest version of online gambling software. After participants completed the study, the researcher debriefed participants with respect to the purpose of the study.

## Analytic Plan

Data were screened at the univariate level, and all dependent variables were normally distributed. Univariate outliers were winsorized such that they were recoded (less than 5 %) to one unit more extreme (i.e., 3 standard deviations from the mean) than the highest or lowest data point not considered an outlier. In terms of equivalency between gambler groups, Chi-square test, Fisher’s exact test, and  $t$  tests were conducted. The results in Table 1 revealed that no statistically significant differences exist between online and non-online gamblers with regards to sex [ $\chi^2(1, N = 45) = 0.74, p = 0.39$ ; Fisher’s exact test,  $p = 0.54$ ], ethnicity [ $\chi^2(1, N = 45) = 0.11, p = 0.74$ ; Fisher’s exact test,  $p = 1.00$ ], and marital status [ $\chi^2(1, N = 45) = 2.86, p = 0.09$ ; Fisher’s exact test,  $p = 0.17$ ]. However, online gamblers reported spending significantly more time gambling (i.e., both online and non-online) than non-online gamblers [ $t(44) = -3.08, p < 0.01$ ].

A multivariate analysis of covariance (MANCOVA) was originally considered because multiple dependent variables were evaluated (e.g., hands played, errors committed, credits

**Table 1** Group differences on demographic variables, problem gambling, and gambling experience between online and non-online gamblers

	Online gamblers ( <i>n</i> = 19)		Non-online gamblers ( <i>n</i> = 26)	
	% ( <i>n</i> )	<i>M</i> ( <i>SD</i> )	% ( <i>n</i> )	<i>M</i> ( <i>SD</i> )
Age		22.37 (7.43)		19.46 (1.33)
Sex				
Male	22.22 (10)		37.77 (17)	
Female	20.00 (9)		20.00 (9)	
Race				
White	37.77 (17)		53.33 (24)	
Non-White	4.44 (2)		4.44 (2)	
Marital status				
Married	4.44 (2)		0.00 (0)	
Single	37.77 (17)		57.78 (26)	
Problem gambling		1.52 (2.01)		0.88 (0.95)
Hours spent gambling		2.84 (2.71)*		0.98 (1.29)

Percentages for sex, race, marital status, problem gambling and hours spent gambling may not add up exactly to 100 % due to rounding. Problem gambling was measured using the SOGS. Hours spent gambling represents the total number of hours spent gambling online or offline per gambling session before participating in the current study

\* *p* < 0.05; \*\* *p* < 0.01

wagered) controlling for the effects of gambling experience, problem gambling, and behavioral impulsivity; however, as a result of multicollinearity among dependent measures and the inappropriateness of analyzing data using a MANCOVA when dependent variables are both highly and positively correlated (Cole et al. 1994; Ramsey 1982), analysis of covariances (ANCOVAs) were conducted. It is a commonly accepted practice to adjust the alpha level when multiple tests are conducted (e.g., Bonferroni adjustment). A closer evaluation of this practice suggests that it may not be necessary to apply such an

**Table 2** Relationship between gambling outcomes and covariates between online and non-online gamblers

Variables	1	2	3	4	5	6
1. Hands played	–	0.82**	0.48**	–0.14	0.06	–0.23
2. Error committed	0.84**	–	0.50**	–0.09	0.09	–0.11
3. Credits wagered	0.45*	0.18	–	0.02	0.41*	0.05
4. Total gambling hours	0.22	–0.07	–0.28	–	–0.02	–0.15
5. SOGS	–0.25	0.07	–0.10	–0.13	–	0.20
6. Behavioral impulsivity	0.22	0.05	–0.16	–0.45	–0.28	–

Zero-order correlations of study variables for non-online (above the diagonal) and online (below the diagonal) gamblers. Total gambling hours represents the total number of hours spent gambling online and offline in the past year

\* *p* < 0.05; \*\* *p* < 0.01

adjustment to control for family-wise error rate (Thomas 1998). Thus, all significance tests in the current study were evaluated based on unadjusted  $p$  values (e.g.,  $p < 0.05$ ). Pearson correlation coefficients were reported to examine the degree of association between variables, and ANCOVAs were conducted separately for each dependent variable controlling for the effects of gambling experience, problem gambling, and behavioral impulsivity to examine if online and non-online gamblers differ in their video-poker gambling behavior.

## Results

An examination of the correlation matrix (Table 2) revealed that for online and non-online gamblers, number of hands played was positively correlated with the number of errors committed (online:  $r(20) = 0.84$ ,  $p < 0.001$ ; non-online:  $r(30) = 0.82$ ,  $p < 0.001$ ) and credits wagered (online:  $r(20) = 0.45$ ,  $p = 0.04$ ; non-online:  $r(30) = 0.48$ ,  $p = 0.01$ ). Interestingly, whereas a statistically significant positive correlation was evidenced for number of errors committed and credits wagered among non-online gamblers,  $r(30) = 0.50$ ,  $p = 0.01$ , the same relationship was not statistically significant for online gamblers,  $r(20) = 0.18$ ,  $p = 0.45$ . Moreover, a statistically significant positive correlation was evidenced for errors committed and SOGS scores among non-online gamblers,  $r(27) = 0.41$ ,  $p = 0.03$ , but not for online gamblers,  $r(19) = -0.07$ ,  $p = 0.77$ .

ANCOVAs were conducted separately for each dependent variable controlling for the effects of gambling experience, problem gambling, and behavioral impulsivity. Online gamblers ( $M = 216.47$ ,  $SD = 51.54$ ) played more hands than non-online gamblers ( $M = 185.88$ ,  $SD = 48.40$ ), a finding which was statistically significant ( $F(1,40) = 5.89$ ,  $p = 0.02$ , Cohen's  $d = 0.72$ ). In terms of number of errors committed, online gamblers ( $M = 146.79$ ,  $SD = 41.38$ ) committed more errors than non-online gamblers ( $M = 120.38$ ,  $SD = 33.60$ ), a finding which was statistically significant ( $F(1,40) = 5.08$ ,  $p = 0.03$ , Cohen's  $d = 0.67$ ). Lastly, online ( $M = 528.15$ ,  $SD = 220.76$ ) and non-online ( $M = 503.16$ ,  $SD = 256.74$ ) gamblers did not differ in regards to the number of credits played across the three gambling session ( $F(1,40) = <1.00$ ,  $p = 0.98$ , Cohen's  $d = 0.01$ ).

## Discussion

By conducting the current study in a controlled laboratory environment where the effects of extraneous variables could be more accurately measured and attenuated, differences in the gambling behavior of online and non-online gamblers were observed among a sample of non-pathological student gamblers. Specifically, online student gamblers played more hands compared to non-online student gamblers. Increased gambling involvement and exposure to gambling have been found to be related to gambling-related negative outcomes and pathological gambling (Currie et al. 2006; Jacques and Ladouceur 2006). Interestingly, no differences in gambling-related harm were evidenced between online and non-online student gamblers in the current study, and only the association between errors committed and gambling-related harm among non-online gamblers was statistically significant. These null finding could be partially attributed to the fact that problem gamblers were excluded from participation in the current study.



In terms of differences in accuracy, online student gamblers were found to commit more errors than non-online student gamblers when playing video poker. However, considering that online gamblers played more hands than non-online gamblers, it could be that both online and non-online gamblers were equally skilled video poker players and that if non-online gamblers were to have played a similar number of hands, no differences in accuracy between online and non-online student gamblers would have been observed. In terms of the relationship between accuracy and problem gambling, a component associated with problem gambling is the extent to which an individual continues to gamble despite experiencing adverse consequences (Rosenthal and Lesieur 1992). It is likely that gambling accuracy plays an integral role in the manifestation of a gambling problem. Specifically, committing more errors (e.g., not playing video poker optimally by either holding or discarding cards that reduce the probability of winning) is intimately tied to gambling losses as number of errors committed is positively associated with gambling losses, with the loss of money associated with gambling identified as both an adverse event for an individual and a key motivator for seeking treatment (Evans and Delfabbro 2005). Interestingly, the relationship between errors committed and problem gambling was only evidenced among non-online student gamblers and not online student gamblers. Future research should continue to monitor gambling accuracy between online and non-online gamblers to better understand why error rate may foreshadow the development of a gambling problem for non-online gamblers but not online gamblers.

In terms of coins wagered, online gamblers wagered a similar number of overall credits across the three gambling sessions compared to non-online gamblers. This finding suggests that online gamblers wagered fewer credits per hand than non-online gamblers, but it may also have been that after betting the maximum per hand and incurring heavy losses, online gamblers drastically reduced the number of credits they wagered. In the current study, 63 % of online student gamblers lost more than two-thirds of their credits whereas only 50 % of non-online student gamblers lost the same percentage of credits. This indicates that online student gamblers may have reduced the amount of credits they wagered in response to incurring heavier gambling losses compared to non-online gamblers. Past epidemiological research appears to be consistent with this interpretation as online gamblers have been found to respond rationally to gambling losses by reducing the total number of credits wagered in response to losses (LaPlante et al. 2009).

## Implications

To the authors' knowledge, the current study is the first to examine the gambling behavior of online and non-online gamblers in a controlled laboratory environment. This study extends gambling research conducted in the lab (Cole et al. 2011) as well as studies which have analyzed online gambling data collected from Internet gambling service providers (Braverman et al. 2014; Broda et al. 2008; LaBrie et al. 2007). As a result of the study being conducted in a controlled laboratory environment, the investigation greatly reduced the biases associated with the examination of self-report gambling data as well as the influence of other extraneous factors (e.g., consuming alcohol or using illicit substances) that could potentially obscure the extent to which online and non-online gamblers differ with respect to their gambling behavior.

From a different perspective, research suggests that online gamblers use alcohol and illicit substance when gambling (McBride and Derevensky 2009), thus controlling for these extraneous variables may obfuscate true differences between online and non-online gamblers. Additional research is needed to augment previous investigations (e.g., Di

Nicola et al. 2014; Kairouz et al. 2012; Martinotti et al. 2006; Quigley et al. 2015) in the exploration of differences between online and non-online student gamblers, particularly with respect to alcohol and illicit substance use, personality temperament, and psychiatric comorbidity.

Overall, this research is of significant importance as the legalization of online gambling is currently being debated in the US and around the world, although relatively little is known about differences between online and non-online gambling, online and non-online gamblers, and online and non-online student gamblers.

## Limitations

The current study is not without limitations. For example, the dichotomy between online and non-online gamblers in the current study may not capture the heterogeneity that exists in the gambling community. Specifically, it has been noted that this dichotomy “does not recognize the full complexity of how people integrate online provision of certain activities within their patterns of gambling behavior more generally” (Wardle et al. 2011, p. 341). Future research could better capture this heterogeneity by recruiting a larger sample of online gamblers to examine how gambler status is differentially related to gambling outcomes. Moreover, we specifically excluded student gamblers from participating in study if they potentially had a gambling problem. Therefore, it is unclear whether the pattern of results observed in the current study generalize to online and non-online problem gamblers.

Although the laboratory nature of the study ensured that participants were not consuming alcohol or using illicit substances when gambling, research suggests that substance use and gambling co-occur and that online gamblers report engaging in more co-occurring alcohol and cannabis use compared to non-online gamblers (Kairouz et al. 2012; McBride and Derevensky 2009). Thus, the current study may not be representative of typical student gambling behavior which may be influenced by substance use. Relatedly, we did not assess whether participants used alcohol or other illicit substances before arriving to the lab. Future studies should assess the extent to which participants used alcohol or other illicit substances before arriving in the laboratory.

In terms of whether participants actually gambled in the current study, one could argue that participants did not actually gamble as they did not wager anything of value given that the credits in the current study held no monetary value. Previous research in this area suggests that individuals play a similar number of hands and are similarly accurate regardless of whether or not credits hold any monetary value (Weatherly and Meier 2007). However, it has also been reported in a study that individuals risk significantly fewer credits when gambling with real money indicating that individuals may be more risk-taking when gambling with credits that hold no monetary value. Future studies should consider providing participants with credits that have monetary value to increase the generalizability of the results from the current study. Lastly, clinical research suggests that psychiatric comorbidity (e.g., bipolar disorder and depression) and personality profile (e.g., novelty seeking and self-transcendence) may be important predictors of gambling outcomes. However, we did not collect data to examine these constructs and researchers should consider examining psychiatric comorbidity and personality dimensions as predictors or covariates in future studies.

## Conclusions

The current study lends evidence which suggests that online and non-online gamblers differ with respect to how they play video poker, with online gamblers found to play more hands and commit more errors than non-online gamblers. The methodological approach taken augments the validity of the findings in the current study as participants gambled in a controlled laboratory environment, thus reducing the influence of extraneous variables which are difficult to control for when data is collected in more naturalistic settings. Future investigations should also continue to complement laboratory based studies by conducting research in more naturalistic settings, possibly even utilizing a case study approach to better understand the effect of contextual factors on online gambling behavior. As more states and countries legalize online gambling, we will look to the literature for answers regarding whether the legalization of online gambling is associated with a higher prevalence of problem gambling and concomitant problems compared to non-online gambling. The academic community is tasked with the responsibility of providing these answers through research which needs to be more methodologically rigorous in order for findings to be more reliable and tenable. Although it may be difficult to recruit online gamblers, additional research conducted in a controlled laboratory environment is needed to better understand how individuals gamble online, the extent to which online gamblers differ from non-online gamblers, and if the prevalence of problem gambling is higher among online gamblers than non-online gamblers.

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