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The Use of Protective Behaviors in Relation to Gambling Among College Students

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Abstract

The purpose of the current study was to evaluate a measure of gambling protective behaviors and examine the relationship between indices of gambling behavior, including frequency, quantity and problem severity, and the use of gambling protective behaviors. Undergraduates from a large public university (N = 4,014) completed a web-based screening survey comprising measures of gambling and health behaviors, from which those who gambled within the past 6-months (n = 1,922, 48% of the entire sample) were invited to complete the baseline assessment, including the Gambling Protective Behavior Scale (GPBS). The GPBS was determined to have two subscales, primarily consisting of harm reduction strategies that reduce the money or time spent on gambling, or avoidance strategies that help to minimize engagement in gambling activities. Hierarchical multiple regressions found participants' sex moderated the relationship between use of protective behavioral strategies and gambling outcomes. However, effects were in the opposite direction to those hypothesized. Specifically, because women gambled less, had lower gambling problem severity, and reported more frequent use of gambling avoidance protective behaviors, the relationship between use of gambling protective behaviors and gambling outcomes was stronger for men than women. Men who used more avoidance strategies gambled less frequently compared

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to men who used fewer avoidance strategies. Similarly, men who used more harm reduction strategies spent fewer dollars on gambling and had lower scores on gambling problem severity compared to men using fewer harm reduction strategies for women these relationships were less pronounced. Implications of incorporating specific gambling protective behavioral strategies into prevention and treatment programs are discussed.

Keywords

gambling; college student; protective behaviors; behavioral strategies

Most studies indicate that over 80% of college students have engaged in some form of gambling at least once during their lifetime (e.g., Lesieur et al., 1991; Winters, Benston, Dorr & Stinchfield, 1998). One study of students from 119 colleges found that 42% had gambled within the past year (LaBrie et al., 2003), while a survey of six universities indicated as many as 23% may gamble on a weekly basis (Lesieur et al., 1991). For some, gambling can be related to substantial harm (APA, 2000; Neighbors, Lostutter, Larimer & Takushi, 2002). Longitudinal research conducted by Winters and colleagues (2002, 2005) found 40% of youth followed from age 16 to 23 had problems related to their gambling at some point, with 4% reporting persistent problems, 13% decreasing, 3% mixed trajectories, and 21% developing new onset of gambling problems as young adults. Thus, the developmental period corresponding with college attendance represents a time of heightened vulnerability to gambling and related negative consequences. Estimates indicate that approximately 11% of college students can be classified as *at-risk* gamblers (Shaffer & Hall, 2001) and between 6% (Shaffer & Hall, 2001) to 8% (Blinn-Pike et al., 2007) can be considered *probable pathological* gamblers, categories that are jointly referred to as *disordered gambling*. Based on the 2009 census data (US Census, 2011), up to 2.6 million college students may be experiencing significant negative consequences associated with their gambling, of which 1.1 million may meet diagnostic criteria for pathological gambling (APA, 2000) at any given time. By comparison, rates of pathological gambling in the general United States adult population (i.e., all individuals aged 25 and older) are closer to 1–2% (Shaffer & Hall, 2001), or approximately 3.9 million individuals (US Census, 2011). Thus, the prevalence of disordered gambling among college students is higher than the general adult population (Shaffer, Hall & Vanderbilt, 1999; Shaffer & Hall, 2001; Blinn-Pike et al., 2007).

Research suggests that disordered gamblers may be more impulsive (Blaszczynski & Nower, 2001; Castellani & Rugle, 1995; McCormick, Taber, Kruedelbach & Russo, 1987; Steel & Blaszczynski, 1996; Vitaro, Arseneault, & Trembly, 1997; Vitaro, Arseneault, & Trembly, 1999) and poorer decision-makers (Cavedini, Riboldi, Keller, D'Annucci, & Bellodi, 2002; Goudriaan, Oosterlaan, de Beurs, & van den Brink, 2004, 2005; Petry, 2001; Sharpe, 2002;) than non-problem gamblers. However, few studies have specifically focused on the types of behaviors that could reduce gambling problems (Joukhador, Maccallum, & Blaszczynski, 2003).

Protective behaviors are strategies that an individual uses to reduce the likelihood of experiencing specific problems. The psychological literature has primarily focused on protective behaviors within specific domains of risk behavior, such as alcohol use or sexual risk-taking. For example, research with college students has investigated protective behaviors such as using a designated driver when deciding to drink or having condoms readily available in case one meets a new sexual partner. Research has indicated using protective behaviors for drinking or risky sex is associated with reduced risk and negative consequences (Lewis et al. 2010; Martens et al, 2004). Work by Martens and colleagues

(2005) has identified three categories of protective behaviors for drinking, which relate to avoiding or reducing drinking; modifying alcohol content or manner of drinking; and harm reduction. It is unclear whether similar factors might emerge in considering protective behaviors for gambling.

Alcohol-related protective behavioral strategies are both teachable and appear to mediate effects of interventions targeting college student drinking (Larimer et al., 2007). Similarly, gambling protective behavioral strategies such as setting limits on the amount of money gambled or time spent gambling might be useful in avoiding or reducing problematic gambling (Hodgins, 2005; Petry, 2005; Petry et al. 2008). However, there is limited research examining the use of protective behavioral strategies among college student gamblers. Perhaps one reason for the dearth of focus on protective behavioral strategies may be the current lack of validated measures of this construct as it relates to gambling specifically. Thus, further research on protective behavioral strategies for gambling and the relationship between use of protective behavioral strategies and gambling behavior is warranted.

Research has also indicated that there are significant sex differences regarding gambling behavior, such that men are more likely to take risks (Byrnes, Miller, & Schafer, 1999), gamble more frequently (Gupta & Derevensky, 1998; LaBrie, Shaffer, LaPlante, & Wechsler, 2003; Lesieur et al., 1991; Moore & Ohtsuka, 1997; Welte, Barnes, Wieczorek, Tidwell & Parker, 2001), hold more positive gambling attitudes (Moore & Ohtsuka, 1997), report more gambling-related problems (Hardoon, Derevensky & Gupta, 2003; Moore & Ohtsuka, 1997), and are at elevated risk for onset of disordered gambling relative to women (Gupta & Derevensky, 1998). By comparison, research on other risk-taking behaviors such as alcohol use has demonstrated that college women utilize more protective drinking strategies than men (Delva et al., 2004; Walters, Roudsari, Vader, & Harris, 2007), and women's use of protective behaviors decreased their experiences of general alcohol consequences, including sexual risking taking, to a greater extent than men (Lewis et al., 2010). Given the previous literature regarding other risky behaviors, it might be expected that women would use more gambling protective behaviors than men. However, the role that sex plays in use of gambling protective behaviors has not been established.

The purpose of the current study was to establish a measure of gambling protective behaviors and examine the relationship between gambling protective behavior use and gambling outcomes, including gambling frequency, quantity and problem severity. We hypothesized that greater use of protective behavioral strategies would be associated with lower scores on all gambling outcomes. Given previous research on women's use of protective behavioral strategies in other behavioral domains such as alcohol use, we also hypothesized that women would use protective behavioral strategies more frequently than men, and that sex would moderate the relationship between the use of gambling protective behaviors and gambling behaviors. Specifically, we expected the relationship would be stronger for women than men.

Method

Participants

Participants were recruited from the undergraduate psychology research subject pool at a large northwestern university in the United States over the course of five academic quarters, from winter 2008–2009. Participants were students enrolled in one or more survey-level psychology courses during the study period. All participants provided informed consent and completed a web-based survey. Students were given extra course credit for their participation. The University's Human Subjects Institutional Review Board approved all protocols.

Recruitment

A total of 5,933 students were invited to participate, of which 4,266 (72%) responded. The remaining 28% of individuals were non-responders. Due to rolling recruitment each academic quarter, individuals could enroll in more than one participating psychology survey course during the study period, therefore 236 individuals were identified who completed the survey twice in different quarters and their second screening survey was excluded from analyses. Thus, the final sample of those completing the online survey consisted of 4,014 unique individuals. Of those responders, participants were on average 19.30 (*SD* = 2.0) years of age and 61% were female. The sample comprised 52% Caucasians, 32% Asians and 16% other racial/ethnic backgrounds. Based on aggregate data of participants' demographics provided by the psychology subject pool (from which the current sample was drawn), our responders were generally representative of the larger pool of eligible participants of whom 62% were female, 49% Caucasian, 38% Asian and 13% other racial/ethnic backgrounds. As the current study focused on use of gambling protective behaviors, the sample was restricted to those participants who reported any gambling behavior within the past 6 months, resulting in a sample of 1,922 individuals (48% of the respondent sample). Of the selected sample, participants were on average 19.5 years of age (*SD* = 2.0), and 44.4% were female (see Table 1 for sample demographics). The selected sample was similar to the larger sample in terms of overall demographics except for sex, as more men than women reported gambling in the past 6 months.

Procedures

Eligible participants (all students enrolled in participating psychology courses) were sent an e-mail describing the study and inviting them to participate. The e-mail contained a hyperlink to a secure website containing an information statement with all elements of informed consent and a more detailed description of the study. Students who accepted participation were directly routed to another website containing survey items. Non-responders to the initial invitation received up to six email reminders requesting them to participate, consistent with best practices for web survey research (Dillman, 1999; Kypri et al. 2004).

Measures

Participants completed a brief *demographics questionnaire* that included their age, birth sex, sexual orientation, ethnic and racial background, and class standing. Prior to being asked any questions regarding gambling, participants were provided with detailed instructions, including a definition of gambling which read "Several of the following questions ask about gambling. By gambling we mean, placing a bet/wager of money on the outcome of an event; this event has an element of chance and you stand to win more money. Typically, people gamble on activities such as the lottery, scratch tickets, bingo, sporting events, card games, casino games, etc."

The frequency with which students use various *gambling protective behaviors* was assessed via the Gambling Protective Behaviors Scale (GPBS). The GPBS items were framed using guiding principles evident in the literature on college student alcohol protective behavior (e.g., Lewis et al., 2010; Martens et al., 2004; Martens et al., 2007a). Specifically, the alcohol protective behavior literature has demonstrated that active and teachable skills are effective in reducing college student drinking consequences (Cronce & Larimer, 2011; Larimer & Cronce, 2002, 2007; Martens et al., 2004). Thus, GPBS items constitute active behaviors that can be used to reduce negative consequences of gambling and can be taught, consistent with the framework of CBT skills-training interventions. These items were theoretically conceived to be a single latent factor of general gambling-related protective

behavioral strategies that college students could naturally be using to reduce harms related to their gambling.

Originally, 23 items for the scale were generated by the first author after a thorough review of the gambling literature and existing CBT treatment manuals (Ciarrocchi, 2001; Petry, 2005). The second, fourth and fifth authors, all experts in college student gambling prevention, reviewed the generated items for face and content validity. As a result of this review, 7 items were deleted due to ambiguous wording or classification as a non-behavioral strategy, leaving the remaining 16 items used in the current study. GPBS items utilize a 5-point Likert-type scale with response option anchors of *Never (0), Rarely (1), Sometimes (2), Usually (3),* and *Always (4)*. The following instructions were provided prior to administration of the GPBS: "The following questions ask about your personal behaviors when you gamble. Answer the questions thinking about how often you actually performed the behavior during the past 6 months." Establishing the psychometric properties of this scale was a primary aim of the current study. The measure's psychometric properties are described further in the results section.

Participants' *gambling frequency and quantity* were assessed using a modified version of the Gambling Quantity and Perceived Norms scale (GQPN; Neighbors et al., 2002). Participants' gambling frequency was assessed using a single-item, "In the past 6 months, how often have you gambled?" The scale has nine response options that include *Never (0), Once in the past 6 months (1), 2 to 3 Times in the past 6 months (2), 4 to 5 times in the past 6 months (3), Once a Month (4), 2 to 3 Times a Month (5), Weekly (6), More than Once a Week (7), Every Other Day (8)* or *Everyday (9).* The amount participants spent on gambling was assessed using the GQPN's 6-item quantity subscale, which asks participants how much money they have won and lost from gambling over the past month, in a typical month, and within the last 6 months. Previous research found the items load on a single factor accounting for 65% of the variance in gambling quantity and have good internal consistency (α = .89) and convergent validity in college populations (Neighbors et al., 2002). The current study also supports good internal consistency (α = .89). Finally, the GQPN asks respondents to report the amount of their monthly income that constitutes "spending money" (money not devoted to bills), which allows for statistical control of expenditure differences across income levels. The current study computed the average amount spent on wins/losses (summary score M = 1.58, SD = 1.37, range = 0 to 9) and then computed the residualized gambling quantity by regressing the participant's disposable monthly income on amount spent.

Participants' *gambling problem severity* was assessed using a revised version of the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), which utilized a 6-month (versus the original "lifetime") time frame (Stinchfield, 2002). The first section of the SOGS assesses the frequency with which an individual engages in various gambling activities. The second section includes 20 items assessing problematic gambling behaviors, such as gambling more than intended or losing time from work or school due to gambling. Responses to items in the second section are summed together to create a problem severity score that is treated as a continuous variable, with higher scores indicating greater gambling problem severity. The current study only utilized the gambling problem severity score and found satisfactory internal consistency (α = .78). Consistent with conventional use of the scale, a score of 3 or greater was used to identify individuals with *disordered* gambling, inclusive of *at-risk* and *probable pathological* gambling (Shaffer & Hall, 2001). Research suggests the SOGS is sensitive for detecting disordered gambling, though not highly specific for diagnosable pathological gambling (Abbott & Volberg, 1996; Ladoucer et al. 2000).

Results

Gambling Protective Behavior Scale

The current study examined a newly developed scale for measuring frequency of using gambling protective behaviors. The final sample of college students who had gambled in the past 6 months (n = 1,922) was randomly split into two equal size samples (n = 961 each) using the random selection command in SPSS 17.0. No significant group differences were noted between the randomly split samples with respect to demographics or gambling outcomes, thus we proceeded to conduct an Exploratory Factor Analysis (EFA) followed by a Confirmatory Factor Analysis (CFA) of hypothesized GPBS factors derived from the EFA.

Exploratory Factor Analysis (EFA)

Analyses were conducted to examine the factor structure and internal consistency reliability of the scale prior to examining the scale's relationship to gambling behavior outcomes. The factor structure of the 16 gambling protective behavior items was assessed using the recommendations of McDonald (1985) for EFA. A principal components analysis with an oblique rotation (Promax) was applied to the data, since it was anticipated that any emerging factors would be correlated with each other. An initial two-factor structure emerged with Eigenvalues equal to or greater than 1, with the next highest Eigenvalue being 0.95. Pattern factor loadings, item means and standard deviations are presented in Table 2. The first identified factor (Eigenvalue 7.07) was labeled *Harm Reduction Strategies* and included 9 items, which primarily describe behaviors individuals use to limit money or time associated with gambling behavior. The second factor (Eigenvalue 1.36) was labeled *Avoidance Strategies* and included 7 items primarily describing steps individuals take to avoid gambling venues or situations. The two-factor solution accounted for 52.7% of the total variance. Items for each factor were summed to create harm reduction strategies and avoidance strategies subscale scores, which were used in later analyses examining relationship of protective behavioral strategies to gambling outcomes.

Confirmatory Factor Analysis (CFA)

A CFA (Bentler, 1995; Bentler & Wu, 1995) with maximum-likelihood estimation procedures was conducted using AMOS 7.0 software (Arbuckle, 2006) to assess the factor structure of the GPBS, with the variance of the factors and the error terms set to 1 for identification purposes. The covariance among the factors was freely estimated. The overall model was significant, $\chi^2(103) = 664.3$, $p < .001$. However, χ^2 is known to be sensitive to sample size, such that with sample sizes as large as the one in this study (n = 908), even trivial deviations from a perfect model are statically significant. For that reason, we used three indices of practical fit to make our main judgments about model fit: Rho (Tucker & Lewis, 1973; also known as Non-Normed Fit Index, NNFI; Bentler & Bonnett, 1980), Comparative Fit Index (CFI; Bentler, 1990) and Root Mean Square Error of Approximation (RMSEA; Browne & Cudeck, 1993; Steiger, Lind, 1980). Rho values ranging from .85 to .89 are considered a possible fit, .90 to .95 are considered an acceptable fit, and greater than .95 is a good fit. CFI values above .90 are considered a moderate fit, while a good fit would be in the range from .95 to 1. RMSEA values below .05 are considered to be a good fit, between .05 and .08 an acceptable fit, and greater than .10 a poor fit (Klein, 2010). Given the overall pattern of fit indices for the two-factor GPBS (Rho = .88, CFI = .91, RMSEA = .08), the fit of the model was judged to be acceptable with no major contradictions to the hypothesized model. The unstandardized parameter estimates, factor loadings and factor variance and covariance values are provided in Table 3. The proposed model along with standardized parameters estimates, factor loadings, and factor correlations are illustrated in Figure 1.

Finally, the internal reliability was examined using the full sample for Cronbach's alpha for the harm reduction strategies and avoidance strategies subscales, resulting in coefficients of .89 and .83, respectively. Each of the GPBS subscales was deemed to meet satisfactory criteria of $\alpha > .70$ and removing any item would have decreased the subscales' internal reliability (Cronbach, 1951; Nunnally, 1978). Given the converging results of the EFA and CFA on the two-factor model of the GPBS with subscales pertaining to harm reduction and avoidance strategies, the remaining analyses were conducted using the full sample to evaluate the relationship of scores on these two subscales to gambling outcomes.

Participant's Sex, Gambling and Protective Behavior Strategies

A series of *t*-tests were conducted to examine the differences between women and men on gambling behavior and the use of gambling protective behavioral strategies (see Table 4). Results indicate that men gambled more frequently, with greater quantities of funds and had greater gambling problem severity than women. Women reported more frequent use of avoidant strategies than men, but there were no significant sex differences in the use of harm reduction strategies.

Overall bivariate correlations were computed to examine the relationship between scores on the two GPBS subscales and gambling behavior outcomes to assess construct validity. Harm reduction strategies were significantly and negatively related to gambling frequency ($r = -.11$, $p < .001$), gambling quantity ($r = -.10$, $p < .001$), and gambling problem severity ($r = -.23$, $p < .001$). Avoidance strategies were also significantly and negatively associated with gambling frequency ($r = -.17$, $p < .001$), gambling quantity ($r = -.09$, $p < .001$), and gambling problem severity ($r = -.13$, $p < .001$). A second set of bivariate correlations were computed by sex to examine the pattern differences between men and women (see Table 5). The pattern of correlations was similar for men and women, but the strength of the associations varied by sex, such that the associations were stronger for men than women. Results among men were similar to the overall pattern of correlations between subscale scores and gambling behavior, with both subscales being significantly and negatively associated with gambling outcomes. However, for women, only harm reduction strategies were significantly and negatively associated with gambling problem severity and only avoidance strategies were significantly and negatively associated with gambling frequency.

Hierarchical multiple regressions were used to determine whether participant's sex moderated the relationship between use of harm reduction and avoidance strategies and gambling behavior outcomes (frequency, quantity, and problem severity) while controlling for participant's age. Main effects for sex (with women coded as 0 and men as 1), participant's age, use of harm reduction strategies and use of avoidance strategies were entered at Step 1. The two-way product interaction terms were entered at Step 2. All predictors were mean centered to facilitate interpretation of parameter estimates (Cohen, Cohen, West, & Aiken, 2001). Results for the regression analyses and effect sizes are reported in Table 6.

Gambling Frequency

At Step 1, participant's sex and use of avoidance strategies were the only significant predictors of gambling frequency. The avoidance strategies subscale score was negatively associated with gambling frequency. There was a small effect for avoidance strategies on gambling frequency ($d = 0.21$). At Step 2, the only statistically significant interaction for gambling frequency was between participant's sex and the use of the avoidance strategies. Using more avoidance strategies was associated with less gambling frequency in the past 6 months. This association was stronger for men than women ($d = 0.14$, see Figure 2, top).

Gambling Quantity

At Step 1, sex, age and use of harm reduction strategies were the only significant predictors of gambling quantity. Scores on the harm reduction strategies subscale were negatively associated with gambling quantity. There was a small effect for harm reduction strategies on gambling quantity ($d = 0.15$). At Step 2, the only significant interaction was between participant's sex and use of harm reduction strategies on gambling quantity. Using more harm reduction strategies was associated with lower gambling quantity in the past 6 months, and this association was stronger for men than for women ($d = 0.10$, see Figure 2, middle).

Gambling Problem Severity

At Step 1, participant's sex, age and scores on the harm reduction and avoidance strategies subscales were significant predictors of gambling problem severity. In this regression, male sex was positively associated with greater gambling problem severity, while higher scores on the harm reduction strategies subscale were negatively associated with gambling problem severity. There was an unexpected result in which avoidance strategies were positively associated with problem severity. There was a medium effect for harm reduction strategies on problem severity ($d = 0.42$). At Step 2, the interaction between participant's sex and scores on the harm reduction strategies subscale was significant. Using more harm reduction strategies was associated with lower scores on gambling problem severity, with this relationship appearing stronger for men than women ($d = 0.24$, see Figure 2, bottom).

Subsequent investigation was undertaken to further investigate the positive association between avoidance strategies and problem severity in the regression analysis. Given the negative zero-order correlation between these two variables, the positive association in the regression represents a suppression effect. Cohen and colleagues (2003) define suppression as present when partial coefficients in the regression are larger or of opposite sign than zero order correlations. We examined this effect in several ways: considering normality, multicollinearity, identification of the variable responsible for suppression, and identification of specific avoidance strategy items in which suppression was present.

We first examined whether the same result was obtained when specifying a more conservative distributional assumption. We repeated the regression analysis specifying the problem severity variable as a negative binomial distribution and obtained the same significant positive association between avoidance strategies and gambling severity.

Next we examined the possibility that multicollinearity might be present. In the model where suppression was observed the highest variance inflation factor was 1.95 and the lowest tolerance value was .51. Neither of these approached values typically suggested as indicators of problematic multicollinearity (10 for VIF; .10 for tolerance; Kutner, 2004).

Next, we systematically examined which variable was responsible for the suppression. When examining problem severity as a function of age, sex, and avoidance strategies, the parameter estimate for avoidance strategies was negative, $\beta = -.112$, $p < .001$. When examining problem severity as a function of harm reduction strategies and avoidance strategies, the parameter estimate for avoidance strategies was positive and approached significance, $\beta = .054$, $p = .07$. Thus, overall, avoidance strategies appear to be positively associated with problem severity after accounting for variance related to harm reduction strategies.

Finally, we utilized stepwise selection to examine problem severity as a function of age, sex, harm reduction strategy, and each individual avoidance strategy to identify which specific strategies were positively associated with problem severity after controlling for harm reduction strategies. Of the avoidance strategies, two were uniquely positively associated

with problem severity in the final selection step, "I avoid drinking alcohol when I gamble," $\beta = .076$, $p = .005$, and "I have a friend let me know when it's time to stop gambling," $\beta = .113$, $p < .001$.

Discussion

The primary aim of the current study was to develop and validate a measure of gambling protective behaviors, such that the use of gambling protective behaviors could be explored in relationship to gambling frequency, quantity and problem severity. In support of this aim, the 16-item Gambling Protective Behaviors Scale (GPBS) was developed. A two-factor structure was supported through exploratory and confirmatory factor analysis, with individual factors largely reflecting use of harm reduction strategies and avoidance strategies. Although these factors were not hypothesized a priori, they make intuitive sense insofar as they may relate to different behavioral goals. That is, avoidance strategies represent steps taken to reduce the likelihood of engaging in gambling behavior or exposure to gambling opportunities/venues, which is generally consistent with an abstinence goal, whereas harm reduction strategies represent steps taken to reduce the likelihood of experiencing harmful consequences while engaging in gambling behavior, which could be consistent with a goal of controlled gambling. College student gamblers appeared to use these two different types of strategies in combination over the past 6 months, sometimes choosing avoidance strategies, perhaps when needing to focus on academics or work responsibilities, yet choosing to use harm reduction strategies when they gambled in an attempt to reduce their financial losses or limit their time spent gambling.

In line with our hypotheses, regression analyses revealed use of protective behavioral strategies was negatively related to gambling behavior. However, each of the two subscales was uniquely associated with different types of gambling outcomes. Specifically, use of harm reduction strategies was associated with lower gambling quantity and gambling problem severity whereas use of avoidance strategies was associated with lower gambling frequency but not quantity or problem severity. As previously mentioned, this may reflect differences in behavioral goals related to gambling. However, both types of protective behavioral strategies appear to be relevant for reducing harm related to gambling in college samples. It should be noted that within the hierarchical regression analyses for gambling problem severity, avoidance strategies were positively associated and statistically significant, which was not expected and represented a suppression effect (Cohen et al., 2003). We examined this issue thoroughly and identified two specific avoidance strategies that have more complex associations with problem severity: avoiding alcohol while gambling and having a friend let me know when it's time to stop gambling. Both of these, after controlling for harm reduction strategies, were uniquely positively associated with problem severity. Thus after taking out the protective effects of harm reduction strategies, these variables are potential indicators of more problematic gambling. It is possible that those who have problems are more likely to utilize these specific avoidance strategies. For example, those who have more problems, after accounting for harm reduction strategies, may be more likely to ask a friend to tell them when to stop. It is also plausible that those more likely to use these avoidance strategies end up over-doing it after repeated attempts at avoidance.

Analyses examining sex differences in the use of gambling protective behavioral strategies revealed only minor differences. Specifically, women reported using more avoidance strategies than men, which partially supported our hypothesis that women would tend to use more protective behavioral strategies overall. Women reported on average *usually* using avoidance strategies compared with men who reported on average *sometimes* using avoidance strategies. By comparison, both men and women reported *usually* using harm

reduction strategies, which by definition are associated with engaging in gambling behavior. Engaging in any level of gambling behavior increases the risk for experiencing gambling losses and problem severity relative to abstinence. Therefore, use of harm reduction strategies may be more effective among individuals who report greater gambling engagement. This is consistent with moderation analyses demonstrating that, in contrast to our initial hypothesis, use of gambling protective behavioral strategies in general had more of an effect for men than women. Specifically, greater use of avoidance strategies was related to lower gambling frequency while greater use of harm reduction strategies was related to lower gambling quantity and gambling problem severity for men, with a less pronounced effect for women. It is possible that the moderating effects of sex on the relationship between gambling protective factors and gambling outcomes that were found in this study were opposite to what was hypothesized based on the alcohol protective behaviors literature due to inherent differences in these risk behaviors and how they are related to one's sex. For example, sex differences in alcohol metabolism result in higher blood alcohol content and more harmful consequences for women than men from the same dose of alcohol (Lewis et al., 2010). As a result, small reductions in alcohol consumption may have a differentially larger impact on reducing harmful alcohol consequences for women, which may explain the increased relationship between protective behavioral strategies and alcohol consequences for women. By comparison, with respect to gambling, women on average already have relatively low gambling involvement and gambling consequences, and when they do gamble they may be doing so for different reasons and participating in different gambling activities than men (Larimer & Neighbors, 2003; Wickwire et al., 2008). Men's greater involvement in a variety of gambling activities and venues may provide more opportunity for the use of protective behavioral strategies to impact reductions in their gambling behavior and harmful consequences.

Implications for Prevention Approaches

Results from the current study suggest protective behavioral strategies may be an important factor in reducing an individual's engagement in gambling behavior and experience of gambling-related negative consequences. To the best of our knowledge, this is the first study to examine the relationship between using specific gambling protective behaviors and individuals' gambling behaviors and problem severity. Results suggest preventive intervention programs targeting college student gambling would benefit from a specific focus on increasing use of these strategies (e.g., skills-training approaches that encourage acquisition, practice and refinement of protective behaviors; brief motivational interventions that help student's develop their own tailored plan for use of protective behaviors appropriate to their readiness to change their gambling behavior), and that use of strategies may be an important mediator of intervention outcomes. Further, results suggest both avoidance and harm reduction strategies may be useful in reducing gambling-related harm, suggesting that integration of specific gambling protective behavioral strategies into intervention content could be tailored to be consistent with an individual's unique intervention goals. In particular, if the client's goal is abstinence, teaching and practicing avoidance strategies may be most appropriate, whereas if the client's goal is to gamble in moderation, the use of the harm reduction strategies may be most useful. Alternatively, both types of strategies may be important regardless of intervention goals, as avoidance of gambling at certain times may be necessary even for those with moderation goals, whereas harm reduction strategies may be an important aspect of relapse prevention (Marlatt & Gordon, 1985) for those pursuing gambling abstinence. The availability of the newly created GPBS should facilitate evaluation of specific skill deficits, as well as track changes in the use of these strategies over time for the purpose of individual intervention and outcome evaluation.

Limitations

Certain limitations must be considered when interpreting the results. The study utilized a cross-sectional design thus limiting the ability to make causal inferences regarding the results. Even though this is a limitation, the current study still provides a valuable first step in establishing a measure of gambling protective behaviors and evaluating those protective behaviors in relation to frequency, quantity and consequences of gambling. Self-report measures were used to assess all constructs relevant to the current study, including personal gambling behaviors. Some researchers have suggested that use of self-report measures in addiction research has the potential for bias based on poor recall (Henry et al., 1994). However, several published studies demonstrate self-report in the context of confidential assessment is generally valid in comparison to collateral reports (Babor, Stephens, and Marlett, 1987; Del Boca & Noll, 2002), and specifically within gamblers (Hodgins & Makarchuck, 2003). The current study examined gambling behavior in the past 6 months as a possible way to improve gamblers' self-report, and participants received assurances of confidentiality of all reports. Given the study design, we do not have demographic information for non-responders to the survey, which makes it impossible to test potential differences between those who completed the survey and those who never responded. Another limitation of the current study is that it did not include assessment of motivation or self-efficacy for skill use, which are important factors that could provide a deeper understanding of use of gambling protective behaviors. An assumed motivation for using protective behaviors is that people are trying to avoid negative consequences or self-regulate their behavior. The current study did not assess why students decide to implement protective behaviors. Perhaps students who have experienced negative consequences in the past are trying to avoid them, or these may be behaviors that are part of their natural behavioral repertoire, and thus were implemented proactively without suffering negative consequences. The current study does not address this question but research to understand student motivations for using protective behavioral strategies could shed light on this important aspect in the future. The current study also does not address how effective students are at implementing these skills or at sticking to them once chosen. However, the associations between greater use of protective behaviors and lower gambling frequency, quantity, and consequences provide some evidence that students can effectively use these skills. It should also be noted that the findings from this study focus on at-risk college student gamblers and may not generalize to other populations. Thus, the GPBS was developed for assessing the use of a circumscribed range of protective behavioral strategies among college students. Although the items contained within the GPBS were drawn from existing research on protective behaviors and initially validated by gambling experts, the strategies assessed by the GPBS are not exhaustive. Individuals may engage in additional protective behavioral strategies not captured by the GPBS. For this reason, more research is needed to validate the use of the GPBS in other populations (e.g., older adults, non-college young adults) and to evaluate the extent to which inclusion of additional protective behaviors may add to the utility of the measure. More research is needed in the area of assessing implementation of, and self-efficacy when utilizing, gambling protective behaviors.

Conclusions

The current findings are an important first step in understanding the types of behaviors that may provide some protection against problematic gambling. Specifically, the present study is the first to systematically assess specific gambling protective behavioral strategies and examine the relationship of those protective behaviors to gambling outcomes, including frequency, quantity and problem severity. Additional research is needed to assess the ability of individuals to develop and incorporate these skills into their behavioral repertoire in order to reduce problematic gambling behavior.

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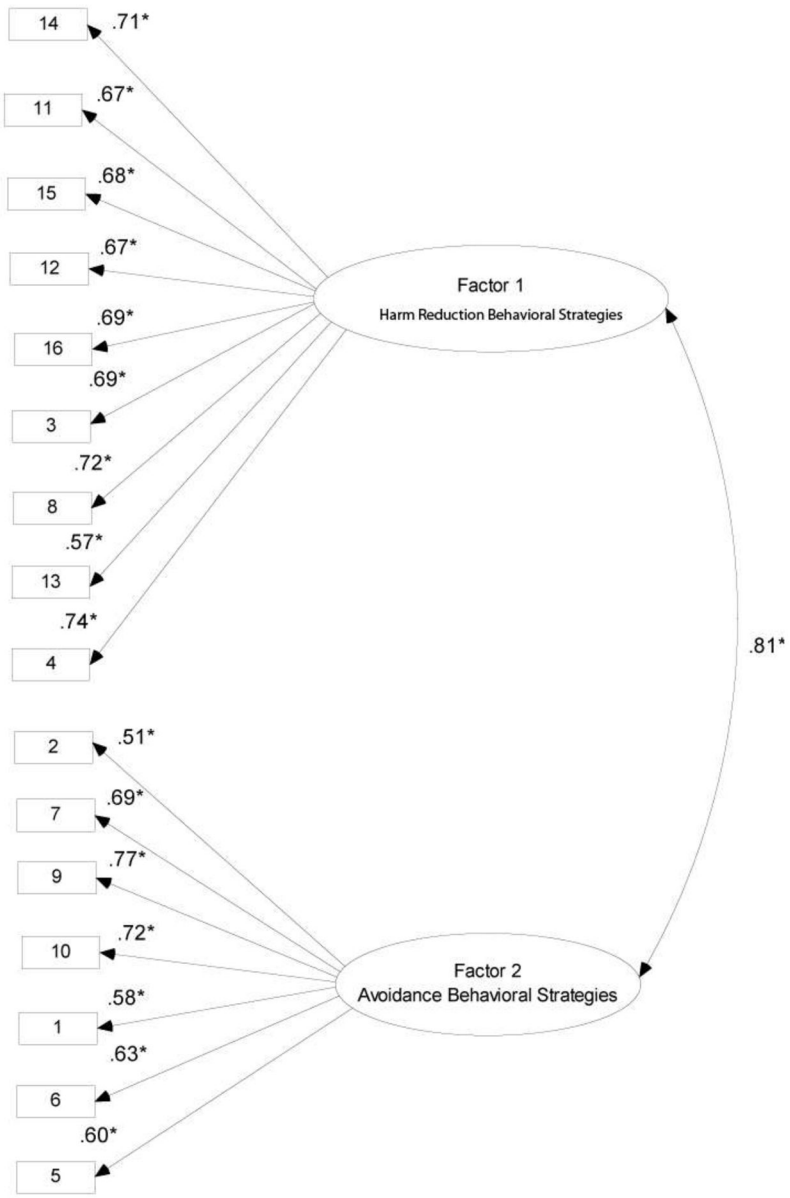
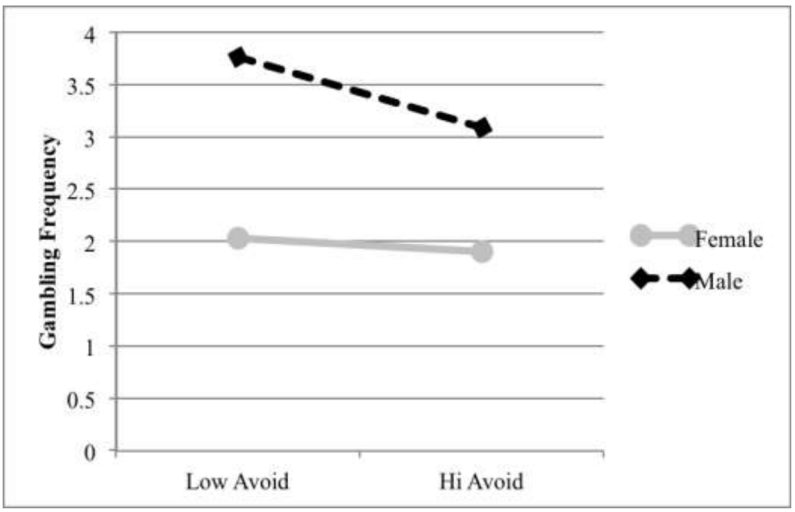
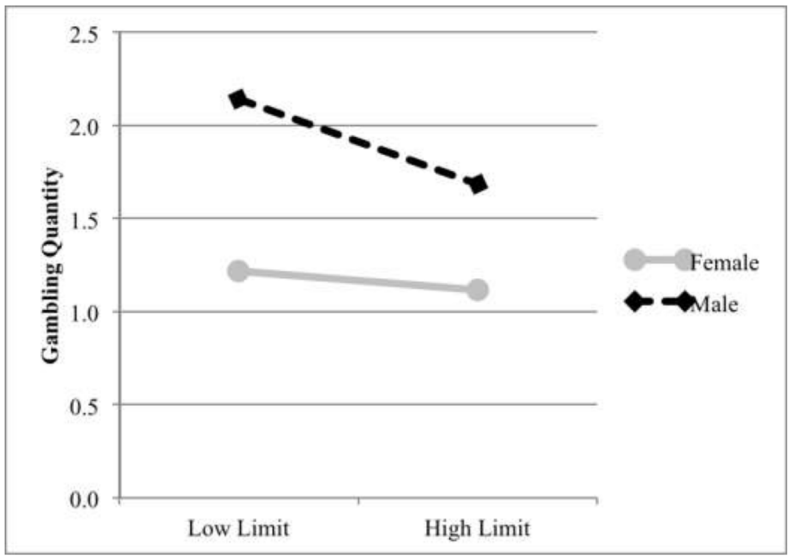


Figure 1.
The Hypothesized 16-Item, 2-Factor Confirmatory Factor Analysis of Gambling Protective Behavior Scale with Standardized Regression and Correlation Coefficient.
Note. $^{*}p < .001$





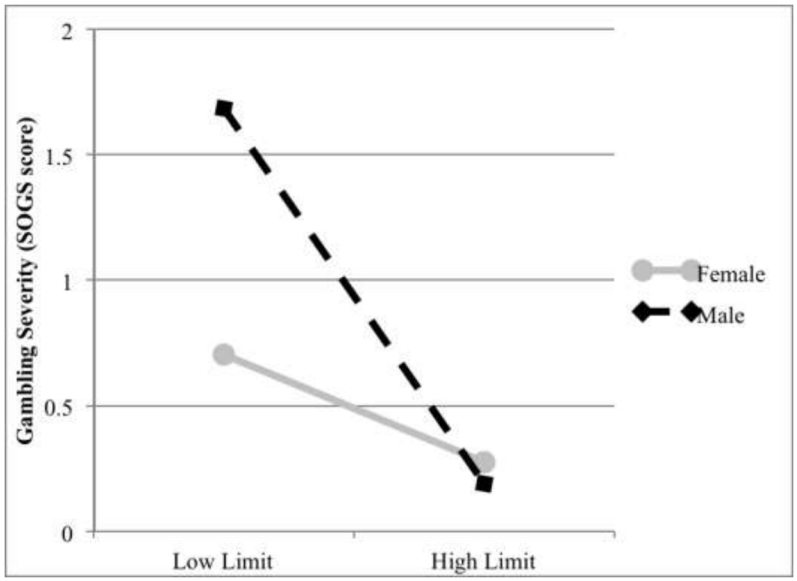


Figure 2.
Interaction between Sex and Avoidance Strategies on Gambling Frequency (top). Interaction between Sex and Harm reduction Strategies on Gambling Quantity (middle) and on Gambling Problem Serverity (bottom).

Table 1

Demographics

	Female n = 854		Males n = 1,068		Total N = 1,922	
Characteristic	**N**	**%**	**n**	**%**	**N**	**%**
Race/Ethnicity						
Hispanic/Latino(a)	46	5.4%	48	4.5%	94	4.9%
American Indian	12	1.4%	4	0.4%	16	0.8%
Asian	264	31.0%	320	30.2%	584	30.6%
African American/Black	12	1.4%	18	1.7%	30	1.6%
Caucasian/White	461	54.1%	604	56.9%	1065	55.7%
Native Hawaiian/Pacific Islander	11	1.3%	7	0.7%	18	0.9%
Multi-racial	68	8.0%	86	8.1%	154	8.1%
Other	23	2.7%	22	2.1%	45	2.4%
Sexual Identity						
Bisexual	28	3.3%	4	0.4%	32	1.6%
Gay/Lesbian	6	0.7%	23	2.2%	29	3.6%
Straight/Heterosexual	813	95.2%	1034	96.9%	1847	95.9%
Questioning	7	0.8%	5	0.5%	12	0.5%

Note. Not all totals and percentages may not add up to 1,922 (100%) due to missing data.

Table 2

Exploratory Factor Analysis using Promax Rotation for Gambling Protective Behavior Scale

Gambling Protective Behavioral Strategies Items	*M*	*SD*	1	2
Factor 1. Harm reduction Strategies Factor				
14. I leave the gambling venue (casino, track etc.) before I run out of money.	3.13	1.27	**0.88**	−0.13
11. I resist the urge to return to the casino or gambling venue in order to make back the money I previously lost.	3.40	1.16	**0.86**	−0.14
15. I avoid borrowing money to gamble.	2.89	1.37	**0.86**	−0.12
12. I plan my gambling so it won't interfere with my work or school priorities.	3.14	1.34	**0.76**	−0.02
16. I avoid using the cash machine in the casino/gambling establishment.	2.87	1.38	**0.65**	0.12
3. I keep track of the amount of money I spend while gambling.	3.27	1.17	**0.51**	0.26
8. I set a limit in the amount of money I can gamble with and I don't break my personal limit.	3.08	1.22	**0.44**	0.37
13. I keep track of the time when I'm gambling.	2.46	1.37	**0.43**	0.41
4. I control the size of my bets not to exceed a personal maximum.	3.08	1.26	**0.42**	0.25
Factor 2. Avoidance Strategies Factor				
2. I have a friend let me know when it's time to stop gambling.	1.49	1.58	−0.29	**0.83**
7. I limit the number of days per week that I gamble.	2.31	1.48	−0.06	**0.80**
9. I avoid gambling when I'm feeling bored.	2.46	1.70	0.01	**0.74**
10. I avoid gambling when I'm feeling down or depressed.	2.63	1.46	0.13	**0.69**
1. I determine in advance a set amount of time I will spend gambling.	2.39	1.53	0.01	**0.67**
6. I avoid taking my credit/debit cards to the casino or gambling venue.	2.64	1.62	0.12	**0.57**
5. I avoid drinking alcohol when I gamble.	2.64	1.44	0.19	**0.49**

Note. Due to missing values the factor analysis was conducted on an n = 908.

Table 3

Parameter Estimates of Hypothesized 16-Item, 2-Factor Confirmatory Factor Analysis of Gambling Protective Behavior Scale

Parameter		Unstandardized	SE
	Item	Factor Loadings	
Harm reduction Behavioral Strategies →	14	1.00[a]	
Harm reduction Behavioral Strategies →	11	1.02*	0.05
Harm reduction Behavioral Strategies →	15	0.87*	0.04
Harm reduction Behavioral Strategies →	12	1.00*	0.05
Harm reduction Behavioral Strategies →	16	1.05*	0.05
Harm reduction Behavioral Strategies →	3	0.90*	0.05
Harm reduction Behavioral Strategies →	8	0.97*	0.05
Harm reduction Behavioral Strategies →	13	0.87*	0.05
Harm reduction Behavioral Strategies →	4	1.03*	0.05
Avoidance Behavioral Strategies →	2	1.00[a]	
Avoidance Behavioral Strategies →	7	1.46*	0.10
Avoidance Behavioral Strategies →	9	1.42*	0.10
Avoidance Behavioral Strategies →	10	1.30*	0.09
Avoidance Behavioral Strategies →	1	1.12*	0.09
Avoidance Behavioral Strategies →	6	1.29*	0.10
Avoidance Behavioral Strategies →	5	1.08*	0.08
		Factor Variances and Covariance	
Harm reduction Behavioral Strategies		0.81*	0.07
Avoidance Behavioral Strategies		0.64*	0.08
Harm reduction ← → Avoidance		0.58*	0.05

Note.

[a] Not tested for statistical significance.

* $p < .001$

Table 4

Mean Sex Differences for Gambling, Protective Behaviors Strategies and Estimated Effect Sizes

	Total		Females		Males				
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*df*	*t*	*d*
Gambling Frequency	1.91	1.47	1.45	0.92	2.28	1.70	1,708	−13.53*	0.65
Gambling Quantity	1.58	1.37	1.17	0.92	1.91	1.57	1,774	−12.77*	0.61
G. Problem Severity	0.74	1.70	0.49	1.13	0.93	2.02	1,734	−6.11*	0.29
Harm Red Strategies	3.04	0.93	3.08	1.02	3.16	0.86	1,630	1.46	0.07
Avoidance Strategies	2.39	1.10	2.52	1.18	2.29	1.02	1,664	4.63*	0.23

Note. All reported *t*-tests use equal variance not assumed. Effect sizes are reported as Cohen's *d* (Rosenthal & Rosnow, 1991), with small, medium, and large effects considered to be 0.2, 0.5, and 0.8, respectively (Cohen, 1992).

* $p < .001$

Table 5

Zero-Order Correlations by Sex

Variables (Males\Females)	1	2	3	4	5
1. Gambling Frequency	--	0.40**	0.30**	−0.06	−0.07*
2. Gambling Quantity	0.58**	--	0.46**	−0.03	−0.02
3. Gambling Problem Severity	0.43**	0.47**	--	−0.14**	−0.06
4. Harm Reduction Strategies	−0.14**	−0.14**	−0.30**	--	0.73**
5. Avoidance Strategies	−0.20**	−0.10**	−0.15**	0.65**	--

Notes. The correlations for men are below the diagonal and women are above the diagonal. *N* for males ranged from 1062–1068, females ranged from 839–854 due to missing values. Correlations are significant at

* $p < .05$,

** $p < .01$

Table 6

Hierarchical Regression Results for Sex, Age and Protective Behaviors Strategies on Gambling Frequency, Gambling Quantity and Gambling Problem Severity.

	Predictor	*B*	*SE B*	*β*	ΔR^2	*d*
Gambling Frequency						
Step 1	Sex	0.77	0.65	0.26***	0.10***	0.54
	Age	−0.17	0.02	−0.02		0.05
	Harm Reduction Strategies	−0.01	0.05	−0.01		0.01
	Avoidance Strategies	−0.19	0.04	−0.14***		0.21
Step 2	Sex × Limit Strategies	−0.03	0.10	−0.04	0.01***	0.02
	Sex × Avoidance Strategies	−0.25	0.81	−0.23**		0.14
Gambling Quantity						
Step 1	Sex	0.75	0.62	0.27***	0.09***	0.56
	Age	0.06	0.02	0.09***		0.18
	Harm Reduction Strategies	−0.15	0.05	−0.10***		0.15
	Avoidance Strategies	0.01	0.04	0.01		0.02
Step 2	Sex × Limit Strategies	−0.19	0.09	−0.23*	0.01***	0.10
	Sex × Avoidance Strategies	−0.03	0.07	−0.03		0.02
Gambling Problem Severity						
Step 1	Sex	0.45	0.08	0.13***	0.07***	0.27
	Age	0.05	0.02	0.05*		0.11
	Harm Reduction Strategies	−0.51	0.06	−0.28***		0.42
	Avoidance Strategies	0.13	0.05	0.08**		0.12
Step 2	Sex × Limit Strategies	−0.57	0.11	−0.55***	0.02***	0.24
	Sex × Avoidance Strategies	0.05	0.10	0.04		0.03

Note.

* $p < .05$,

** $p < .01$,

*** $p < .001$.