Analysis of Gambling Behavior

Volume 5 Article 1

2011

Predicting College Student Gambling Frequency Using the Theory of Planned Behvior: Does the Theory Work Differently for Disordered and Non-Disordered Gamblers?

Ryan J. Martin
East Carolina University, martinry@ecu.edu

Sarah Nelson
Harvard Medical School

Stuart Usdan
University of Alabama

Lori Turner
University of Alabama

Analysis of Gambling Behavior 2011, **5**, 45-62 Number 2 (Winter, 2011)

PREDICTING COLLEGE STUDENT GAMBLING FREQUENCY USING THE THEORY OF PLANNED BEHAVIOR: DOES THE THEORY WORK DIFFERENTLY FOR DISORDERED AND NON-DISORDERED GAMBLERS?

Ryan J. Martin
East Carolina University

Sarah Nelson
Harvard Medical School

Stuart Usdan & Lori Turner
University of Alabama

We examined whether disordered gambling moderates the prediction of gambling behavior via the theory of planned behavior (TPB; i.e., intentions, subjective norms, perceived behavioral control, and attitudes) among college students. A convenience sample of undergraduate students (N=377) at a large, Southeastern university who gambled in the past year completed a classroom-based survey. Approximately half of participants were male (n = 205; 54.4%), and the majority were Caucasian (n = 310; 83.8%). Gambling frequency, gambling problems and gambling-specific TPB constructs were assessed via a cross-sectional survey. A series of regression analyses were conducted to test the utility of the TPB model to predict gambling behavior (i.e., frequency) among (1) non-disordered gamblers (N=342) and (2) disordered gamblers (N=35). Moderation analyses indicated that disordered gamblers might not proceed through the thought processes that guide gambling in non-disordered gamblers. However, findings should be interpreted cautiously, as our study was limited by a small number of lifetime disordered gamblers.

Keywords: disordered gambling, moderation, college students, theory of planned behavior

---

Pathological gambling (PG) is a clinical psychiatric disorder defined as "persistent and recurrent maladaptive gambling behavior that disrupts personal, family or vocational pursuits" (American Psychiatric Association, 1994, p. 615). Gambling is considered problem (i.e., sub-clinical) gambling when it does not meet the criteria for PG but results in harmful effects to gamblers, their families, significant others, friends, co-workers, and/or others (National Research Council, 1999). Shaffer, Hall and Vander Bilt (1997) coined the term disordered gambling to describe the full range of gambling problems, which includes pathological and sub-clinical gambling.

Research has estimated that the vast majority (nearly 80%) of the US population has gambled and most have not experienced gambling-related problems (Kessler et al., 2008). The percentage of individuals experiencing gambling-related problems is relatively low, as it is estimated that approximately one half of 1% (0.4 to 0.6%) of the U.S. population have experienced pathological gambling in

Address all correspondence to:
Ryan J. Martin
Department of Health Education and Promotion, East Carolina University
2206 Carol Belk Building
Greenville, NC 27858
Email: martinry@ecu.edu

their lifetime, and 0.9 to 2.3% have experienced sub-clinical pathological gambling in their lifetime (Kessler et al., 2008; Petry, Stinson, & Grant, 2005). The following gambling-related clinical signs/symptoms are indicative of disordered gambling: Preoccupation, tolerance, inability to cut down or quit, withdrawal 'chasing' one's losses, lying, committing illegal acts, jeopardizing or losing a significant relationship, job, educational or career opportunity, and relying on others to provide money to relieve a desperate financial situation (American Psychiatric Association, 2000).

Although research suggests that the etiology of gambling disorders is complex and multifactorial (Shaffer & Martin, 2011), one noticeable difference between disordered gamblers and non-disordered gamblers is the presence of co-occurring psychiatric disorders. For instance, research indicates that individuals with psychiatric disorders are approximately 17 times more likely to develop disordered gambling than those without such disorders (Kessler et al., 2008). Specifically, disordered gamblers are 5.5 times more likely than non- disordered gamblers to have had a substance abuse disorder, 4 times more likely than non-disordered gamblers to experience a mood disorder in their lifetime, and 3 times more likely to have had an anxiety disorder (Kessler et al., 2008).

Research indicates that, apart from clinical disorders, there are other psychological factors that also influence disordered gambling. For example, studies have found that the expectations, such as excitement, that gamblers have about the games they play also impact gambling (e.g., Ladouceur, Sevigny, Blaszczynski, O'Connor, & Lavoie, 2003; Pantalon, Maciejewski, Desai, & Potenza, 2008). Further, these expectations and the development of gambling-related problems also are associated with impulsivity (e.g., Blanco et al., 2009; Petry, 2001; Vitaro, Arsenault, & Tremblay, 1999).

College students are particularly vulnerable to disordered gambling. Research indicates that gambling participation and disordered gambling are associated with numerous negative consequences and are highly correlated with other risky behaviors exhibited by the college student population (e.g., Engwall, Hunter, & Steinberg, 2004; LaBrie, Shaffer, LaPlante, & Wechsler, 2003; Stuhldreher, Stuhldreher, & Forrest, 2007), including driving under the influence, binge drinking, illicit drug use, depression, stress, and considering and attempting suicide. Further, even though the percentage of college students that gamble varies across studies (e.g., American Council on Education, 2007; LaBrie et al., 2003; Martin et al., 2010; Slutske, Jackson, & Sher, 2003; Winters, Bengston, Door, & Stinchfield, 1998), research indicates that college students who gamble are more likely to do so at a disordered level than other gamblers (e.g., Barnes, Welte, Hoffman, & Tidwell, 2010; Blinn-Pike, Lokken Worthy, & Jonkman, 2007; Shaffer & Hall, 2001). To illustrate, Shaffer and Hall (2001) found that over 16% of college students experienced a clinical or sub-clinical gambling problem in their lifetimes; a rate higher than those observed in the general population (6.1%) and adolescent population (11.8%). Collectively, these findings suggest that college student gamblers might be at greater risk for gambling-related consequences (e.g., chasing losses, tolerance, withdrawal, gambling-related lying) and other negative correlates (e.g., driving under the influence, depression) than other segments of the population.

Gambling problems are typically preceded by an increase in gambling frequency (Kessler et al., 2008). Researchers do not completely understand why certain individuals might gamble more frequently than others (Shaffer & Martin, 2011). The theory of reasoned action posits that one's behavior is influenced by one's intention to perform that behavior and that one's intention is influenced

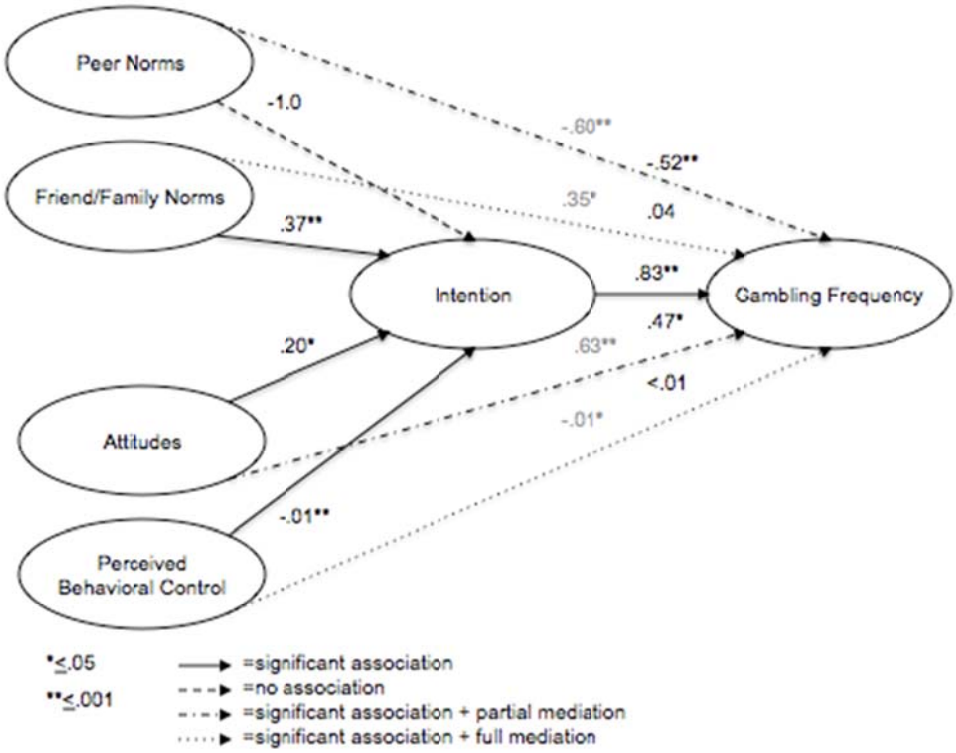

Figure 1. TPB model: Gambling frequency among past year gamblers (N=377)

by attitudes and perceived subjective norms regarding that behavior (Fishbein, 1967). Further, an adaptation of the theory of reasoned action, the theory of planned behavior (TPB), also includes the construct of perceived behavioral control, which is similar to self-efficacy (Ajzen & Fishbein, 1980).

According to Ajzen (1991), an individual's intention to perform a given behavior is the central factor in the TPB and the theory includes three determinants of intention: attitude toward the behavior, subjective norm, and perceived behavioral control. According to the theory, more favorable attitudes, subjective norms, and perceived behavioral control concerning a behavior positively correlate with an individual's intention to perform that behavior and behavioral intentions positively correlate with participation in the behavior (Ajzen, 1991).

Researchers (Larimer & Neighbors, 2003; Martin et al., 2010; Moore & Ohtsuka, 1997, 1999; Neighbors et al., 2007) have examined some components of this process among college student gamblers. Specifically, Moore and Ohtsuka (1997) found that (1) intention to gamble correlated strongly and positively with both gambling frequency and problem gambling and (2) intention to gamble was significantly associated with both attitudes and subjective norms. Further, Neighbors et al. (2007) found that favorable attitudes toward gambling correlated with problematic gambling (i.e., gambling frequency, expenditure, and negative consequences). Although these studies were informative, they did not examine the role of one TPB construct (i.e., perceived behavioral control) in the prediction of gambling outcomes.

Recently, Martin et al. (2010) examined the usefulness of utilizing the entire TPB model (including perceived behavioral control) to predict gambling behavior (i.e., past year gambling and gambling frequency) among a

sample of college students (see Figure 1 for the model to predict gambling frequency). Results from that study supported the utility of the TPB to explain gambling behavior in this population. Specifically, in TPB models predicting gambling behavior, friend and family subjective norms and perceived behavioral control predicted past year gambling and friend and family subjective norms, attitudes and perceived behavioral control predicted gambling frequency. Further, intention to gamble mediated these relationships.

Whereas the studies mentioned above have increased our understanding of the TPB's ability to predict gambling behavior, researchers have yet to examine whether the chain of events described by the TPB is the same for those who gamble at a disordered level and those who do not. One reason we might expect the model to perform differently for disordered and non-disordered gamblers is that pathological gambling is an impulse-control disorder (American Psychiatric Association, 2000). Individuals with impulse disorders might experience very different relationships among gambling behavior and attitudes, perceptions, and especially, perceived behavioral control compared with gamblers who can regulate their risk-taking. Further, those with impulse control problems might have a different relationship between intention and behavior; as such individuals might experience difficulty controlling their behavior despite their intentions to do otherwise.

Purpose/Significance

The purpose of this study was to investigate whether the TPB applies differently for individuals who have and have not experienced gambling problems. In other words, we examined whether disordered gambling status moderates the ability of the TPB to predict gambling frequency. It is important to note that this study assessed lifetime (i.e., current or historic) disordered gambling; thus, disordered gamblers in this analysis include all respondents who indicated ever experienced disordered gambling, including those who might not have been currently experiencing problems.

To conduct this examination, we used a classroom-based survey to assess the gambling behavior and gambling-related TPB constructs (i.e., intentions, subjective norms, perceived behavioral control, and attitudes) of a sub-sample of undergraduate student gamblers (n = 377; 48.9%) enrolled in 17 general education classes at a university located in the southeastern United States. This research builds on our previous research (Martin et al., 2010) by examining whether disordered gambling status moderates the aforementioned relationships between the TPB and gambling frequency. We hypothesized that disordered gambling would moderate the aforementioned relationships, such that the relationships posited by TPB would not hold for disordered gamblers.

METHOD

Participants

A total of 819 participants enrolled in courses in fall 2007 at a large public university in the southeastern United States returned the assessment battery. Forty-eight (48) assessment batteries were not included in the analysis because participants failed to complete the demographic variable item used in this analysis (i.e., sex) and/or one or more TPB subscales; thus 771 participants returned completed surveys. The sub-sample used for analysis consisted of those participants (n = 377; 48.9%) who indicated that they gambled during the past year. Demographics (i.e., sex, race, class status, and Greek affiliation) among non-disordered gamblers and disordered gamblers are listed in Table 1.

Materials

We used the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) to assess gambling problems and participation in spe-

Table 1. Gambling Frequency and Gambling-related TPB Variable Scores in a Sample of College Student Non-disordered Gamblers (N=342) and College Student Disordered Gamblers (N=35)

	Non-disordered gamblers (N=342)	Disordered gamblers (N=35)
	N (%)	**N (%)**
Sex		
Male	178 (52.0)	27 (77.1)
Female	164 (48.0)	8 (22.9)
Race/ethnicity		
Caucasian	282 (82.5)	28 (80.0)
African American	46 (13.5)	5 (14.3)
Other	14 (4.0)	2 (5.7)
Class status		
Underclassman	122 (35.7)	15 (42.9)
Upperclassman	220 (64.3)	20 (57.1)
Greek affiliation		
Yes	111 (32.5)	7 (20.0)
No	231 (67.5)	28 (80.0)

cific gambling types (i.e., cards, horses/dogs, sports, dice games, casino gambling, lottery, bingo, stocks/commodities, slot/poker machines, games of skill, pull tabs, internet). The SOGS is a widely used gambling screen based on the DSM-III (American Psychiatric Association, 1980) and DSM-III-R (American Psychiatric Association, 1987) criteria for pathological gambling. As mentioned previously, researchers recommend using the term "disordered gambling" to discuss the full range of problem and pathological gambling (Shaffer et al., 1997). SOGS scores determined our classification of disordered gambling. The SOGS consists of 20 items and participants scoring 3 or higher were classified as disordered gamblers.

We assessed gambling frequency via one question in the Gambling Quantity and Perceived Norms Scale (GQPN; Neighbors, Lostutter, Larimer, & Takushi, 2002). The GQPN assesses money won and lost gambling, disposable income and perceptions of peer gambling behavior. Gambling frequency was assessed by the GQPN through one question regarding how often the respondent currently gambles (i.e., never, once a year, 2 to 3 times a year, every other month, once a month, 2 to 3 times a month, weekly, more than once a week, every other day, and every day).

We used the 32-item Gambling Attitudes and Injunctive Norms Scale (GAINS; Neighbors et al., 2007) to assess gambling attitudes and the subjective norms of peers (i.e., other college students at the participant's university). The GAINS measures both attitudinal items (i.e., the respondent's approval or disapproval of other college students engaging in different gambling behaviors) and norms items (e.g., How do most college students feel about other students' gambling behavior?).

We assessed perceived behavioral control via the 16-item Gambling Self-Efficacy Questionnaire (GSEQ; May, Whelan, Steenbergh, & Meyers, 2003), a measure of beliefs about one's ability to control his or her gambling in various situations. May et al. (2003) found

Table 2. Gambling Frequency and Gambling-related TPB Variable Scores in a Sample of College Student Non-disordered Gamblers (N=342) and College Student Disordered Gamblers (N=35)

	Non-disordered gamblers (N=342)		Disordered gamblers (N=35)	
Past year Gambling Frequency	**N (%)**	**M (SD)**	**N (%)**	**M (SD)**
Once per year	165 (48.2)		5 (14.3)	
2-3 times per year	112 (32.7)		13 (37.1)	
Every other month	21 (6.1)		5 (14.3)	
Once per month	14 (4.1)		3 (8.6)	
2-3 times per month	17 (5.0)		1 (2.9)	
Weekly	9 (2.6)		4 (11.4)	
More than once per week	3 (0.9)		2 (5.7)	
Every other day	0 (0.0)		1 (2.9)	
Every day	1 (0.3)		1 (2.9)	
TPB Variables				
Intention to gamble (range: 1-5)		1.7 (.7)		2.3 (.9)
Peer norms (range: 1-5)		2.5 (.6)		2.7 (.7)
Friend/family norms (range: 1-5)		3.0 (.6)		3.2 (.6)
Attitudes (range: 1-5)		2.2 (.5)		2.4 (.5)
Perceived behavioral control (range: 0-100)		90.5 (15.1)		71.9 (23.0)

that the GSEQ negatively correlates with gambling behavior, and individuals who report gambling problems score significantly lower on this scale than those not experiencing problems.

We assessed subjective norms of friend/family via the 12-item Gambling Injunctive Norms Scale (GINS; Moore & Ohtsuka, 1997). Respondents indicated there agreement with five norm-related statements regarding friends gambling (e.g., most of my friends approve of gambling) and seven regarding family gambling (e.g., people in my family often go to places where gambling occurs). Moore and Ohtsuka (1997) found that GINS scores positively correlated with perceived gambling behavior and approval of gambling behavior by friend/family of the respondent. Finally, we assessed intention to gamble through the seven-item Gambling Intention Scale (GIS; Moore & Ohtsuka, 1997). Moore and Ohtsuka (1997) found that GIS positively correlated with the intention to gamble in the next 2 weeks. In addition, we collected information about participants' sociodemographics, including gender and race.

Procedure

This study received approval from the institutional review board of the university at which we conducted the research. The study occurred during October and November of the 2007 fall semester. Students enrolled and in attendance in one of 17 general education courses in one college at the university where this research was conducted were eligible to

complete the assessment battery. At the beginning of each participating class, we briefly explained the project to potential participants and distributed informed consent forms. In addition, participants who previously completed the assessment battery in another class were asked not to complete it a subsequent time. After participants completed the informed consents, we distributed the assessment battery. Students who completed the assessment battery received no incentives. Each survey included an assigned ID number, so that no information collected from the assessment linked to the participant's name.

Data Cleaning and Reduction

Participants returned 819 surveys. We analyzed the data using SPSS statistical software (SPSS Inc., 2006). Data cleaning first involved removing participants who failed to complete the demographic variable item used in this analysis (i.e., sex) and/or one or more TPB subscales in the assessment battery (N=48). We considered a subscale incomplete if a participant left blank two or more responses (Little & Rubin, 1987).

As mentioned previously, this analysis examined a sub-sample of students who gambled in the past year (N=377; 48.9%). Further, to examine whether disordered gambling moderates the relationship between TPB constructs and gambling frequency, we grouped this sub-sample by students who indicated gambling at a disordered level in their lifetimes (N=35) and students who did not indicate disordered gambling (N=342). As mentioned above, we classified respondents who scored 3+ on the SOGS as disordered gamblers.

Among these sub-sample groups (i.e., disordered gamblers and non-disordered gamblers), we computed past year gambling frequency rates and computed average scores for each TPB construct subscale to create composite TPB variables (see Table 2). See Martin et al. (2010) for (1) a description of how TPB construct subscales were summed and (2) reliability analyses for subscales.

Data Analyses

To test our hypotheses, we utilized the mediation analysis technique (Barron & Kenny, 1986) conducted in our previous study (Martin et al., 2010). In that study, we used a set of multiple regressions to test the ability of the TPB model to predict gambling frequency. The first regression model predicted gambling frequency from the three distal determinants in the TPB model: attitudes, subjective norms (peer and friend/family), and perceived behavioral control. The second regression model predicted gambling frequency from gambling intentions. The third regression model predicted gambling intention from the distal determinants in the TPB model. The fourth and final regression model included both the distal determinants and intention as predictors of gambling frequency to test whether intention mediated the distal determinants' relation to gambling behavior. For the present study, consistent with the approach suggested for moderation analysis (Barron & Kenny, 1986), we ran the aforementioned regression analyses separately for disordered gamblers and non-disordered gamblers to examine if disordered gambling moderates the relationships suggested by the TPB model.

RESULTS

Demographics and Gambling Behavior

Gambling frequency and gambling-related TPB variable scores among non-disordered gamblers and disordered gamblers are listed in Table 2. Consistent with our previous study (Martin et al., 2010), we conducted one-way ANOVAs to examine relationships between potential confounding demographic variables (i.e., sex, race/ethnicity, class status and Greek affiliation) and the outcome variables (i.e., intention to gamble and frequent gambling). Because we were ultimately inter-

Table 3. Pearson Correlation Coefficients of Gambling Frequency and Gambling-related TPB Variable Scores in a Sample of College Student Non-disordered Gamblers (N = 342) / College Student Disordered Gamblers (N=35)[1]

	Gambling frequency	Intention	Peer norms	Friend/ family norms	Attitudes	Perceived behavioral control
Gambling frequency	-					
Intention	.46**/.58**	-				
Peer norms	-.23**/-.26	-.03/-.30	-			
Friend/family norms	.26**/.08	.40**/.32	-.01/.06	-		
Attitudes	.22**/.45**	.28**/.21	.18**/.20	.45**/.54**	-	
Perceived behavioral control	-.14**/-.12	-.29**/-.15	-.05/.11	-.10/.16	-.06/.21	-

***p* value < .001.

[1]Note that scores for non-disordered gamblers are listed first (on the right), followed (on the left) by scores for disordered gamblers.

ested in examining the moderating effect of disordered gambling, we conducted these one-way ANOVAs separately among students who indicated gambling at a disordered level in their lifetimes (N=35) and students who did not indicate disordered gambling (N=342).

Among non-disordered gamblers, the analyses indicated that sex was significantly associated with intention to gamble and frequent gambling, whereas race/ethnicity, class status, and Greek-affiliation were not. Specifically, males (M = 1.77; SD = 0.69) had significantly higher intention to gamble scores (F = 11.45; p = .001) than their female counterparts (M = 1.52; SD = 0.64) and males (M = 3.50; SD = 1.64) had significantly higher gambling frequency scores (F = 60.8; p < .001) than females in this sample (M = 2.41; SD = 0.73). Among disordered gamblers, none of the demographic variables were significantly associated with the outcomes of interest (i.e., intention to gamble and frequent gambling).

TPB Model and Construct Relationships

Consistent with our previous study, we conducted Pearson correlations to examine univariate correlations among the TPB constructs (see Table 3) for both groups (i.e., disordered gamblers and non-disordered gamblers). Among non-disordered gamblers all TPB distal determinants except for peer norms were significantly correlated with intention to gamble (p < .001) and all TPB constructs were significantly correlated with gambling frequency (p < .001). All of these relationships were in the direction postulated by the TPB except for peer norms, which was associated in the opposite direction (i.e., had a negative correlation with gambling frequency).

Among disordered gamblers, no TPB distal determinants were significantly correlated with intention to gamble, whereas the TPB constructs intention to gamble and attitudes were significantly correlated with gambling frequency (p < .001).

Table 4. Regression Models to Predict Intention to Gamble and Gambling Frequency in a Sample of College Student Non-disordered Gamblers (N = 342)

	F	*p* value	R^2	β	*p* value
Regression 1: Predicting gambling frequency via TPB distal determinants	24.8	<.001	.27		
Sex				-.95	<.001
Peer norms				-.54	<.001
Friend/family norms				.47	<.001
Attitudes				.33	<.05
Perceived behavioral control				-.01	<.05
Regression 2: Predicting gambling frequency via gambling intention	75.4	<.001	.31		
Sex				-.88	<.001
Intention				.83	<.001
Regression 3: Predicting gambling intention via TPB distal determinants	22.9	<.001	.25		
Sex				-.18	<.01
Peer norms				-.06	.36
Friend/family norms				.37	<.001
Attitudes				.17	.04
Perceived behavioral control				-.01	<.001
Regression 4: Predicting gambling frequency via gambling intention and TPB distal determinants	30.9	<.001	.36		
Sex				-.82	<.001
Peer norms				-.50	<.001
Friend/family norms				.21	.08
Attitudes				.21	.19
Perceived behavioral control				<-.01	.82
Intention				.70	<.001

Testing the TPB model

To examine whether disordered gambling moderates the relationship between gambling frequency and the TPB, we conducted two sets of mediation analyses: (1) for non-disordered gamblers (see Table 4 and Figure 2) and (2) for disordered gamblers (see Table 5 and Figure 3). As mentioned previously, gender was a significantly correlated confounding demographic variable and thus included as an independent variable in the proceeding models.

Step 1: Distal Determinants and Gambling Frequency

The first step to testing the proposed TPB model was conducting a multiple regression procedure to examine the association between gambling frequency and TPB distal determinants peer norms (i.e., other college students

Table 5. Regression Models to Predict Intention to Gamble and Gambling in a Sample of College Student Disordered Gamblers (N=35)

	F	*p* value	R^2	β	*p* value
Regression 1: Predicting gambling frequency via TPB distal determinants	4.7	<.01	.45		
Sex				-1.42	.06
Peer norms				-1.26	<.01
Friend/family norms				-.97	.11
Attitudes				2.64	<.001
Perceived behavioral control				<.01	.59
Regression 2: Predicting gambling frequency via gambling intention	8.1	<.001	.34		
Sex				-.86	.264
Intention				1.28	<.001
Regression 3: Predicting gambling intention via TPB distal determinants	2.2	.08	.28		
Sex				-.35	.32
Peer norms				-.44	<.05
Friend/family norms				.40	.16
Attitudes				.28	.39
Perceived behavioral control				<-.01	.25
Regression 4: Predicting gambling frequency via gambling intention and TPB distal determinants	7.8	<.001	.63		
Sex				-1.01	.11
Peer norms				-.74	.08
Friend/family norms				-1.44	<.01
Attitudes				2.30	<.001
Perceived behavioral control				.02	.17
Intention				1.19	<.01

at the participant's university), friend/family norms, attitudes, and perceived behavioral control.

Model 1A (Non-disordered gamblers): The model was statistically significant ($p < .001$) and explained 27% ($R2 = .27$) of the variability in gambling frequency. All TPB distal determinants were significantly associated ($p < .05$) with gambling frequency. With the exception of peer norms, they all had a relationship to frequent gambling in a direction consistent with what is postulated by the TPB. Consistent with the Pearson correlations described above, peer norms had a negative relationship with the outcome variable.

Model 1B (Disordered gamblers): The model was statistically significant ($p < .01$) and explained 45% ($R2 = .45$) of the variability in gambling frequency. Peer norms and attitudes were significantly associated ($p < .01$)

with gambling frequency. Again, peer norms evidenced a relationship opposite to the direction postulated by the TPB.

Step 2: Gambling Intention and Gambling Frequency

The second step to testing the proposed TPB model was conducting a regression analysis to examine the association between intention to gamble and gambling frequency.

Model 2A (Non-disordered gamblers): The model explained 31% (R2 = .31) of the variance in gambling frequency. Findings indicated that intention to gamble had a positive significant ($p < .001$) relationship to gambling frequency.

Model 2B (Disordered gamblers): The model explained 36% (R2 = .36) of the variance in gambling frequency. Similar to Model 1, the analysis indicated that intention to gamble had a positive significant ($p < .001$) relationship to gambling frequency.

Step 3: Distal Determinants and Gambling Intention

The third step to test the proposed TPB model was conducting a multiple regression procedure to examine the association between intention to gamble and TPB distal determinants peer norms, friend/family norms, attitudes, and perceived behavioral control.

Model 3A (Non-disordered gamblers): The model was statistically significant ($p < .001$) and explained 25% (R2 = .25) of the variance in intention to gamble scores among participants in this sample. All TPB distal determinants, except for peer norms, were significantly associated ($p < .05$) in with intention to gamble.

Model 3B (Disordered gamblers): The model was not statistically significant ($p = .08$) and explained 28% (R2 = .28) of the variance in intention to gamble scores among participants in this sample. Peer norms was the only TPB distal determinant significantly associated ($p < .05$) with intention to gamble but was associated in a direction opposite to that hypothesized by the TPB.

Step 4: Distal Determinants, Gambling Intention and Gambling Frequency

The fourth and final step to testing the proposed TPB model was conducting a multiple regression procedure to predict frequent gambling using all TPB construct variables, including intention.

Model 4A (Non-disordered gamblers): This model indicated that intention to gamble served as a mediator in the model, especially concerning the relationship between frequent gambling and the following TPB constructs: (1) perceived behavioral control, (2) friend/family norms and (3) attitudes. As mentioned previously, the first model indicated that all four TPB distal determinants, peer norms, friend and family norms, attitudes, and perceived behavioral control, were significantly associated ($p < .05$) with gambling frequency and explained 36% (R2 = .36) of the variance in intention to gamble scores among participants in this sample. When intention was included in the model, the distal determinants perceived behavioral control, friend/family norms, and attitudes were no longer significantly associated with frequent gambling and their beta values were substantially lowered. Further, the results indicated that intention served as a partial mediator in the relationship between peer norms and frequent gambling. When intention was added to the model, peer norms remained significantly associated to frequent gambling but had a lower beta value.

Model 4B (Disordered gamblers): This model explained 63% (R2 = .63) of the variance in intention to gamble scores among participants in this sample. Further this model indicated that intention to gamble did not serve as a mediator in the model. Specifically, intention did not mediate the relationship between frequent gambling and the following TPB constructs: (1) perceived behavioral con-

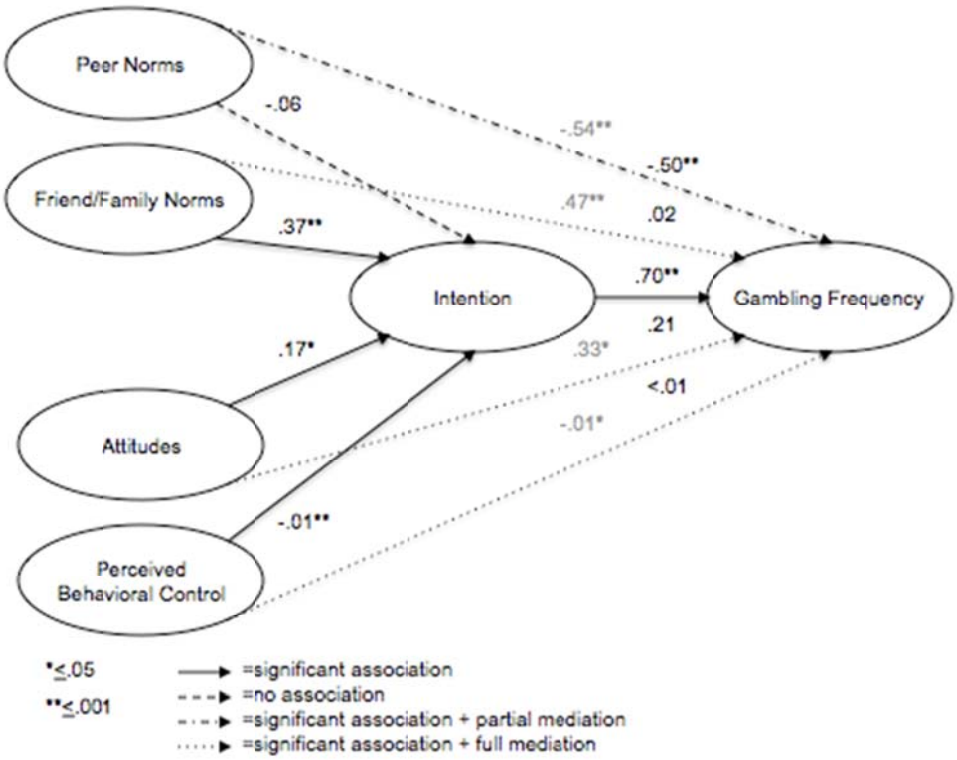

Figure 2. TPB Model: Non-disordered gamblers (N=342)

trol, (2) friend/family norms and (3) attitudes. Intention did mediate the relationship between frequent gambling and peer norms; however, this relationship was the direction opposite to that hypothesized by the TPB.

DISCUSSION

Disordered Gambling as a Moderator

Disordered gambling appears to moderate the aforementioned TPB models. The models for non-disordered gamblers were consistent with the previously reported models for the entire sample (Martin et al., 2010). However, the model for disordered gamblers was observably different from the one examining non-disordered gamblers (see Figures 2 & 3). Specifically, though the analyses for the sample of disordered gamblers indicated that (1) the distal determinants in the TPB model and (2) intention were predictive of frequent gambling, similar to the model for non-disordered gamblers, the relationship was cumulative, not meditational, and the individual predictors were different. For disordered gamblers, none of the TPB distal determinants were significantly associated with gambling intention in the model, and, consequently, intention, though it added to prediction, did not mediate the association between distal determinants and gambling frequency. In addition, neither perceived behavioral control nor friend and family norms were significantly associated with gambling frequency, and attitudes were more strongly related to gambling frequency than in the model for non-disordered gamblers. Further, these findings are not an artifact of less variance among disordered gamblers, as TPB distal determinants and gambling intention have more variance among disordered gamblers than non-disordered gamblers (see Table 2).

In general, the results from this research support the utility of TPB in explaining gambling behavior among college students who have not experienced gambling-related prob-

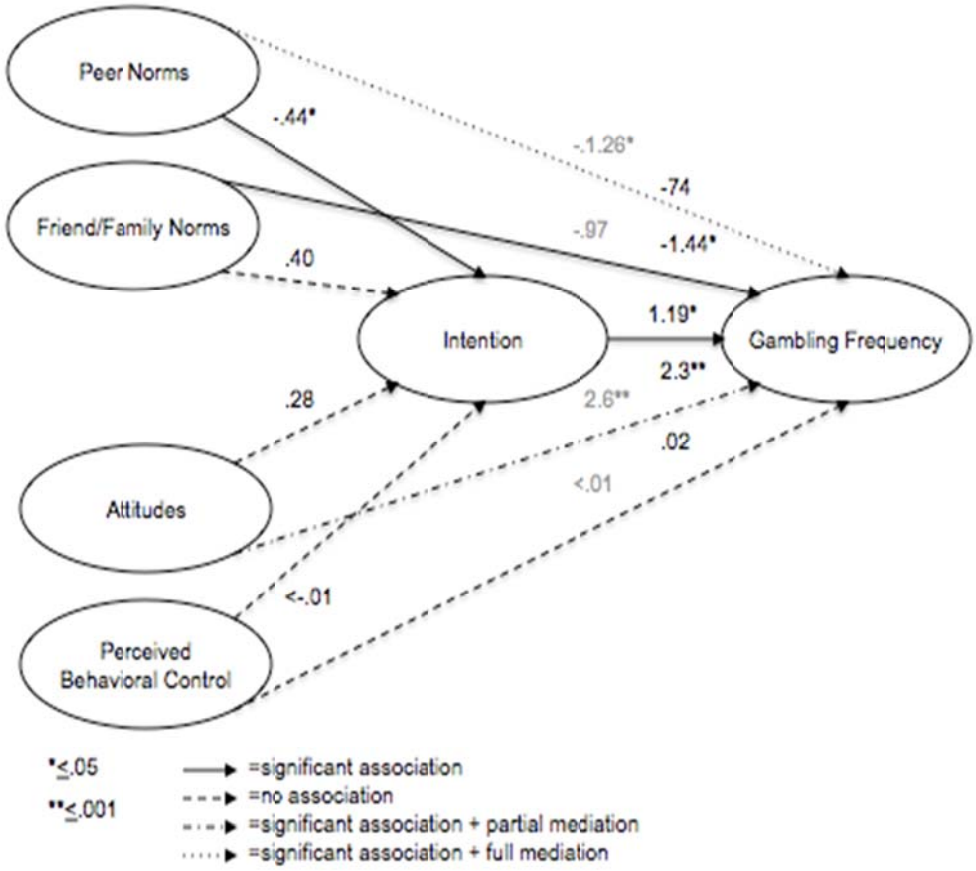

Figure 3. TPB Model: Disordered Gamblers (N=35)

lems. Friend/family norms, attitudes, and perceived behavioral control were significantly associated with gambling frequency and perceived behavioral control were significantly associated with gambling frequency and intention to gamble mediated the relationship. The findings of this study were consistent with results reported in other research (Larimer & Neighbors, 2003; Martin et al., 2010; Moore & Ohtsuka, 1997, 1999; Neighbors et al., 2007) that has examined gambling behavior among college students using TPB constructs.

However, this study also demonstrated that the TPB did not function as expected in predicting the gambling behavior among those who gambled at a disordered level. Moderator analyses indicated that TPB distal determinants (i.e., attitudes, subjective norms, and perceived behavioral control) did not predict intention to gamble among disordered gamblers. However, the model to predict frequent gambling of disordered gamblers via distal determinants was significant and attitudes significantly predicted gambling frequency. Thus, this analysis indicated that among disordered gamblers, distal determinants were predictive of gambling frequency regardless of one's intention. Though intention did also predict frequency, it did so independently of the distal determinants in the model. This suggests that for disordered gamblers, their attitudes may be influencing their behavior directly, despite their best intentions, and that gambling attitudes might be an important focus of intervention among these gamblers. Overall, this study indicates that the TPB is appropriate for predicting gambling intention and frequency among those without a gambling problem but that a different theoretical

model may be needed to predict gambling behavior among those with such a problem.

Significance

This study is the first of its kind to examine the role of intention to gamble as a mediator separately among disordered and non-disordered gamblers. Despite being limited by cross-sectional data, this study provides evidence of a mediating relationship between TPB constructs and gambling frequency among non-disordered gamblers that is consistent with what the TPB hypothesizes. However, among disordered gamblers, this study also found that intention did not mediate the relationship hypothesized by the TPB.

Implications

The results of this study have implications for researchers and other health professionals with an interest in promoting responsible gambling. Among non-disordered gamblers, results indicate that the TPB distal determinants, friend/family norms, attitudes and perceived behavioral control predict gambling intention and in turn, intention predicts gambling frequency. Thus, as mentioned in our previous study (Martin et al., 2010), efforts to decrease gambling frequency among college students without gambling problems should consider decreasing students' personal approval of gambling and increasing students' perception of their ability to control gambling in various situations.

Though one may think that TPB inspired interventions would be best served to target disordered gamblers, moderation analyses indicated that the relationship between TPB constructs and gambling frequency among disordered gamblers is less clear and requires further study. Specifically, although attitudes significantly predicted the gambling frequency of disordered gamblers, other TPB distal determinants (i.e., perceived behavioral control and friend and family norms) did not. In addition, results from this study show that disordered gamblers' intention to gamble is not influenced by any of the TPB distal determinants. These results indicate that disordered gamblers experience different relationships among gambling behavior and TPB distal determinants compared with gamblers who can regulate their behavior. This has implications for how we understand the decision-making process involved in gambling at disordered levels. Most notably, disordered gamblers appear to have difficulty controlling their behavior despite intentions to do otherwise. These findings are consistent with the classification of pathological gambling as an impulse-control disorder (American Psychiatric Association, 2000). Future research should consider exploring other potential influences on the gambling intention and gambling frequency of disordered gamblers, as well as the apparently strong direct relationship between attitudes and gambling in this population. In addition, more research is needed to determine what influences the move from frequent gambling to disordered gambling, as these gambling groups look fundamentally different according to the TPB model.

Future research using the TPB to predict gambling behavior might consider including other potentially pertinent variables, such as co-occurring psychiatric disorders. Researchers have found that disordered gamblers have a high likelihood of co-occurring disorders, including mood, anxiety, and alcohol and substance disorders (Kessler et al., 2008; Petry et al., 2005). In addition, it might be useful to examine expectations (e.g., Ladouceur et al., 2003; Pantalon et al., 2008) and impulsivity (e.g., Blanco et al., 2009; Petry, 2001; Vitaro et al., 1999), as those have been shown to influence gambling behavior.

Another alternative to further examine the usefulness of this model among disordered gamblers is dividing the gamblers into subsets. For instance, researchers have found that (1) positive reinforcement and (2) negative reinforcement show promise in predict

maintaining gambling behavior (Miller, Meier, Muehlenkamp, & Weatherly, 2009).

We also found that peer norms were negatively associated with gambling intention and frequency, a relationship that is opposite to that hypothesized by the TPB but that was also observed in other research (e.g., Neighbors et al., 2007). As mentioned in our previous research (Martin et al., 2010), this finding indicates that social norms campaigns concerning the gambling of peers and the perceptions of gambling of peers might not be an advisable strategy to decreasing gambling behavior on college campuses.

Limitations

There are a number of limitations in this research. This study relied on participants to self-report their gambling behavior; thus, participants might have been hesitant to share such information. In addition, there was also potential for recall bias, as we asked participants to report past year and lifetime gambling behavior. Consequently, respondents might not have accurately recalled their gambling behavior from those timeframes.

Another limitation is the lack of generalizability and the selection bias associated with the use of convenience samples. To decrease this limitation, we used general education courses, which included students from various majors. However, because this is a convenience sample, our findings might not be generalizable to the general college student population. Further, because this study examined college students at one large, public university in the Southeast, findings might not be generalizable to students attending colleges/universities of differing sizes and in differing parts of the US.

Another limitation was assessing disordered gambling over an individual's lifetime (current or historic) as opposed to specifically assessing problems in the past year. Contrary to the idea that PG is a relentlessly progressive disorder, research reveals that individuals move in and out of PG problems (LaPlante, Nelson, LaBrie, & Shaffer, 2008). Thus, it is likely that some of the participants classified as disordered gamblers might not have been experiencing problems currently or recently. Future research testing the ability of the TPB to predict gambling behavior among disordered gamblers should consider and account for the temporality of participant disordered gambling.

Another significant limitation was the small number of disordered gamblers. Consequently, sample size (i.e., inadequate statistical power) might account for coefficients not reaching significance in the model to explain gambling frequency among the sample of disordered gamblers. Future research testing the TPB among disordered gamblers should attempt to increase the number of disordered gamblers; thus, increasing the ability of the model to detect statistical significance.

Conclusion

Because of this study design and the limitations mentioned above, our results should be interpreted cautiously. However, our findings support further study of the predictive value of the TPB concerning gambling behavior, especially among disordered gamblers. Specifically, lessons from this research indicate that similar subsequent research should account for the temporality of disordered gambling (i.e., past year vs. lifetime) and increase the number of disordered gamblers to increase the ability of the model to detect statistical differences. Such a study could attain a more precise picture of gambling behavior and further validate the utility of TPB in examining gambling behavior.

These findings are consistent with previous research supporting the use of the TPB to explain gambling behavior among college students, especially those students who do not gamble at a disordered level. However, moderation analyses indicated that disordered gamblers might not proceed through the

thought processes that guide gambling in non-disordered gamblers (i.e., none of the TPB distal determinants predicted gambling intention and only attitudes predicted gambling frequency). Because the TPB is a rational model, it might not account for some of the processes going on among disordered gamblers. Finally, because of the small sample size of disordered gamblers and low statistical power observed in this research, the utility of the TPB among disordered gamblers requires further study.

REFERENCES

Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and *Human Decisional Process, 50*, 179-211.

Ajzen, I., & Fishbein, M. (1980). *The theory of planned behavior*. Englewood Cliff, NJ: Prentice Hall.

American Council on Education. (2007). *Fact Sheet on Higher Education*.

American Psychiatric Association. (1980). *DSM-III: Diagnostic and statistical manual of mental disorders* (Third ed.). Washington, D.C.: American Psychiatric Association.

American Psychiatric Association. (1987). *DSM III-R: Diagnostic and statistical manual of mental disorders*, third edition, revised. Washington, DC: American Psychiatric Association.

American Psychiatric Association. (1994). *DSM-IV: Diagnostic and statistical manual of mental disorders* (Fourth ed.). Washington, D.C.: American Psychiatric Association.

American Psychiatric Association. (2000). *DSM IV-TR: Diagnostic and statistical manual of mental disorders--Text revision* (Fourth ed.). Washington, D.C.: American Psychiatric Association.

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

Barron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173-1182.

Blanco, C., Potenza, M., Kim, S.-W., Ibanez, A., Zaninelli, R., Saiz-Ruiz, J., & Grant, J. (2009). A pilot study of impulsivity and compulsivity in pathological gambling. *Psychiatry Research, 167*, 161-168.

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

Engwall, D., Hunter, R., & Steinberg, M. (2004). Gambling and other risk behaviors on university campuses. *Journal of American College Health, 52*, 245-255.

Fishbein, M. (1967). Attitude and the prediction of behavior. In M. Fishbein (Ed.), *Readings in attitude theory and measurement* (pp. 477-492). New York: Wiley.

Kessler, R. C., Hwang, I., LaBrie, R. A., Petukhova, M., Sampson, N., Winters, K., & Shaffer, H. J. (2008). DSM-IV pathological gambling in the National Comorbidity Survey Replication. *Psychological Medicine 38*, 1351-1360.

LaBrie, R. A., Shaffer, H. J., LaPlante, D. A., & Wechsler, H. (2003). Correlates of college student gambling in the United States. *Journal of American College Health, 52*, 53-62.

Ladouceur, R., Sevigny, S., Blaszczynski, A. P., O'Connor, K., & Lavoie, M. E. (2003). Video lottery: Winning expectancies and arousal. *Addiction, 98*, 733-738.

LaPlante, D. A., Nelson, S. E., LaBrie, R. A., & Shaffer, H. J. (2008). Stability and progression of disordered gambling: Lessons from longitudinal studies. *Canadian Journal of Psychiatry, 53*, 52-60.

Larimer, M. E., & Neighbors, C. (2003). Normative misperception and the impact of descriptive and injunctive norms on college student gambling. *Psychology of Addictive Behaviors, 17*, 235-243.

Lesieur, H. R., & Blume, S. B. (1987). The South Oaks Gambling Screen (SOGS): A new instrument for the identification of pathological gamblers. *American Journal of Psychiatry, 144*, 1184-1188.

Little, R., & Rubin, D. (1987). *Statistical analysis with missing data*. New York: Wiley.

Martin, R. J., Usdan, S., Nelson, S. E., Umstattd, R., LaPlante, D. A., Perko, M., & Shaffer, H. J. (2010). Using the theory of planned behavior to predict gambling behavior. *Psychology of Addictive Behavior, 24*, 89-97.

May, R., Whelan, J., Steenbergh, T., & Meyers, A. (2003). The Gambling Self-Efficacy Questionnaire: An initial psychometric evaluation. *Journal of Gambling Studies, 19*, 339-357.

Miller, J., Meier, E., Muehlenkamp, J., & Weatherly, J. (2009). Testing the construct and validity of Dixon and Johnson's (2007) Gambling Functional Assessment. *Behavior Modification, 33*, 156-174.

Moore, S. M., & Ohtsuka, K. (1997). Gambling activities of young Australians: Developing a model of behaviour. *Journal of Gambling Studies, 13*, 207-236.

Moore, S. M., & Ohtsuka, K. (1999). The prediction of gambling behavior and problem gambling from attitudes and perceived norms. *Social Behavior & Personality, 27*, 455-466.

National Research Council. (1999). *Pathological gambling: A critical review*. Washington D.C.: National Academy Press.

Neighbors, C., Lostutter, T., Larimer, M., & Takushi, R. (2002). Measuring gambling outcomes among college students. *Journal of Gambling Studies, 18*, 339-360.

Neighbors, C., Lostutter, T., Whiterside, U., Fossos, N., Walker, D., & Larimer, M. (2007). Injunctive norms and problem gambling among college students. *Journal of Gambling Studies, 23*, 259-273.

Pantalon, M., Maciejewski, P., Desai, M., & Potenza, M. (2008). Excitement-seeking gambling in a nationally representative sample of recreational gamblers. *Journal of Gambling Studies, 24*, 63-78.

Petry, N. M. (2001). Substance abuse, pathological gambling, and impulsiveness. *Drug & Alcohol Dependence, 63*, 29-38.

Petry, N. M., Stinson, F. S., & Grant, B. F. (2005). Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry, 66*, 564-574.

Shaffer, H. J., & Hall, M. N. (2001). Updating and refining prevalence estimates of disordered gambling behaviour in the United States and Canada. *Canadian Journal of Public Health, 92*, 168-172.

Shaffer, H. J., Hall, M. N., & Vander Bilt, J. (1997). *Estimating the prevalence of disordered gambling behavior in the United States and Canada: A meta-analysis* (p. 122). Boston: Presidents and Fellows of Harvard College.

Shaffer, H. J., & Martin, R. J. (2011). Disordered gambling: Etiology, trajectory, and clinical considerations. *Annual Review of Clinical Psychology, 7,* 3.1-3.28.

Slutske, W. S., Jackson, K. M., & Sher, K. J. (2003). The natural history of problem gambling from age 18 to 29. *Journal of Abnormal Psychology, 112,* 263-274.

SPSS Inc. (2006). *SPSS* (Version 14.0). Chicago: SPSS.

Stuhldreher, W. L., Stuhldreher, T. J., & Forrest, K. Y. (2007). Gambling as an emerging health problem on campus. *Journal of American College Health, 56,* 75-83.

Vitaro, F., Arsenault, L., & Tremblay, R. E. (1999). Impulsivity predicts problem gambling in low SES adolescent males. *Addiction, 94,* 565-575.

Winters, K., Bengston, P., Door, D., & Stinchfield, R. (1998). Prevalence and risk factors of problem gambling among college students. *Psychology of Addictive Behaviors, 12,* 127-135.

Action Editor: Jeffrey N. Weatherly