Association Between Posttreatment Gambling Behavior and Harm in Pathological Gamblers

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This study investigated the relationship between posttreatment gambling behavior and harm in a sample of treatment-seeking pathological gamblers. One year after initiating treatment, participants ($n = 178$) completed the Gambling Timeline Followback (D. C. Hodgins & K. Makarchuk, 2003; J. Weinstock, J. P. Whelan, & A. W. Meyers, 2004) and the South Oaks Gambling Screen (SOGS; H. R. Lesieur & S. B. Blume, 1987), both of which assessed gambling behaviors and problems over the prior 6 months. Based upon self-reports of gambling-related problems on the SOGS, participants were classified as problem free (SOGS scores $= 0$) or symptomatic gamblers (SOGS scores ≥ 1). Receiver operator characteristic curves evaluated classification by gambling behaviors for individuals classified in these 2 groups. Behavioral indicators for problem-free gambling were gambling no more than once per month, gambling for no more than 1.5 hr per month, and spending no more than 1.9% of monthly income on gambling. Alternative behavioral indicators were examined along a continuum of harm (SOGS cut-points of 1–5). These results provide preliminary data regarding intensity of gambling behavior associated with problem-free to probable pathological gambling in gamblers who presented for treatment.

Keywords: pathological gambling, gambling behavior, harm

A significant proportion of pathological gamblers who resolve their gambling problems seek nonabstinence as their recovery goal (Blaszczynski, McConaghy, & Frankova, 1991; Dickerson & Weeks, 1979; Hodgins, Currie, & el-Guebaly, 2001; Hodgins & el-Guebaly, 2000; Marotta, 1999). Moreover, some prospective longitudinal and treatment studies have demonstrated that a proportion of former pathological gamblers can gamble, albeit at a significantly lower intensity, without experiencing problems (Abbott, Williams, & Volberg, 2004; Hodgins, Currie, el-Guebaly, & Peden, 2004; Ladouceur, 2005; Robson, Edwards, Smith, & Colman, 2002; Slutske, Jackson, & Sher, 2003; Stinchfield & Winters, 2001; Taber, McCormick, Russo, Adkins, & Ramirez, 1987). However, these studies did not provide specific information about the gambling behavior of those individuals who were no longer experiencing gambling-related harm. Therefore, the aim of this study was to develop behavioral indicators that would quantify the relationship between posttreatment gambling behavior and harm with the eventual long-term goal of establishing empirically based guidelines for moderation. Moderation guidelines would ultimately provide clinicians and those seeking to reduce their gambling behavior answers to the questions: "How often can I gamble?" and "How much can I spend?" Using a sample of individuals interviewed after seeking treatment for pathological gambling, this

article presents behavioral indicators for monthly gambling frequency, monthly gambling duration, and percentage of income spent gambling that are not associated with a return to problematic gambling.

Pathological gambling is described in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association, 1994) as "persistent and recurrent maladaptive gambling behavior" (p. 615), and approximately 1% of the general population meets diagnostic criteria (Gerstein et al., 1999; Shaffer, Hall, & Vander Bilt, 1999; Welte, Barnes, Wieczorek, Tidwell, & Parker, 2001). A defining characteristic of the disorder is a loss of control, in which the individual continues to gamble at the expense of relationships, job, finances, and possibly legal standing (National Research Council; NRC, 1999). The vast majority of pathological gamblers entering treatment report gambling at least weekly, wagering hundreds to thousands of dollars per month, and accumulating significant gambling-related debt (Hodgins et al., 2001; Stinchfield & Winters, 2001).

Moderation gambling, as opposed to pathological gambling, is defined as gambling at an intensity that does not cause harm to the individual or others, such as family and friends. Both Blaszczynski et al. (1991) and Stinchfield and Winters (2001) demonstrated the viability of moderation gambling with a proportion of pathological gamblers who have sought treatment. During follow-up evaluations, some nonabstinent gamblers in these studies reported similar improvements in psychosocial and financial functioning as abstinent pathological gamblers. In addition to being a viable outcome, a moderation-gambling goal as a treatment strategy has been hypothesized to encourage more pathological gamblers to seek treatment. Such a goal offers an alternative to abstinence for those not willing to quit gambling (Ladouceur, 2005).

Before moderation guidelines can be developed, a better understanding of pathological gamblers' behavior after treatment and

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how that behavior relates to harm is needed. In order to investigate this relationship, a criterion measure of harm or problems associated with gambling is needed. Such a measure would provide an operational guide to determine who is and is not experiencing gambling-related problems. Unfortunately, few psychometrically supported measures of problems related to gambling currently exist. Even fewer measures were in existence in 1998, when this present study began. The South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) was the only psychometrically supported measure of problem and pathological gambling at the time, and it was used to operationalize harm related to gambling behavior in this study.

Stinchfield (2002), in a psychometric evaluation of the SOGS, noted a potential problem with the measure in that at least three items are subjective and rely solely on individual judgment rather than actual behaviors. The three items are "Did you ever feel you had a gambling problem," "Did you gamble more than you intended," and "Did you ever feel guilty about your gambling?" The author also noted that social–recreational gamblers might endorse these subjective items. To overcome this shortcoming, two sets of behavioral indicators were highlighted in this study: (a) problem-free and (b) the continuum associated with various levels of harm. Problem-free gambling indicators were derived from analyses of individuals who, 12 months after initiating treatment, did not endorse any items on the SOGS (SOGS score = 0), including the subjective items. The continuum of harm behavioral indicators was derived from analyses of individuals who, 12 months after initiating treatment, endorsed problems associated with their gambling. We report behavioral indicators associated with four additional SOGS cut-points to elucidate the continuum of gambling behaviors associated with minimal problems (e.g., SOGS scores ≤ 1 vs. SOGS scores ≥ 2) up to probable pathological gambling (SOGS scores ≤ 4 vs. SOGS scores ≥ 5).

Difficulties also arise when assessing gambling intensity because of the lack of a single behavioral metric, such as standard drinks for alcohol consumption. This difficulty is partly because gambling is a heterogeneous collection of activities, including slot machines, lotteries, scratch tickets, bingo, and wagering on sports or animals (i.e., horses, dogs, etc.), all of which have different typologies (Dickerson, 1993). For example, Petry (2003) found sports bettors gambled less frequently than scratch–lottery players; however, the sports bettors wagered significantly more money and had larger gambling debts than the scratch–lottery players. These findings highlight the need to assess across several dimensions of gambling behavior.

Therefore, indices of gambling intensity evaluated and reported in this article include frequency, duration, and money spent gambling. These indices are commonly used to assess gambling intensity (e.g., Hodgins et al., 2001; Sylvain, Ladouceur, & Boisvert, 1998) and are reported within a monthly timeframe because gambling behavior can fluctuate dramatically over shorter periods (e.g., weekly). One variable, money spent gambling, is confounded by annual income (Volberg, 1994). An individual with an annual income of $100,000 would most likely characterize a gambling episode in which $1,000 was risked differently than an individual who earns $25,000 annually. Therefore, reporting money spent gambling as a percentage of income, instead of in dollars, reduces the influence of this individual difference and provides a standard-

ized scale for comparison. Money spent gambling was reported as a proportion of income in this article.

This study investigated posttreatment gambling behavior and how the behavior relates to gambling-related harm in pathological gamblers who have sought professional treatment. Problem-free behavioral indicators were derived such that those pathological gamblers who were no longer experiencing any symptoms of problematic gambling were distributed below the behavioral cutoffs on all three indices of gambling intensity and those still experiencing symptoms were distributed above the cutoffs. Alternative behavioral indicators using similar methods were explored along the continuum of harm from minimal problems to probable pathological gambling.

Method

Participants

The sample consisted of the 178 individuals who participated in a randomized controlled trial for the treatment of pathological gambling and completed the 12-month follow-up assessment, 77.1% of the original sample, $N = 231$; see Petry et al. (2006) for treatment outcome results. Participants were recruited using media announcements. Inclusion criteria were *DSM-IV* diagnosis of pathological gambling, gambling within the 2 months prior to enrolling in the study, age 18 years or older, and minimum of fifth grade reading level. Participants were excluded from the study if they expressed strong suicidal ideation, reported psychotic symptoms in the past month, or were receiving gambling treatment at another program at the time of the baseline assessment. The University of Connecticut Health Center Institutional Review Board approved this study, and informed consent was obtained prior to enrollment.

Procedures

Participants were randomized to one of three treatment conditions: referral to Gamblers Anonymous (GA), referral to GA plus cognitive behavioral treatment (CBT) provided in a workbook format, or referral to GA plus eight sessions of individual CBT. Participants completed assessments at baseline and at 1, 2, 6, and 12 months posttreatment. Petry et al. (2006) reported treatment outcomes across conditions. In this article, we report only relevant information from the baseline and 12-month assessments, regardless of treatment assignment.

Measures

Demographics. Information collected included age, gender, ethnicity, education, income, and marital status.

Gambling Timeline Followback (G-TLFB; Hodgins & Makarchuk, 2003; Weinstock, Whelan, & Meyers, 2004). The G-TLFB is a retrospective, calendar-based self-report measure of gambling behavior. It is an adaptation of the timeline follow-back assessment method that has been used widely to assess addictive behaviors (Sobell & Sobell, 1992). For each day the participant reported any gambling, the participant provided information about the total time and dollar amount spent gambling. The G-TLFB has adequate reliability and validity for gambling frequency, duration, and dollar amount spent (Hodgins & Makarchuk, 2003; Weinstock et al.,

2004). Participant reports of gambling on the G-TLFB have been found to be consistent with collateral reports in other samples (Hodgins & Makarchuk, 2003; McCormick & Taber, 1991) and in the present sample (Petry et al., 2006). Participants completed a 3-month G-TLFB at baseline and a 6-month G-TLFB at the 12-month follow-up evaluation.

South Oaks Gambling Screen (SOGS). The SOGS is a 20-item questionnaire that has demonstrated adequate reliability and validity in clinical samples (Lesieur & Blume, 1987; Stinchfield, 2002). Lesieur and Blume (1987) reported adequate test–retest reliability ($r = .71$) and convergent validity with clinician assessment of pathological gambling ($r = .86$) for the lifetime version of the SOGS. The past-6-months version of the SOGS correlated with *DSM-IV* diagnostic criteria for pathological gambling ($r = .83$), had satisfactory internal consistency ($\alpha = .86$), and had an overall sensitivity of 0.99 and specificity of 0.75 in a clinical sample (Stinchfield, 2002). Participants completed the lifetime version of the SOGS at the baseline assessment and a past-6-months version of the SOGS at the 12-month follow-up assessment. In this sample, the internal consistency of the past-6-months SOGS was $\alpha = .84$.

One item on the SOGS asks participants if they "ever had a problem with gambling," and response choices are "yes, now," "yes, in the past, not now," and "no." In scoring the measure (Lesieur & Blume, 1987), both yes responses are scored as positive and one point is added to a person's score. For purposes of this study, the response, "yes, in the past, not now" was not scored at the 12-month follow-up evaluation, because the entire sample consisted of pathological gamblers who sought treatment for gambling. If a participant endorsed, "yes, now," at the 12-month follow-up evaluation, this answer was tallied as a point in the scoring of the measure. All other scoring criteria were identical to that described by Lesieur and Blume (1987).

SOGS scores range from 0-20 with higher scores indicating more severe problems. Traditionally, scores 5 and higher on the SOGS are indicative of probable pathological gambling (Lesieur & Blume, 1987; Stinchfield, 2002). In this study, we emphasized the 12-month follow-up evaluation SOGS scores of 0 to identify individuals who were not experiencing any problems due to their gambling (i.e., problem-free) and compared these participants to those with SOGS scores of 1 or more (i.e., symptomatic). Alternative behavioral indicators were also investigated based on all other possible divisions of the SOGS up to a score of ≥ 5, the probable pathological gambling cutoff.

Collateral reports were obtained for the SOGS at the 12-month follow-up evaluation ($n = 109$). The collateral SOGS items had excellent internal consistency ($\alpha = .90$) in this sample and were correlated with participant SOGS scores ($r = .45$, $p < .001$). The percent agreement on SOGS classification (scores of 0, 1–2, ≥ 3) was 70.1% ($n = 77$ pairs), and coefficient kappa was 0.29. When the participant and collateral were not in agreement, the participant was more likely to indicate a more severe gambling problem than the collateral. These reports indicate external validity of the outcomes used in this study.

Analysis Plan

On the basis of past-6-month SOGS scores obtained from the participant at the 12-month follow-up assessment, participants were categorized as either problem-free (SOGS score = 0; $n = 45$)

or symptomatic gamblers (SOGS scores ≥ 1; $n = 133$). The 6-month G-TLFB from the 12-month follow-up evaluation served as the measure of gambling behavior. Separate receiver operator characteristic curve analyses (Macmillan & Creeland, 1991) determined the cutoff for three gambling behaviors: monthly gambling frequency, monthly gambling duration, and percentage of monthly income spent gambling. The cutoffs were selected to maximize both sensitivity and specificity while minimizing the discrepancy between the two. This method equally minimizes false positives and false negatives (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998; Gordon et al. 2001). Further evaluation of each of these behavioral cutoffs included positive predictive value, negative predictive value, and percentage of the sample correctly classified. Significance level was set at $p < .05$.

To further explore the behavior associated with gambling problems, the same analyses were repeated with participants recategorized along the range of possible SOGS cut-points from SOGS scores 1–5. Finally, two sets of behavioral indicators are derived using the procedures described previously with abstinent gamblers removed from the analyses because, by definition, abstinent gamblers' behavioral criteria are zero.

Results

The initial sample of treatment-seeking pathological gamblers consisted of 231 participants. No significant baseline gambling differences were found between those who completed the 12-month follow-up assessment ($n = 178$) and those who did not ($n = 53$) including number of days gambled, total time spent gambling, percentage of monthly income spent gambling, and number of *DSM-IV* pathological gambling criteria met, $p > .05$ (data not shown).

Baseline demographic and gambling characteristics of the 12-month follow-up sample are shown in Table 1. Slot machines were endorsed as the primary problematic gambling activity at baseline by 43.8% of the sample, 19.0% reported table games (e.g., roulette, blackjack, craps), 11.9% indicated lottery–scratch tickets, 7.9% endorsed betting on animals, 7.3% indicated sports betting, and the remaining 11.1% reported other types of gambling activities. Average lifetime SOGS score was 12.6 ($SD = 3.7$), and participants endorsed an average of 7.3 *DSM-IV* pathological gambling criteria ($SD = 1.6$) at baseline.

Problem-Free Indicators

On the basis of past-6-month SOGS scores obtained at the 12-month follow-up assessment, 45 participants were categorized as problem-free gamblers (SOGS scores = 0) and 133 were categorized as symptomatic gamblers (SOGS scores ≥ 1). The two groups were not significantly different on any demographic variables or baseline gambling behaviors, $p > .05$ (See Table 1).

Table 2 displays the past-6-month gambling behavior of the sample at the 12-month follow-up evaluation. In comparison to the symptomatic gambling group (SOGS scores ≥ 1), the problem-free gambling group (SOGS scores = 0) reported gambling less frequently, $F(1, 176) = 14.1$, $p < .001$, spending less time gambling, $F(1, 176) = 15.7$, $p < .001$, and spending a smaller proportion of their monthly income gambling, $F(1, 175) = 5.4$, $p < .05$. In the problem-free group, 30 participants were abstinent

Table 1
Baseline Characteristics of Sample That Completed the 12-Month Follow-Up Evaluation

Variable	Overall sample (*n* = 178)	Problem-free gamblers at follow-up (*n* = 45)	Symptomatic gamblers at follow-up (*n* = 133)
Age (years)	46.2 (10.6)	45.5 (10.2)	46.5 (10.8)
Annual income ($)	42,714 (35,557)	46,969 (38,639)	41,275 (34,489)
Male	92 (51.7%)	27 (60.0%)	65 (48.9%)
Education			
≤ High school	67 (37.6%)	16 (35.6%)	51 (38.3%)
Some college	53 (29.8%)	12 (26.7%)	41 (30.8%)
≥ College graduate	58 (32.6%)	17 (37.8%)	41 (30.8%)
Marital status			
Married/partner	78 (43.8%)	23 (51.1%)	55 (41.4%)
Divorced/separated	42 (23.6%)	12 (26.7%)	30 (22.6%)
Single	48 (27.0%)	9 (20.0%)	39 (29.3%)
Widowed	10 (5.6%)	1 (2.2%)	9 (6.8%)
Ethnicity			
African American	15 (8.4%)	8 (17.8%)	7 (5.3%)
Caucasian	153 (86.0%)	35 (77.8%)	118 (88.7%)
Other	10 (5.6%)	2 (4.4%)	8 (6.1%)
Employment status			
Work full time	102 (57.3%)	26 (57.8%)	76 (57.1%)
Work part time	30 (16.9%)	8 (17.8%)	22 (16.5%)
Unemployed	32 (18.0%)	4 (8.9%)	28 (21.1%)
Not in labor force	14 (7.9%)	7 (15.6%)	7 (5.3%)
Past-90-day gambling at baseline			
Monthly frequency	11.9 (9.2)	12.0 (9.5)	11.8 (9.2)
Monthly duration (hours)	31.8 (28.7)	26.5 (29.5)	33.2 (28.3)
Proportion of income spent gambling (%)	162.7 (364.1)	199.2 (544.8)	150.9 (283.4)

Note. Sample first characterized as problem-free or symptomatic based upon the 12-month follow-up evaluation. Identical sample later characterized as nondisordered or disordered based upon the 12-month follow-up evaluation. Values represent *n,* with percentages or means and standard deviations in parentheses.

throughout the 6 months prior to the 12-month follow-up evaluation along with 2 participants classified in the symptomatic gambling group.

Table 3 shows potential cutoffs obtained from the receiver operator characteristic curve analysis of problem-free gamblers (SOGS scores = 0). Also displayed on Table 3 are positive and negative predictive value and percent correctly classified associated with these cutoffs. For monthly frequency, the optimal problem-free cutoff in which sensitivity and specificity were maximized was gambling 0.7 times or less per month, area under the curve (AUC) = .87. For monthly gambling duration, the optimal problem-free cutoff was gambling 1.5 hr or less per month (AUC = .89). The optimal cutoff for percentage of monthly

income spent gambling was gambling 1.9% or less of monthly income (AUC = .90). Sensitivity and specificity were above 0.80 for all three cutoffs.

Range of Possible SOGS Cut-Points

The sample also was divided by 12-month follow-up SOGS scores four additional times to investigate the continuum of gambling from problem-free to probable pathological. The additional SOGS cut-points were SOGS scores ≤ 1 versus SOGS scores ≥ 2, SOGS scores ≤ 2 versus SOGS scores ≥ 3, SOGS scores ≤ 3 versus SOGS scores ≥ 4, and SOGS scores ≤ 4 versus SOGS scores ≥ 5. This examination of behavioral indicators at each

Table 2
Mean Values of Past-6-Month Gambling Behavior at 12-Month Follow-Up Evaluation

Variable	Problem-free gamblers (SOGS = 0; *n* = 45)		Symptomatic gamblers (SOGS ≥ 1; *n* = 133)	
	M	*SD*	*M*	*SD*
Monthly frequency (days)[**]	1.7	5.6	6.3	7.4
Monthly duration (hours)[**]	3.5	10.6	16.4	21.2
Percentage of monthly income spent[*]	3.9	10.8	73.9	202.1

Note. SOGS = South Oaks Gambling Screen.
[*] *p* < .05.   [**] *p* < .001.

Table 3
Sensitivity, Specificity, Predictive Values, and Percent Correctly Classified of Cutoffs for Problem-Free Gamblers at the 12-Month Follow-Up Evaluation (South Oaks Gambling Screen Scores = 0)

Indicator cutoffs	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Percent correctly classified
Monthly frequency					
0.0 episodes	0.98	0.67	0.90	0.94	90.4
≤ 0.7 episodes	0.86	0.80	0.93	0.67	84.8
≤ 1.0 episodes	0.76	0.82	0.93	0.54	77.5
Monthly duration					
0.0 hr	0.98	0.67	0.90	0.94	90.4
≤ 1.5 hr	0.83	0.87	0.95	0.64	84.3
≤ 3.0 hr	0.68	0.89	0.95	0.49	73.6
Percentage of monthly income spent gambling					
0.0	0.99	0.67	0.90	0.97	91.0
≤ 1.9	0.86	0.80	0.93	0.67	84.7
≤ 5.4	0.78	0.84	0.94	0.57	79.7

possible SOGS score cut-point between 0 and 5 related differing levels of harm in treatment-seeking pathological gamblers after treatment. Table 4 displays these cutoffs. Monthly gambling frequency ranged from less than 1 episode per month for the problem-free indicator to 1.5 episodes per month for the indicator associated with probable pathological gambling (SOGS scores ≤ 4 vs. SOGS scores ≥ 5). Monthly duration ranged from no more than 1.5 hr per month for the problem-free indicator to no more than 3.5 hr per month for the indicator associated with probable pathological gambling. Percentage of monthly income spent gambling ranged from no more than 1.9% of monthly income for the problem-free indicator to no more than 7.1% of monthly income for the indicator associated with probable pathological gambling. Sensitivity and specificity for all cutoffs ranged between 0.70 and 0.87.

Table 5 presents the potential behavioral cutoffs with the abstinent gamblers (n = 32) removed from the sample for two of the cutoffs: (a) disordered gamblers (SOGS scores ≥ 3) and (b) probable pathological gamblers (SOGS scores ≥ 5). For the disordered gambling grouping (SOGS scores 0–2; n = 28 and SOGS scores ≥ 3; n = 118) the optimal monthly frequency cutoff was 1.6 episodes or fewer per month (AUC = .63). For monthly duration, the optimal cutoff was gambling 4.6 hr or less per month (AUC = .72). The optimal cutoff for percentage of monthly income spent gambling was gambling 6.7% or less of monthly income (AUC = .76). Sensitivity for these three cutoffs ranged from 0.69 to 0.78, and specificity ranged from 0.50 to 0.71, when all abstinent gamblers were removed from the analyses.

Table 4
Sensitivity, Specificity, Predictive Values, and Percent Correctly Classified of Gambling Behavior Cutoffs Across a Range of South Oaks Gambling Screen (SOGS) Cut-Points (n = 178)

Behavioral indicator	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Percent correctly classified
Monthly frequency					
SOGS score 0; 1–20: ≤ 0.7 episodes	0.86	0.80	0.93	0.67	84.8
SOGS score 0–1; 2–20: ≤ 0.9 episodes	0.80	0.78	0.90	0.61	79.7
SOGS score 0–2; 3–20: ≤ 0.8 episodes	0.81	0.71	0.85	0.64	77.5
SOGS score 0–3; 4–20: ≤ 1.6 episodes	0.70	0.71	0.79	0.60	70.6
SOGS score 0–4; 5–20: ≤ 1.6 episodes	0.74	0.70	0.75	0.69	72.3
Monthly duration					
SOGS score 0; 1–20: ≤ 1.5 hr	0.83	0.87	0.95	0.64	84.3
SOGS score 0–1; 2–20: ≤ 1.4 hr	0.85	0.78	0.91	0.67	83.1
SOGS score 0–2; 3–20: ≤ 1.5 hr	0.86	0.76	0.88	0.72	82.6
SOGS score 0–3; 4–20: ≤ 3.5 hr	0.78	0.77	0.84	0.69	77.4
SOGS score 0–4; 5–20: ≤ 3.5 hr	0.82	0.75	0.80	0.78	79.1
Percentage of monthly income spent gambling					
SOGS score 0; 1–20: ≤ 1.9	0.86	0.80	0.93	0.67	84.7
SOGS score 0–1; 2–20: ≤ 3.5	0.83	0.78	0.91	0.64	81.4
SOGS score 0–2; 3–20: ≤ 5.8	0.82	0.83	0.91	0.69	81.9
SOGS score 0–3; 4–20: ≤ 6.7	0.81	0.83	0.88	0.73	81.4
SOGS score 0–4; 5–20: ≤ 7.1	0.84	0.80	0.84	0.80	81.9

Table 5

Sensitivity, Specificity, Predictive Values, and Percent Correctly Classified of Cutoffs With Abstinent Gamblers Removed at the 12-Month Follow-Up Evaluation (n = 146)

Indicator cutoffs	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Percent correctly classified
Disordered cutoff (SOGS ≥ 3; abstinent gamblers excluded)					
Monthly frequency					
≤ 0.9 episodes	0.82	0.39	0.85	0.34	74.0
≤ 1.6 episodes	0.69	0.50	0.85	0.28	65.8
≤ 3.1 episodes	0.55	0.57	0.84	0.23	55.5
Monthly duration					
≤ 1.5 hr	0.87	0.50	0.88	0.48	80.1
≤ 4.6 hr	0.70	0.64	0.89	0.34	69.2
≤ 7.1 hr	0.59	0.71	0.90	0.29	61.6
Percentage of monthly income spent gambling					
≤ 3.1	0.89	0.50	0.88	0.52	81.4
≤ 6.7	0.78	0.71	0.92	0.43	76.6
≤ 17.0	0.56	0.75	0.90	0.29	60.0
Probable pathological cutoff (SOGS ≥ 5; abstinent gamblers excluded)					
Monthly frequency					
≤ 0.9 episodes	0.87	0.39	0.73	0.63	70.5
≤ 1.9 episodes	0.71	0.57	0.75	0.51	65.8
≤ 3.1 episodes	0.61	0.63	0.75	0.46	61.6
Monthly duration					
≤ 4.0 hr	0.80	0.59	0.78	0.61	72.6
≤ 6.2 hr	0.73	0.71	0.82	0.58	71.9
≤ 9.1 hr	0.58	0.80	0.85	0.51	65.8
Percentage of monthly income spent gambling					
≤ 6.0	0.89	0.62	0.82	0.76	80.0
≤ 10.6	0.78	0.74	0.85	0.64	76.6
≤ 20.1	0.62	0.80	0.86	0.53	68.3

Note. SOGS = South Oaks Gambling Screen.

For the probable pathological gambling grouping (SOGS scores 0–4; *n* = 51 and SOGS scores ≥ 5; *n* = 95), the optimal monthly frequency cutoff was 1.9 episodes or fewer per month (AUC = .68). For monthly duration, the optimal cutoff was gambling 6.2 hr or less per month (AUC = .78). The optimal cutoff for percentage of monthly income spent gambling was gambling 10.6% or less of monthly income (AUC = .83). Sensitivity for these three cutoffs ranged from 0.71 to 0.78 and specificity ranged from 0.57 to 0.74, when all abstinent gamblers were removed from the analyses.

Discussion

This article provides pertinent information about the behavior of pathological gamblers after seeking treatment and how that behavior relates to harm. Specific gambling behavioral indicators were identified. Gambling behavior found to be associated with no problems in pathological gamblers who sought treatment was gambling less than once per month for a duration of no more than 1.5 hr per month and spending no more than 1.9% of monthly income on gambling. Additionally, the performance of these problem-free indicators was robust. Sensitivity and specificity were at least 0.80 for all three indicators, meaning that more than 80% of the problem-free gamblers were gambling below the indicator and more than 80% of the symptomatic gamblers were gambling above the behavioral indicators. These findings provide detailed information about gambling behavior that is not related to harm in pathological gamblers who sought professional treatment. The findings also represent an initial step toward the ultimate goal of understanding moderation gambling after treatment.

A range of behavior was associated with the continuum of gambling-related harm (i.e., SOGS scores). Monthly frequency and monthly duration approximately doubled from the problem-free to the probable pathological cutoffs. The indicator for percentage of income spent gambling had the most dramatic increase, being three times higher at the probable pathological cutoff (7.1%) than at the problem-free cutoff (1.9%). This finding highlights the importance of money as a measure of gambling intensity and its relationship to harm. Other studies from the field of economics indicate that a disproportionate amount of gambling expenditures are derived from problem and pathological gamblers (Volberg, Gerstein, Christiansen, & Baldridge, 2001) and that financial well-being is threatened as the proportion of income spent gambling increases (MacDonald, McMullan, & Perrier, 2004). The relationship between expenditures and gambling-related harm was also apparent in our investigation. Overall, the problem-free percentage

of monthly income indicator appears to have the greatest face validity in that the amount of money it represents is conservative and relatively minimal, especially in comparison to the probable pathological indicator and the participants' baseline gambling.

The fact that several problem-free gamblers exceeded the cut-offs and did not experience problems suggests that these behavioral indicators are conservative estimates, and clearly no indicator will have perfect sensitivity and specificity. The converse should also be noted in that a proportion of symptomatic gamblers were gambling below the cutoff and still experiencing problems. This disparity may partly be because different gambling activities are associated with different gambling typologies (Dickerson, 1993; Petry, 2003). Therefore, these behavioral indicators may need adjustment depending upon type of gambling activity in which the individual engages. Unfortunately, we were unable to investigate by type of gambling activity with this sample due to the small sample sizes that would have resulted from dividing the sample into multiple subgroups.

Meanwhile, gambling indicators were completed both with and without abstinent gamblers included in the analyses. When abstinent gamblers were removed from the sample, the disordered gambling indicators increased twofold in terms of monthly frequency and monthly duration. Percentage of monthly income spent gambling increased only marginally ($\leq 5.8\%$ to $\leq 6.7\%$). However, sensitivity and specificity decreased when abstinent gamblers were excluded from the analyses. In part, these reductions may relate to the small sample of individuals that remained when abstinent gamblers were removed, effectively decreasing the sample size by half. The inclusion of abstinent gamblers in the problem-free indicators likely yielded lower, more conservative thresholds of gambling behavior. Because these indicators are the first set to be propagated, we chose to focus upon a more conservative strategy.

Several caveats go along with these behavioral indicators of gambling without harm. First, the type of gambling activity engaged in during the follow-up assessment period may differ from the problematic gambling activity identified at baseline. For example, playing slot machines may have been the problematic gambling activity at baseline; and, during the follow-up period, the individual may have purchased lottery tickets. Unfortunately, type of gambling was not collected at the 12-month follow-up assessment; and, even if it had been, we would not have had the power to detect differences between groups subdivided by gambling types. Second, the context surrounding the gambling behavior reported during the follow-up time period is unknown. That is, gambling may have been a planned episode, or it may have been a slip. This contextual factor is important, as some pathological gamblers may be able to gamble in a controlled manner over time whereas others cannot. We did not collect information about participants' intention to engage in abstinence or controlled gambling following treatment. Regardless of the type of gambling during the follow-up time period and whether it was planned or not, in most cases gambling behavior that was below the indicators presented here did not cause notable harm.

Another limitation of these behavioral indicators is applicability beyond pathological gamblers to social and recreational gamblers. Social and recreational gamblers who have never experienced pathological gambling may be able to gamble at differing intensities without experiencing problems. This topic is just beginning to garner attention from researchers (Currie et al., 2006), and we should be cautious in applying these behavioral indicators to nontreatment-seeking individuals. The indicators do appear to be applicable to treatment-seeking pathological gamblers regardless of initial problem severity as no differences in baseline severity were detected between those below and above the indicators, including number of days gambled, dollars spent gambling, and *DSM-IV* pathological gambling criteria. Therefore, initial problem gambling severity does not appear to be linked to later gambling-related harm in treatment-seeking pathological gamblers.

Nevertheless, gambling after treatment may not be an appropriate goal for everyone. Within this sample, only a small minority of individuals were gambling after treatment without significant problems. We recommend that future studies investigate for whom moderation gambling is appropriate. Blaszczynski and Nower (2002) posit that a subset of pathological gamblers who gamble excessively due to behavioral conditioning but are relatively psychologically healthy seem most appropriate for a moderation goal. Alternatively, they also suggest that a moderation goal may not be appropriate for pathological gamblers with comorbid conditions, such as depression or impulsivity, because these comorbid conditions may negatively influence the gambling behavior. A review of the research on controlled drinking suggests that a moderation goal might also be appropriate for those who believe a controlled goal is realistic and sustainable and for those who are more psychologically and socially stable (Rosenberg, 1993).

Although one strength of this investigation was the 6-month assessment period for gambling behavior and associated harm, the performance of these behavioral indicators beyond the timeframe studied remains unknown. Longer term follow-up is needed to investigate whether gambling at these levels is sustainable or results in relapse to pathological gambling. Moreover, 23% of the initial sample did not complete the 12-month follow-up evaluation. Although no differences in gambling behavior or severity were noted between those who completed the 12-month follow-up evaluation and those who did not, the impact of these missing individuals upon the indicators is unclear.

The SOGS was the sole measure of harm used in this study, as *DSM-IV* criteria counts were not administered at the posttreatment and follow-up evaluations. However, the SOGS may be more sensitive than other measures (National Research Council, 1999) because studies identify a much higher proportion of people as problem and pathological gamblers when the SOGS is used relative to when *DSM-IV* based measures are employed (Cox, Enns, & Michaud, 2004; Welte et al., 2001). Thus, the measure we used may be an even better evaluation tool than *DSM-IV*-based assessments for determining harm associated with gambling behavior.

Due to the preliminary nature of these behavioral indicators and concerns about how to best define harm, this article emphasized different thresholds of harm and the subsequent behavioral indicators. Additionally, because gambling behavior can be viewed as a continuum (National Research Council, 1999) and the relationship between exposure (i.e., frequency, duration, and money spent) and harm is complex (Orford, 2005), we presented indicators derived from alternative SOGS score cut-points between 0 and 5. Together, all these possible cutoffs present a continuum of gambling behavior related to differing levels of harm. Obviously, empirical confirmation is needed and recommended, not only to ensure that these indicators are valid but also to begin the task of

developing moderation guidelines and identifying for whom moderation gambling is, and for whom it is not, an appropriate goal.

Whenever self-reports are used, especially with addictive behaviors, concern exists about measurement error associated with these reports (Babor & Del Boca, 1992). In this study, there was no known advantage for participants to misrepresent themselves during the follow-up evaluations, aside from social desirability, as the information was not shared with therapists or any other party. Previous studies have found social desirability was not associated with various self-report measures of gambling and gambling behavior (May, Whelan, Steenbergh, & Meyers, 2003; Steenbergh, Meyers, May, & Whelan, 2002; Weinstock et al., 2004). Furthermore, this study utilized collateral reports and found concordance between participant and collateral reports for gambling behavior and associated harm.

The use of a treatment sample provided two distinct advantages for developing behavioral indicators. First, all participants were assessed at multiple time points (e.g., pre- and posttreatment) using psychometrically supported instruments that independently assessed gambling behaviors and problems. Second, a significant proportion of individuals moved from problematic gambling to being problem free, while some individuals continued to experience problems due to their gambling. The movement or lack of movement along the continuum of gambling problems permitted within-subject comparison.

In summary, this study empirically evaluated posttreatment gambling in relation to harm in a sample of pathological gamblers who presented for treatment. Behavioral indicators for problem-free gambling were gambling less than once per month, gambling no more than 1.5 hr per month, and spending no more than 1.9% of monthly income on gambling. These novel findings provide information about when former pathological gamblers' gambling behavior may no longer be harmful. The study also represents an initial step in developing moderation guidelines that would offer a potential alternative to abstinence for some pathological gamblers seeking to change their behavior.

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