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## Daily Tobacco Smoking in Treatment-Seeking Pathological Gamblers: Clinical Correlates and Co-occurring Psychiatric Disorders

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### Abstract

**Objectives**—Tobacco smoking and pathological gambling (PG) frequently co-occur. Little is known, however, about the clinical correlates and co-occurring psychiatric disorders in treatment-seeking pathological gamblers with and without daily tobacco smoking.

**Methods**—Among a sample of 465 consecutive treatment-seeking subjects with current DSM-IV PG, those with daily tobacco smoking were compared to those without daily tobacco smoking on measures of gambling symptom severity (South Oaks Gambling Screen [SOGS] and the Yale Brown Obsessive Compulsive Scale Modified for Pathological Gambling [PG-YBOCS]), types of gambling, social and legal problems, and co-occurring disorders.

**Results**—Two hundred and nine (44.9%) of the 465 subjects with PG reported current daily tobacco smoking. Gamblers with daily tobacco smoking as compared to those without had higher SOGS scores, had more severe PG-YBOCS behavior scores, endorsed more DSM-IV PG criteria, lost more money gambling, and were more likely to engage in non-strategic gambling, and were less likely to have a co-occurring mood disorder. Gamblers with daily tobacco smoking and a current substance use disorder reported a greater percentage of income lost to gambling during the past year.

**Conclusions**—Daily tobacco smoking in PG is common and associated with multiple important clinical features including more severe gambling and financial problems. These findings suggest that pathological gamblers with daily tobacco smoking might need unique or enhanced treatment strategies.

### Keywords

pathological gambling; nicotine; impulse control disorders; tobacco; addiction

## INTRODUCTION

Pathological gambling (PG) is characterized by persistent and recurrent maladaptive patterns of gambling. PG is associated with impaired functioning, reduced quality of life, bankruptcy, divorce and suicide.<sup>1-4</sup> Past-year adult prevalence rates for PG are estimated at 1%.<sup>5-6</sup> PG frequently co-occurs with other psychiatric disorders, including nicotine dependence.<sup>5</sup>

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Among US adults, 16.7% to 22.4% report daily tobacco use.<sup>7-8</sup> Estimates of daily tobacco use among problem/pathological gamblers have varied from 41% to 69%.<sup>9-12</sup> Previous research has suggested that tobacco use is associated with more severe gambling problems,<sup>13-14</sup> depressive symptoms, and non-strategic forms of gambling.<sup>9</sup> However, these investigations did not consistently study individuals with PG, utilize diagnostic assessments for PG or other psychiatric disorders, use clinician-based assessments of gambling severity, examine treatment-seeking populations, or consider the relationship with non-tobacco forms of substance abuse or dependence. As both PG and tobacco smoking are associated with other substance use disorders, considering the potential influence of other forms of substance abuse/dependence on the relationship between tobacco smoking and PG is important. Recognizing the associations between daily tobacco smoking and current gambling symptomatology among individuals seeking treatment for PG is important as tobacco use may have implications for the clinical course of PG. For example, a recent study using imaginal desensitization in the treatment of PG found that current tobacco use was the strongest predictor of relapse to gambling after response to psychotherapy.<sup>15</sup>

The goal of the present study was to clarify the association between daily tobacco smoking and gambling symptomatology using a large sample of individuals meeting DSM-IV criteria for current PG and seeking treatment for the disorder. Based on previous research,<sup>9, 13-14</sup> we hypothesized that for PG subjects with and without other substance abuse/dependence: 1) daily tobacco smoking would be common; 2) daily tobacco smoking would be associated with worse gambling symptomatology; 3) daily tobacco smoking would be associated with non-strategic forms of gambling; and 4) daily tobacco smoking would be associated with mood disorders.

## METHODS

### Subjects

Participants included 465 adult outpatients aged  $\geq 18$  years meeting current (past-year) DSM-IV criteria for PG and seeking treatment for the condition. Participants were recruited over a 7-year period (2001-2007) by advertisements and referrals for a cognitive-behavioral therapy study, pharmacological studies, or for outpatient treatment at either a private or a public hospital. Recruitment methods have been described in detail previously<sup>15-19</sup> and are described in brief below. Although each treatment study had specific exclusion/inclusion criteria,<sup>15-19</sup> subjects not meeting these criteria were offered treatment in an outpatient clinic and asked to be included in ongoing, naturalistic treatment studies of PG. Although the treatment studies excluded subjects with current psychotic disorders or lifetime bipolar disorder, all subjects who sought treatment and were excluded from treatment studies were offered treatment in an outpatient clinic and included in the database. Data are not available on how many subjects were excluded from treatment studies who then came to the outpatient clinic versus those who came to clinic for outpatient treatment without contacting us for a study. No inclusion/exclusion criteria applied to those subjects who were treated in the outpatient clinic. Of the 465 subjects included in this database, 253 (54.4%) were recruited from pharmacological studies, 76 (16.3%) were recruited from a psychotherapy study, and 136 (29.2%) were recruited from an outpatient clinic. Subjects were recruited from two geographical sites – a Midwest public university hospital ( $n=393$ ; 84.5%) and an East coast private university hospital ( $n=72$ ; 15.5%).

The investigation was conducted in accordance with the Declaration of Helsinki. The Institutional Review Boards of the University of Minnesota and Butler Hospital approved the studies and the consent statements. All study participants provided voluntary written informed consent.

## Assessments

At the intake interview, raters assessed each subject using the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I)<sup>20</sup> and the Structured Clinical Interview for Pathological Gambling (SCI-PG), a valid and reliable diagnostic instrument.<sup>21</sup>

A detailed clinical examination was used to collect information on demographic and clinical features of PG. All subjects included in this analysis were drawn from states where multiple types of gambling (i.e. both strategic and non-strategic) were available. Financial information was collected with routine questions asking about money lost to gambling and financial effects of gambling.

### PG symptom severity was assessed with three measures

**Yale Brown Obsessive Compulsive Scale Modified for Pathological Gambling (PG-YBOCS):** The PG-YBOCS is a reliable and valid, 10-item, clinician-administered scale, reflecting gambling symptoms within the last seven days.<sup>22</sup> The first five items of the PG-YBOCS comprise the gambling urge/thought subscale (time occupied with urges/thoughts; interference and distress due to urges/thoughts; resistance against and control over urges/thoughts), and items 6-10 comprise the gambling behavior subscale (time spent gambling and amount of gambling; interference and distress due to gambling; ability to resist and control gambling). Items are rated from 0 to 4, with higher scores reflecting greater severity, and total scores ranging from 0 to 40.

**South Oaks Gambling Screen (SOGS):** The SOGS is a valid and reliable, 20-item, self-report screening instrument. The SOGS assesses gambling symptoms over a person's lifetime.<sup>23</sup> A score of 5 or more on the SOGS indicates probable PG.

**Clinical Global Impression-Severity scale (CGI):** The CGI Severity scale is a reliable and valid, 7-item scale assessing severity of PG symptoms at the baseline visit. The scale ranges from 1 = "not ill at all" to 7 = "among the most severely ill."<sup>24</sup>

All subjects were queried regarding tobacco use. Subjects were drawn from states which did not restrict smoking in the casinos. Although no formalized smoking assessment was used, all subjects were interviewed by two of the investigators (JEG or SWK) who asked if the person was a current user of tobacco, the form of tobacco, and the amount of tobacco use. Subjects who smoked tobacco daily for the past 12-months were categorized as "daily tobacco smokers." All daily tobacco smokers reported smoking cigarettes and self-reported measures of cigarettes per day were collected.

## Statistical analysis

The percentage of PG subjects who reported current (past 12 months) daily tobacco smoking was determined. Those PG subjects who smoked tobacco daily were compared to those without daily tobacco smoking on demographic and clinical variables. Differences between the two groups were examined using Pearson chi-square, Fisher's exact, t-tests (two-tailed), or Mann-Whitney test. To investigate whether some observed differences between daily and non-daily tobacco users may be associated with current substance use disorders, the sample was stratified according to current substance use status. All comparison tests were two-tailed. A Bonferroni correction was used to correct for multiple comparisons, yielding an alpha level of .004 to determine statistical significance. Although no data reached statistical significance using the Bonferroni correction, we highlight statistical differences at the .05 alpha level as these findings may have clinical significance.

## RESULTS

### Daily Tobacco Smoking and Sociodemographic Variables

465 adults (250 [53.8%] females; mean age =  $47.6 \pm 11.4$  [range 19-78]) with DSM-IV PG participated in the studies. The majority of subjects were white, non-Hispanic ( $n=429$ ; 92.3%). 143 (30.8%) subjects were single and 322 (69.2%) were married, divorced, separated, or widowed. 277 (59.6%) had at least some college education.

Of the 465 PG subjects, 209 (44.9%) (95%CI=40.4%-49.4%) reported current daily tobacco smoking. Subjects with daily tobacco use smoked a mean of  $25.2 \pm 13.4$  [range 5-80] cigarettes per day. The daily tobacco smoking group did not significantly differ from those without daily tobacco smoking on demographic features (Table 1). Of the non-daily tobacco smokers, 107 (23.0%) were former smokers.

### Gambling Severity

PG subjects with daily tobacco smoking were distinguished at  $p<0.05$  from those without daily tobacco smoking group on money lost gambling during the past year (\$21,243 vs. \$14,738;  $z=-2.106$ ;  $p=.035$ ), financial difficulties secondary to gambling (80.9% compared 73.0%;  $\chi^2=3.915$ ;  $df=1$ ;  $p=.048$ ), SOGS scores ( $14.3 \pm 3.3$  vs.  $13.1 \pm 3.8$ ;  $t=2.407$ ;  $df=463$ ;  $p=.017$ ), PG-YBOCS behavior scores ( $10.3 \pm 3.8$  compared to  $9.3 \pm 4.0$ ;  $t=2.068$ ;  $df=463$ ;  $p=.040$ ), and DSM-IV PG criteria ( $8.1 \pm 1.3$  compared to  $7.5 \pm 1.6$ ;  $t=2.351$ ;  $df=463$ ;  $p=.020$ ). In all cases, PG subjects with daily tobacco smoking had mean values reflecting greater problem gambling severity.

Of the 465 PG subjects, 110 (23.7%) had a current substance use disorder. 94 (20.2%) had an alcohol use disorder and 32 (6.9%) had a drug use disorder (most commonly, cannabis use disorder and cocaine use disorder). When the subjects were grouped by current substance use disorders, PG subjects with current substance use disorders plus daily tobacco smoking were distinguished at  $p<0.05$  from those with current substance use disorders but without daily tobacco smoking in terms of the percentage of income spent gambling in the past year (75% compared to 55%;  $z=-1.983$ ;  $p=.047$ ). For those PG subjects without current substance use disorders, daily smokers had higher SOGS scores ( $14.1 \pm 3.3$  vs.  $13.0 \pm 3.8$ ;  $t=1.989$ ;  $df=353$ ;  $p=.048$ ). No other differences were significant at the  $p<.05$  level when stratifying the sample according to the presence or absence of current substance use disorders.

### Types of Gambling Problems

PG subjects with daily tobacco smoking and no current substance use disorder were distinguished at  $p<0.05$  from those without daily tobacco smoking and no current substance use disorder on the measure of non-strategic gambling problems. For those with no current substance use disorder, PG subjects with daily tobacco smoking more frequently reported problems with non-strategic gambling (86.5% compared 78.0%;  $\chi^2=4.170$ ;  $df=1$ ;  $p=.041$ ). This difference seemed largely attributable to slot machine and bingo gambling.

### Psychiatric Comorbidity

Although rates of most Axis I co-occurring disorders did not significantly differ between groups, PG subjects with daily tobacco smoking and no current substance use disorder were significantly less likely to have a co-occurring mood disorder (18.7% vs. 30.5%;  $\chi^2=6.414$ ;  $df=1$ ;  $p=.011$ ) (Table 3). In those without a current substance use disorder, the groups of PG subjects with and without daily tobacco smoking were distinguished at  $p<0.05$  in terms the rate of depressive disorder NOS but not by the presence of any anxiety or eating disorder (Table 3).

## DISCUSSION

This study is the first to examine a large group of treatment-seeking individuals with PG with respect to daily tobacco smoking. A broad range of self-report and clinician-based measures was used. In contrast to prior studies which either used only self-report measures of gambling<sup>14</sup> or had smaller samples,<sup>13</sup> this study allowed for a more complete assessment of gambling-related thoughts and behaviors and had the power to identify between-group differences related to smoking status. In addition, this is the first study to investigate the relationship between PG and tobacco smoking in a large clinical sample when stratifying the group according to presence or absence of a non-tobacco substance use disorder.

### Hypothesis 1 (daily tobacco smoking will be common in PG)

In this study, we determined the frequency and clinical correlates of daily tobacco smoking in 465 treatment-seeking individuals with current DSM-IV PG. Consistent with our first hypothesis, close to one-half (45%) of PG subjects in this study reported current daily tobacco smoking. This percentage is two to three times higher than that found in the general population (16.7% to 22.4%)<sup>7-8</sup> and consistent with frequencies found previously in problem and pathological gamblers (41% to 69%).<sup>9-14, 25</sup>

### Hypothesis 2 (daily tobacco smoking will be associated with worse gambling symptomatology)

Consistent with previous studies<sup>14</sup> and generally supportive of our second hypothesis, we found that daily tobacco smoking was associated with more severe gambling symptoms as determined by most measures. For example, the SOGS scores, as well as the percentage of gross income spent on gambling, were higher in those with daily nicotine use, but the PG-YBOCS behavior subscale, the CGI Severity scores, and the amount of time spent gambling did not differ significantly based on daily tobacco smoking. Some of these measures did, however, approach significance at  $p < 0.05$ . These findings suggest an influence of tobacco smoking on gambling, particularly with respect to specific aspects. For example, between-group differences in PG-YBOCS measures of gambling behavior but not thoughts or urges suggests that impairments in behavioral control might be related to the co-occurrence of tobacco smoking and PG. This interpretation would suggest that treatment strategies enhancing behavioral control might be particularly helpful for targeting smoking cessation and excessive gambling in daily smoking pathological gamblers.

The association between smoking and gambling could be mediated in multiple, non-mutually exclusive manners. For example, individuals who smoke could be more likely to gamble through events related to tobacco smoking; e.g., purchasing of scratch-off lottery tickets when purchasing cigarettes. Alternatively, individuals who gamble might be more likely to smoke; e.g., if smoking is a cultural component of a gambling venue like a casino. A third possibility is that smoking may influence gambling through experiences of reward or pleasure that influence behavioral decision-making.<sup>26-27</sup> A fourth possibility is that specific individuals (e.g., those who are more impulsive) may be predisposed to engage excessively in both smoking and gambling. Additional research is needed to clarify these possibilities and develop more effective treatment strategies for individuals with co-occurring PG and daily tobacco smoking.

### Hypothesis 3 (daily tobacco smoking will be associated with non-strategic forms of gambling)

Consistent with prior research,<sup>9</sup> daily tobacco smoking was associated with non-strategic forms of problem gambling, particularly slot machine and bingo gambling. This association appeared particularly relevant to daily-tobacco-smoking PG subjects without another current substance use disorder, suggesting that the confluence of substance use disorders influence the

pattern of gambling in which individuals with PG engage. Non-strategic forms of gambling typically occur in casinos, halls or other venues in which groups congregate. Public health concerns related to first- and second-hand smoke have led to recent restrictions on smoking within some but not all such venues. The potential impact that such restrictions have on gambling behaviors warrants investigation.

#### **Hypothesis 4 (daily tobacco smoking will be associated with greater rates of mood disorders)**

Contrary to our fourth hypothesis, PG subjects with daily tobacco smoking in this study were less likely meet criteria for a current mood disorder. This finding was observed within the group of PG subjects without a current non-tobacco substance use disorder but not in those with a current non-tobacco substance use disorder. Previous research in community samples has found higher estimates of most Axis I disorders, including major depressive disorder, in individuals with daily tobacco use as well as in pathological gamblers.<sup>5, 28-31</sup> However, these studies typically did not stratify according to non-tobacco substance use disorder status. One previous study reported no significant between-group differences in ratings of depression in tobacco smoking and non-smoking problem gamblers in treatment.<sup>14</sup> Our estimates of current mood disorders for the overall sample are consistent with rates found in other studies (16.1% - 20.0%).<sup>5,32</sup> One explanation for the lower current rates of mood disorders found in tobacco smokers might be that lifetime rates of mood disorders were higher in those PG subjects with daily tobacco smoking but current rates reflect having sought treatment for mood disorders. Alternatively, this finding raises the question of whether tobacco smoking, in some PG subjects, may have an antidepressant effect. Causal factors underlying the relationship between mood, tobacco smoking and PG, particularly in relation to other substance use disorders, however, have yet to be identified and warrant further investigation.

#### **Clinical Implications**

The finding that pathological gamblers with daily tobacco smoking as compared to those without differed on multiple clinical measures is consistent with research on tobacco's influence on other disorders and has significant implications for PG. Studies of cannabis use disorders demonstrate that untreated tobacco use results in fewer weeks of continuous abstinence.<sup>33-34</sup> Additionally, some research suggests that treatment for tobacco use may benefit individuals who are attempting to maintain abstinence from alcohol.<sup>35</sup> The implications of this research for PG are numerous. First, because gambling severity is associated with tobacco use, there is a significant need to understand better the nature of this relationship and enhance screening and prevention efforts related to tobacco use in individuals with PG. Second, daily tobacco smoking in PG was associated with more severe financial and possible legal difficulties secondary to gambling. Clinicians who screen for PG should be aware of treatment and counseling services that include financial and legal service. Third, in that types of problematic gambling appear more closely linked with tobacco smoking, prevention efforts targeting smoking cessation in gambling venues should consider assessing the public health implications related to PG.

#### **Limitations and Strengths**

This study has several limitations. First, daily tobacco smokers were considered together as a group. Additional information relating to severity and chronicity of tobacco smoking could be helpful in better understanding the relationship between smoking and gambling in PG. Second, non-daily tobacco smokers were considered together as a group. This group could include tobacco users ("chippers", cigar or pipe smokers, users of chewable tobacco) who might not smoke on a daily basis, as well as prior daily tobacco smokers who are typically infrequent amongst problem gamblers.<sup>9</sup> Future studies should delineate subsets of pathological gamblers according to a more complete battery of qualitative and quantitative set of smoking measures



(e.g., a Fagerstrom Test for Nicotine Dependence<sup>36</sup>) in order to better characterize smoking-related clinical correlates. Third, since a treatment-seeking sample was used, it is unclear how generalizable the results are to non-treatment seeking individuals with PG. Fourth, lack of ethnic/racial diversity in our sample may suggest that these findings will not generalize to members of different ethnic and cultural groups. Fifth, the subjects were recruited over several years from a variety of venues without control groups taken from these various settings. Although this may have introduced some bias, this heterogeneity of place and time may actually reflect “real world” gambling pathology more closely. Sixth, smoking policy in public places such as casinos has been changing over the past decade and will likely continue to change in the near future. Monitoring the possible influences of these changes on the clinical correlates of tobacco smoking in individuals with PG will be important. Despite the limitations, the study has multiple strengths, including the large sample of treatment-seeking pathological gamblers and the use of both self-report and clinician-administered measures with strong psychometric properties and established norms.

### Conclusions and Future Directions

The results provide further support that daily tobacco smoking in PG is common and has important clinical implications. Future research should investigate potential factors that may contribute to the etiology and pathophysiology of daily tobacco smoking and PG identify treatments specially tailored for individuals with both conditions.

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### References

1. National Opinion Research Center. Gambling Impact and Behavior Study. Chicago: University of Chicago; 1999.
2. Potenza MN, Steinberg MA, McLaughlin SD, et al. Illegal behaviors in problem gambling: analysis of data from a gambling helpline. *J Am Acad Psychiatry Law* 2000;28(4):389–403. [PubMed: 11196248]
3. Grant JE, Kim SW. Demographic and clinical features of 131 adult pathological gamblers. *J Clin Psychiatry* 2001 Dec;62(12):957–962. [PubMed: 11780876]
4. Petry NM, Kiluk BD. Suicidal ideation and suicide attempts in treatment-seeking pathological gamblers. *J Nerv Ment Dis* 2002 Jul;190(7):462–469. [PubMed: 12142848]
5. Cunningham-Williams RM, Cottler LB, Compton WM III, et al. Taking chances: Problem gamblers and mental health disorders – results from the St. Louis Epidemiologic Catchment Area study. *Am J Public Health* 1998;88:1093–1096. [PubMed: 9663161]
6. Shaffer HJ, Hall MN, Vander Bilt J. Estimating the prevalence of disordered gambling behavior in the United States and Canada: a research synthesis. *Am J Pub Health* 1999;89:1369–1376. [PubMed: 10474555]
7. Fagan P, Augustson E, Backinger CL, et al. Quit attempts and intention to quit cigarette smoking among young adults in the United States. *Am J Public Health* 2007 Aug;97(8):1412–1420. [PubMed: 17600244]
8. Falk DE, Yi HY, Hiller-Sturmhofel S. An epidemiologic analysis of co-occurring alcohol and tobacco use and disorders: findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *Alcohol Res Health* 2006;29(3):162–171. [PubMed: 17373404]
9. Potenza MN, Steinberg MA, McLaughlin SD, et al. Characteristics of tobacco-smoking problem gamblers calling a gambling helpline. *Am J Addict* 2004 Oct-Dec;13(5):471–493. [PubMed: 15764425]

10. Crockford DN, El-Guebaly N. Psychiatric comorbidity in pathological gambling: a critical review. *Can J Psychiatry* 1998 Feb;43(1):43–50. [PubMed: 9494746]
11. Smart RG, Ferris J. Alcohol, drugs and gambling in the Ontario adult population, 1994. *Can J Psychiatry* 1996 Feb;41(1):36–45. [PubMed: 8919422]
12. Stinchfield, R.; Winters, K. St Paul: Compulsive Gambling Program. Mental Health Division, Minnesota Department of Human Services; 1996. Effectiveness of six state-supported compulsive gambling treatment programs in Minnesota.
13. Grant JE, Potenza MN. Tobacco use and pathological gambling. *Ann Clin Psychiatry* 2005 Oct-Dec; 17(4):237–241. [PubMed: 16402757]
14. Petry NM, Oncken C. Cigarette smoking is associated with increased severity of gambling problems in treatment-seeking gamblers. *Addiction* 2002 Jun;97(6):745–753. [PubMed: 12084144]
15. Grant, JE.; Donahue, C.; Kim, SW. 161st Annual Meeting of the American Psychiatric Association. Washington DC: APA; 2008. Imaginal desensitization plus motivational interviewing in the treatment of pathological gambling: a randomized controlled trial. New Research Program and Abstracts. poster
16. Grant JE, Kim SW, Potenza MN, et al. Paroxetine treatment of pathological gambling: a multi-centre randomized controlled trial. *Int Clin Psychopharmacol* 2003;184:243–249. [PubMed: 12817159]
17. Grant JE, Potenza MN. Escitalopram treatment of pathological gambling with co-occurring anxiety: an open-label pilot study with double-blind discontinuation. *Int Clin Psychopharmacol* 2006;214:203–209. [PubMed: 16687991]
18. Grant JE, Kim SW, Hartman BK. A double-blind, placebo-controlled study of the opiate antagonist, naltrexone, in the treatment of pathological gambling urges. *J Clin Psychiatry*. in press
19. Grant JE, Potenza MN, Hollander E, et al. Multicenter investigation of the opioid antagonist nalmefene in the treatment of pathological gambling. *Am J Psychiatry* 2006;1632:303–312. [PubMed: 16449486]
20. First, MB.; Spitzer, RL.; Gibbon, M., et al. Structured Clinical Interview for DSM-IV-Patient Edition (SCID-I/P, Version 2.0). New York, NY: Biometrics Research Department, New York State Psychiatric Institute; 1995.
21. Grant JE, Steinberg MA, Kim SW, et al. Preliminary validity and reliability testing of a structured clinical interview for pathological gambling. *Psychiatry Res* 2004 Aug 30;128(1):79–88. [PubMed: 15450917]
22. Pallanti S, DeCaria CM, Grant JE, et al. Reliability and validity of the pathological gambling adaptation of the Yale-Brown Obsessive-Compulsive Scale (PG-YBOCS). *J Gambl Stud* 2005 Winter;21(4):431–443. [PubMed: 16311876]
23. Lesieur HR, Blume SB. The South Oaks Gambling Screen (SOGS): a new instrument for the identification of pathological gamblers. *Am J Psychiatry* 1987 Sep;144(9):1184–1188. [PubMed: 3631315]
24. Guy, W. US Dept Health, Education and Welfare publication (ADM)76-338. Rockville, MD: National Institute of Mental Health; 1976. ECDEU Assessment Manual for Psychopharmacology.
25. Petry NM, Stinson FS, Grant BF. Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *J Clin Psychiatry* 2005 May;66(5):564–574. [PubMed: 15889941]
26. Rice ME, Cragg SJ. Nicotine amplifies reward-related dopamine signals in striatum. *Nat Neurosci* 2004 Jun;7(6):583–584. [PubMed: 15146188]
27. Zhang H, Sulzer D. Frequency-dependent modulation of dopamine release by nicotine. *Nat Neurosci* 2004 Jun;7(6):581–582. [PubMed: 15146187]
28. Dierker L, Donny E. The role of psychiatric disorders in the relationship between cigarette smoking and DSM-IV nicotine dependence among young adults. *Nicotine Tob Res* 2008 Mar;10(3):439–446. [PubMed: 18324562]
29. Desai RA, Potenza MN. Gender differences in the associations between past-year gambling problems and psychiatric disorders. *Soc Psychiatry Psychiatr Epidemiol* 2008 Mar;43(3):173–183. [PubMed: 18080792]
30. Lasser K, Boyd JW, Wollhandler S, et al. Smoking and mental illness. *JAMA* 2000;284:2606–2610. [PubMed: 11086367]



31. Breslau N, Kilbey MM, Andreski P. Vulnerability to psychopathology in nicotine-dependent smokers: an epidemiologic study of young adults. *Am J Psychiatry* 1993 Jun;150(6):941–946. [PubMed: 8494073]
32. Hodgins DC, Peden N, Cassidy E. The association between comorbidity and outcome in pathological gambling: a prospective follow-up of recent quitters. *J Gambl Stud* 2005 Fall;21(3):255–271. [PubMed: 16134008]
33. Moore BA, Budney AJ. Tobacco smoking in marijuana-dependent outpatients. *J Subst Abuse* 2001;13:583–596. [PubMed: 11775084]
34. Sullivan MA, Covey LS. Current perspectives on smoking cessation among substance abusers. *Curr Psychiatr Rep* 2002;4:388–396.
35. Burling TA, Marshall GD, Seidner AL. Smoking cessation for substance abuse inpatients. *J Subst Abuse* 1991;3:269–276. [PubMed: 1668228]
36. Fagerstrom KO, Schneider NG. Measuring nicotine dependence: a review of the Fagerstrom Tolerance Questionnaire. *J Behav Med* 1989;12:159–182. [PubMed: 2668531]

Table 1

Demographics of 465 Pathological Gamblers with and without Current Daily Tobacco Smoking

	All Pathological Gambling Subjects					No Current Substance Use Disorder (n=355)					Current Substance Use Disorders (n=110)				
	No Daily Tobacco Smoking (n=256)	Daily Tobacco Smoking (n=209)	Stat *	df	p-value	No Daily Tobacco Smoking (n=200)	Daily Tobacco Smoking (n=155)	Stat *	df	p-value	No Daily Tobacco Smoking (n=56)	Daily Tobacco Smoking (n=54)	Stat *	df	p-value
<b>Age, years</b>	48.45 (11.8) [19-78]	46.8 (10.7) [20-72]	1.588t	463	.133	47.8 (12.0) [19-78]	47.0 (10.4) [20-72]	.702t	353	.483	50.7(11.0) [25-74]	46.3(11.5) [20-68]	2.091t	108	.039
<b>Marital, n (%)</b>															
Single	79 (30.9)	64 (30.6)	2.01c	1	.654	60 (30.0)	44 (28.4)	.063c	1	.803	19 (33.9)	20 (37.0)	.116c	1	.733
Married/Div./Widow	177(69.1)	145 (69.4)				140 (70.0)	111 (71.6)				37 (66.1)	34 (63.0)			
<b>Race, n (%)</b>															
Caucasian	238 (93.0)	191 (91.4)	.908c	1	.341	189 (94.5)	145 (93.5)	.419c	1	.518	49 (87.5)	46 (85.2)	.791c	1	.374
Other	18 (7.0)	18 (8.6)				11(5.5)	10 (6.5)				7 (12.5)	8 (14.8)			
<b>Education, n (%)</b>															
High School or less	101 (39.5)	87 (41.6)	2.232c	1	.135	68 (34.0)	53 (34.2)	1.619c	1	.203	33 (58.9)	34 (63.0)	.248c	1	.618
At least some college	155 (60.5)	122 (58.4)				132 (68.0)	102 (65.8)				23 (45.1)	20 (37.0)			
<b>Gender, n (%)</b>															
Female	135 (52.7)	115 (55.0)	.254c	1	.614	115 (57.5)	92 (59.4)	.136c	1	.712	20 (35.7)	23 (42.6)	.546c	1	.460

All scores are Mean ( $\pm$ SD), [range] unless otherwise indicated;

\* Statistic: c = Chi-square; t = t-test

**Table 2** Clinical Characteristics of 465 Pathological Gamblers with and without Current Daily Tobacco Smoking Based on Current Substance Use Disorder Status

	All Pathological Gambling Subjects				No Current Substance Use Disorder (n=355)				Current Substance Use Disorders (n=110)						
	No Daily Tobacco Smoking (n=256)	Daily Tobacco Smoking (n=209)	Stat*	df	P-value	No Daily Tobacco Smoking (n=200)	Daily Tobacco Smoking (n=155)	Stat*	df	P-value	No Daily Tobacco Smoking (n=56)	Daily Tobacco Smoking (n=54)	Stat*	df	P-value
Hours spent gambling per week	13.2 (12.3) [0-90]	16.4 (13.1) [0-60]	-1.912z	n/a	.056	13.7 (9.9) [1-48]	18.3 (14.4) [0-60]	-1.764z	n/a	.078	11.7 (18.4) [0-90]	12.4 (8.5) [0-34]	-1.483z	n/a	.138
Total amount of money lost gambling during past year, dollars	\$14,738 (\$18,287) [\$75-\$120,000]	\$21,243 (\$26,823) [\$0-\$190,000]	-2.106z	n/a	.035	15,718.4 (18,396) [150-12,000]	21,608.4 (27,884) [0-190,000]	-1.503z	n/a	.133	11,819.4 (17,850) [75-75,000]	20,386.1 (24,437) [10-100,000]	-1.431z	n/a	.153
Percentage of income lost to gambling during past year	55.7% (72.2%)	76.8% (158.3%)	-1.942z	n/a	.052	55.9 (72.3)	77.5 (176.8)	-1.052z	n/a	.293	55.0 (73.0)	74.7 (83.6)	-1.983z	n/a	.047
Legal Problems, n (%)															
Bankruptcy	42 (16.4)	45 (21.5)	1.987c	1	.159	30 (15.0)	27 (17.4)	.379c	1	.538	12 (21.4)	18 (33.3)	1.964c	1	.161
Any other legal issues	44 (17.2)	51 (24.2)	3.684c	1	.055	29 (14.5)	31 (20.0)	1.881c	1	.170	15 (26.8)	20 (37.0)	1.332c	1	.249
Other Problems, n (%)															
Financial	187 (73.0)	169 (80.9)	3.915c	1	.048	145 (72.5)	126 (81.3)	3.736c	1	.053	42 (75.0)	43 (79.6)	.336c	1	.562
Work	31 (12.1)	33 (15.8)	1.313c	1	.252	23 (11.5)	23 (14.8)	.863c	1	.353	8 (14.3)	10 (18.5)	.360c	1	.549
Housing	26 (10.2)	30 (14.3)	1.914c	1	.167	19 (9.5)	18 (11.6)	.418c	1	.518	7 (12.5)	12 (22.2)	1.818c	1	.177
Number of DSM-IV Criteria	7.5 (1.6) [5-10]	8.1 (1.3) [5-10]	2.351t	463	.020	7.5 (1.6) [5-10]	8.0 (1.4) [5-10]	1.589t	353	.115	7.6 (1.9) [5-10]	8.3 (1.1) [6-10]	1.503t	108	.144
South Oaks Gambling Screen	13.1 (3.8) [1-19]	14.3 (3.3) [5-20]	2.407t	463	.017	13.0 (3.8) [5-19]	14.1 (3.3) [6-19]	1.989t	353	.048	13.4 (3.6) [7-19]	14.9 (3.5) [5-20]	1.372t	108	.177
Clinical Global Impression Severity score	4.7 (83) [2-7]	4.9 (93) [0-7]	1.782t	463	.076	4.7 (0.8) [2-7]	4.8 (0.9) [0-7]	.888t	268	.375	4.6 (0.9) [3-7]	5.0 (0.9) [3-7]	1.947t	108	.054
PG-YBOCS total score	19.4 (5.4) [5-40]	20.6 (5.6) [9-35]	1.863t	463	.063	19.5 (5.2) [5-40]	20.8 (5.7) [9-35]	1.695t	268	.092	19.1 (6.1) [9-33]	20.2 (5.4) [10-33]	.782t	98	.437
PG-YBOCS Urge score	9.0 (3.2) [2-20]	9.1 (3.4) [2-19]	.354t	463	.724	9.0 (3.1) [2-20]	9.3 (3.4) [4-19]	.804t	268	.422	9.1 (3.7) [3-20]	8.7 (3.3) [2-19]	-.531t	98	.597
PG-YBOCS Behavior score	9.3 (4.0) [0-20]	10.3 (3.8) [0-19]	2.068t	463	.040	9.5 (3.8) [0-20]	10.4 (3.7) [0-19]	1.719t	268	.087	8.8 (4.4) [1-17]	10.1 (4.1) [4-18]	1.205t	98	.232
Types of Problem Gambling, n															

	All Pathological Gambling Subjects				No Current Substance Use Disorder (n=355)				Current Substance Use Disorders (n=110)						
	No Daily Tobacco Smoking (n=256)	Daily Tobacco Smoking (n=209)	Stat <sup>*</sup>	df	p- value	No Daily Tobacco Smoking (n=200)	Daily Tobacco Smoking (n=155)	Stat <sup>*</sup>	df	p- value	No Daily Tobacco Smoking (n=56)	Daily Tobacco Smoking (n=54)	Stat <sup>*</sup>	df	p- value
(%)															
Any Strategic	133 (52.0)	107 (51.2)	.026c	1	.871	107 (53.5)	76 (49.0)	.698c	1	.403	26 (46.4)	31 (57.4)	1.327c	1	.249
Any Non-strategic	203 (79.3)	181 (86.6)	4.270c	1	.039	156 (78.0)	134 (86.5)	4.170c	1	.041	47 (83.9)	47 (87.0)	.214c	1	.644
Slots	168 (65.6)	159 (76.1)	6.022c	1	.014	130 (65.4)	121 (78.1)	7.196c	1	.007	38 (67.9)	38 (70.4)	.081c	1	.776
Lottery	64 (25.0)	57 (27.3)	.309c	1	.578	48 (24.0)	50 (32.3)	2.980c	1	.084	16 (28.6)	7 (13.0)	4.050c	1	.044
Pull tabs	22 (8.6)	25 (12.0)	1.436c	1	.231	16 (8.0)	16 (10.3)	.574c	1	.449	6 (10.7)	9 (16.7)	.827c	1	.363
Bingo	33 (12.9)	41 (19.6)	3.891c	1	.049	29 (14.5)	39 (25.2)	6.409c	1	.011	4 (7.1)	2 (3.7)	f	n/a	.679
Keno	8 (3.1)	4 (1.9)	.671c	1	.413	6 (3.0)	3 (1.9)	.400c	1	.527	2 (3.6)	1 (1.9)	f	n/a	1.00

\* Statistic: c = Chi-square t = t-test f = Fisher's exact z = Mann-Whitney

All scores are Mean ( $\pm$  SD), [range] unless otherwise indicated;

PG-YBOCS=Yale Brown Obsessive Compulsive Scale Modified for Pathological Gambling

**Table 3** Co-Occurring Disorders in 465 Pathological Gamblers with and without Current Daily Tobacco Smoking Based on Current Substance Use Disorder Status

Current (past 12 months) Co-occurring Disorder, n (%)	All Pathological Gambling Subjects					No Current Substance Use Disorder (n=355)					Current Substance Use Disorders (n=110)				
	No Daily Tobacco Smoking (n=256)	Daily Tobacco Smoking (n=209)	Stat*	df	p-value	No Daily Tobacco Smoking (n=200)	Daily Tobacco Smoking (n=155)	Stat*	df	p-value	No Daily Tobacco Smoking (n=56)	Daily Tobacco Smoking (n=54)	Stat*	df	p-value
<b>Any Mood Disorder</b>	86 (33.6)	51 (24.4)	4.678c	1	.031	<b>61 (30.5)</b>	<b>29 (18.7)</b>	6.414c	1	<b>.011</b>	25 (44.6)	22 (40.7)	.171c	1	.679
Major depressive d/o	36 (14.1)	25 (12.0)	.446c	1	.504	22 (11.0)	13 (8.4)	.671c	1	.413	14 (25.0)	12 (22.2)	.118c	1	.732
Depressive disorder NOS	49 (19.1)	26 (12.4)	3.819c	1	.051	<b>39 (19.5)</b>	<b>16 (10.3)</b>	.5618c	1	<b>.018</b>	10 (17.9)	10 (18.5)	.008c	1	.928
Dysthymia	21 (8.2)	10 (4.8)	f	n/a	.190	17 (8.5)	7 (4.5)	1.035c	1	.309	4 (7.1)	3 (5.6)	f	n/a	.106
<b>Any Anxiety Disorder</b>	33 (12.9)	20 (9.6)	1.257c	1	.262	25 (12.5)	11 (7.1)	2.798c	1	.094	8 (14.3)	9 (16.7)	.119c	1	.730
<b>Any Eating Disorder</b>	9 (3.5)	2 (1.0)	3.262c	1	.071	6 (3.0)	1 (0.6)	f	n/a	.142	3 (5.4)	1 (1.9)	f	n/a	.618

\* Statistic: c = Chi-square f = Fisher's exact