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Risk Factors for Suicide Ideation and Attempts Among Pathological Gamblers

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Risk Factors for Suicide Ideation and Attempts among Pathological Gamblers

**Abstract**

**Objective** The link between pathological gambling and suicide is poorly understood. The current study has two major goals: 1) to provide descriptive information about suicide ideation and attempts among pathological gamblers trying to quit; and 2) to identify predictors of suicidal ideation and attempts, with a particular emphasis on mood and substance use disorders.

**Method** A community sample of 101 individuals with gambling problems who had made a recent quit attempt was assessed using structured instruments.

**Results** 28.7% of the sample reported no history of suicide ideation or attempts, 38.6% reported having only thoughts of suicide, and 32.7% reported a suicide attempt. Ideation predated the onset of gambling problems by an average of more than ten years. History of ideation was increasingly likely with a greater severity of gambling problem as determined by DSM criteria. Those experiencing ideation were also more likely to over gamble on gambling days and were also five times more likely to have a history of depression.

Substance abuse history was the only factor that distinguished between individuals who had a history of suicide attempts versus ideation only. Having a drug history was related to more than six times greater likelihood of having made a suicide attempt. Gambling-related suicide attempts were relatively rare, 21.2 % of attempters or 7% of the total sample.

**Conclusion** These findings are consistent with the common factor model of etiology in which the suicidality of gambling is related to prior mental health disorders. More research on the relationship between alcohol and other drug disorders and their complex relationship to pathological gambling and suicide is crucial.

## Introduction

Pathological gambling affects approximately 1.5% of the adult population in North America (1). The disorder is associated with significant financial problems, employment, family and social difficulties and emotional distress (2). Research evidence and clinical observation suggest that rates of suicide and suicide attempts are elevated in pathological gamblers compared with the general population (3-5). There is not, however, a clear understanding of the link between pathological gambling and suicide. The negative consequences and losses associated with gambling problems may act as precipitants to suicidal ideation and behaviours. Moreover, mood and substance use disorders are common comorbidities with pathological gambling that are highly associated with suicide (6). It is possible that these are “common factors” that explain the pathological gambling – suicide link. The common factors can be conceptualized as a diathesis that interacts with the gambling disorder and its related stresses. This common factors model is displayed in Figure 1.

Newman and Thompson (7) provided support for the common factor model in a population-based sample from Edmonton, Canada. A statistically significant association was found between a history of pathological gambling and suicide attempt history. However, this relationship was no longer found when other psychiatric disorders were included as covariates. The authors concluded that the pathological-suicide link might be due to a common “mental illness” factor. One limitation of this study was that the data came from two earlier surveys conducted in the 1980s that pre-dated the large increase in gambling opportunities in the Edmonton region. The prevalence of pathological gambling has increased with the expansion of gambling accessibility(1;8) and the characteristics of pathological gamblers may also have shifted.

In recent years a body of research concerned with the connections between suicidality and pathological gambling has begun to develop. Two areas have been explored: completed suicides and suicidal ideation and attempts.

**Completed Suicides and Gambling.** The relationship between accessibility of gambling and completed suicide the data are mixed. Much of the available research has focused on the relationship between the existence of casinos and suicide. One American study reported that suicide rates for visitors to Atlantic City rose following casino openings and that large gaming cities such as Las Vegas and Reno had elevated levels of suicide for both residents and visitors (9). Higher per capita expenditures on lotteries have also been found to correlate with suicide rates (10). On the other hand, another investigation found that casino openings did not increase suicide rates, although cities with casinos had relatively elevated suicide rates for residents (11). Marfels (12) also refutes the link between casinos and suicide. In an examination of 249 adult suicides among visitors to Las Vegas, only a small minority of cases (6%) was related to gambling. The most frequent predisposing factors were substance abuse, depression and relationship problems.

In an Australian descriptive study of 44 gambling-related suicides, completers tended to be middle aged males from lower socioeconomic status (13). Identified risk factors included treatment history, comorbid depression, low self-esteem, previous suicidal behaviours, large financial debts and relationship difficulties.

**Suicidal Ideation and Attempts Among Pathological Gamblers.** Whereas the above studies examined the link between pathological gambling and completed suicides, a number of studies have focused on the prevalence and characteristics of suicidal ideation and attempts. These studies have mostly focused on treatment-seeking samples and estimates for ideation have

ranged from 12% to 92% and the number of actual attempts has been reported to be between 4% and 40% (3;14-18;18-22). The large variability in these estimates is likely related to differences in sample characteristics, definitions of attempts and ideation and reporting time frames between studies. Notably, few of these studies distinguish gambling-related suicide attempts from attempts related to other factors. Two outpatients samples, one in Canada (14) and one in the United States (23), revealed gambling-related suicide attempt rates of 11 and 12% respectively, and a rate of 26% was found in an American inpatient sample (22;24).

A small number of studies provide a comparison of pathological gamblers who report previous ideation or attempts with those that do not. In a predominantly male sample (94%) of Gamblers Anonymous survey respondents, those who had experienced suicidal ideation or suicide attempts reported gambling at an earlier age, engaging in treatment earlier, having higher rates of divorce or separation, being more likely to engage in theft to support gambling and having a greater number of addicted children and alcoholic relatives (17). There were no differences found between gamblers who experienced suicidal ideation versus those who made attempts. Another study that assessed male inpatients found that suicidality was linked to younger age and history of depression (15). A retrospective chart review of inpatients (91% male) found that attempters were more likely to report lifetime history of drug dependence (but not alcohol dependence) and to have a current psychiatric disorder. Impulsivity was related to suicide attempts but only among those with a history of drug or alcohol dependence (24).

Two studies of outpatients are available. Petry (23) found that outpatients with a prior history of suicidality had higher levels of psychiatric difficulties, more severe gambling problems, increased gambling cravings, more bankruptcies, more prior involvement in gambling treatment, and higher levels of interpersonal distress. Few differences were found between those

who had ideated only and those who had attempted, although this finding may be a function of limited sample size.

One final study, in contrast to the above studies, did not find an association between severity of gambling problems and suicidal ideation, plans or attempts. (25). In this Australian sample of 85 outpatients, current depression, marital difficulties and presence of illegal behaviours were more frequent in the small group of gamblers (n=11) who were currently experiencing suicidal ideation compared to those never having experienced ideation.

Overall, a fairly consistent finding in the above studies was that elevated rates of depression and more severe gambling problems were found among pathological gamblers who had experienced suicidal ideation or previous attempts. Unfortunately, the existing literature has a number of limitations related to methodology and research design. It is difficult to compare the results of these studies due to differences in sampling and in the types of variables assessed. Furthermore, mood disorders have not typically been assessed using standardized diagnostic instruments. Instead, measures of negative affect or indirect indicators such as a history of mental health treatment have been used to assume the presence of clinical disorders. Moreover, only one of these studies assessed alcohol and other drug use disorders as potential correlates (24). A further limitation of previous research is that participants have typically been sampled from a single treatment service.

The current study attempts to add to this growing body of evidence with two major goals:

1. To provide descriptive information about suicide ideation and attempts among a community sample of pathological gamblers trying to quit.
2. To identify predictors of suicidal ideation and attempts, with a particular emphasis on mood and substance use disorders.

## Material and Methods

### Participants

Participants (N=101) were recruited via media announcements (e.g., press releases, paid advertisements in newspapers, television radio, and flyers) in Calgary, Canada. Eligible participants had to identify themselves as having a gambling problem and as having initiated quitting in the past two weeks. Further inclusion criteria included: a South Oak Gambling Screen (SOGS;(26) score of five or greater, some gambling in the last four weeks, agreement to participate in a comprehensive personal interview and three follow-up interviews at 3, 6 and 12 months after the initial assessment. Participants needed to agree to be contacted once every seven days for three months if randomly assigned to the weekly contact group and to provide the names of three collaterals to confirm gambling histories. All participants were paid \$20 Canadian in gift certificates for the three month and six month interviews and \$30 for the final interview.

### Procedure

Eligible volunteers underwent an initial face-to-face assessment in which information regarding demographics, gambling history and related problems, gambling activities and frequency, gambling goals and confidence, and reasons for changing gambling behaviours were obtained using a variety of self-report and structured interview measures. As this study is part of a larger investigation, readers are referred to Hodgins & el-Guebaly (27) for a more comprehensive description of methods. Relevant to this report, current and lifetime mood disorders, substance abuse and dependence and alcohol abuse and dependence were assessed using the Structured Clinical Interview for DSM-IV (SCID;(28). Inter-rater diagnostic agreement across 12 audiotapes was 100%. DSM-IV Pathological Gambling criteria were assessed using a structured interview patterned after the SCID. Inter-rater diagnostic agreement across 12

audiotapes was also 100%. The South Oaks Gambling Screen (SOGS;(26) was used as a descriptive measure of gambling severity. It is a widely used 20-item self-report questionnaire that assesses lifetime gambling-related difficulties. A score of 5 or greater indicates probable pathological gambling as validated against clinician ratings (26;29). The Socialization subscale of the California Personality Inventory (CPI-Soc; (30) is a 46 item true or false scale that has been validated as a measure of antisocial traits and behaviours (31;32). The CPI-Soc was included because of a link between gambling disorders and antisocial personality traits.

The Suicide module of the Semi-structured Assessment for the Genetics of Alcoholism measure (33) was used to obtain a description of past suicide attempts and suicidal ideation. Inter-rater and retest reliability of this measure is good at the diagnostic level and acceptable at the item level as demonstrated in a sample of participants from substance abuse treatment units, psychiatric patients and non-patient groups (33). Questions focus on suicidal ideation occurrence and persistence, suicidal planning, number of attempts, age of first attempt, need for medical treatment and self-rated circumstances (feeling depressed, extremely good or high, drinking, using drugs, having strange thoughts/ experiences/seeing visions, gambling).

### **Sample Characteristics**

Sixty four percent of the sample was male. The mean age of the participants was 39 years (SD = 10.09, range = 19-77) and 76% described their ethnicity as being Canadian. Fifty five percent were employed full time, 12% worked part-time and 22% were unemployed. Reported annual income was less than \$20,000 for 30%, between \$20,000-\$39,999 for 24% and over \$40,000 for 17% of participants. Post secondary education had been obtained by 67% of participants (range = 0.5 years to 12 years). At the time of the study, 38% had never been married, 8% were living common law, 8% were separated, 26% were divorced and 21% were

married. About half (52%) of participants were parents and 83% subscribed to some form of religion. Eighty one percent described smoking regularly at some point in their lives. Overall, these figures are similar to those found in recent local treatment seeking samples.

The mean SOGS score for the participants was 12.2 ( $SD = 3.4$ ) and the DSM IV criteria for pathological gambling were met by 87% of the participants. The most problematic gambling involvement was with video lottery terminals (49%). Thirty four percent of the sample reported having difficulties with more than one type of gambling, 12% with casinos and 3% with bingo or another form of gambling. About half (52%) of participants reported a history of gambling treatment and 39% of participants reported having a familial history of gambling difficulties. All participants gambled at least one day in the previous thirty ( $M=13.3$ ,  $SD=9.0$ ), and reported gambling more than they could afford an average of 10.6 days in the previous thirty ( $SD=9.1$ ).

Lifetime alcohol problems were reported by 72%, including 48% who met the criteria for alcohol dependence. Lifetime other drug problems were described by about half the sample (49%). The majority of these were drug dependent, with the most frequent drug classes being cocaine, stimulants, other hallucinogens, and cannabis. Only 7% were currently drug abusers or dependent, and of these all were cannabis users. Past mood disorders were reported by 60%, including major depressive disorder (50%), bipolar I (4%), bipolar II (2%), dysthymia (2%) and double depression (3%).

### **Analytic Plan**

In light of the limited and conflicting research on suicidality and gambling, an exploratory approach was taken. Information about suicide ideation and attempts was summarized using descriptive statistics, and comparisons between groups were made using Chi squared statistics for categorical variables and t-tests for continuous variables.

To address our goal of identifying predictors of suicide ideation and attempts, we used the multinomial logistic regression procedure (MLR). Logistic regression is a robust statistical technique used to examine the relationship between a number of predictor variables and a dichotomous dependent variable. When the dependent variable has more than two categories, a multinomial logistic regression (MLR) can be used. We wanted to expand on the existing research by examining differences between suicide ideation and suicide attempts. Therefore, MLR analyses were conducted to identify which variables could be used to differentiate between participants never having experienced ideation, those with ideation only, and those who had made an attempt. Goodness of fit was assessed using the Nagelkerke  $R^2$  and Chi squared statistics and parameter estimates were used to examine the effects of predictor variables within each comparison.

## Results

### *Suicidal Ideation and Attempts History*

Of the 101 participants, 28.7% ( $n=29$ ) of the sample reported no lifetime history of suicide ideation or attempts (Non-Suicidal), 38.6% ( $n=39$ ) reported having only thoughts of suicide (Ideators), and 32.7% ( $n=33$ ) reported a suicide attempt (Attempters). Of those who reported ideation ( $n=72$ ), almost half (40.8%,  $n=29$ ) reported that the ideation lasted at least seven days in a row, and more than half had established a plan (54.2%,  $n=39$ ). These individuals reported that ideation first occurred at a mean age of 21.8 ( $SD = 14.4$ ). In comparison, their gambling problems were described as starting at a significantly older age ( $M = 33.5$ ,  $SD = 10.7$ ,  $t(70)=6.82$ ,  $p < 0.01$ ).

Participants who reported attempts were significantly more likely to have a plan (66.7%,  $n=22$ ) than those with ideation only (43.6%,  $n=17$ ,  $\chi^2(1, N=72)=3.83$ ,  $p=0.05$ ). More than half of

those who reported attempts had made more than one attempt (60.6%, n=20; Median=2) and needed medical treatment for an attempt (63.6%, n=21). Only one participant reported an attempt while they were feeling extremely good or high. Almost all participants (97.0%, n=32) reported that the attempt had taken place while they were feeling depressed, and most made the attempt while drinking and/or using drugs (60.6%, n=20). More specifically, about half made the attempt while drinking (51.5%, n=17), and a third while using drugs (33.3%, n=11). Twenty-four percent of the sample (n=8) reported strange thoughts, experiences, or seeing visions at the time they attempted. Notably, only 21.2% (n=7) reported gambling as a reason for the attempt.

Of the seven individuals reporting a gambling-related suicide attempt, six reported that they had first experienced suicidal ideation a number of years prior to both starting to gamble regularly and to developing a gambling problem. In this group, suicide ideation began at a mean age of 23.9 (SD=14.6), regular gambling at a mean age of 30.8 (SD=7.6), and a gambling problem developed at an age of 33.2 (SD=5.6). All six had a lifetime mood disorder, five met lifetime criteria for alcohol dependence and four for other drug dependence.

#### *Prediction of Risk Factors*

A two-step approach was taken for this analysis. First, a number of variables identified in the literature were examined for differences between Non-Suicidal participants, Ideators, and Attempters. A series of Chi-squares and one-way ANOVAs were conducted for categorical and continuous variables respectively. A significance value of 0.10 was chosen as the criteria for inclusion in the subsequent analyses (34).

In the first step, we identified which variables were different between groups. A number of variables did not discriminate among the groups. These were age of onset of gambling problem, age of first quit attempt, age of onset for mood, alcohol, and drug disorders, days

gambled in last 30, income, gender, marital status, religion, type of problematic gambling (video lottery terminal vs. other), and history of gambling treatment (yes or no).

Significant differences were noted for a number of variables. Groups differed in history of a mood disorder,  $\chi^2(2, N=101)=14.67, p<0.01$ . Ideators and Attempters were more likely to have a history of a mood disorder (72.7% and 71.8%, respectively) than Non-Suicidal participants (31.0%). Groups also differed in history of a drug use disorder ( $\chi^2(2, N=101)=14.58, p<0.01$ ). Attempters were more likely to have had a drug use disorder (75.8%) than both Non-Suicidal participants (35.9%) and Ideators (34.5%).

Significant differences between groups were also noted for the total SOGS score ( $F(2,98)=4.74, p<0.05$ ), the number of DSM-IV pathological gambling criteria met ( $F(2,98)=7.32, p<0.01$ ), and CPI Soc score ( $F(2,98)=5.56, p<0.01$ ). To include a measure of severity that was independent of monetary value and gambling frequency, an “overspending” ratio was created by dividing the number of days in the last thirty that participants gambled more than they could afford by the total number of days gambled. Significant differences between groups were also noted on this variable ( $F(2,98)=7.08, p<0.01$ ).

In the second step, a multinomial logistic regression analysis was conducted to investigate which variables would best distinguish between Non-Suicidal participants, Ideators, and Attempters. Predictors were selected on the basis of which variables from the first step were found to be significantly different at  $p < 0.10$ . Categorical predictors (yes/no) included history of a mood disorder, history of an alcohol use disorder, and history of a drug use disorder (not including alcohol). Continuous predictors included number of DSM-IV pathological gambling criteria met, CPI Soc score, and the overspending ratio. SOGS score was omitted from the analysis due to the high overlap with DSM-IV criteria. History of an alcohol use disorder was

not significantly different between groups, but was included in the analysis due to the high comorbidity with mood disorders and substance use disorders. As there is no previous research comparing these three groups (Non-Suicidal, Ideators, and Attempters) in a single analysis, a priori ordering of the variables in a hierarchical analysis was not feasible. As such, all variables were entered into the regression simultaneously. Descriptive statistics for each predictor variable as a function of suicide group can be found in Table 1.

There was a good model fit on the basis of the six predictor variables,  $\chi^2(12, N=101)=47.25, p<0.01$ , indicating that the six predictor variables reliably discriminated between suicide groups. The resulting model accounted for a significant amount of variance (Nagelkerke  $R^2 = 0.42$ ) and resulted in an overall correct classification rate of 58.4%. The model had a slightly better classification rate in terms of predicting attempts specifically, correctly identifying 69.7% (23 of 33 attemptors).

Likelihood ratio tests on individual variables revealed that three variables contributed significantly to the overall model: mood diagnosis, drug use disorder diagnosis, and days gambled to days afford ratio (see Table 2).

Parameter estimates, presented in Table 3, were used to examine the effects of predictor variables within each comparison. Although the number of problem gambling criteria met did not distinguish between groups in the overall model, it did distinguish between the Non-Suicidal group and Ideators. For each additional DSM-IV criteria met, participants were 1.45 times more likely to be Ideators than Non-Suicidal participants (Wald  $\chi^2(1)=4.30, p<0.05$ ).

The overspending ratio also distinguished between groups in the overall model, but only distinguished between Ideators and Non-Suicidal participants. Ideators were more likely than the Non-Suicidal group to overspend when gambling (OR=8.23; Wald  $\chi^2(1)=5.02, p<0.05$ ).

Attempters also overspent more in comparison to the Non-Suicidal group (OR=5.81), but this finding was not significant.

Scores on the CPI Soc score did not distinguish between groups for any of the comparisons. Similarly, history of an alcohol use disorder did not distinguish between any of the groups.

History of a mood disorder distinguished between groups in the overall model. In comparison to the Non-Suicidal group, Ideators were 4.98 times more likely to have a past or current mood disorder (Wald  $\chi^2(1)=6.86$ ,  $p<0.05$ ), and Attempters were 3.75 times more likely (Wald  $\chi^2(1)=4.21$ ,  $p<0.05$ ). Ideators and Attempters were equally likely to have a history of a mood disorder.

Drug use disorder history also distinguished between groups in the overall model. Attempters were 5.78 times more likely than Ideators to have a history of a drug use disorder (Wald  $\chi^2(1)=9.07$ ,  $p<0.05$ ). Attempters were also more likely than the Non-Suicidal group to have such a history (OR=3.54), but this did not reach significance (Wald  $\chi^2(1)=3.26$ ,  $p=0.07$ ). Due to the high associations between mood disorders, alcohol use disorders, and drug use disorders, we wanted to investigate whether interaction effects may provide additional information. The previous analysis was re-run three times, each time adding one the following interactions: mood x alcohol, mood x drug, and alcohol x drug. Only one interaction significantly improved the model – alcohol disorder x drug use disorder ( $\Delta\chi^2(2)=10.40$ ,  $p<0.05$ ). With the addition of this interaction, the Nagelkerke  $R^2$  increased to 0.49 ( $\Delta R^2= 0.07$ ). The overall correct classification rate rose to 61.4%, and the sensitivity for predicting attempts rose to 72.7%. Likelihood ratio tests on individual variables can be found in Table 4. Risk for attempted suicide differed on the basis of previous drug and alcohol diagnoses, with a history of drug and/or

alcohol use disorders associated with increased risk. However, because there was one cell with a count of zero, parameter estimates were considered suspect and further investigation of the drug x alcohol use interaction was not viable.

### **Discussion**

The purpose of this exploratory study was to examine the correlates of suicidality in people having gambling difficulties. The results confirmed that suicidality represents a significant concern for this clinical group. Strikingly, almost three quarters of the sample reported past suicidality. Ideation tended to predate the onset of gambling problems by an average of more than ten years, a finding that is consistent with the common factor model of etiology presented in Figure 1. Within this model, the suicidality of gamblers is related to prior mental health disorders.

Suicide attempts were also prevalent, reported by a third of participants, and were often serious with the majority requiring medical attention. More than half of participants reported multiple attempts. Attempts were almost universally made when participants reported feeling depressed and were made under the influence of alcohol or other drugs more than half the time. Gambling-related suicide attempts were relatively rare, comprising 21% of attempters or 7% of the total sample. These figures are consistent with the small number of previous reports that have recorded suicide attempts specifically related to gambling (14;22-24). In this sample, those reporting gambling-related suicide attempts tended to experience prior non-gambling related ideation. It appears that gambling difficulties are but one of a number of stressors that may contribute to suicide attempts. These results underscore the importance of assessing both prior and current suicidal ideation in pathological gamblers presenting for treatment.

A number of key differences emerged between people who had never been suicidal and those who had experienced ideation at some point in their lives. Controlling for other factors, a history of ideation was related to increased gambling problems as determined by DSM criteria. Those experiencing ideation were also more likely to overspend on gambling days. These individuals were also five times more likely to have a history of a mood disorder than those who had never been suicidal. Likewise, individuals who attempted suicide were almost four times more likely than those who had never been suicidal to have a history of a mood disorder. A history of mood disorders was equally likely among participants with suicide ideation and those with attempts.

The only factor that distinguished between individuals who had a history of ideation versus actual attempts was substance abuse history. A history of a drug use disorder was related to a sixfold increase in risk for attempts. Further investigation revealed an interaction between drug and alcohol use diagnoses. Unfortunately, the sample size limited a thorough inspection of this complex interaction. Pathological gamblers in this study who abused or were dependent on drugs were a heterogeneous group. The majority reported the abuse of more than one drug category with substances ranging from cocaine, stimulants, other hallucinogens, to cannabis. There was also very few current drug abusers in our sample (7%). Kausch (22) reported that among pathological gamblers attending residential treatment, current drug abusers were less likely to report a gambling-specific suicide attempt than were recent alcohol abusers or non-substance abusing gamblers. The three groups, however, were equally likely to make a non-gambling related suicide attempt. However, another report on this same sample indicated that a history of drug dependence but not alcohol dependence was related to likelihood of suicide

attempt (24). Clearly, more research is warranted on the relationship between suicidality, pathological gambling and current and lifetime substance use disorders.

Although the substance abuse and gambling relationship is unclear, the general finding that substance use disorder history predicted suicide attempts is also consistent with the common factors model of etiology. Prior comorbidity, which is frequent among people with gambling disorders, should be seen by clinicians as a distinct risk factor for suicidality. Because substance use disorders distinguished between gamblers with ideation only and those who had made attempts, history of substance abuse and dependence should always be assessed. Mood disorders should also be of significant interest, particularly in light of self-reports that 97% of attempts were made while feeling depressed.

The data in this study were obtained from retrospective self-reports, which can be influenced by personal bias and recall difficulties, particularly in distressed individuals (27). Although structured assessment questionnaires were used to enhance validity and reliability, a prospective, longitudinal study would best elucidate the correlates of suicidality in people experiencing gambling difficulties. The separate influences of current states (e.g., drinking and drug use, moods, distress) and history can also be better examined in such a design. Additional factors, that have been linked to suicide, such as gender and impulsivity, can also be evaluated in such research. Large samples will be required to examine gambling-related suicide attempts because of their low incidence. In conclusion, the present report underscores the importance of understanding the gambling–suicide link for optimizing the impact of our treatment interventions.

**Table1****Predictor Variables as a Function of Suicide Group**

Predictor	<i>Suicide Group</i>		
	<i>Never Suicidal</i> (n=29)	<i>Ideators</i> (n=39)	<i>Attempters</i> (n=33)
<i>Means (Standard Deviations)</i>			
Number DSM-IV PG Criteria Met	5.38 (1.86)	6.77 (1.83)	6.97 (1.63)
SOGS Score	10.66 (2.69)	13.08 (3.41)	12.36 (3.49)
CPI – Soc	20.21 (6.39)	23.05 (7.04)	26.12 (7.39)
Overspending Ratio	0.64 (0.36)	0.89 (0.25)	0.87 (0.29)
<i>Frequency Counts</i>			
History of Mood Disorder			
No	20	11	9
Yes	9	28	24
History of Alcohol Use Disorder			
No	12	10	6
Yes	17	29	27
History of Drug Use Disorder			
No	19	25	8
Yes	10	14	25

*Note.* PG = Pathological Gambling. SOGS = South Oaks Gambling Screen. CPI Soc = California Personality Inventory – Socialization Scale

**Table 2****Likelihood Ratio Tests for Individual Effects in the Multinomial Logistic Regression Model Relating Predictor Variables to Suicide Group**

Variable	$\chi^2$ to remove	df	sig.
Number of PG Criteria Met	4.95	2	0.08
CPI Soc	2.20	2	0.33
Overspending Ratio	6.00	2	0.05*
History of Mood Diagnosis	7.86	2	0.02*
History of Alcohol Diagnosis	2.43	2	0.30
History of Drug Use Disorder Diagnosis	10.34	2	0.01*

*Note.* PG = Pathological Gambling CPI Soc = California Personality Inventory – Socialization Scale

\* $p < 0.05$

**Table 3****Parameter Estimates for Multinomial Logistic Regression Predicting Suicide Group**

Comparison	Predictor	Wald $\chi^2$	$\beta$	SE	Odds Ratio	Odds Ratio 95% Confidence Interval
Ideators vs. Non-Suicidal as Referent	Number of PG Criteria Met	4.30*	0.37	0.18	1.45	1.02 - 2.06
	CPI Score	0.09	-0.01	0.05	0.99	0.90 - 1.08
	Overspending Ratio	5.02*	2.11	0.94	8.23	1.30 -51.95
	History of Mood Disorder	6.86*	1.61	0.61	4.98	1.50 -16.56
	History of Alcohol Disorder	2.34	1.04	0.68	2.82	0.75 -10.63
	History of Drug Use Disorder	0.55	-0.49	0.67	0.62	0.17 - 2.26
Attempters vs. Non-Suicidal as Referent	Number of PG Criteria Met	2.68	0.31	0.19	1.37	0.94 - 1.98
	CPI Score	0.81	0.04	0.05	1.05	0.95 - 1.15
	Overspending Ratio	3.04	1.76	1.01	5.81	0.80 -42.07
	History of Mood Disorder	4.21*	1.32	0.65	3.75	1.06 -13.28
	History of Alcohol Disorder	0.62	0.60	0.77	1.83	0.41 - 8.17
	History of Drug Use Disorder	3.26	1.26	0.70	3.54	0.90 -13.93
Attempters vs. Ideators as Referent	Number of PG Criteria Met	0.15	-0.06	0.16	0.94	0.69 - 1.29
	CPI Score	1.98	0.06	0.04	1.06	0.98 - 1.15
	Overspending Ratio	0.11	-0.35	1.04	0.71	0.09 - 5.44
	History of Mood Disorder	0.22	-0.28	0.60	0.75	0.23 - 2.44
	History of Alcohol Disorder	0.40	-0.43	0.69	0.65	0.17 - 2.49
	History of Drug Use Disorder	9.07*	1.76	0.58	5.78	1.85 -18.11

\* $p < 0.05$

**Table 4****Likelihood Ratio Tests for Individual Effects in the Multinomial Logistic Regression Model with Interaction of Substance Use History and Alcohol Use History**

Variable	$\chi^2$ to remove	df	sig.
Number of PG Criteria Met	6.05	2	0.05*
CPI Soc	1.68	2	0.43
Ratio of Days Gambled to Days Could Afford	7.26	2	0.03*
History of Mood Diagnosis	7.78	2	0.02*
Alcohol Diagnosis x Drug Use Diagnosis	23.39	6	<0.01*
No Alcohol/No Drug			
Alcohol/No Drug			
Drug/No Alcohol			
Both Alcohol & Drug Diagnoses			

*Note.* PG = Pathological Gambling CPI Soc = California Personality Inventory – Socialization Scale

\* $p < 0.05$

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Figure 1: Common Factor Model of the Gambling-Suicide Link

