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Pathological Gambling and Posttraumatic Stress Disorder: A Study of the Co-Morbidity versus Each Alone

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Abstract This report is the first empirical study to compare pathological gambling (PG), posttraumatic stress disorder (PTSD), and their co-occurrence. The sample was 106 adults recruited from the community (35 with current PG; 36 with current PTSD, and 35 with BOTH). Using a cross-sectional design, the three groups were rigorously diagnosed and compared on various measures including sociodemographics, psychopathology (e.g., dissociation, suicidality, comorbid Axis I and II disorders), functioning, cognition, life history, and severity of gambling and PTSD. Overall, the PG group reported better psychological health and higher functioning than PTSD or BOTH; and there were virtually no differences between PTSD and BOTH. This suggests that it is the impact of PTSD, rather than comorbidity per se, that appears to drive a substantial increase in symptoms. We also found high rates of additional co-occurring disorders and suicidality in PTSD and BOTH, which warrants further clinical attention. Across the total sample, many reported a family history of substance use disorder (59%) and gambling problems (34%), highlighting the intergenerational impact of these. We also found notable subthreshold PTSD and gambling symptoms even among those not diagnosed with the disorders, suggesting a need for preventive care. Dissociation measures had mixed results. Discussion includes methodology considerations and future research areas.

Keywords Problem gambling · Pathological gambling · PTSD · Posttraumatic stress disorder · Trauma · Comorbidity

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"When I have flashbacks, I usually go to the casino to calm down."
"Gambling helps me to escape and not think about trauma."

Pathological gamblers have high rates of co-occurring disorders, including mood, personality, and substance use disorders (Kessler et al. 2008; Petry et al. 2005). There is also evidence for a compelling association between posttraumatic stress disorder (PTSD) and pathological gambling (PG). In the National Comorbidity Study Replication, a community epidemiology study, 14.8% of those with lifetime PG met criteria for lifetime PTSD (Kessler et al. 2008). In a community study of over 1200 American Indian and Hispanic-American veterans, 17% of those with lifetime PG also met lifetime PTSD (Westermeyer et al. 2005). In a community study of 843 elderly adults, 11% were "at risk" gamblers, with current PTSD symptoms one of the strongest predictors (Levens et al. 2005).

Treatment-seeking populations, as expected, show even higher rates. Estimates of PTSD among treatment-seeking gamblers range from 12 to 29%, and high PTSD symptoms per se have been documented in 34% (Ledgerwood and Petry 2006a). Conversely, among a sample entering treatment for PTSD (Biddle et al. 2005), 17% met DSM-IV criteria for PG. Trauma per se, aside from PTSD, has also consistently been found to be associated with problem and/or pathological gambling (Kausch et al. 2006; Petry and Steinberg 2005; Scherrer et al. 2007; Taber et al. 1987), with much of the trauma having occurred in childhood.

Various studies have identified basic characteristics of those with PTSD (or trauma) and PG. Overall, there is greater pathology and worse functioning among those with the comorbidity, compared to those with just one of these problem areas. This includes increased depressive, anxiety, and substance abuse symptoms, and a more avoidant personality style (Taber et al. 1987); earlier age of gambling onset and more severe gambling problems (Petry and Steinberg 2005); greater lifetime gambling severity, psychiatric symptom severity, impulsivity, and dissociation (Ledgerwood and Petry 2006a); greater frequency of suicide attempts and drug and alcohol dependence, and more severe psychiatric distress (Kausch et al. 2006); and "an entrenched gambling culture" and self-reported desire to escape problems (Biddle et al. 2005).

Of particular salience from a public health perspective is that PTSD is known to be understudied, underdiagnosed, and undertreated relative to the more commonly diagnosed mood, anxiety and addictive disorders that so commonly co-occur with it and/or are misdiagnosed instead of it (Davidson 2001; Dansky et al. 1997). The reasons for this disparity are several: there are more psychopharmacologic treatments available for mood and anxiety disorders then for PTSD (and thus psychiatrists are more likely to focus on disorders other than PTSD); some addiction treatment professionals express the concern that if they diagnose PTSD they will have to treat it, which historically they have not typically been trained to do (Najavits 2002); and treatment programs do not routinely assess for PTSD (Davidson 2001; Dansky et al. 1997). Nonetheless, PTSD is a prevalent disorder (7% lifetime rate in the general population; Kessler et al. 1995), is typically chronic for many years, incurs high health care utilization and cost, and is associated with various life problems (including physical health disorders, homelessness, loss of custody of children, and numerous co-occurring Axis I and Axis II disorders) (Ouimette and Brown 2002; Bisson 2005; Najavits et al. 1997). Although PG is less prevalent than PTSD (0.6% lifetime PG rate in the general population, 2.3% for problem gambling); PG has been shown to predict the subsequent onset of posttraumatic stress disorder (Kessler et al. 2008).

Based on a literature review on PTSD and PG, the following theory-based variables were selected to guide this project. (a) *Impulsiveness.* This variable differentiated PG patients high versus low in PTSD symptoms in Ledgerwood and Petry (2006a). It has long been understood as a central trait in all addictive disorders as well as in PTSD (e.g., self-harm behavior). (b) *Suicidality.* PTSD and PG are each associated with increased suicide risk (Hodgins et al. 2006). It is unclear, however, to what degree that risk is increased when the disorders co-occur. (c) *Dissociation.* This variable refers to a "spacing-out," trance-like state in which cognition is altered. It was elevated among PG patients high in PTSD symptoms in Ledgerwood and Petry (2006a), yet not elevated in Grant and Kim (2003) in PG alone compared to normal controls. (d) *Risk and Protective factors.* The ability to cope well and to "bounce back" from adversity has been a topic of major interest in both the PTSD and PG fields. We thus sought to test various childhood and adulthood risk and protective factors that may help explain why some people develop one disorder versus the other or both. (e) *Comorbid diagnoses (Axis I and II).* Both PG and PTSD have been found comorbid with additional co-occurring disorders (Petry et al. 2005; Kessler et al. 2008). Of interest are how many and what types of disorders occur in conjunction with PTSD/PG. (f) *Severity of PG, PTSD.* In addition to simple presence of a disorder, its severity is of major clinical importance. (g) *Gambling self-efficacy.* This is believed important for regulation of gambling behavior (May et al. 2003), and is a widely-used construct in studying other addictions (DiClemente et al. 1994). (h) *Cognitions related to PG and PTSD.* Cognitions are a sign of psychopathology and also a target of treatment. We thus wanted to evaluate the level of PG- and PTSD-specific cognitions. (i) *Age of onset of PG and PTSD.* Research suggests that mental illness occurs prior to most addictions including PG (El Guebaly 1990). Yet this pattern may be different for PG in relation to PTSD, as noted earlier (Kessler et al. 2008).

We hypothesized that participants with comorbid PG and PTSD would evidence an overall worse profile than those with either disorder alone (e.g., more additional Axis I and II disorders, higher rate of family history of mental illness; lower functioning and cognition). We also hypothesized that those with PTSD and PG would not show differences on most variables as each is a major psychiatric disorder with known impact on many areas of functioning.

To our knowledge, this is the first study that sought to specifically address the comorbidity of PG/PTSD in relation to each disorder alone. It is also the first to include such a broad range of variables, many of which have never before been studied in PG/PTSD comorbidity (e.g., suicidality, risk and protective factors, cognitions related to PTSD and gambling).

Method

Sample

The sample consisted of 106 adults from Toronto and Boston: 36 with current PTSD (21 and 15 in the respective cities); 35 with current PG (24 and 11, respectively), and 35 with current PTSD and PG (15 and 20, respectively). The targeted sample size of 105 was determined by power analysis based on the assumption of .05 significance level and ability to detect differences of .75 on means based on three primary variables reported in one of the best studies thus far on PTSD/PG (that of Ledgerwood and Petry (2006a): Global Severity Inventory total (Derogatis 1977); dissociation on the Dissociative Experiences Scale (Bernstein and Putnam 1986); and impulsivity on the Eysenck Scales-Impulsiveness subscale (Eysenck and Eysenck 1978).

Procedure

Recruitment was conducted primarily in the community through local advertising, online postings, and fliers; also some recruitment occurred at local treatment centers. Inclusion criteria were current PTSD, PG, or both; and age 18 or older. Exclusion criteria were: current uncontrolled bipolar I disorder; current psychotic disorder; and/or inability to read or write. The inclusion/exclusion criteria were minimal to capture a broad sample. Thus, for example, we did not exclude participants if they had substance use disorder, other Axis I disorders, Axis II disorders, etc. Participants were assessed only at one time (a cross-sectional study design), and they received up to $70 (Canadian dollars) in cash or gift cards for full completion of the assessments. All ethical safeguards for informed consent and confidentiality of records were followed, and the study was IRB-approved for each site.

An initial telephone screen included the two-item Lie/Bet problem gambling screen (Gotestam et al. 2004; Johnson et al. 1988) and four-item PTSD screen (Kimerling et al. 2006). Following the phone screen, participants attended an in-person assessment that included a diagnostic interview to ascertain the presence of the inclusion/exclusion criteria. All diagnostic assessments were conducted by trained interviewers (an advanced doctoral student in clinical psychology for Toronto and a licensed clinical social worker in Boston), both supervised by the author based on audiotapes of the interviews.

Measures

Participants who met eligibility criteria completed a battery of measures as follows. The list below includes all of the theory-driven variables identified earlier, as well as some additional ones. All measures are self-report unless noted otherwise; and all were selected for their psychometric validation and/or use in prior research. All measures were scored per the measure developer.

Sociodemographics

Sociodemographic characteristics were obtained from the Addiction Severity Index (McLellan et al. 1992) and the Canadian Problem Gambling Index (CPGI; Ferris and Wynne 2001).

Psychopathology

The Mini-International Neuropsychiatric Interview (MINI; Sheehan et al. 1998) is a structured interview that was used to assess for all major current DSM-IV Axis 1 disorders (including all inclusion/exclusion diagnoses except for PG), plus a suicidality rating. Disorders assessed on the MINI were: *mood disorders* (major depressive episode, dysthymia, hypomanic episode); *anxiety disorders* (panic disorder, agoraphobia, social phobia/social anxiety disorder, specific phobia, obsessive compulsive disorder, generalized anxiety disorder); *substance use disorders* (alcohol dependence, alcohol abuse, any substance dependence, any substance abuse; *eating disorders* (anorexia nervosa, bulimia nervosa); *somatoform disorders* (somatization disorder, hypochondriasis, body dysmorphic disorder, pain disorder); *disorders usually first diagnosed in infancy, childhood, or adolescence* (conduct disorder, attention deficit hyperactivity disorder); and *suicidality* (the latter not an actual disorder). The Structured Clinical Interview for DSM-IV Personality Disorders (SCID II; First et al. 1997) was an interview to assess all DSM-IV Axis II disorders. The Addiction

Severity Index (ASI; McLellan et al. 1992) was an interview to assess composite scores related to addiction (e.g., alcohol, drugs, psychiatric, legal, employment, medical, family/social), as well as sociodemographics. The Brief Symptom Inventory (BSI; Derogatis 1983) evaluated psychological symptoms, from 0 (*not at all*) to 4 (*extremely*), in nine areas (somatization, obsessive–compulsive behavior, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism). The Dissociative Experiences Questionnaire (DES; Bernstein and Putnam 1986) was used to measure dissociation, ranging from 0 to 100. The Short Form-12 Version 2 (SF-12; Ware et al. 1996) provided a measure of overall health status. The Coping Strategies Inventory (Tobin et al. 1989) measures coping strategies, rated 1 (*not at all*) to 5 (*very much*). The Crowne-Marlowe Social Desirability Scale (Strahan and Gerbasi 1972), Form 2, based on the original Social Desirability Scale, (Crowne and Marlowe 1960) contains 10 true–false items that describe both acceptable but improbable behaviors, and unacceptable but probable behaviors; it is widely used as a measure of social desirability. The BASIS-32 (Eisen et al. 1999) offers 32 items to assess mental health functioning in five areas: relation to self/others, depression/anxiety, daily living/role functioning, impulsive/addictive behavior, and psychosis, with items rated 0 (*no difficulty*) to 4 (*extreme difficulty*). The Brief Barratt Impulsivity Scale (Barratt 1959) assesses impulsivity using 30 items rated on a 4-point scale. The New-Buss Aggression Questionnaire (Gidron et al. 2001) is an eight-item version of the Buss and Perry Aggression Questionnaire (Buss and Perry 1992), with questions on a 5-point scale. The Risk and Protective Factors Questionnaire (Najavits 1994a, b) is a 33-item scale to assess life experiences in childhood and adulthood (e.g., safety of your neighborhood, sense of purpose in life). The Self-Compassion Scale (Neff 2003) has 26 items on a five-point scale to measure six subscales: self-kindness, common humanity, mindfulness, over-identification, self-judgement, and isolation. The General Self-Efficacy Scale (Schwarzer and Jerusalem 1995) has 10 items rated on a four-point scale. The Multidimensional Scale of Perceived Social Support (Zimet et al. 1988, 1990) has 12 items on a seven-point scale. Finally, the Abbreviated Quality of Life Enjoyment and Satisfaction Questionnaire (Ritsner et al. 2005) is composed of 17 items on a five-point scale that offers an abbreviated version of the Quality of Life Enjoyment and Satisfaction Questionnaire (Endicott et al. 1993).

Gambling

The Diagnostic Interview for Gambling Severity—Revised (DIGS-R) (Winters et al. 2002) is a 40-item structured interview that queries each of the DSM-IV criteria for PG; it was used to determine the inclusion criterion of PG. It also assessed specific gambling behaviors; for these, the scaling was 1 = never, 2 = less than monthly, 3 = monthly, 4 = weekly, 5 = daily. (Note: the original measure had erroneously reversed the 2 and 3 anchors; we corrected this and thus our results may differ from means in the literature). For report of money spent on gambling dollars not adjusted for exchange-rate difference between US and Canada, but at time of assessment, these were very close. The Canadian Problem Gambling Index (Ferris and Wynne 2001) provided the nine-item Problem Gambling Scale (PGS) which is a self-report screening tool that classifies respondents into non-problem gamblers, low-risk gamblers, moderate-risk gamblers, and problem gamblers. The Gambling Experiences Measure (Ledgerwood and Petry 2006b) has 18 items to measure psychological experiences of problem gamblers on a 5-point scale. The Gamblers' Beliefs Questionnaire (Steenbergh et al. 2002) has 21 items to evaluate cognitive distortions related to gambling, rated from 1 (*strongly agree)* to 7 (*strongly disagree*). The Gambling Self-Efficacy Questionnaire (May et al. 2003) has 16 items to assess perceived

confidence in controlling gambling behavior in specific situations, rated from 0 to 100. The Gambling Cognitions Questionnaire (Petry n.d.) has 29 items to evaluate gambling cognitions ("I think that my gambling losses are due primarily to bad luck and bad circumstances"), from 1 (strongly disagree) to 6 (strongly agree).

Trauma/PTSD

The inclusion criterion of PTSD was assessed on the MINI. In addition, the 17-item PTSD Checklist–Civilian Version (Weathers et al. 1993) was used to assess level of PTSD symptoms. The World Assumptions Scale (Janoff-Bulman 1989) assessed beliefs related to PTSD, with 32 items on a 6-point scale from "*strongly disagree*" to "*strongly agree*". The Trauma History Questionnaire (Green 1996) assessed for lifetime traumas. The Trauma Symptom Checklist-40 (Briere 1996) was used to evaluate 40 trauma-related symptoms from which six subscales derive: anxiety, depression, dissociation, sexual abuse trauma index, sexual problems, and sleep disturbance. The PG/PTSD Timeline (Najavits 2008) identified the onset of each disorder, and was adapted from an earlier version on SUD/PTSD (Najavits 1994a, b).

Data Analysis

The primary question of interest was the comparison of the three groups (PTSD alone, PG alone, and PTSD/PG). For continuous variables, one-way ANOVAs were conducted followed by the least-significant-difference post-hoc test. For categorical variables, chi square tests were conducted; if the overall chi square was significant, pairwise chi square tests were then conducted post hoc. We also evaluated site differences (Boston versus Toronto) via independent samples t-tests and chi squares. All differences reported were significant at .05 or below, but trends at .10 or below are also noted, given the exploratory nature of this project. To minimize Type I error, we emphasize total and subscale scores for each measure. We did not apply Bonferroni correction as that is too conservative for a small exploratory study such as this.

Results

All results below were significant unless noted otherwise.

Demographics

Most of the 106 participants were female ($n = 63$, 59.43%), with an average age of 43 (SD = 14.06). Most were never married ($n = 46$; 43.4%); then equal numbers of married and divorced (each $n = 18$; 17%); and the rest were living with someone ($n = 11$, 10.4%); separated ($n = 8$, 7.5%), or widowed ($n = 5$, 4.7%). Most had no children ($n = 56$, 52.8% without children; $n = 50$, 47.2% with children). In education level, most had some college ($n = 60$, 56.6% either graduated or had attended college); the rest were equal amounts with high school or less or some graduate/professional school (each $n = 23$, 21.7%). Median annual income was $10,000–$25,000. By race/ethnicity, most of the sample was Caucasian ($n = 73$, 68.9%), then Black ($n = 14$, 13.2%), Asian ($n = 9$, 8.5%), Hispanic ($n = 6$, 5.7%), and more than one ($n = 4$, 3.8%).

Comparison of the three study groups revealed no difference on age, marital status, education level, or income. However, on gender, PTSD was higher than PG ($n = 27$ women versus $n = 15$ women; chi square $= 7.59$, $P < .01$, df $= 1$). On race/ethnicity, PTSD was more likely to be Caucasian than minority compared to PG ($n = 33$ Caucasian versus $n = 20$, chi square $= 11.18$, df $= 1$, $P = .001$) and also compared to BOTH ($n = 33$ Caucasian versus $n = 20$, chi square $= 11.18$, df $= 1$, $P = .001$). On number of children, there was a trend for BOTH to have more children ($M = 1.31$, SD $= 1.34$) than PTSD ($M = .78$, SD $= 1.22$) or PG ($M = .66$, SD $= .91$) ($F = 3.04$, df $= 2$, 103, $P = .052$).

Age of Onset and Related Variables

Note: the Toronto diagnostician failed to ask questions related to the onset of PTSD and PG, and thus data on age of onset are only available for the Boston site; thus the sample sizes are lower than expected, and should be interpreted with caution. Trauma onset occurred quite young ($M = 13.98$ years old, SD $= 12.99$, $n = 40$); and a substantial percentage reported their trauma as continuous ($n = 18$, 35.3% of the $n = 51$). PTSD onset occurred on average at 22 years old (SD $= 12.47$, $n = 40$). PTSD was at its most severe from an age 28.15 (SD $= 13.11$, $n = 27$) to age of 33.78 (SD $= 13.48$, $n = 27$). Age of first gambling experience was 24.63 (SD $= 11.88$, $n = 49$), with PG onset later at age 32.88 (SD $= 12.73$, $n = 50$). PG was at its most severe from age 35.69 (SD $= 12.34$, $n = 49$) to age 40.35 (SD $= 13.10$, $n = 49$). Participants had 6.22 periods of abstinence from gambling lasting at least one month or more (SD $= 15.56$, $n = 45$). Most reported gambling alone ($n = 28$, 50% of $n = 56$), followed by with friends ($n = 13$, 23.2%), or a combination of different people ($n = 8$, 14.3%). Among those with both PG and PTSD, the vast majority reported PTSD onset first ($n = 23$, 71.9% of $n = 32$), with just a few reporting PG first ($n = 3$, 9.4%), or both at the same time ($n = 2$, 6.3%); a few others could not say which occurred first ($n = 4$, 12.5%). Most believed their PTSD and PG was related ($n = 17$, 53.1% of $n = 32$); others did not believe they were related ($n = 5$, 15.6%), or could not say ($n = 10$, 31.3%).

Family History

Most participants reported a family history of SUD ($n = 63$; 59.4%), and a sizeable minority reported a family history of gambling problems ($n = 36$, 34%). The three groups did not differ on family history of gambling problems, but did differ on family history of SUD. That is, PTSD reported this more than PG ($n = 29$ versus $n = 13$, chi square $= 13.84$, $P < .0001$), and had a trend toward more than BOTH ($n = 29$ versus $n = 21$, chi square $= 3.6$, $P = .058$).

Possible Confounds: Site and Social Desirability

Two key variables were analyzed to identify potential confounds. The first analysis was demographics and family history by site (Toronto versus Boston); no differences were found on any of the sociodemographic variables (marital status, number of children, income, education level, race/ethnicity, gender, age, or family history of gambling problems or SUD).

Second, was analysis of social desirability. The Marlowe-Crowne Social Desirability Scale had been included to evaluate possible "faking good." Some participants scored

above the recommended cutpoint on the total score of this scale and thus all measures below were analyzed twice: first including all participants, then rerunning the analysis with only those below the cutpoint. There is no one cutpoint widely agreed on, especially for the short form of the scale; however, a review article (Van de Mortel 2008) notes that one can use a cutpoint of 1.5 standard deviations above the mean of the sample. For this study, the mean was 4.92, SD = 2.31; thus 1.5 standard deviations, 3.47 = 8.39; we thus used a cutpoint of 8, which is conservative; this represented 16% of the sample. Notably the PG group scored higher ($M = 5.91$, SD = 2.50) on the Crowne-Marlowe than PTSD ($M = 4.33$, SD = 2.08) and BOTH ($M = 4.54$, SD = 2.05) ($F = 5.27$, $P = .007$, df = 2, 103). It is important to note, however, that the literature on the Crowne-Marlowe indicates significant debate about its validity (Barger 2002); also power is reduced when deleting cases on a small study such as this. Thus, interpretation of results in this paper are based on overall patterns rather than strictly by those that take into account results on the Crowne-Marlowe scale. We note, however, that the pattern of results was highly similar when analyzed with and without the adjustment for the Crowne-Marlowe scores; the main difference was that some variables were no longer significant (or as significant) with the Crowne-Marlowe, as indicated in the Tables. The loss of significance, however, may be the result of diminished statistical power and thus is interpreted cautiously.

Psychopathology. See Table 1.

(a) *Psychological symptoms (Brief Symptom Inventory).* Differences as well as all subscales. All findings indicated PG to be healthier than both PTSD and BOTH.
(b) *Dissociation (Dissociative Experiences Questionnaire).* No significant differences were found. Means were: PG ($M = 9.20$, SD = 13.45), PTSD ($M = 14.25$, SD = 12.13), BOTH ($M = 4.76$, SD = 88.08). Higher scores indicate more pathology.
(c) *Functioning (BASIS-32).* Differences as well as all subscales. All findings indicated PG to be healthier than PTSD and/or BOTH.
(d) *Aggression (New-Buss).* PG reported less aggression than either PTSD or BOTH.
(e) *Multidimensional Scale of Perceived Social Support.* PG endorsed more social support than BOTH (on the overall mean, and subscales for significant other, and friends), and more than PTSD (on the family subscale).
(f) *Coping Strategies Inventory.* Only five differences were found, of which two were trends; the other nine subscales were not significant. Moreover, the post-hoc tests were only significant on three subscales (and not necessarily the ones significant in the overall F test). Further, no results remained significant in the Crowne-Marlowe reanalysis. Caution is thus urged on interpreting this measure. Findings indicate that PG, compared to PTSD and BOTH, had greater use of positive coping strategies and lower use of negative coping strategies.
(g) *Risk and Protective Factors.* Differences were found on the total score and both subscales (child and adult), per Table 1. On all of those, PG reported higher protective factors than PTSD and BOTH.

Each individual variable on this scale was also analyzed to try to understand better the life factors that may have played a role in the development of PG, PTSD, or BOTH. In the item analysis, 20 variables were significant out of 66 tested (with "significant" referring to any variables at trend level or below and with a significant post-hoc test difference). The consistent pattern of findings was PG indicating more protective and fewer risk factors than BOTH, and to some extent, than PTSD. The largest number of significant variables was in adulthood: having a sense of purpose in life ($F = 4.97$, $P = .009$ (PG > PTSD, BOTH);

Table 1 General psychopathology and related scales

Measure	PG		PTSD		BOTH		
	Mean	SD	Mean	SD	Mean	SD	F
Psychological Symptoms: Brief Symptom Inventory[1]							
Positive symptom total (number of symptoms)	14.29[a,b]	12.80	30.36[a]	14.77	29.91[b]	.58	13.561***(s)
Positive symptom distress index (intensity of symptoms)	1.53[a,b]	.59	2.19[a]	1.11	2.08[b]	.41	5.664**(s)
Global severity index (overall psychological distress)	.49[a,b]	.52	1.35[a]	.82	1.29[b]	.47	11.947***(s)
Somatization	.46[a,b]	.61	1.11[a]	1.01	1.16[b]	1.21	5.685**(s)
Obsessive–compulsive	.80[a,b]	.88	1.82[a]	1.07	1.50[b]	1.18	8.694***(s)
Interpersonal sensitivity	.52[a,b]	.67	1.57[a]	1.12	1.44[b]	1.14	11.508***(s)
Depression	.68[a,b]	.89	1.59[a]	1.08	1.48[b]	1.30	7.159***(s)
Anxiety	.40[a,b]	.58	1.50[a]	1.04	1.34[b]	1.32	11.529***(s)
Hostility	.27[a,b]	.41	1.01[a]	.92	.90[b]	.61	9.337***(s)
Phobic anxiety	.26[a,b]	.47	.89[a]	.96	1.05[b]	.88	6.753**(s)
Paranoid ideation	.49[a,b]	.79	1.34[a]	1.14	1.38[b]	.67	9.363***(s)
Psychoticism	.42[a,b]	.57	1.22[a]	.93	1.11[b]	.89	8.270***(s)
Functioning: BASIS-32[1]							
Overall mean	.66[a,b]	.71	1.32[a]	.79	1.32[b]	.79	8.19***(s)
Relation to self and others	.88[a,b]	.98	1.64[a]	.95	1.64[b]	.95	6.91**(s)
Depression and anxiety	.81[a,b]	.85	1.72[a]	1.06	1.72[b]	1.06	8.90***(s)
Daily living skills	.91[a,b]	.94	1.79[a]	1.09	1.79[b]	1.09	6.95***(s)
Impulsive and addictive behaviors	.31[b]	.70	.67	.77	.67[b]	.77	5.97**(s)
Psychosis	.26[b]	.62	.54	.77	.54[b]	.77	4.12*(s)
Aggression: New-Buss[1]							
Overall mean	2.25[a,b]	.97	2.83[a]	.89	2.69[b]	.77	4.30*(ns)
Multidimensional Scale of Perceived Social Support[2]							
Overall mean	5.06[b]	1.40	4.47	1.42	4.21[b]	1.50	3.23*(ns)
Significant other	5.17[b]	1.63	5.06	1.67	4.25[b]	1.89	2.96[†](ns)
Family	5.12[a]	1.71	3.76[a]	1.82	4.44	1.68	5.40**(s)
Friend	4.89[b]	1.63	4.60	1.82	3.94[b]	1.74	2.81[†](ns)
Coping Strategies Inventory[2,3]							
Express emotions	2.97	.79	3.09	.91	2.86	1.07	.57
Social support	3.23	1.10	3.23	1.03	3.03	1.14	.42
Problem avoidance	2.77	.74	2.69	.78	2.92	.85	.78
Wishful thinking	3.02[b]	.89	3.24	1.09	3.48[b]	.92	1.98
Self criticism	2.72	.98	3.15	.98	3.02	.99	1.78
Social withdrawal	2.81[a]	1.09	3.38[a]	.93	3.27	1.02	3.13*(ns)
Problem solving	3.57	.88	3.17	.80	3.15	.99	2.414[†](ns)
Cognitive restructuring	3.55[a,b]	.93	3.02[a]	.93	2.95[b]	.99	4.26*(ns)
Problem–focused engagement	7.12[a,b]	1.74	6.19[a]	1.59	6.10[b]	1.87	3.72*(ns)
Emotion-focused engagement	6.20	1.73	6.33	1.58	5.89	2.08	.55
Problem-focused disengagement	5.79	1.45	5.93	1.61	6.40	1.50	1.55[†](ns)

Table 1 continued

Measure	PG		PTSD		BOTH		
	Mean	SD	Mean	SD	Mean	SD	F
Emotion-focused disengagement	5.53[a]	1.92	6.53[a]	1.67	6.29	1.83	2.945
Engagement	13.32	3.11	12.52	2.69	11.99	3.34	1.686
Disengagement	11.32	2.89	12.46	2.90	12.69	2.87	2.260
Risk and Protective Factors[4,5]							
Total protective factors	2.37[a,b]	.23	2.16[a]	.26	2.17[b]	.37	5.73**(s)
Childhood protective factors	2.38[a,b]	.27	2.21[a]	.35	2.19[b]	.41	3.10*(ns)
Adult protective factors	2.36[a,b]	.25	2.11[a]	.25	2.16[b]	.40	6.74**(s)
Addiction Severity Index[1,6]							
Psychological composite	.95[a,b]	.18	1.18[a]	.21	1.13[b]	.25	11.09***(s)
Quality of Life Enjoyment and Satisfaction Scale (Abbreviated Version)[2]							
General index	3.51[a,b]	.65	2.96[a]	.78	2.73[b]	.80	9.88***(s)
Satisfaction with medication	2.53	1.58	2.41	1.46	2.06	1.30	.99 (ns)
Physical	3.45[a,b]	1.28	2.78[a]	1.16	2.79[b]	1.09	3.71*(ns)
Subjective feelings	3.91[a,b]	.77	3.20[a]	.84	2.98[b]	1.05	10.16***(s)
Leisure activities	3.75[a,b]	.79	3.03[a]	1.12	2.99[b]	1.05	6.34**(s)
Social relationships	3.54[b]	.82	3.11	1.06	2.71[b]	.91	5.71**(s)
General Self-Efficacy Scale[2]							
Overall mean	3.15	.54	2.87	.62	2.83	.82	2.38†(ns)
Self-Compassion Scale[2]							
Overall mean	3.31[a,b]	.75	2.65[a]	.64	2.62[b]	.70	10.88***(s)
Self-kindness	3.18[b]	.97	2.92[c]	1.09	2.40[b,c]	.78	6.03**(t)
Self-judgment	2.67[a,b]	.92	3.57[a]	.96	3.31[b]	1.10	7.6***(s)
Common humanity	3.22[b]	1.02	2.83	1.00	2.60[b]	.97	3.57*(ns)
Isolation	2.61[a,b]	1.10	3.64[a]	.93	3.35[b]	1.14	8.95***(t)
Mindfulness	2.59[a,b]	.92	3.69[a]	.89	3.28[b]	1.15	11.12***(s)
Over-identified	2.61[a,b]	1.10	3.64[a]	.93	3.35[b]	1.14	8.95***(t)
Health: SF-12							
Physical score	39.59[a,b]	4.72	36.53[a]	3.99	36.91[b]	4.07	4.22*(s)
Mental score	38.34[a,b]	4.37	36.29[a]	3.98	37.34[b]	5.89	1.33
Current DSMIV Axis 1 Disorders: MINI[7,8]							
Total number of disorders[8]	1.17[a,b]	1.54	3.31[a]	2.48	3.60[b]	2.99	10.57***
Number of mood disorders (of 3)	.23	.49	.50	.65	.60	.60	3.75*
Number of anxiety disorders (of 6)	.51	.82	1.92	1.48	1.74	1.63	11.15***
Number of substance use disorders (of 4)	.26	.51	.53	.74	.49	.66	1.82
Number of somatoform disorders (of 4)	.11[b]	.40	.17[c]	.45	.46[b,c]	.78	3.71*
Number of eating disorders (of 2)	.00[b]	.00	.11	.32	.14[b]	.36	2.59†
Number of disorders usually first diagnosed in childhood/adolescence (of 2)	.06	.24	.08	.28	.17	.38	1.35
Suicidality (yes/no)	6[a,b]	17.1%	20[a]	55.6%	16[b]	45.7%	11.76**
DSM-IV Axis II Disorders: SCID-2[7]							
Any Axis II disorder	8[a,b]	22.9%	22[a]	61.1%	26[b]	74.3%	20.07***
Total number of Axis II disorders (of 13)	.34[a,b]	.73	1.08[a]	1.16	1.51[b]	1.52	8.83***

Table 1 continued

Measure	PG		PTSD		BOTH		
	Mean	SD	Mean	SD	Mean	SD	F
Avoidant	1[a,b]	2.9%	5[a†]	13.9%	7[b]*	20%	4.91[†]
Obsessive–compulsive	4[b]	11.4%	6	16.7%	11[b]	31.4%	4.75[†]
Dependent	1	2.9%	0	0%	2	5.7%	2.11
Passive-aggressive	0[a,b]	0%	4[a]	11.4%	5[b]	14.3%	4.97[†]
Depressive	1[a]	2.9%	5[a†]	13.9%	4	11.4%	2.77
Paranoid	0[a,b]	0%	5[a]	13.9%	8[b]	22.9%	8.63*
Schizotypal	0	0%	0	0%	1	2.9%	2.05
Schizoid	0	0%	2	5.6%	2	6.0%	2.08
Histrionic	0	0%	0	0%	1	2.9%	2.05
Narcissistic	2	5.7%	0	0%	1	2.9%	2.11
Borderline	0[a,b]	0%	5[a]	13.9%	6[b]	17.1%	6.25*
Antisocial	3	8.6%	4	11.1%	1	2.9%	1.81
Not otherwise specified	0[a,b]	0%	3[a†]	8.3%	4[b,]*	11.4%	3.97

Superscripts denote pairs that are significantly different based on the least significant difference test (LSD) for continuous variables and chisquare tests for categorical variables; subscript "a" refers to PG versus PTSD; "b" is PG versus BOTH; "c" is PTSD versus BOTH. See the Results section for a listing of non-significant results

In parentheses are results when participants high on the Crowne-Marlow measure of social desirability were deleted (those with 8 and above): *t* trend; *s* significant; *ns* not significant. See text, however, on the limitations of the Crowne-Marlowe scale

For chi square analyses, we list number of positive cases per group, percentage within group, chi square values, and significance values

[†] $P < .10$; * $P < .05$; ** $P < .01$; *** $P < .001$

[1] Higher scores indicate more pathology

[2] Higher scores indicate greater health

[3] Higher scores indicate more use of the coping strategy

[4] Higher scores indicate more protective factors

[5] See text for individual item analysis for this measure

[6] Two subscales were unable to be calculated due to missing data (legal and employment). The remaining subscales were not significant (alcohol, drug, family, medical)

[7] For diagnoses, the "total number" variables are continuous; for the categorical variables (meets versus does not meet criteria), they are the number of positive cases, per cent within condition, and the F column is the chi square value; because these measures were clinician-administered, we did not reanalyze on the basis of the Crown-Marlowe scale. On the follow-up chi square analyses for these measures, we indicate trend versus significance

[8] Not included are disorders that were inclusionary (PTSD, pathological gambling) or exclusionary (current mania or psychotic disorder)

relationship with your parents ($F = 3.64$, $P = .03$) (PG > PTSD); safety of your neighborhood ($P = .006$) (PG > BOTH); sense of life being meaningful ($P = .03$) (PG > BOTH); physical health of family members ($P = <.001$) (PTSD < PG, BOTH); romantic relationships ($P = .03$) (PG > PTSD, BOTH); destructive relationships ($P < .001$) (PG < PTSD, BOTH); financial situation (trend) (PTSD < BOTH); level of responsibilities, stresses (e.g., taking care of others, excessive work) ($P = .002$)

(PG > PTSD); your self-discipline (ability to get things done, to be productive) (trend) (PG > PTSD); sense of humor (trend) (PG > BOTH); having positive attention paid to you (being praised, noticed, valued) ($P = .04$) (PG > BOTH). Childhood variables that were significant were: your physical health (trend) (PG > BOTH); level of responsibilities, stresses (e.g., taking care of others, excessive work) (trend) (PG > PTSD); stable life situations (e.g., living arrangements, job, school) ($P = .03$) (PTSD < PG, BOTH); safety of your neighborhood ($P = .07$) (PG > BOTH); romantic relationships ($P = .03$) (PG > BOTH); the physical health of family members ($P = .04$) (PG > PTSD); sense of life being meaningful ($P = .03$) (PG > PTSD). Not significant for either childhood or adult-hood were: intelligence, interest in the arts, involvement in hobbies or activities, structure of life (e.g., routines), family's social status in the community, involvement in community organizations, sense of principles, institutionalization of family members, deaths of people close to them, opportunities in life, popularity, athletic ability, physical attractiveness, relationship with parents, relationship with adults other than parents, access to needed treatments.

(h) *Impulsiveness (Brief Barratt Impulsiveness Scale)*. No differences were found. Total scores were: PG ($M = 63.86$, SD = 9.19), PTSD ($M = 68.78$, SD = 10.69), BOTH ($M = 66.83$, SD = 10.41). Higher scores indicate more impulsivity.

(i) *Addiction Severity Index (ASI)*. Only the psychological problems subscale was significant, with PG reporting fewer problems than PTSD and BOTH; however, as noted in Table 1, two subscales could not be calculated due to missing data.

(j) *Quality of Life Enjoyment and Satisfaction Scale (abbreviated version)*. There were significant differences on the overall score and four of the five subscales. On all significant variables, PG reported higher quality of life than PTSD and BOTH.

(k) *General Self-Efficacy Scale*. There was a trend overall ANOVA, but no significant differences on the post-hoc test.

(l) *Self-Compassion Scale*. Differences were found on the overall score and all subscales. Findings indicated PG to be healthier than PTSD and/or BOTH, except for one finding for PTSD to be healthier than BOTH.

(m) *Health (SF-12)*. PG scored healthier than PTSD and BOTH on the physical subscale, but not on the mental (although this may be due to reduced sample size). All three groups were lower than the US population mean of 50 (University of Massachusetts 2008), indicating somewhat impaired health, both physical and mental.

(n) *DSM-IV Axis I disorders (MINI)*. Several summary variables were significant, with all but one indicating that PG was lower than PTSD and BOTH. The exception was somatoform disorders, on which PG was lower than BOTH (but not lower than PTSD), and BOTH was higher than PTSD.

(o) *SCID-2 (personality disorders)*. First, we analyzed the number of co-occurring Axis II disorders, and found several differences, all in the direction of PG being lower than PTSD or BOTH. The differences between PG and BOTH were strongest; and the specific disorders of paranoid personality disorder and borderline personality disorder were strongest as well. Second, we analyzed any Axis II disorder, and found comparable results: PG was lower than PTSD or BOTH. Nonetheless, it is notable that the majority of the full study sample ($n = 56$, 52.8%) had at least one Axis II disorder.

Gambling measures. See Table 2.

(a) *Gambling Experiences Questionnaire*. Differences were found on the overall score and all subscales. Most were in the expected direction (PTSD was lower than PG and/

or BOTH). However, one interesting finding was that BOTH was higher than PG and PTSD on the dissociation subscale.

(b) *Gambling Beliefs Questionnaire.* The PTSD group had healthier assumptions about gambling than PG and BOTH.

(c) *Gambling Self-Efficacy Questionnaire.* The PTSD group had more self-efficacy about gambling than PG and BOTH.

(d) *Gambling Cognitions Questionnaire.* The PTSD group was healthier than both PG and BOTH.

(e) *Diagnostic Inventory for Gambling Severity (DIGS).* On the clinician-administered portion of the DIGS, no difference was found on the number of PG criteria met by PG versus BOTH ($M = 8.34$, SD $= 1.59$ versus 8.34, SD $= 1.26$). The PTSD group met an average of .58 criteria (SD $= 1.11$). It is notable, however, that among the 36 PTSD participants, 20 reported gambling in the prior 12 months—highlighting that even though they did not meet criteria for PG, gambling is common even in this group.

The DIGS also has a self-report section that assesses for types of gambling and amount of money lost. Per Table 2, there was no difference between PG and BOTH; the only differences were in relation to the PTSD group. Finally, the DIGS assessed for gambling-related financial problems. Only a few showed results, and in all PG was lower than BOTH: cashed in life insurance: PG lower than BOTH (1 positive versus 6, chi square $= 3.97$, $P < .05$, df $= 1$); writing bad checks, a trend: PG lower than BOTH (4 positive versus 10, chi square $= 3.21$, $P = .07$, df $= 1$); forging someone's signature to cash in an insurance policy or obtain a loan, a trend (0 positive versus 3, chi square $= 3.13$, $P = .08$, df $= 1$). All of these retained their significant or trend level under the Crowne-Marlowe reanalysis.

(f) *Canadian Problem Gambling Index.* The primary comparison was PG versus BOTH, and no differences were found between these on either the nine-item problem gambling scale (PGS) nor the sum. It is notable, however, that on the PGS, which represents a self-report screening tool, among the 21 participants in the PTSD group who reported gambling in the prior year, 5 (24%) scored in the problem range for moderate risk gambling (score of 3-7) and 2 (9.5%) scored in the problem gambling range (score of 8 or more) even though none met criteria for PG.

PTSD/trauma measures. See Table 3.

(a) *Trauma Symptom Checklist-40.* There were differences on all overall indices as well as all subscales; see Table 1. However, all differences were PG being healthier than both PTSD and BOTH, which is expected given that PG were selected to have no PTSD. No differences were found between PTSD and BOTH.

(b) *PTSD Symptoms (PTSD Checklist).* There were differences on all overall indices as well as all subscales; see Table 1. However, all differences were PG being healthier than both PTSD and BOTH, which is expected given that PG were selected to have no PTSD. There were no differences between PTSD and BOTH.

(c) *PTSD cognitions (World Assumptions Scale).* See Table 3. There were significant differences on the total score and two of the three subscales. Findings indicated PG to be healthier than PTSD and/or PG, except for one finding for PTSD to be healthier than BOTH.

(d) *Trauma History Questionnaire.* There were differences on various summary scores of this measure, most of which were in the expected direction (PG less than PTSD and

Table 2 Gambling measures

Measure	PG		PTSD		BOTH		
	Mean	SD	Mean	SD	Mean	SD	F
Gambling Experiences Questionnaire[1]							
Overall mean	2.85[a]	.41	2.23[a,c]	.38	2.98[c]	.39	37.47***(s)
Escape	3.18[a]	.66	2.61[a,c]	.68	3.29[c]	.53	8.67***(s)
Dissociation	2.16[b]	.34	2.01[c]	.20	2.34[b,c]	.47	7.98***(s)
Ego	2.92[a]	.85	1.82[a,c]	.71	3.10[c]	.89	16.77***(s)
Gambling Beliefs Questionnaire[1,3]							
Overall mean	4.24[a]	1.23	1.70[a,c]	1.21	4.71[c]	1.31	58.67***(s)
Gambling Self-Efficacy Questionnaire[2]							
Overall mean	46.47[a]	22.69	75.69[a,c]	26.25	40.00[c]	21.12	16.78***(s)
Gambling Cognitions Questionnaire[1,3]							
Overall mean	3.19[a]	.73	2.67[a,c]	.78	3.53[c]	.76	8.60***(s)
Diagnostic Interview for Gambling Severity							
Played cards for money with friends?	2.11[a]	1.30	.75[a,c]	.91	2.17[c]	1.04	19.29***
Played cards at a casino?	2.00[a]	1.24	1.15[a,c]	.37	1.86[c]	.85	5.4***
Bet on horses, dogs or other animals?	1.57	1.01	1.10[c]	.31	1.74[c]	.98	3.37*
Bet on the outcome of a sporting event?	1.91	1.09	1.30[c]	.92	2.29[c]	1.45	4.20*
Played dice games for money?	1.57	.95	1.10	.45	1.54	1.01	2.06
Played numbers or bet on lotteries?	3.31	1.30	3.05[c]	.94	3.77[c]	1.19	2.64[†]
Played bingo for money?	2.06	1.21	1.70	1.03	2.06	1.30	.67
Played slot/poker/gambling machines?	2.69[a]	1.41	1.50[a,c]	.69[a]	2.40[c]	1.22	6.29**
Bowled, shot pool, played golf for money?	1.91[a]	1.34	1.15	.49[a]	1.49	.82	3.91*
Played pull tabs?	1.49	.89	1.25	.64	1.80	1.26	2.04
Gambled on commodities/high risk stocks?	1.34	1.00	1.10	.45	1.43	.92	.92
How much total money in the past 12 months have you lost…as a result of your gambling?[2]	$14,970	$35430	$191	$345	$11582	$33786	$1.53
How much total money in the past 12 months do you currently owe…as a result of your …gambling?[2]	$11,566[a]	$26,950	$250[a]	$1118	$7083	$17,657	$2.01

Superscripts denote pairs that are significantly different based on the least significant difference test (LSD) for continuous variables and chisquare tests for categorical variables; subscript "a" refers to PG versus PTSD; "b" is PG versus BOTH; "c" is PTSD versus BOTH. ee Results section for a listing of non-significant results

In parentheses are results when participants high on the Crowne-Marlow measure of social desirability were deleted (those with 8 and above): t = trend; s = significant; ns = not significant. See text, however, on the limitations of the Crowne-Marlowe scale

For chi square analyses, we list number of positive cases per group, percentage within group, chi square values, and significance values

[†] $P < .10$; * $P < .05$; ** $P < .01$; *** $P < .001$

[1] Higher scores indicate more pathology

[2] Higher scores indicate less pathology

[3] $n = 21$ PTSD (participants had to have gambled in prior year to fill out this scale)

Table 3 PTSD measures

Measure	PG		PTSD		BOTH		
	Mean	SD	Mean	SD	Mean	SD	F
Trauma Symptom Checklist-40[1]							
Overall mean	.55[a,b]	.41	1.21[a]	.58	1.14[b]	.71	13.58***(s)
Anxiety	.53[a,b]	.44	1.13[a]	.70	1.01[b]	.76	8.24***(s)
Depression	.69[a,b]	.53	1.33[a]	.65	1.24[b]	.76	9.88***(s)
Dissociation	.39[a,b]	.45	1.17[a]	.76	.97[b]	.83	11.83***(s)
Sexual abuse trauma index	.35[a,b]	.37	1.29[a]	.69	1.12[b]	.75	22.17***(s)
Sexual problems	.37[a,b]	.45	.95[a]	.73	1.01[b]	.84	9.09***(s)
Sleep disturbance	1.06[a,b]	.87	1.82[a]	.83	1.93[b]	.98	9.51***(s)
PTSD Checklist[1]							
Total score	40.29[a,b]	14.67	59.67[a]	14.92	58.54[b]	13.55	11.86***(s)
B criteria (re-experiencing)	11.82[a,b]	5.48	18.07[a]	4.91	18.17[b]	4.58	11.35***(s)
C criteria (avoidance)	15.76[a,b]	6.21	23.54[a]	6.66	22.83[b]	5.74	9.88***(s)
D criteria (arousal)	12.71[a,b]	5.61	18.06[a]	5.15	17.54[b]	5.10	6.62**(s)
PTSD Cognitions (World Assumptions Scale)[2]							
Overall mean	4.06[a,b]	.62	3.75[a]	.63	3.57[b]	.56	5.92**(t)
Benevolence	4.45[b]	.94	4.12	.99	3.82[b]	.83	4.01*(t)
Meaning	3.57	.63	3.29	.77	3.48	.59	1.61 (ns)
Self-world	4.29[b]	.95	3.96[c]	.77	3.49[b,c]	.92	7.28***(s)
Trauma History Questionnaire[3]							
Number of types of crime events	.94[a]	1.08	1.89[a]	1.39	1.40	1.24	5.12**(s)
Number of types of general disaster events	2.54[a,b]	2.47	4.92[a]	2.39	4.11[b]	2.64	8.24***(s)
Number of types of unwanted physical/sexual events	.86[a,b]	1.40	2.94[a,c]	1.71	2.14[b,c]	1.78	14.63***(s)
Total number of types of events	4.34[a,b]	4.11	9.75[a,c]	4.24	7.66[b,c]	4.72	13.85***(s)
Total number of times—crime events	1.40	1.75	9.69	13.76	9.46	29.27	2.25
Total number of times	25.54[a]	57.31	103.14[a,c]	113.49	57.20[c]	80.74	7.11**(s)
Total number of times—general disaster	9.86[a]	20.39	46.53[a,c]	78.61	15.20[c]	26.73	5.66**(s)
Total number of times—unwanted physical/sexual events	14.29[a]	44.23	46.92[a]	83.98	32.54	49.78	2.46[†]
Average age across all trauma types	26.40	13.71	21.32	9.66	21.39	8.18	2.46[†](s)
Average age-Crime events	25.49	12.94	19.93	12.58	24.12	10.03	1.46
Average age-general disaster events	27.11	13.44	24.84	10.88	25.80	11.05	.29
Average age-unwanted physical/sexual event	16.73	9.47	17.63[c]	11.54	11.86[c]	6.13	2.83[†](t)
Age of 1st trauma	19.06[a,b]	15.90	9.00[a]	8.73	10.15[b]	9.22	7.47**(s)

Superscripts denote pairs that are significantly different based on the least significant difference test (LSD) for continuous variables and chisquare tests for categorical variables; subscript "a" refers to PG versus PTSD; "b" is PG versus BOTH; "c" is PTSD versus BOTH. ee Results section for a listing of non-significant results

In parentheses are results when participants high on the Crowne-Marlow measure of social desirability were deleted (those with 8 and above): t = trend; s = significant; ns = not significant. See text, however, on the limitations of the Crowne-Marlowe scale

For chi square analyses, we list number of positive cases per group, percentage within group, chi square values, and significance values

[†] $P < .10$; * $P < .05$; ** $P < .01$; *** $P < .001$

[1] Higher scores indicate more pathology

[2] Higher scores indicate greater health

[3] Sample size per question ranged from 13–35 (if a participant answered "no" to a trauma type, other questions such as age or number of times had to be missing)

BOTH). However, it is also notable that PG nonetheless met an average of over 4 trauma types, and in frequency had an average of 25 traumas, reinforcing that trauma history may still be present in quite a few people with PG even in the absence of a PTSD diagnosis. Also notable was that there were some differences between PTSD and BOTH, which would not necessarily be expected. Specifically, PTSD had more types of sexual trauma, more total number of types of trauma, a higher frequency of traumas (by a wide margin), more frequent sexual traumas, yet a higher average age of sexual trauma.

Discussion

This is the first study to compare people with PG, PTSD, and both disorders. Strengths include a sample of 106, based on power analysis; rigorous diagnoses; theory-driven selection of measures; and a larger battery of measures than any study thus far in the area of PG/PTSD comorbidity. Our goal was to evaluate sociodemographic, psychopathology, functioning, cognition, and life history variables. No site differences were found on sociodemographics of the sample, indicating that our recruitment methods appeared successful across the two study sites.

Several key findings emerged. First was the clear and consistent pattern across virtually all measures of psychopathology: those with PG reported less pathology and higher functioning than those in the other two groups (PTSD and BOTH); yet virtually no differences were found between PTSD and BOTH. In contrast, it would have been predicted based on prior literature on comorbidity that those with BOTH would report higher pathology than the single-diagnosis groups (PG, PTSD). Also, it might have been expected that the single-diagnosis groups would have been comparable in pathology. The findings of this study, however, suggest that PTSD appears to drive a substantial increase in symptom reporting over and above what is found just from PG. Yet alternative explanations must also be considered. We recruited primarily in the community rather than in treatment settings. It may be that participants with PG alone may have primarily wanted remuneration and may have been less than honest in their reporting of symptoms. Or they may simply have been less aware of symptoms. The fact that the PG group had significantly higher endorsement of socially desirable responses on the Crowne-Marlowe scale suggests that something about the PG participants was different than the other two study samples. As noted earlier, however, the Crowne-Marlowe has serious limitations and is thus interpreted with caution. All of the self-report measures were analyzed twice: with all participants, and then also omitting those who scored excessively high on the Crowne-Marlowe. The pattern of results remained the same overall under both sets of analyses, although some significant findings disappeared in the Crowne-Marlowe reanalysis. It cannot be determined whether the loss of some findings on this reanalysis may reflect loss of power, or a true difference in findings.

Second, our sample had a notable number of additional psychiatric disorders, both Axis I and II. This was particularly true for those with PTSD or BOTH, with an average of over 3 additional Axis I disorders and an average of over 1 Axis II disorders. The majority of our full study sample had at least one Axis II disorder, which highlights the importance of assessing for Axis II (which is not typically not done in most studies, yet which can have major clinical relevance, affecting level of perceived difficulty of patients, therapeutic alliance, and outcomes). Suicidality was also prominent, especially among PTSD (56%)

and BOTH (46%), but also among a sizeable minority of PG (17%). Clearly, these various areas would need attention in clinical treatment. They also highlight that comorbidity is not simply the presence of two disorders, but typically also a constellation of various disorders in different combinations. These results are comparable to prior and larger studies of comorbidity (Kessler et al. 2005; Petry et al. 2005).

Third, from the family history data of this study it is clear that most of the sample (59%) had a family history of SUD, with PTSD having the highest rate of this (more than PG, $n = 29$ versus $n = 13$; and a trend toward more than BOTH, $n = 29$ versus $n = 21$). Also, a sizeable minority of the total sample reported a family history of gambling problems ($n = 36$, 34%). Such intergeneration history of addictive and psychiatric disorders is consistent with prior literature.

Fourth, we explored dissociation, which is an area frequently noted as common to both PG and PTSD. It was thus curious to find that on the *Dissociative Experiences Scale*, there were no differences between the three groups. It might have been expected that BOTH would have been higher on dissociation as they have the additive impact of both disorders. However, our other measure with a dissociation component, the *Gambling Experiences Questionnaire*, did in fact indicate that those with BOTH had higher dissociation than those with PG or PTSD. These discrepant findings suggest that more work is needed to understand the concept and assessment of dissociation in relation to PG/PTSD comorbidity.

Fifth, we were interested in the gambling- and PTSD-specific measures. By and large, we found the BOTH group was not worse on these measures than the respective single-diagnosis groups, although there were a few exceptions to this. Overall, it suggests that those with PG/PTSD were not necessarily more severe than their single-diagnosis counterparts, but they simply had two disorders rather than one.

Sixth, we note that even though our single-diagnosis samples were selected for the absence of the other co-occurring conditions (PG or PTSD), there were nonetheless subthreshold issues that would deserve more attention. Among those with PTSD, for example, 21 of the 36 reported gambling in the prior year, and of these, on the problem gambling scale of the Canadian Problem Gambling Inventory, 5 (24%) scored in the range for moderate-risk gambling and 2 (9.5%) scored in the problem gambling range. We note, however, that this problem gambling scale is simply a brief self-report screening tool in contrast to our rigorous, DSM-IV diagnosis-based, clinician-administered, lengthier DIGS. The latter is the gold standard for an actual diagnosis of PG, which none of these participants met criteria for. Nonetheless, perhaps some preventive efforts would be advised for such participants, to forestall the development of PG. Similarly, the PG sample had an average of over 4 trauma types, and in frequency had an average of 25 traumas, reinforcing that trauma history may still be present in quite a few people with PG even in the absence of a PTSD diagnosis.

Finally, we were also interested in the relationship between PG and PTSD. Average PTSD onset was earlier than PG onset (22 years versus 33 years); and trauma onset was much earlier at age 14. For those with BOTH, the PTSD occurred first in 72% of cases. Among the BOTH group, it is also noteworthy that 12% could not say which disorder came first. In qualitative comments, one participant said, "I never have connected my addictions to my PTSD until you asked me these questions." Our findings are consistent with prior PTSD comorbidity literature, which generally indicates that PTSD typically precedes SUD (Ouimette and Brown 2002). However, it contrasts with the National Comorbidity Study Replication (Kessler et al. 2008), in which onset was about half the time PG first, and the other half PTSD first. This may relate in part to the different assessments and recruitment methods of our study versus Kessler et al. Our findings should be interpreted with caution, however, as our sample size for age of onset data was limited.

Despite the strengths of this project, there were also several limitations. Our sample size, while more substantial than prior studies, nonetheless was relatively small in comparison to the size needed for rigorous exploration of the topics we tried to address. Our large number of measures and variables also made Type I error more likely, although the number of significant findings certainly exceeded the rate that would be expected by chance. Further, this study was limited to one time-point and thus did not allow for evaluation of change over time or test–retest reliability of responses. It was also focused solely on current diagnoses; lifetime diagnoses would be useful to assess in a subsequent study. Finally, our sample was recruited from various sources, including local treatment programs and postings on the Internet.

There are various future research directions that could help advance greater understanding of PTSD/PG comorbidity. Clinical profiles may differ depending on context; for example, participants in treatment may differ from those not in treatment (which we did not have the statistical power to explore). Other subsample issues also could also be studied: differences by gender, type of trauma, level of sub-threshold PTSD symptoms, type of gambling problem, age, ethnicity/race, and other factors that would have required a larger sample size than our study had. Longitudinal, prospective studies could uncover how PTSD and PG interact over time, and could address the development of the disorders, especially during key developmental phases such as adolescence. Studying personality variables that relate to PTSD and PG would also be interesting, to try to determine whether some "third factor" variables might underlie both disorders (internalization versus externalization, level of impulsivity, etc.). Given the high rate of Axis II disorders in the sample, greater study of personality variables would appear important. Identifying the relationship between PTSD/PG and other psychiatric conditions would also be useful, with larger sample sizes than we had in this project. For example, substance use disorder, personality disorders, affective disorders, and other disorders may play an important role in the onset and continuation of each or the comorbidity. There are also many treatment implications that would need further study: what combination of existing PTSD and PG treatments might be most successful for this comorbidity; how to engage patients into treatment (as PG is associated with low treatment utilization; Najavits 2010); and optimal methods for training clinicians to working with this comorbidity.

Overall, this project offers a lens on a problem that is growing in recognition: the association between PG and PTSD. Greater understanding of this comorbidity may set the stage for larger scientific studies in the future, may deepen our understanding of the etiology of the two disorders and their comorbidity, and may ultimately help inform treatment.

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