



## Short Communication

# Pathological gambling subtypes: A comparison of treatment-seeking and non-treatment-seeking samples from Brazil and Canada



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## ARTICLE INFO

Available online 12 March 2014

## Keywords:

Pathological gambling  
Gambling subtypes  
Personality  
Problem gambling

## ABSTRACT

**Background:** Pathological gambling (PG) is a heterogeneous disorder. The identification and characterization of PG subtypes could lead to tailored treatment approaches, which may, in turn, improve treatment outcomes.

**Objective:** To investigate PG subtypes based on personality traits across two different cultural and clinical settings. Consistent with the Pathways Model, we hypothesized the presence of three subtypes (behaviorally conditioned – BC, emotionally vulnerable – EV, and antisocial impulsivist – AI).

**Methods:** 140 PG adults from São Paulo, Brazil (SP sample) and 352 adults with PG ( $n = 214$ ) or sub-clinical PG ( $n = 138$ ) from Toronto, Canada (TO sample) completed the Temperament and Character Inventory (TCI). Latent-class analysis was used to investigate subtypes.

**Results:** A 2-class solution was the best model for the pooled SP and TO samples. Class 1 presented a normative personality profile and was composed exclusively of participants from Toronto (BC subtype). Class 2 was characterized by high novelty seeking, high harm avoidance, and low self-directedness, and included participants from both SP and TO (EV subtype). When sub-clinical PGs were excluded from the analysis, a single-class solution better characterized the SP and TO samples.

**Conclusions:** Our results suggest that PG severity, rather than community or clinical settings, may have an effect on PG subtypes. The generalizability of the results is limited by the demographic and clinical features of the selected samples. Future neurobiological studies may contribute to the categorization of subjects into PG subtypes based on different underlying biological pathways.

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## 1. Introduction

Several studies have proposed that the identification of pathological gambling (PG) subtypes may be an important factor in the development of more specific treatment strategies (Blaszczynski & Nower, 2002; Ledgerwood & Petry, 2010; Milosevic & Ledgerwood, 2010). Blaszczynski and Nower (2002) proposed “the pathways model” for the development of PG, which has been generally investigated in terms of three PG subtypes: (1) behaviorally conditioned (BC),

(2) emotionally vulnerable (EV), and (3) antisocial impulsivist (sic) (AI). Overall, studies have confirmed the pathways model subtypes; however, questions remain as to whether subtypes that have been identified in community samples can also be identified in clinical samples (Milosevic & Ledgerwood, 2010; Slutske, Caspi, Moffitt, & Poulton, 2005). This is a critically important issue as most individuals who develop PG never seek treatment. Further, studies to date have been performed in English-speaking countries and predominantly Anglo-Saxon cultures (i.e., U.S., Canada, and Australia), such that little information is available regarding PG subtypes in other language groups and cultures.

The Temperament and Character Inventory (TCI) (Cloninger, Svrakic, & Przybeck, 1993) has been extensively used in psychiatry research (Albayrak, Ekinci, & Caykoylu, 2012; Goekoop, De Winter, & Goekoop, 2011; Kampman & Poutanen, 2011; Sarisoy et al., 2012). To date, two published studies have identified four PG subtypes using the TCI, with the first study using a community-based sample (Turner,

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Jain, Spence, & Zangeneh, 2008) and the second study using a clinical sample (Alvarez-Moya et al., 2010).

Our objective was to investigate PG subtypes based on the TCI in two different countries (Brazil and Canada) from two different samples — a treatment-seeking PG sample recruited from a clinical setting and a sample of non-treatment-seeking PGs, recruited from a community setting. We hypothesized that we would identify three PG subtypes consistent with Blaszczynski and Nower (2002) in both settings. We expected the BC subtype to be characterized by normative TCI trait levels, whereas both the EV and AI subtypes would be characterized by high Novelty Seeking and low Self-Directedness which are correlated with impulsivity measures (Piero, 2010; Yoo et al., 2006). We expected that Harm Avoidance would differentiate the EV and AI subtypes because it has been significantly associated with mood and anxiety disorders (Cloninger, Zohar, Hirschmann, & Dahan, 2012). We also hypothesized that the EV and AI subtypes would be found more frequently in the treatment-seeking sample, whereas the BC subtype would be more frequent in the community sample.

## 2. Methods

### 2.1. Sample and assessments

Pathological gamblers seeking treatment at the University of São Paulo (Tavares, Gentil, Oliveira, & Tavares, 1999) (Brazil) between 2001 and 2004 were invited to participate in a PG study (da Silva Lobo et al., 2007). In the São Paulo sample (SP sample) individuals who met  $\geq 5$  DSM-IV diagnostic criteria for PG were included in the study. Psychiatric comorbidities were assessed through the Schedules for Clinical Assessment in Neuropsychiatry (SCAN) (Wing et al., 1990).

Adult gamblers from Toronto (Canada) were recruited from the general population between 2003 and 2006. Both sub-clinical pathological gamblers (1–4 DSM-IV criteria) and individuals meeting full DSM-IV diagnostic criteria for PG ( $\geq 5$  DSM-IV criteria) were included in the TO sample. Psychiatric comorbidities were assessed through the Structured Clinical Interview for DSM-IV-TR Axis I Disorders, non-patient version — SCID-I/NP (First, Spitzer, Gibbon, & Williams, 2002).

In both the SP and TO samples, gambling status was ascertained through a DSM-IV based interview (NODS) (N.O.R.C., 1999) and lifetime history of psychoses, bipolar disorder and neurological diseases were exclusion criteria.

The Temperament and Character Inventory — TCI (Cloninger et al., 1993; Fuentes, Tavares, Camargo, & Gorenstein, 2000) was used to assess personality characteristics in both samples. The TCI is composed of 4 temperament (Novelty Seeking — NS, Harm Avoidance — HA, Reward Dependence — RD, and Persistence — P) and 3 character scales (Self-Directedness — SD, Cooperativeness — C, and Self-Transcendence — ST).

### 2.2. Statistical analyses

Because the TO sample included sub-clinical pathological gamblers, we carried out analyses using all participants as well as only those meeting the DSM-IV criteria for PG (TO PG Only sample,  $n = 214$ ).

Socio-demographic data and TCI scores from the SP, TO and TO PG Only samples were analyzed using chi-squared tests, *t*-tests or ANCOVAs as appropriate. The LCA approach developed by Fraley and Raftery (2002, 2006) was used to investigate the presence of classes in each of the samples. Statistical analyses were performed using MPlus 6.0 (Muthén & Muthén, 1998–2010). The best-fit model was selected based primarily on the lower values of the Bayesian Information Criterion (BIC) statistic while taking into consideration other indices (AIC, adjusted-BIC, Lo–Mendell–Rubin test — LMRT, bootstrap likelihood ratio test — BLRT, and entropy), class sizes and convergence of the model (Nylund, Asparouhov, & Muthén, 2007). Sample origin was included as a covariate to determine whether the class solution differed across samples or whether the probability of membership in a particular

class differed across samples. In the event of more than one class, chi-square tests based on the log-likelihood difference associated with models determined whether classes differed in their mean scores on each TCI scale where a) the group means on a particular scale are assumed to be the same in each class vs. b) the mean scores are allowed to differ across classes.

## 3. Results

### 3.1. Socio-demographic characteristics and TCI scores

#### 3.1.1. SP $\times$ TO samples

Compared with the TO sample, the SP sample presented a higher proportion of females ( $\chi^2(df) = 8.4(1), p < .001$ ); and of individuals who were married or living with a partner ( $\chi^2(df) = 31(1), p < .001$ ), who were employed ( $\chi^2(df) = 17(3), p = .001$ ), and who presented higher PG severity (corrected for gender,  $F(df) = 151.5(1), p < .001, d = 1.3$ ). The TO sample presented a higher proportion of individuals who completed high school ( $\chi^2 = 5, df = 1, p = .02$ ).

The SP sample exhibited higher scores on NS ( $F(df) = 22.7(1), p < .001, d = 0.5$ ) and HA ( $F(df) = 26.8(1), p < .001, d = 0.3$ ), and lower scores on SD ( $F(df) = 19.4(1), p < .001, d = 0.4$ ) after controlling for gender and PG severity.

#### 3.1.2. SP $\times$ TO PG Only samples

Compared with the TO PG Only sample, the SP sample presented a higher proportion of females ( $\chi^2(df) = 19(1), p < .001$ ), and of individuals who were married or living with a partner ( $\chi^2(df) = 41(1), p < .001$ ), and who were employed ( $\chi^2(df) = 23(3), p < .001$ ). PG was also more severe in the SP sample (corrected for gender,  $F(df) = 46.8(1), p < .001, d = .7$ ).

Finally, the SP sample presented higher scores on NS ( $F(df) = 26.8(1), p < .001, d = .6$ ) and HA ( $F(df) = 7.8(1), p = .005, d = .6$ ), and lower scores on SD ( $F(df) = 17.1(1), p < .001, d = .4$ ) after controlling for gender and PG severity.

### 3.2. Psychiatric comorbidity and types of gambling

No psychiatric comorbidity diagnosis data was available for the TO sample but individuals with positive screenings on depression, anxiety and substance abuse as assessed by the SCID N/P were included in the study. No psychotic, bipolar, or neurological disorders were present.

In the SP sample 80% ( $n = 112$ ) of the subjects presented with tobacco dependence, 67% ( $n = 94$ ) presented with major depression, 12.9% ( $n = 18$ ) presented with alcohol dependence, 6.4% ( $n = 9$ ) presented with obsessive-compulsive disorder, and 5.7% ( $n = 8$ ) presented with panic disorder. The elevated rate of psychiatric comorbidity in the SP sample is consistent with rates found in other treatment-seeking (Crockford & el-Guebaly, 1998; Petry, Stinson, & Grant, 2005) and general population samples of PG (Lorains, Cowlshaw, & Thomas, 2011).

### 3.3. Latent class analyses

A series of solutions consisting of 1 to 5 classes were fit within each of the individual samples (SP, TO and TO PG Only). Our results indicate that no subtypes exist in any of the three individual samples (*results available upon request*).

#### 3.3.1. Pooled SP and TO samples

The “best-fitted” model was the 2-class solution (Table 1), according to BIC and LMRT statistics. Class 1 is composed 316 subjects from the TO sample. Class 2 consists of 176 subjects and is composed of the entire SP sample ( $n = 140, 79.5\%$ ) and a proportion of the TO sample ( $n = 36, 20.5\%$ ). Because sample origin and treatment-seeking status are

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