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Risk factors for pathological gambling along a continuum of severity: Individual and relational variables

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Abstract

This study's aim was to identify characteristics with higher odds of distinguishing a group of pathological gamblers (PG) from (1) a group of gamblers without a gambling problem (NP) and 2) a sub-clinical group (SP). An additional aim was to investigate those characteristics as risk/protective factors along the continuum of problem-gambling severity. Sociodemographic (gender, age, marital status, and educational level), individual (psychopathological symptoms) and relational (family functioning, dyadic adjustment, and differentiation of self) variables were considered. The sample consisted of 331 participants: 162 NP, 117 SP and 52 PG. The main results indicate that the characteristics with higher odds of distinguishing among the groups were gender, educational level, age, differentiation of self, and psychopathological symptoms. The odds of being a PG were higher for men with a low educational level and less adaptive psycho-relational functioning. Conversely, the odds of being a NP were higher for women with a high educational level and more adaptive psycho-relational functioning. Gender and educational level stood out with respect to their relevance as risk/protective factors, and their role was found to be dynamic and interdependent with the severity of problem gambling and/or the investigated psycho-relational characteristics. The risk/protective value was more remarkable when gamblers already exhibited SP.

Keywords: gambling disorder, continuum of severity, psycho-relational, risk/protection

Résumé

L'objectif de cette étude consistait à trouver les caractéristiques qui aident le mieux à distinguer un groupe de joueurs pathologiques (PG) (1) d'un groupe de joueurs sans problème de jeu (NP) et (2) d'un groupe infraclinique (SP). Cette recherche visait

également à faire l'analyse de ces caractéristiques en tant que facteurs de risque ou de protection pour ce qui est de la gravité des problèmes de jeu. Les variables sociodémographiques (sexe, âge, état matrimonial et niveau de scolarité), individuelles (symptômes psychopathologiques) et relationnelles (dynamique familiale, ajustement dyadique et différenciation du soi) ont été prises en considération. L'échantillon était composé de 331 participants : 162 NP, 117 SP et 52 PG. Les principaux résultats indiquent que les caractéristiques qui aident le mieux à distinguer les groupes étaient le sexe, le niveau de scolarité, l'âge, la différenciation du soi et les symptômes psychopathologiques. Les hommes ayant un faible niveau de scolarité et un fonctionnement psycho-relationnel moins adaptatif présentaient plus de risques d'être un joueur pathologique PG). À l'inverse, les femmes ayant un niveau de scolarité élevé et un fonctionnement psycho-relationnel plus adaptatif avaient moins de chances d'avoir un problème de jeu (NP). Le sexe et le niveau de scolarité sont ressortis en fonction de leur pertinence comme facteurs de risque ou de protection. Leur rôle s'est révélé être dynamique et interdépendant de la gravité du problème de jeu ou des caractéristiques psycho-relationnelles étudiées. Leur valeur de risque ou de protection était plus remarquable chez les joueurs qui appartenaient au groupe infraclinique (SP).

Introduction

The idea of risk suggests the idea of danger and is associated with high odds of adverse outcomes (Lupton, 1999). That is, risk exposes individuals to danger and potentially harmful outcomes (Werner, 1993). However, risk is variable in the course of one' life: it changes according to life circumstances and has different repercussions depending on the person (P. Cowan, C. Cowan, & Schulz, 1996). This dynamic nature of risk factors makes room for the concept of resilience, i.e., the set of social and psychological processes that facilitate the development of a healthy lifestyle even in unhealthy environments (Pesce, Assis, Santos, & Oliveira, 2004).

Games of chance involve wagering something of value (often money) in the hope of winning something of greater value (Ferentzy & Turner, 2013; Petry, 2005; Potenza, 2013). For most individuals, gambling is a recreational activity that entails no associated problems. However, a small fraction of individuals develops a problematic relationship with gambling (Ashley & Boehlke, 2012; Dickson-Swift, James, & Kippen, 2005; Weinstock, Massura, & Petry, 2013) that is associated with various and severe financial, family-related, emotional and legal consequences, among others (Oliveira, Silveira, & Silva, 2008). Such problematic relationships with gambling might eventually become pathological, a state currently known as gambling disorder, which corresponds to an addictive behavior that is diagnosed when an individual exhibits four or more of the following symptoms during a 12-month period (American Psychiatric Association, 2013): that person (1) needs to gamble with increasing amounts of money

to achieve the desired excitement; (2) is restless or irritable when attempting to reduce or stop gambling; (3) has made repeated unsuccessful efforts to control, reduce, or stop gambling; (4) is often preoccupied with gambling; (5) often gambles when feeling distressed; (6) after losing money gambling, often returns another day to recoup the losses; (7) lies to conceal the extent of an involvement with gambling; (8) has jeopardized or lost a significant relationship, job, or educational or career opportunity because of gambling; and (9) relies on others to provide money to relieve desperate financial situations caused by gambling.

The literature reports several risk factors for the development of gambling disorder, namely, factors that increase the odds of occurrence of the negative consequences of gambling (Breen, 2011). Based on a literature review, Ciarrocchi (2001) describes the following risk factors: age, gender, ethnicity and family context. Pathological gamblers often engage in gambling from a young age, which suggests that younger age is a risk factor for problem gambling. In addition, they are frequently male and have relatives who are pathological gamblers. (The ethnicity data are inconsistent). Regard family context, several studies established that having close relatives with gambling problems, particularly parents, is a risk factor for gambling disorder (e.g., Vachon, Vitaro, Wanner, & Tremblay, 2004). Based on a demographic analysis, Kessler et al. (2008) describe several risk factors for gambling disorder: male gender, low educational and socioeconomic level, and being unemployed. Following a critical literature review, Johansson, Grant, Kim, Odlaug and Götestam (2009) found that the following groups of risk factors were most often reported: (1) demographic variables (age under 29 years old; male gender); (2) cognitive distortions (wrong perceptions, illusion of control); (3) sensory characteristics (e.g., speed-sound relationship, counter present); (4) schedules of reinforcement (e.g., operant conditioning); and (5) delinquency (e.g., illegal acts). Concerning older adults, Subramaniam et al. (2015) conducted a study on gamblers aged 60 years old or older and found that the odds of pathological gamblers being single or divorced/separated were higher compared with a control group, and that they gambled to improve their emotional state and to compensate for their inability to perform activities of which they were previously capable.

Psychological distress (Raylu & Oei, 2002) is also an important risk factor implicated in gambling disorder. Mood disorders, anxiety disorders and low self-esteem are some examples of psychological problems that may increase the risk for an individual develop a problem with gambling (Derevensky & Gupta 2004). Depression is, probably, the psychological problem most reported in literature as an important risk factor for gambling disorder (Broffman, 2002; González-Ortega, Echeburúa, Corral, Polo-López, & Alberich, 2013; Hodgins et al., 2012; Kim, Grant, Eckert, Faris, & Hartman, 2006).

In sum, the risk factors described by the various authors correspond to socio-demographic characteristics, such as (1) gender (Ciarrocchi, 2001; Johansson et al., 2009; Kessler et al., 2008), (2) age (Ciarrocchi, 2001; Johansson et al., 2009), (3) individual aspects, such as cognitive distortions and comorbidities (Johansson et al., 2009), and (4) the presence of gambling disorder behaviors within the family context (Ciarrocchi, 2001; Vachon et al., 2004).

An accurate knowledge of the risk factors for gambling disorder provides an empirical basis for developing scientifically based public health policies that target this condition. In addition, such knowledge might be highly relevant for therapeutic interventions because the risk factors play a significant role in the development and maintenance of gambling disorder (Perese, Bellringer, & Abbott, 2005). The significance of these risk factors and the fact that problem gambling has not been thoroughly investigated, (i.e., certain aspects have been poorly studied, particularly the relational variables) underlines the importance of this study.

This study analyzed sociodemographic variables (gender, age, marital status, educational level), selected based on the comparison of sample groups (see analysis of sociodemographic variables below), as well as individual (psychopathological symptoms) and relational (family functioning, dyadic adjustment, and differentiation of self) variables. The aim was to identify the factors with higher odds of distinguishing the group of pathological gamblers (PG) from the groups of gamblers (1) without a gambling problem (NP) and (2) with some gambling problem/ sub-clinical group (SP). The use of these three groups is an asset because it facilitates analyzing the relevance of each of the investigated variables as a risk/protective factor along the continuum of problem-gambling severity.

Method

Participants

The sample consisted of 331 participants: 162 NP, 117 SP and 52 PG (see Table 1). Group NP primarily consisted of women (n = 118, 72.84%) with an average age of 33.58 (standard deviation [SD] = 10.90) years. Most of the individuals in this group were single (n = 86, 53.08%), had at least a bachelor's degree (n = 131, 80.86%), resided in a predominantly urban area (PUA) (n = 140, 86.42%) (INE, 2009) and were of middle socioeconomic status (SES) (n = 89, 54.94%) (Simões, 1994). Group SP also primarily consisted of women (n = 49, 63.64%) with an average age of 29.03 (SD = 8.35) years. Most of the members of this group were single (n = 79, 67.50%), had a bachelor's degree or higher (n = 84, 71.8%), resided in a PUA (n = 98, 83.80%) (INE, 2009), were of middle SES (n = 49, 41.90%) (Simões, 1994) or were students (n = 31, 26.50%). The PG were mostly male (n = 43, 82.70%) with an average age of 36.66 (SD = 12.66) years. Most were single (n = 21, 40.38%) or married/with a stable union (n = 20, 38.46%), had only completed secondary education (n = 20, 38.46%) or had a bachelor's degree (n = 19, 36.54%), resided in a PUA (n = 41, 78.85%), were of middle SES (n = 20, 38.46%) (Simões, 1994), or were students (n = 11, 21.15%).

Data Collection Procedure

The participants were recruited in two ways: (1) organizations for gamblers (such as Gamblers Anonymous) were asked to present and announce the study and to ask their members to participate; for that purpose, several copies of the study protocol

Table 1
Sample characterization

	Groups					
	NP		SP		PG	
	M	*SD*	*M*	*SD*	*M*	*SD*
Age	33.58	10.90	29.03	8.35	36.66	12.66
	n	%	*n*	%	*n*	%
Gender						
Female	118	72.84	66	56.40	9	17.30
Male	44	27.16	51	43.60	43	82.70
Marital status						
Single	86	53.08	79	67.50	21	40.38
Married/stable union	63	38.89	34	29.10	20	38.46
Divorced	9	5.56	4	3.40	11	21.15
Widowed	4	2.47	0	0.00	0	0.00
Educational level						
1st cycle of basic education	0	0.00	1	0.90	1	1.92
2nd and 3rd cycles of basic education	7	4.32	7	6.00	8	15.38
Secondary education	24	14.81	25	21.40	20	38.46
Bachelor's degree	62	38.27	42	35.90	19	36.54
Master's degree	57	35.19	35	29.90	4	7.69
Doctorate	12	7.41	7	6.00	0	0.00
Area of residence						
PUA	140	86.42	98	83.80	41	78.85
Medium urban area (MUA)	10	6.17	13	11.10	3	5.77
Predominantly rural area (PRA)	5	3.09	4	3.40	3	5.77
Missing values	7	4.32	2	1.70	5	9.62
SES						
Low	5	3.09	7	6.00	7	3.64
Middle	89	54.94	49	41.90	20	38.46
High	30	18.52	21	17.90	9	17.31
Student	30	18.52	31	26.50	11	21.15
Retiree	2	1.23	1	0.90	1	1.92
Unemployed	6	3.70	8	6.80	4	7.69

were delivered to be distributed among potential participants; (2) the study protocol was announced *online* (via *online* gambling websites, social networks and mailing lists) together with an invitation to any individual of legal age to participate, thus representing the virtual equivalent of the *snowball* recruiting technique (Goodman, 1961). Group PG was recruited in person and *online*. The other groups were only recruited *online*. The single inclusion/exclusion criterion was being 18 years old or older. Then, the participants were categorized into the groups based on their SOGS score (see Instruments).

The invitation to participate was accompanied by the following information: study objectives, an explanation regarding the protection of the confidentiality of the data and anonymity, an explanation regarding the voluntary nature of participation and the contact data of the couples and family therapy service at the authors' host institution, which provides free-of-charge, specialized help for problem gamblers. Because of the voluntary and anonymous nature of participation and the confidentiality of the data, the participants were not requested to sign an informed consent form (American Psychological Association, 2002). The study was performed in accordance with the ethical standards laid down in Declaration of Helsinki and it was approved by an external agency (like a national ethical committee)—Foundation for Science and Technology (FCT) (SFRH / BD / 71001 / 2010)—which sponsored the project as well.

Instruments

The study protocol (see Table 2) included a questionnaire for sociodemographic data and four self-report instruments (Likert scales) that were adapted for the Portuguese population and had good psychometric properties. Thus, the following aspects were considered: (1) sociodemographic variables (gender, age, marital status, educational level), (2) family functioning [*Systemic Clinical Outcome and Routine Evaluation–15* (SCORE-15)], (3) dyadic adjustment [*Dyadic Adjustment Scale* (DAS)], differentiation of self [*Differentiation of Self Inventory - Revised* (DSI-R)], and (4) psychopathological symptoms [*Brief Symptom Inventory* (BSI)]. The *South Oaks Gambling Screen* (SOGS) was used to allocate the participants to the groups as follows: score 0 – NP; 1 to 4 – SP; and 5 or more – PG.

Statistical Analysis

The groups were compared using parametric (one-factor analysis of variance (ANOVA) (F)) and non-parametric (chi-square test (χ^2), Fisher's exact test and corresponding residual analysis) tests employing the Statistical Package for Social Science*s* (SPSS) software, version 21, for sample characterization. The effect size was calculated relative to all the intergroup comparisons and categorized as follows: V [0.1 – small effect; 0.3 – medium effect; 0.5 – large effect (Cohen, 1992)] and η^2 [0.01 – small effect; 0.06 – medium effect; 0.14 – large effect (Cohen, 1988)]. The significance level was set to 5% in all the tests.

To meet this study's primary aim, the BayesX (Belitz, Brezger, Kneib, Lang, & Umlauf, 2012) and R (R Development Core Team, 2014) software packages were used to estimate multinomial models. This analysis was performed based on structured additive regression (STAR) models to model linear and non-linear effects (Brezger, Kneib, & Lang, 2005) and thus obtain more complete results. Because of the small size of group PG, only the total scores of the instruments were used, whereas the subscales were dismissed. For the same reason, only the sociodemographic variables that facilitated distinguishing among the groups in a statistically significant manner were

Table 2
Description of instruments

Instruments (Authors)	Assessed aspects/dimensions (total α in the present study)	Cutoff point
Sociodemographic data questionnaire	Sociodemographic characteristics	
SCORE-15 (Stratton, Bland, Janes, & Lask, 2010; Portuguese version by Vilaça, Silva, & Relvas, 2014)	Self-report instrument to assess family functioning (α = .84); this consists of 15 items spread over three dimensions: Family Strengths (α = .85), Family Communication (α = .83), and Family Difficulties (α = .82). The subject evaluates how each item describes their family via a 5 point Likert scale, where 1 represents "Describes Us Very Well" and 5 "Describes Us Very Badly." A higher score corresponds to a more problematic family functioning. Example items: (3) Each of us is listened to in our family; (11) Things always seem to go wrong for my family; and (15) We are good at finding new ways to deal with things that are difficult.	-
DAS (Spanier, 1976; Portuguese version by Lourenço, 2006)	The DAS (α = .90) aims to assess marital adjustment through 32 items grouped into four dimensions: Dyadic consensus (α = .85), Dyadic Satisfaction (α = .83), Affectional Expression (α = .66), and Dyadic Cohesion (α = .72). The response options on a Likert scale range from 5 or 6 points for most items, and only 2 (items 29 and 30), have a dichotomous response scale. The higher the dimensional and global results, the better the dyadic adjustment. Example items: (17) How often do you or your mate leave the house after a fight?; (28) Work together on a project; (29) Being too tired for sex.	Poor adjustment total score < 100
DSI-R (Skowron & Schmitt, 2003; Portuguese version by Major, Rodríguez-González, Miranda, Rousselot, & Relvas, 2014)	The DSI-R (α = .92) is a self-report inventory comprising 46 items that assess the differentiation of self in adults, using a Likert scale ranging from 1 ("not true for me") and 6 ("very true for me"). This tool consists of four dimensions: Emotional Reactivity (α = .89), Emotional Cut-off (α = .84), I Position (α = .81), and Fusion with Others (α = .86). A higher score is equivalent to greater differentiation of self. Example items: (4) I tend to remain pretty calm even under stress; (23) I'm fairly self-accepting; (35) My self-esteem really depends on how others think of me.	-

Table 2 Continued.

Sociodemographic data questionnaire	Sociodemographic characteristics	
BSI (Derogatis & Spencer, 1982; Portuguese version by Canavarro, 1999)	It is a self-report inventory consisting of 53 items, whose response options are on a Likert scale ranging from never (0) to very often (4). It should be noted that these items are spread over nine dimensions: Somatization (α = .80), Obsessions-Compulsions (α = .77), Interpersonal Sensitivity (α = .76), Depression (α = .73), Anxiety (α = .77), Hostility (α = .76), Phobic Anxiety (α = .62), Paranoid Ideation (α = .72) and Psychoticism (α = .62). It also provides figures on three global indices: the General Symptom Index (GSI), Positive Symptom Total (PST) and Positive Symptom Index (PSI) summarily rating emotional disorders. Example items: (3) The idea that someone else can control your thoughts; (19) Feeling fearful; (49) Feeling so restless you couldn't sit still.	Emotionally disturbed populationsPSD PSI $\geqslant$ 1.7
SOGS (Lesieur & Blume, 1987; Portuguese version by Lopes, 2009)	SOGS is composed of 20 items, based on the DSM-III, it allows the evaluation of the impact of gambling on various fields of the gambler's life: family, social, professional, financial, and emotional aspects. The gambler is considered pathological when he or she scores 5 or more points out of a possible 20, and the more severe, the higher is the final score. The SOGS also provides additional data (via informational items that are not included in the calculation of the overall score) on the type and frequency of gambling, the amounts involved in the bet and the existence of family and friends with problems related to gambling (α = 0.91). Example items: (7) Did you ever gamble more than you intended to?; (9) Have you ever felt guilty about the way you gamble, or what happens when you gamble?	No problem= 0Some problem= 1-4Probable pathological gambler$\geqslant$ 5

analyzed (age, gender, educational level, and marital status). In sum, the variables considered in the models were as follows. (1): a response variable, i.e., gambling severity (total SOGS score) considering three groups NP, SP and PG (category PG was the reference class in both models, presented later). (2): fixed effects: gender (1 = male, 0 = female), marital status (1 = married, 0 = not married), and educational level (1 = secondary education or lower, 0 = higher education). Finally, (3): covariables: age, BSI-PSI, total DSI-R score , total DAS score and total SCORE-15 score.

Results

Analysis of Sociodemographic Characteristics

One-factor ANOVA detected statistically significant difference among the groups regarding age [$F(2, 331) = 11.353$, $p < 0.001$, $\eta^2 = 0.07$]. The post-hoc test (Tukey's honest significant difference (HSD) test) demonstrated that the difference occurred between groups SP and NP as well as between groups SP and PG, whereby group SP was the group with the youngest participants. The chi-square test demonstrated that the groups also differed with respect to the variable gender [χ^2 (2, $N = 331$) = 50.203, $p < 0.001$, $V = -0.39$]. Fisher's exact test detected statistically significant differences among the groups for the variables educational level ($p < .001$, $V = 0.24$) and marital status ($p < .001$, $V = 0.21$). The residuals analysis demonstrated that the difference in gender among the groups primarily occurred because there were more women/fewer men (residual 2.4/-2.9) in group NP and fewer women/ more men in group PG (residual -3.0/4.6) than expected had the variables been independent. Regarding educational level, the difference among the groups primarily occurred because there were more individuals who only completed secondary education (residual 3.6) and fewer individuals with master's degrees (residual - 2.9) in group PG than expected had the variables been independent. Regarding marital status, the difference observed primarily occurred because there were more divorced individuals in group PG (residual 3.7) than expected had the variables been independent.

Analysis of STAR Modeling

Firstly, in order to a better acknowledgment of comparison groups, Table 3 presents the means and standard deviations by group.

Descriptive statistics. The following models were analyzed in the present study: model 1, which included all the participants (thus, variable DAS was not considered because it only applies to married individuals), and model 2, which only considered the married participants and all the variables. Only the results of model 1 will be presented for the following reasons: (1) the behavior of all the variables was similar in both models; (2) the behavior of DSI-R and DAS agreed in both models, which corroborates the strong positive association between differentiation of self and conjugality reported in the literature (Peleg, 2008; Skowron, 2000); and (3) the sample included in model 1 was larger, which enabled the (indirect) analysis of the aspects

Table 3
Descriptive statistics

Measures	NP *M* (*DP*)	SP *M* (*DP*)	PG *M* (*DP*)
SCORE-15	2.01 (0.73)	2.07 (0.55)	2.41 (0.66)
DAS	116.16 (16.02)	117.71 (11.25)	103.50 (14.21)
DSI-R	3.95 (0.64)	3.85 (0.49)	3.54 (0.56)
BSI-PSI	1.47 (0.38)	1.48 (0.44)	1.88 (0.61)
BSI-PST	22.54 (13.97)	25.91 (13.75)	36.16 (10.57)
BSI-GSI	0.69 (0.52)	0.78 (0.59)	1.38 (0.73)
SOGS	0 (0)	2.10 (1.03)	9.70 (4.18)

related to conjugality through DSI-R while avoiding repetitions (because the models were highly similar).

We proceed to a detailed analysis of the results of model 1. The dependent variable was a categorical variable with three levels: *Y*, which represents the three types of gambler considered in the study (NP (1), SP (2) and PG (3)). Regarding the independent variables, the following were considered to be fixed effects: gender (1 = male, 0 = female), married (1 = yes, 0 = no) and educational level (1 = secondary education or lower, 0 = higher education), and the following were considered to be covariables: age (years), BSI-PSI, DSI-R and SCORE-15. The multinomial model can be defined as follows:

$$\eta_{jr} = f_{r1}(age_j) + f_{r2}(BSI - PSD_j) + f_{r3}(DSI - R_j) + f_{r4}(SCORE - 15_j) + \gamma_{r0} + \gamma_{r1} gender_j + \gamma_{r2} married_j + \gamma_{r3} educational\ level_j \quad (1)$$

where the additive predictor is $\eta_{jr} = \log\left(\frac{\pi_{jr}}{\pi_{jR}}\right)$ for $j = 1, \ldots, 331$ and $r = 1.2$. Terms π_{jr} and π_{jR} represent the odds of occurrence of gambler type *r, r* = 1 and 2, and the odds of occurrence of PG, i.e., reference class R, respectively Functions f_{ir} (.),$i = 1, \ldots, 4$ are smoothing functions estimated based on Bayesian cubic P-splines (Brezger & Lang, 2006; Lang & Brezger, 2004) with 20 internal nodes and a second-order random walk penalty. The coefficients $\gamma_{rc} c = 1...3$ represent the fixed effects associated with each categorical variable for the r^{th} gambler type (r = 1.2). The model inference results followed an empirical Bayes approach based on a penalized likelihood inference for estimation of the coefficients and on a restricted maximum likelihood (REML) for estimation of the variance components (Fahrmeir & Lang, 2001; Kneib, 2006).

Table 4 describes the estimates of the $\gamma's$ coefficients and the corresponding odds ratio (OR) in the multinomial model, whereby PG was considered to be the reference class. Because all the fixed effects are represented by binary variables, the OR values might be interpreted as an increase in/reduction of the odds ratio when the covariable

assumes value 1 instead of value 0; i.e., X_{ri} represents the remainder of the independent variables in the model.

$$e^{\gamma rk} = \frac{\mathrm{p}\left(\mathrm{Y_j} = r | X_{rk} = 1;\ X_{ri}, i \neq k\right)}{\mathrm{p}\left(\mathrm{Y_j} = R | X_{rk} = 1;\ X_{ri}, i \neq k\right)} \Big/ \frac{\mathrm{p}\left(\mathrm{Y_j} = r | X_{rk} = 0;\ X_{ri}, i \neq k\right)}{\mathrm{p}\left(\mathrm{Y_j} = R | X_{rk} = 0;\ X_{ri}, i \neq k\right)} \tag{2}$$

In the comparison of NP with PG, the men and the participants with lower education level exhibited statistically significant lower OR compared with the women and the participants with higher education, respectively. Marital status did not cause a statistically significant variation between the groups (NP and PG). In the comparison of SP with PG, only the variable gender was statistically significant (at the 5% level), whereby the men exhibited statistically significant lower OR compared with the women. Educational level and marital status did not cause any statistically significant variation between the groups (SP and PG).

The following plots (Figures 1 to 4) depict the estimated effects of the covariables included in the model. Such effects correspond to the logarithm of $\frac{\pi_{\mathrm{jr}}}{\pi_{\mathrm{jR}}} = \frac{p\left(Y_j = r\right)}{p\left(Y_j = R\right)}$ and respective 95% confidence intervals. Positive effect means higher odds of belonging to a given class (NP or SP) in comparison with the reference class (PG). Negative effect means the opposite.

Table 4
Estimates of the fixed effects (OR) with PG as the reference class in the model

	NP	SP
Constant	3.341*	1.751*
Gender (m)	-2.900* (0.055)	-1.864* (0.155)
Married (yes)	-0.186 (0.830)	-0.112 (0.894)
Educ. level ($\leqslant$ Sec.)	-1.304* (0.271)	-1.767*(0.171)

* Significant at $p < 0.05$

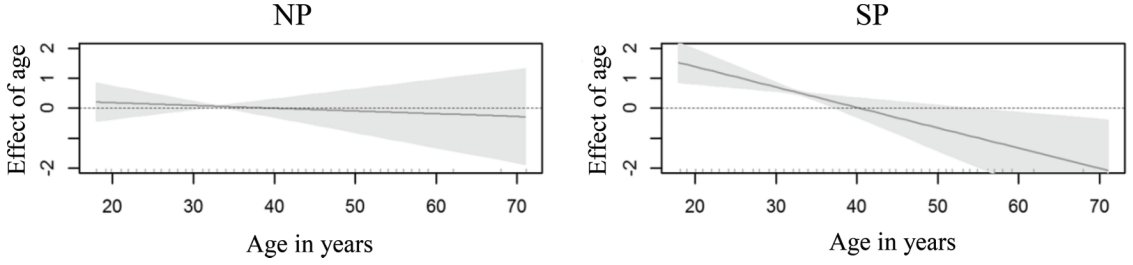

Figure 1. Plots of the estimated effect of the covariable age for NP vs. PG and SP vs. PG

Regarding age (see Figure 1), the effect was non-significant when NP and PG were compared (the confidence intervals contain the value zero). When SP and PG were compared, there was a significant linear effect, which indicates that the older the participants were, the higher their odds of belonging to group PG, with the critical age (the shift from SP to PG) being at approximately 40 years. Thus, age is a relative risk factor only when gamblers already exhibit SP.

Regarding BSI-PSI (see Figure 2), in the comparison of NP with PG, the effect was significant and nonlinear. That is, for lower BSI-PSI scores (up to approximately 1.69, in which case the lower limit of the confidence interval was greater than zero), the odds of belonging to either group were nearly constant. For higher BSI-PSI scores (over

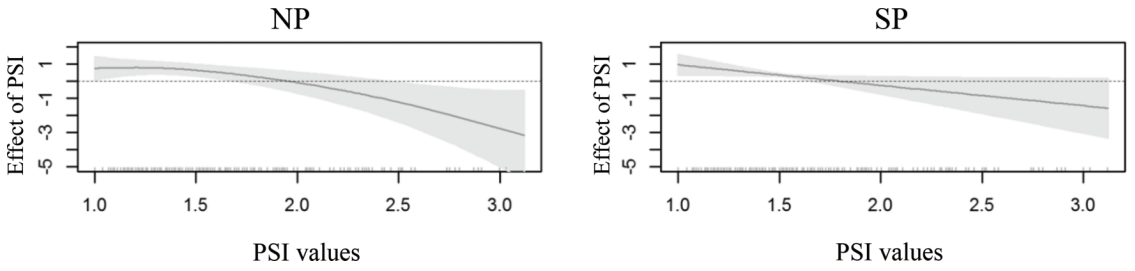

Figure 2. Plots of the estimated effect of the covariable BSI-PSI for NP vs. PG and SP vs. PG

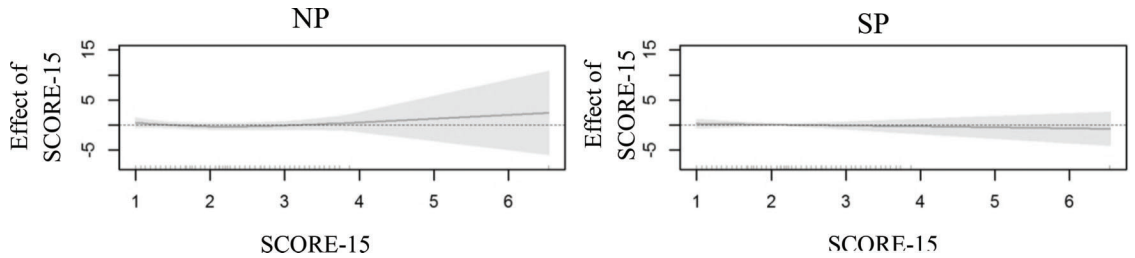

Figure 3. Plots of the estimated effect of the covariable SCORE-15 for NP vs. PG and SP vs. PG

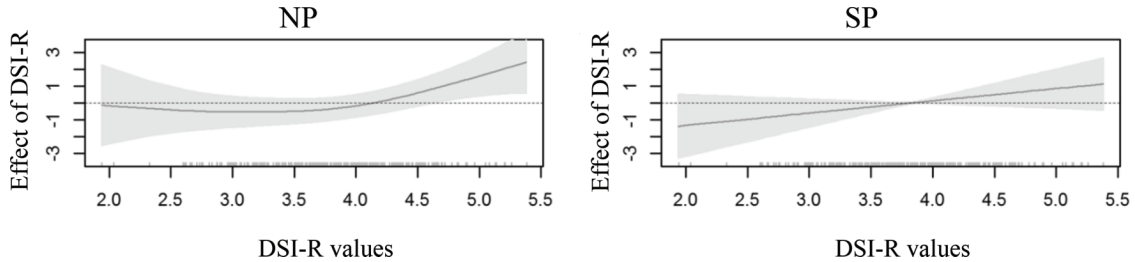

Figure 4. Plots of the estimated effect of the covariable DSI-R for NP vs. PG and SP vs. PG

approximately 2.46, in which case the upper limit of the confidence level was less than zero), the odds of belonging to group PG were higher. In the comparison of SP with PG, the effect was significant and linear, which indicates that above approximately 1.79, the higher the BSI-PSI score was, the higher the odds that participants belonged to group PG compared with the odds of belonging to group SP. Thus, BSI-PSI is a relative risk factor only when gamblers already exhibit some SP or when the BSI-PSI score is high (approximately 2.46 or higher) in cases in which the subject does not exhibit a gambling problem (NP).

SCORE-15 (see Figure 3) had non-significant effects in all the group comparisons. That is, no matter what the SCORE-15 score was, the odds of belonging to any group were similar.

Finally, DSI-R (which also represents conjugality, given the similar behavior of covariables DSI-R and DAS) exhibited significant nonlinear effect in the comparison of NP with PG. That is, for lower DSI-R scores (up to approximately 4.63, in which case the lower limit of the confidence limit was greater than zero), the odds of belonging to either group were approximately the same. For higher scores, approximately above 4.63, the odds of belonging to group NP were higher compared with group PG. In the comparison of SP with PG, the effect was significant and linear, which indicates that high DSI-R scores were associated with higher odds of belonging to group SP compared with PG, with 3.82 being the critical value (the shift from SP to PG). Thus, DSI-R is a relative protective factor when gamblers already exhibit SP or when the DSI-R score is considerably high (over approximately 4.63) in cases in which the subject does not exhibit a gambling problem (NP).

Calculation of the Odds of Player Types

The multinomial model used also enabled calculation of the odds of the participants being NP, SP or PG. For that purpose, the following equation can be used:

$$p\left(Y_j = r\right) = \pi_{jr}$$

$$= \frac{\exp\left(f_{r1}\left(age_j\right) + f_{r2}\left(BSI - PSD_j\right) + f_{r3}\left(DSI - R_j\right) + f_{r4}\left(SCORE - 15_j\right) + \gamma ro + x'r\gamma r\right)}{1 + \sum_{s=1}^{r} \exp\left(f_{s1}\left(age_j\right) + f_{s2}\left(BSI - PSD_j\right) + f_{s3}\left(DSI - R_j\right) + f_{s4}\left(SCORE - 15_j\right) + \gamma so + x's\gamma r\right)} \quad (3)$$

for r = 1,2 and for the reference group PG,

$$P\left(Y_j = R\right) = 1 - \pi_{j1} - \pi_{j2} \quad (4)$$

The odds were calculated for all the possible combinations of fixed effects and considering the following three levels of values for the covariables:

1. Median age (29 years), median of PSI values *above* 1.7 (2.00), median of values *below* the DSI-R normative reference range (3.08) and median of values *above* the SCORE-15 normative reference range (3.04). The conditions are representative of greater difficulties compared with the normative population (Table 5).
2. Median age (29 years old), median of PSI values *below* 1.7 (1.25), median of values *above* the DSI-R normative reference range (3.08) and median of values *below* the SCORE-15 normative reference range (3.04). The conditions are representative of lesser difficulties compared with the normative population (Table 6).
3. Median age (29 years old), midpoint of the PSI normative reference range (1.7), midpoint of the DSI-R normative reference range (3.88) and SCORE-15 normative reference value (2.02). The conditions correspond to the normative population (Table 7).

The odds of belonging to group PG while being a male and having a low educational level were the highest of any tested condition (1, 2 and 3). However, those odds (belonging to PG and being a man with low educational level) gradually decreased with increasingly adaptive levels of family and individual functioning, i.e., a shift from condition (1) to (3) and from (3) to (2). In the case of the women, the trend was the same but with significantly lower odds.

For the women, the highest odds were to belong to group NP, particularly when they exhibited a high educational level in any of the tested conditions (1, 2 and 3). In contrast, for the men, the highest odds were to belong to class PG, to have lower educational levels and to be under the condition representative of greater difficulties compared with the normative population. In addition, it should be noted that for the men, the odds of belonging to group NP were higher among those men with high educational levels, which was the opposite situation of the men in group PG.

The odds of any participant belonging to group SP were the same in the three tested conditions (1, 2 and 3). Therefore, whereas groups PG and NP (the extremes) seemed to follow a given probabilistic "profile" (highlighted by the grey shading), group SP behaved as the most homogeneous one.

Discussion

The present study sought to identify the characteristics—gender, age, marital status, educational level, family functioning, differentiation of self (and, indirectly, dyadic adjustment) and psychopathological symptoms—with higher odds of distinguishing among groups PG, SP and NP while investigating the relevance of the characteristics as risk/protective factors along the continuum of problem-gambling severity.

The analysis of the results of STAR modeling for the sociodemographic variables demonstrated that marital status did not distinguish among the groups and did not seem to represent a risk/protective factor for gambling disorder. Although pathological gamblers allegedly exhibit higher odds of being divorced/separated (Black,

Table 5
Fixed conditions: median age, PSI, DSI-R and SCORE with values representative of greater difficulties compared with the normative population

PG (*n* = 52, 15.7%)								**NP** (*n* = 162, 48.9%)								**SP** (*n* = 117, 75.3%)							
M				W				**M**				W				**M**				W			
Ma		**NM**		Ma		NM		**Ma**		**NM**		Ma		NM		**Ma**		**NM**		Ma		NM	
BA	**S**	**BA**	**S**	BA	S	BA	S	**BA**	**S**	**BA**	**S**	BA	S	**BA**	S	**BA**	**S**	**BA**	**S**	BA	S	BA	S
.406	.651	.370	.619	.052	.146	.044	.127	.307	.154	.337	.153	.711	.544	.730	.571	.288	.217	.294	.228	.237	.310	.226	.302

PG – pathological gambler; NP – gambler with no problem; SP – gambler with some problem/sub-clinical
M – man; W – woman; Ma – married; NM – not married; BA – bachelor's degree or higher; S – secondary education or lower

Table 6
Fixed conditions: median age, PSI, DSI-R and SCORE with values representative of lesser difficulties compared with the normative population

PG (*n* = 52, 15.7%)								**NP** (*n* = 162, 48.9%)								**SP** (*n* = 117, 75.3%)							
M				W				**M**				W				**M**				W			
Ma		**NM**		Ma		NM		**Ma**		**NM**		Ma		NM		**Ma**		**NM**		Ma		NM	
BA	**S**	**BA**	**S**	BA	S	BA	S	**BA**	**S**	**BA**	**S**	BA	S	BA	S	**BA**	**S**	**BA**	**S**	BA	S	BA	S
.056	.142	.049	.126	.005	.014	.004	.012	.516	.355	.537	.377	.769	.656	.782	.673	.428	.503	.414	.497	.226	.330	.214	.315

PG – pathological gambler; NP – gambler with no problem; SP – gambler with some problem/sub-clinical
M – man; W – woman; Ma – married; NM – not married; BA – bachelor's degree or higher; S – secondary education or lower

Table 7
Fixed conditions: median age, PSI, DSI-R and SCORE with values representative of the normative population

PG (n = 52, 15.7%)								**NP** (n = 162, 48.9%)								**SP** (n = 117, 75.3%)							
M				W				**M**				W				**M**				W			
Ma		**NM**		Ma		NM		**Ma**		**NM**		Ma		NM		**Ma**		**NM**		Ma		NM	
BA	**S**	**BA**	**S**	BA	S	BA	S	**BA**	**S**	**BA**	**S**	BA	S	BA	S	**BA**	**S**	**BA**	**S**	BA	S	BA	S
.224	.422	.201	.390	.027	.073	.023	.063	.274	.140	.296	.156	.590	.440	.610	.461	.501	.438	.503	.453	.383	.488	.368	.475

PG – pathological gambler; NP – gambler with no problem; SP – gambler with some problem/sub-clinical
M – man; W – woman; Ma – married; NM – not married; BA – bachelor's degree or higher; S – secondary education or lower

Shaw, McCormick, & Alien, 2012), this characteristic seems to be a consequence of the gambling problem (Grant & Odlaug, 2014) rather than a risk factor. The literature review by Johansson et al. (2009) indicated that gender is one of the most consistent risk factors, and it is widely demonstrated that most pathological gamblers are men (Aymamí, Ibáñez, & Jiménez, 1999; Becoña, 1999; Ladouceur, 1991; Turón & Crespo, 1999), whereas only approximately one-third are women (American Psychiatric Association, 2002). Therefore, the results of this study for gender are not surprising. The variable educational level also appeared as a significant risk factor, more specifically having a lower educational level (secondary education or lower), which agrees with the results reported by several authors (Becoña, 1999; Kessler et al., 2008; Legarda, Babio, & Abreu, 1992). In fact, gender and educational level remained such significant predictors within the models even after accounting for other potential sources of variance (e.g., psychological symptomatology, differentiation of self). Possibly this happens because gender and educational level are transversal predictors, this is, independently of the baseline conditions, gender and educational level seems to be determinant to define gamblers "profile." Finally, the variable age seems to be a relevant risk factor only when gamblers already have SP (older age was associated with higher odds of being a PG). In fact, Granero et al. (2014) found that age has an influence on gambling problems, with older patients exhibiting more severe and more diversified problems (e.g., psychopathological symptoms). However, there is a consensus in the literature that younger age (under 29 years old) is a considerable risk factor for gambling disorder (Johansson et al., 2009).

Regarding the BSI (psychopathological symptoms), DSI-R differentiation of self, which entails a balance between intimacy and autonomy in the relationships with significant others, e.g., spouse or family of origin (Rodríguez-González, 2009), and SCORE-15 (family strengths, difficulties and communication) variables, the most surprising result concerns family functioning (SCORE-15). As expected, the odds of belonging to groups SP/PG should increase parallel to the increase in family difficulties given that the literature unanimously reports the occurrence of various problems at this level. Such problems include the management of emotions and affection (more specifically their expression and communication), poorly defined family rules and roles, and poor communication, which is often characterized by discussions and lies (Kalischuk, Nowatzki, Cardwell, Klein, & Solowoniuk, 2006). However, several studies conducted in Portugal (Cunha & Relvas, 2014; Cunha, de Sousa, Fonseca, & Relvas, 2015) suggest that the difficulties in family functioning only appear in the most severe forms of gambling disorder and thus do not facilitate distinguishing PG from the other types of gambler (NP and SP), as was the case in this study. In contrast, psychopathological symptoms (BSI-PSI) and differentiation of self (DSI-R) enabled distinguishing the groups in the two sets of performed comparisons (NP vs. PG and SP vs. PG), and their behavior was highly similar. That is, those variables represent relative risk/protective factors in cases in which SP already exists, whereas in the NP cases, the level of difficulties (PSI over approximately 2.46) or of strength/competence (total DSI-R over approximately 4.63) should be high for the corresponding risk or protective effect to occur. These

results are related to the probabilistic "profile" of group SP, which emerges as the most homogeneous one. Thus, regardless of the sociodemographic and psycho-relational characteristics, the odds of exhibiting SP are similar. This finding might indicate that this type of gambler represents a "transitional/indefinite" level. That is, considering the continuum of problem-gambling severity, SP represents either a progression toward PG or a regression to NP. In fact, according to the literature, the continuum of severity extends in both directions (Ladouceur, 2002), and while increased severity is more patent (because studies tend to focus on the development of gambling disorder), the opposite direction (in a natural manner, i.e., without any specific intervention) is beginning to acquire empirical relevance because of the occurrence of cases of spontaneous remission (Slutske, 2006). In fact, approximately 35% of the individuals with a history of gambling disorder recover without any intervention, which suggests that the progression of gambling disorder is not always chronic or persistent (Slutske, 2006). Therefore, assuming that SP represents a stage of progression toward PG or of regression to NP, it is natural that the weight of the risk or protective factors should be greater in group SP compared with group NP. This finding is related to the previously mentioned idea of dynamic risk (P. Cowan et al., 1996).

Regarding the probabilistic "profile" of the group with the most severe level of gambling disorder (PG), it seems that regardless of their (more or less adaptive) psycho-relational status, pathological gamblers tend to be men who have only completed secondary education. These results agree with the reports in the literature (Becoña, 1999, Kessler et al., 2008). However, the odds of being a pathological gambler (male with low educational level) were higher when the psycho-relational functioning (BSI, DSI-R) was less adaptive, which demonstrates that these characteristics might be concurrent risk factors. In fact, according to the literature, the psycho-relational aspects are important risk factors for gambling disorder (Johansson et al., 2009). In addition, these results directly indicate the concept of dynamic risk, which demonstrates the relevance of other variables (in this case, BSI and DSI-R) in the modulation of the studied risk/protective factors (P. Cowan et al., 1996). Female pathological gamblers seem to be a minority (as previously discussed), and, similar to male pathological gamblers, tended to exhibit a low educational level. The odds of women being pathological gamblers (having a low educational level) were higher when their psycho-relational status was less adaptive.

The probabilistic "profile" of SP was generally complementary to that of PG, which was expected because these types represent the extremes of the continuum of problem-gambling severity. Therefore, regardless of their (more or less adaptive) psycho-relational status, the gamblers without a gambling problem tended to be female and to have a high educational level. That group was also "characterized" by men with high educational levels (a bachelor's degree or higher) under the condition representative of lesser difficulties compared with the normative population. That is, it seems that men should gather a larger number of "optimal" conditions (in addition to their educational level), in particular of psycho-relational functioning, to belong to group NP.

In sum, the characteristics with higher odds of distinguishing among groups PG, SP and NP were as follows: (1) among the sociodemographic variables, gender, educational level and age, and (2) among the psycho-relational variables, differentiation of self (and, indirectly, dyadic adjustment) and psychopathological symptoms. Gender and educational level stood out with respect to their relevance as risk/protective factors, and their role was found to be dynamic and interdependent with the severity of problem gambling and/or the investigated psycho-relational characteristics. The risk/protective value was more remarkable when gamblers already exhibited SP.

Limitations and Future Studies

In this study, due to the unsystematic recruitment of the participants, the differences between the three groups could be confounded by differences introduced by the sampling method. Thus, risk or protective factors should be carefully considered only as indicators or clues for future studies and not as definitive conclusions. Furthermore, as we stated before, they could be consequences of gambling (e.g. divorce/separation) rather than those risk factors which are not possible to know in this study.

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