J Gambl Stud (2015) 31:91–103
DOI 10.1007/s10899-013-9419-0

ORIGINAL PAPER

The Impulsivity and Sensation-Seeking Mediators of the Psychological Consequences of Pathological Gambling in Adolescence

Ana Estevez · David Herrero-Fernández · Izaskun Sarabia · Paula Jauregui

Published online: 3 December 2013

Abstract Pathological gambling has severe consequences for adolescents and their families and friends. Despite its high prevalence, pathological gambling in adolescents has been insufficiently studied. Sensation seeking and impulsivity are two variables that are related to the appearance and maintenance of pathological gambling. However, few studies have determined the role these variables play in the development of the dysfunctional symptomatology of gambling behavior in adolescents and young adults. The aims of this study were to analyze the consequences of gambling in young adults and adolescents, and to evaluate the roles of sensation seeking and impulsivity in the appearance of dysfunctional symptomatology. The sample consisted of 1,241 young adults and adolescents recruited from scholar centers and free-time groups, as well as 71 subjects from associations that assist pathological gamblers. Pathological gambling, impulsive behavior, dysfunctional symptomatology and sensation seeking were assessed. The results confirmed that young adults and adolescents who gamble pathologically have more dysfunctional symptomatology related to anxiety, depression, hostility, obsessive–compulsive behavior and somatization, as well as sensation seeking, impulsivity and addictive behavior. Moreover, the results showed that sensation seeking did not mediate the appearance of dysfunctional symptomatology and that impulsivity partially mediated the appearance of anxiety, phobic anxiety, depression and psychosis and perfectly mediated somatization, obsessive–compulsive behavior, interpersonal sensitivity, paranoid ideation and hostility. These results have consequences for the development of treatment and prevention programs for adolescent pathological gambling.

Keywords Adolescence · Pathological gambling · Impulsivity · Sensation seeking · Psychological consequences · Addictive behavior

A. Estevez (✉) · D. Herrero-Fernández · P. Jauregui
Faculty of Psychology and Education, University of Deusto, Apartado 1, 48080 Bilbao, Spain
e-mail: aestevez@deusto.es

I. Sarabia
Deusto Institute of Drug Dependencies, Bilbao, Spain

Introduction

Behavioral addictions are repetitive behaviors that result in loss of control, not because of the behavior itself but due to the relationship established with the behavior (Echeburua 2012). These behaviors can interfere severely with daily life, including with family, work and social relationships (Fairburn 1995; Labrador and Villadangos 2009; Young 1998).

The prevalence of gambling addiction in adolescents and young adults is higher than in adult populations, regardless of the measures used or where the study was conducted (Muñoz-Molina 2008). For example, a study conducted by Huang et al. (2007) surveyed 20,739 American students using the DSM-IV criteria and found a gambling prevalence of 0.8 %, whereas another study, conducted by Ellenbogen et al. (2007), surveyed 1,256 Canadian adolescents using the DSM-IV-TR criteria and found a prevalence of 3 %. Petry (2006) found that the prevalence of gambling in adolescents was 3.9 %. Apart from the relevance of these data, many investigators have indicated that adult gamblers begin gambling during adolescence or young adulthood (Jacobs 2000); thus, the study of gambling in adolescence is of great importance.

Gambling in adolescence has not been as studied as adult gambling has (Volberg et al. 2010), although studies conducted on this subject have shown that problematic gambling among adolescents is associated with mental illnesses. These illnesses include high levels of depressive symptomatology (Molde et al. 2009), high risk of alcohol and substance abuse (Hardoon et al. 2004), risk of suicidal ideation and suicide attempts, and high anxiety (Gupta and Derevensky 1998), as well as poor overall health (Potenza et al. 2011). The consequences of early pathological gambling are serious, and this damage could be devastating to adolescents.

There are some personality traits that are correlated with the appearance and maintenance of pathological gambling, such as impulsivity and sensation seeking. For example, Shead et al. (2010) reported that adolescents with impulsive, high sensation-seeking personalities were more likely to experience gambling problems. In particular, impulsivity might be a predictor of gambling frequency (Benson et al. 2012) and severity (MacLaren et al. 2012). The majority of investigations into the relationship between impulsivity and gambling have been conducted in adults. Nevertheless, studies in adolescent and young adult populations have yielded similar findings, indicating a strong relationship between gambling severity and narrow impulsiveness on the Eysenck Impulsiveness Scale (Nower et al. 2004). In fact, some longitudinal studies (Slutske et al. 2005; Vitaro et al. 1999) have reported that high impulsivity during adolescence predicts later gambling problems; therefore, high impulsivity constitutes a risk factor that contributes to the subsequent development of problem gambling. There is general agreement that further investigations linking impulsivity and gambling would be relevant to the prevention and treatment of pathological gambling (Nower and Blaszczynski 2006).

Sensation seeking is a concept that is related to impulsivity. According to Zuckerman (1979), sensation seeking is the need for varied, novel, and complex sensations and experiences, and the willingness to take risks for the sake of such experiences. Zuckerman (1994) suggested combining sensation seeking with impulsivity to create a super-trait called 'impulsive sensation seeking'. Nevertheless, there has been some controversy over the role of sensation seeking in problem gambling. Authors such as Gupta et al. (2006) have noted that sensation seeking might play an important role in pathological gambling, but other studies have not supported this point of view (MacLaren et al. 2011). Some studies have found evidence of a relationship between sensation seeking and problem

gambling in adolescents (Donati et al. 2013), but this relationship has been investigated only rarely in this population.

Although it appears that these concepts are related to problem gambling, the role that they play, if any, in the appearance of dysfunctional symptomatology in youth and adolescent gambling is unknown because there have been few studies on this subject. For example, Blaszczynski et al. (1997) reported that heightened impulsivity was associated with the degree of severity of psychological and behavioral changes in gamblers.

As mentioned above, gambling in adolescence has received far less attention in comparison to adult gambling (Winters et al. 2002). However, changes in the profiles of gamblers, who are becoming increasingly younger in age (Secades and Villa 1998), show that additional research is warranted.

Therefore, the aims of this study were, first, to analyze the psychological consequences of pathological gambling in young adults and adolescents; second, to compare the presence of addictive behaviors in adolescent gamblers and non-gamblers; and in third place to investigate the mediating effect of impulsivity and sensation seeking between gambling and the appearance of general symptomatology (depression, anxiety, phobic anxiety, somatization, obsessive–compulsive behavior, interpersonal sensitivity, hostility, paranoid ideation, and psychoticism).

Methods

Participants

The sample consisted of 1,312 participants from Spain. The participants were recruited from scholar centers, universities and free-time groups and from associations and centers associated with FEJAR (Spanish Federation of Rehabilitated Gamblers). We used MULTICAGE CAD-4 (Pedrero Pérez et al. 2007) to identify two groups according to the presence or absence of pathological gambling and thereby to correctly assign participants from the non-clinical sample to the clinical sample if they presented with pathological gambling.

The sample with pathological gambling consisted of 71 subjects between 14 and 30 years of age ($M = 19.27$, $SD = 4.65$). Fifty-seven subjects were male (81.4 %), and 13 were female (18.6 %). A total of 75.4 % came from Spain, and 24.6 % of the subjects came from other countries. The subjects from other countries came from Latin America (55.6 %), Asian countries (16.7 %), other European countries (16.7 %), and Africa (11.1 %). The majority of the sample were students (74.6 %), followed by employed people (18.3 %) and unemployed people (7 %). The education level of this group was as follows: secondary studies (49.3 %), professional training (22.5 %), primary studies (19.7 %), no education (5.6 %), and university studies (2.8 %).

The sample without pathological gambling consisted of 1,241 subjects, between 12 and 30 years of age ($M = 17.16$, $SD = 2.49$). A total of 695 subjects were male (56 %), and 546 (44 %) were female. A total of 81.1 % came from Spain, and 18.8 % of the subjects came from other countries. The subjects from other countries came from Latin America (64.3 %), Africa (20.6), Asian countries (6.3 %), other European countries (5 %), and other places (3.8 %). The majority of the sample were students (97.4 %), followed by people who studied and worked at the same time (2.3 %), and unemployed people (0.3 %). The education level of this group was as follows: secondary studies (58.9 %), professional training (18.6 %), primary studies (15.4 %), university studies (6.9 %), and no education (0.2 %).

Measurements

Pathological Gambling and Impulsive Behavior

MULTICAGE CAD-4 (Pedrero Pérez et al. 2007). It measures impulsivity and addictive behaviors, with or without substance use, including pathological gambling, alcohol abuse or dependency, substance addiction, eating disorders, addiction to the Internet, addiction to videogames, compulsive shopping, and addiction to sex. MULTICAGE CAD-4 has 32 items and is designed for men and women between 14 and 90 years of age. The results are classified as the absence of a problem (from 0 to 1), a possible problem (2 points), a very probable problem (3 points), or the certain existence of a problem (4 points). Its internal consistency is satisfactory (Cronbach's α of the total scale = .86; the subscales show values greater than .70). The test–retest reliability over 20 days is $r = .89$. The validity of its criteria is also adequate (it detects between 90 and 100 % of cases already diagnosed), as is its construct validity (an exploratory factor analysis identified the 8 proposed scales as independent, which explained 63.8 % of the total variance). In our sample, the Cronbach's α of the total scale was .69 and that of the pathological gambling subscale was .77. In relation to the statistical analysis, on the one hand the punctuation on the impulsive gambling subscale was taken into account, and on the other hand, the addition of all the subscales except impulsive gambling was taken into consideration as a total punctuation for a general impulsivity measure. The cutoff point for creating both groups (gamblers and non gamblers) was set at 3 points in the gambling subscale.

General Symptomatology

Symptom Checklist-90-Revised (SCL-90-R; Derogatis 1997). It is a multidimensional instrument that evaluates the existence and intensity of 90 psychiatric and psychosomatic symptoms. The SCL is rated using a Likert scale from 0 (*none at all*) to 4 (*very severe*) based on the symptoms experienced over the previous 7 days. It explores nine factors or symptomatic dimensions: somatization, obsessive–compulsive behavior, interpersonal sensitivity, depression, anxiety, phobic anxiety, hostility, paranoid ideation, and psychoticism. It was designed for subjects between 13 and 65 years of age. Regarding its reliability, the Cronbach's α of this instrument ranges between .77 and .90. In this study, the α was .97.

Sensation Seeking

Arnett Inventory of Sensation Seeking (AISS; Arnett 1994). It is an inventory that evaluates sensation seeking as a tendency to incur risks and a predisposition to experience novelty and intensity. The AISS has 20 items: 10 items evaluate intensity and the other 10 evaluate novelty. The AISS is rated using a Likert scale from A ("*Describes me very well*") to D ("*Does not describe me at all*") and is designed for subjects between 16 and 28 years of age. The Spanish adaptation (Ferrando and Chico 2001) has a Cronbach's α of .70 for the total scale, and Cronbach's α ranges between .50 and .64 for the remainder of the subscales. In our sample, the Cronbach's α was .56.

Procedures

Prospective participants were provided with a letter that thoroughly explained the study, including the name and contact information for the researchers conducting the study, the

funding source, the aims of the study, the measures to be used and the anticipated duration of participation. Information regarding informed consent, including voluntary participation and confidentiality, was also included in this letter. Prospective participants could choose between completing the survey online or in print.

The questionnaires were administered either in print or online. In the case of the printed questionnaires, the researchers of the study collected the data at the centers in most cases. The digital version on the Internet contained the same questions as the printed version. This study received ethics approval from the university.

Results

Simptomatology in Pathological Gambling

First, differences in simptomatology through the two groups (group of gamblers and group of non-gamblers) were analyzed. With this aim three multivariate analyses of variance (MANOVA) were conducted. In all the cases both significance and effect size (η^2) are reported. This was interpreted according to the Cohen's criterion, considering values between .01 and .04 as small; values between .04 and .14 as medium, and values above .14 as high (Cohen 1988).

In the first comparison differences in general symptomatology were analyzed, observing a significant multivariate effect, $F(9, 1300) = 4.54$, $p < .001$, $\eta^2 = .03$. The univariate contrasts are showed in the Table 1. As it can be verified, all of the univariate contrasts showed significant differences, so gamblers group scored higher than non-gamblers one in all the assessed symptoms.

In the second MANOVA, differences in sensation seeking were explored, observing again a significant multivariate effect, $F(2, 1306) = 4.30$, $p = .014$, $\eta^2 = .01$. The univariate analyses are showed in the Table 2. As it can be seen, significant differences were evidenced both in the "intensity" factor and in the total score in sensation seeking, although no differences were observed in "novelty" factor.

Table 1 Comparison between gamblers and non-gamblers in general symptomatology

	Gamblers (n = 68)		Non-gamblers (n = 1,241)		*F*	η^2
	M	SD	M	SD		
Anxiety	10.70	8.59	7.26	6.34	18.45***	.01
Phobic anxiety	4.61	5.90	2.20	3.51	28.24***	.02
Depression	15.74	12.67	11.46	9.49	12.76***	.01
Somatization	13.00	10.32	10.17	7.95	8.01**	.01
Obs. compuls.	12.90	8.71	10.08	7.24	9.69**	.01
Interp. sensit.	9.62	7.90	7.52	6.67	6.38*	.01
Hostility	8.06	6.20	5.57	4.61	15.14***	.01
Paranoid ideat.	7.19	5.38	5.48	4.61	8.79**	.01
Psychoticism	9.25	8.52	5.61	6.12	22.05***	.02

Obs. compuls obsessive–compulsive, *interp. sensit.* interpersonal sensitivity, *paranoid ideat.* paranoid ideation

* $p < .05$; ** $p < .01$; *** $p < .001$

Finally, the third MANOVA analyzed the adictive behaviors, observing again a significant multivariate effect, $F(8, 1286) = 66.33$, $p < .001$, $\eta^2 = .29$. The univariate contrasts are showed in the Table 3. As it can be seen, significant differences were observed in all the cases, except in eating disorders and addiction to the Internet.

Multivariate Relationship Between Gambling Behavior and Symptomatology

Then, mediational effect of impulsivity and sensation seeking in the relationship between gambling behavior and symptomatology was analyzed. With this aim, first of all the correlation matrix of all the variables was calculated. The results are showed in the Table 4. As it can be seen, impulsivity variable showed a strong correlation with gambling behavior and with each one of the symptomatology variables, whilst the strength of the association between gambling behavior and sensation seeking was very weak, although it attained signification. Therefore, their meditational effect in the relationship between gambling behavior and symptomatology was analyzed. Thus, in all the comparisons gambling was assumed as independent variable, impulsivity and sensation seeking as mediators, and each one of the symptoms as dependent. Therefore, in each one of the comparisons that are going to be showed the Sobel test was carried out to verify the possible partial mediation when the direct effect remained significant.

Firstly the role of impulsivity as mediator was analyzed. Then, partial mediation of the impulsivity in the relationship between gambling behavior and anxiety was observed (total

Table 2 Comparison between gamblers and non-gamblers in sensation seeking

	Gamblers (n = 68)		Non-gamblers (n = 1,241)		*F*	η^2
	M	SD	M	SD		
Intensity	23.26	4.77	25.02	4.86	8.38*	.01
Novelty	22.50	3.85	23.35	4.35	2.47	.00
Total	45.76	7.32	48.36	7.68	7.41*	.01

* $p < .01$

Table 3 Comparison between gamblers and non-gamblers in addictive behaviors

	Gamblers (n = 68)		Non-Gamblers (n = 1,241)		*F*	η^2
	M	SD	M	SD		
Alcohol	1.25	1.16	0.63	0.95	25.14**	.02
Gambling	1.41	1.78	0.08	0.27	485.14**	.27
Drugs	0.67	1.22	0.33	0.82	9.45*	.01
Eating	0.46	0.91	0.51	1.04	0.17	.00
Internet	1.14	1.50	0.99	1.42	0.65	.00
Videogames	0.79	1.42	0.43	1.00	7.38*	.01
Shopping	1.19	1.48	0.37	0.83	52.69**	.04
Sex	0.46	1.01	0.21	0.65	8.21*	.01
Total	7.06	4.96	3.35	3.42	66.87**	.05

* $p < .01$, ** $p < .001$

Table 4 Correlation among gambling, impulsivity, sensation seeking, and dysfunctional symptomatology

	1	2	3	4	5	6	7	8	9	10	11
Gambling	–										
Impulsivity	.25**	–									
Sensation. seeking	−.06*	−.23**	–								
Anxiety	.15**	.31**	−.13**	–							
Phobic anxiety	.16**	.27**	−.03	.68**	–						
Somatization	.10**	.27**	−.12**	.77**	.59**	–					
Obsessive compulsive	.09**	.33**	−.13**	.76**	.58**	.72**	–				
Interpersonal. sensitivity	.09**	.30**	−.06*	.71**	.64**	.64**	.73**	–			
Depression	.15**	.33**	−.09**	.77**	.60**	.71**	.77**	.79**	–		
Hostility	.10**	.36**	−.21**	.66**	.44**	.61**	.60**	.56**	.64**	–	
Paranoid ideation	.12**	.34**	−.14**	.69**	.56**	.60**	.70**	.78**	.73**	.63**	–
Psychoticism	.15**	.38**	−.14**	.79**	.70**	.67**	.72**	.76**	.79**	.61**	.74**

* $p < .05$; ** $p < .001$

effect, $\beta = .15$, $p < .001$; direct effect, $\beta = .07$, $p = .007$; Sobel test, $Z = 7.13$, $p < .001$). Samely, partial mediation was verified when phobic anxiety was analyzed as dependent variable, (total effect, $\beta = .16$, $p < .001$; direct effect, $\beta = .10$, $p < .001$; Sobel test, $Z = 6.31$, $p < .001$). In the case of somatization as dependent variable, a perfect mediation was obtained (total effect, $\beta = .10$, $p < .001$; direct effect, $\beta = .03$, $p = .225$). Equally, a perfect mediation was observed when obsessive–compulsive behavior was introduced as dependent variable (total effect, $\beta = .09$, $p < .001$; direct effect, $\beta = .01$, $p = .692$), and with interpersonal sensitivity (total effect, $\beta = .09$, $p = .001$; direct effect, $\beta = .02$, $p = .409$). When depression was introduced, a partial meditational effect was observed (total effect, $\beta = .15$, $p < .001$; direct effect, $\beta = .08$, $p = .006$; Sobel test, $Z = 7.52$, $p < .001$). In the case of hostility, the mediation was perfect (total effect, $\beta = .10$, $p < .001$; direct effect, $\beta = .01$, $p = .540$). Samely, it was obtained a perfect mediation when paranoid ideation was analyzed (total effect, $\beta = .12$, $p < .001$; direct effect, $\beta = .04$, $p = .202$). Finally, a partial mediation was obtained when psychoticism was introduced (total effect, $\beta = .15$, $p < .001$; direct effect, $\beta = .06$, $p = .019$; Sobel test, $Z = 7.66$, $p < .001$).

Subsequently, the effect of the sensation seeking as mediator was analyzed too. Then, partial mediation in the relationship between gambling behavior and anxiety was observed (total effect, $\beta = .15$, $p < .001$; direct effect, $\beta = .14$, $p < .001$; Sobel test, $Z = 2.06$, $p = .039$). Phobic anxiety was not analyzed as dependent variable, given that it was not significantly correlated with sensation seeking. In the case of somatization as dependent variable, a partial mediation was obtained (total effect, $\beta = .10$, $p < .001$; direct effect, $\beta = .10$, $p < .001$, Sobel test $Z = 1.97$, $p = .049$). Equally, a partial mediation was observed when obsessive–compulsive behavior was introduced as dependent variable (total effect, $\beta = .09$, $p = .001$; direct effect, $\beta = .09$, $p = .001$, $Z = 1.97$, $p = .049$). In the case of interpersonal sensitivity, there was not a significant meditational effect (total effect, $\beta = .09$, $p = .001$; direct effect, $\beta = .09$, $p < .001$, $Z = 1.68$, *ns*), as well as in the case of depression (total effect, $\beta = .15$, $p < .001$; direct effect, $\beta = .15$, $p < .001$; Sobel test, $Z = 1.74$, *ns*). In the case of hostility, a partial mediation was found (total effect, $\beta = .10$, $p < .001$; direct effect, $\beta = .09$, $p < .001$, Sobel test, $Z = 2.15$, $p = .032$). Samely, it was obtained a partial mediation when paranoid ideation was analyzed (total effect, $\beta = .12$, $p < .001$; direct effect, $\beta = .11$, $p < .001$, Sobel test, $Z = 1.97$, $p = .049$). Finally, a partial mediation was obtained when psychoticism was introduced (total effect, $\beta = .15$, $p < .001$; direct effect, $\beta = .14$, $p < .001$; Sobel test, $Z = 2.09$, $p = .037$).

Therefore, both impulsivity had a mediator effect, partial or perfect, between gambling behavior and the assessed symptomatology. Sensation seeking showed also some partial meditational effects, although the indirect effects suggested that its influence in the relationship between gambling behavior and symptomatology is weaker than the influence of impulsivity.

Discussion

The consequences of young adult and adolescent pathological gambling can be devastating for sufferers. In this study, the data confirmed that young adults and adolescents with pathological gambling have more dysfunctional symptomatology than do non-gambling individuals in terms of anxiety, depression, hostility, obsessive–compulsive behavior and somatization. These results are in agreement with those of the few existing studies. Anxiety and depression have been found in samples of young gamblers (Shead et al. 2010). In a

study conducted by Blaszczynski and McConaghy (1988), gamblers had higher scores than psychiatric outpatients on obsessive–compulsive behavior, depression, and anxiety scales (in agreement with our study), as well as on interpersonal sensitivity and phobic anxiety subscales. Moreover, Petry (2000) found, in a sample of gamblers, higher scores on somatization, obsessive–compulsive, and hostility scales, as well as for paranoia and interpersonal sensitivity. However, Blaszczynski and McConaghy (1988) and Petry (2000) studied samples of adult gamblers. Therefore, this study provides new data about which dysfunctional symptomatology is present in young adults and adolescents who gamble, as results regarding hostility, obsessive–compulsive behavior, and somatization have been previously shown in adults. Recurrent thinking and hostility are two elements that are characteristic of people with pathological gambling. According to the DSM-IV-TR (APA 2000), being preoccupied with gambling and being restless or irritable when attempting to decrease or stop one's gambling are two behaviors that are evaluated for a diagnosis of pathological gambling.

Sensation seeking in problem gambling was also studied. The results showed that sensation seeking was high in young gamblers, which confirms the findings of previous studies within this age range (Burger 2007). It is interesting to note that intensity was more significant than novelty, in agreement with previous studies (Nower et al. 2004). Young and adolescent problem gamblers choose certain types of games based on the maximum amount that can be bet, and, as the DSM-IV-TR (APA 2000) mentions, one of the characteristics of pathological gambling is the need to gamble with increasing amounts of money to achieve the desired excitement.

The problem of behavioral addictions use in young adults with pathological gambling was studied. The results showed that there were significant differences between groups with and without pathological gambling significant differences, with more elevated scores among gamblers for addictions to alcohol, drugs, videogames, and sex, and for compulsive shopping. These results are in agreement with those of previous studies, which found relationships between gambling and addiction to drugs (Winters and Anderson 2000), alcohol (Molde et al. 2009), and videogames (Walther et al. 2012) in young adults. Previously, addiction to sex (Grant and Steinberg 2005) and compulsive shopping had only been correlated with gambling among adult gamblers (Kausch 2003).

In contrast, there were no significant differences between our groups for compulsive eating or Internet addiction. In the case of compulsive eating, these results are in agreement with previous studies in adults, which did not find relationships between gambling and eating disorders (Cunningham-Williams et al. 2005). In the case of the Internet, its use is generalized in adolescence, so the difference between groups might be due to the use of the Internet specifically for gambling.

Finally, the mediating effect of impulsivity and sensation seeking between gambling and the appearance of general symptomatology (depression, anxiety, phobic anxiety, somatization, obsessive–compulsive behavior, interpersonal sensitivity, hostility, paranoid ideation, and psychoticism) in pathological gambling was assessed. The results showed that impulsivity, partially mediated the appearance of anxiety, phobic anxiety, depression, and psychoticism, and perfectly mediated the appearance of somatization, obsessive–compulsive behavior, interpersonal sensitivity, paranoid ideation, and hostility. Although sensation seeking has also shown effect of partial mediation in anxiety, somatization, obsessive–compulsive behavior, hostility, paranoid ideation, and psychoticism, values for the Z of Sobel test, even though being statistically signifficant in the mentioned cases, are still lower than the ones found in the relative contrasts of the partial mediations found in

Impulsivity variable. This indicates that the mediating role of impulsivity is better than the mediating role of sensation seeking for this model.

Previous studies have found that sensation seeking was significantly correlated with gambling behavior (Coventry and Brown 1993; Kuley and Jacobs 1988; Nower et al. 2004; Zuckerman 1994). However, many studies have had mixed results (Blaszczynski et al. 1986; Dickerson et al. 1987). It has also been found that sensation seeking can vary depending on the psychopathology of the gamblers (González-Ibáñez et al. 2003) or on the type of gambling; for example, Bonnaire et al. (2009) found that gamblers who bet at racetracks had significantly higher scores on sensation seeking than those who played games available in cafés. The weakest mediation effects of sensation seeking compared to impulsivity, in the present study, together with the disparity of results found in other studies, might indicate that impulsivity may be a more determinant variable than sensation seeking in this specific pathology. From this research, it is difficult to determine whether sensation seeking or impulsivity leads to gambling or whether gambling increases an individual's tendency to be impulsive or sensation seeking. It is necessary to pursue further longitudinal studies on sensation seeking to identify its role among young adults and adolescents.

In the case of impulsivity, although there have been exceptions (Allcock and Grace 1988), the results regarding its relationship with pathological gambling have been more consistent (Barnes et al. 2005; De Wit 2009; Vitaro et al. 1999). There have been only a few studies analyzing impulsivity as a mediator in the appearance of dysfunctional symptomatology in pathological gambling. Some of these studies, such as that conducted by Tang and Wu (2012), have shown that impulsivity partially mediated the influence of life stress on pathological gambling. Another study, conducted by Clarke (2006), found impulsivity to be a mediator between depression and pathological gambling. Longitudinal studies, such as the one conducted by Dussault et al. (2011), revealed a positive predictive link between impulsivity at age 14 and depressive symptoms and gambling problems at age 17. In turn, gambling problems at age 17 predicted an increase in depressive symptoms from age 17 to age 23, and depressive symptoms at age 17 predicted an increase in gambling problems from age 17 to age 23. The results of the present study provide useful data for understanding the role of impulsivity in gambling among adolescents and young adults. As it can be seen, is the impulsive behavior that mediates the appearance on symptomatology. The preventive work, making special impact on reducing impulsive behavior, would help to reduce pathologic gambling and dysfunctional symptomatology.

This study was not without limitations. One of the most important limitations is its cross-sectional design, which means that causality among the variables cannot be assured. Longitudinal studies are necessary to deepen our knowledge of the roles of impulsivity and sensation seeking in pathological gambling. Another important limitation is that retrospective self-report measurements were used, which might have biased the collected information. Finally, the number of women with pathological gambling recruited for this study was limited. It is unclear why there were fewer women than men in our sample. With more female subjects in the sample, the comparisons and analyses might have produced more detailed results.

In conclusion, this study is important for understanding pathological gambling in adolescence. It has shown some of the harmful consequences that this pathology causes, as well as other addictive behaviors that can be associated with it. Furthermore, impulsivity stood out overall as a mediator in the appearance of dysfunctional symptomatology. Finally, it would be an interesting idea to include activities to work an impulsivity reduction in preventive and treatment programs for youngsters and teenagers. Future

studies in this line of research would be helpful in the deepening of gambling problematic in youngsters and teenagers.

Acknowledgments The results presented in this article are part of an investigation conducted with funding obtained from the I edition of the International Contest ONCE of Research on Responsible Gambling. The sample was obtained thanks to the collaboration of the Spanish Federation of Rehabilitated Gamblers FEJAR.

Conflict of interest The authors declare that they have no conflicts of interest.

References

Allcock, C. C., & Grace, D. M. (1988). Pathological gamblers are neither impulsive nor sensation-seekers. *Australian and New Zealand Journal of Psychiatry, 22*, 307–311.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: Author.

Arnett, J. (1994). Sensation seeking: A new conceptualization and a new scale. *Personality and Individual Differences, 16*(2), 189–296.

Barnes, G. M., Welte, J. W., Hoffman, J. H., & Dintcheff, B. A. (2005). Shared predictors of youthful gambling, substance use and delinquency. *Psychology of Addictive Behaviors, 19*, 165–174.

Benson, L. A., Norman, C., & Griffiths, M. D. (2012). The role of impulsivity, sensation seeking, coping, and year of study in student gambling: A pilot study. *International Journal of Mental Health and Addiction, 10*(4), 461–473.

Blaszczynski, A., & McConaghy, N. (1988). SCL-90 assessed psychopathology in pathological gamblers. *Psychological Reports, 62*, 547–552.

Blaszczynski, A. A., Steel, Z. Z., & Mcconaghy, N. N. (1997). Impulsivity in pathological gambling: The antisocial impulsivist. *Addiction, 92*(1), 75–87.

Blaszczynski, A. P., Wilson, A. C., & McConaghy, N. (1986). Sensation seeking and pathological gambling. *British Journal of Addiction, 81*, 113–117.

Bonnaire, C., Bungener, C., & Varescon, I. (2009). Subtypes of French pathological gamblers: Comparison of sensation seeking, alexithymia and depression scores. *Journal of Gambling Studies, 25*(4), 455–471.

Burger, T. D. (2007). *College students and gambling: Gauging the effects of gender on impulse control, sensation seeking, and mental health as predictors of involvement*. Doctoral dissertation, Indiana State University.

Clarke, D. (2006). Impulsivity as a mediator in the relationship between depression and problem gambling. *Personality and Individual Differences, 40*(1), 5–15.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Coventry, K. R., & Brown, R. (1993). Sensation seeking, gambling and gambling addictions. *Addiction, 88*(4), 541–554.

Cunningham-Williams, R. M., Grucza, R. A., Cottler, L. B., Womack, S. B., Books, S. J., Pszybeck, T. R., et al. (2005). Prevalence and predictors of pathological gambling: Results from the St. Louis personality, health and lifestyle (SLPHL) study. *Journal of Psychiatric Research, 39*(4), 377–390.

De Wit, H. (2009). Impulsivity as a determinant and consequence of drug use: A review of underlying processes. *Addiction Biology, 14*(1), 22–31.

Derogatis, L. R. (1997). *SCL-90-R, administration, scoring and procedures manual for the revised version*. Baltimore: School of Medicine, Johns Hopkins University.

Dickerson, M., Hinchy, J., & Fabre, J. (1987). Chasing, arousal, and sensation seeking in off-course gamblers. *British Journal of Addiction, 82*, 673–680.

Donati, M., Chiesi, F., & Primi, C. (2013). A model to explain at-risk/problem gambling among male and female adolescents: Gender similarities and differences. *Journal of Adolescence, 36*(1), 129–137.

Dussault, F., Brendgen, M., Vitaro, F., Wanner, B., & Tremblay, R. E. (2011). Longitudinal links between impulsivity, gambling problems and depressive symptoms: A transactional model from adolescence to early adulthood. *Journal of Child Psychology and Psychiatry, 52*(2), 130–138.

Echeburua, E. (2012). Factores de riesgo y factores de protección en la adicción a las nuevas tecnologías y redes sociales en jóvenes y adolescentes [Risk and protective factors in the addiction to the Internet and to social online networkings in young people]. *Revista Española de Drogodependencias., 37*(4), 435–447.

Ellenbogen, S., Gupta, R., & Derevensky, J. L. (2007). A cross-cultural study of gambling behaviour among adolescents. *Journal of Gambling Studies, 23*(1), 25–39.

Fairburn, C. G. (1995). *Overcoming binge eating*. New York: Guilford Press.

Ferrando, P. J., & Chico, E. (2001). The construct of sensation seeking as measured by Zuckerman's SSS-V and Arnett's AISS: A structural equation model. *Personality and Individual Differences, 31*, 1121–1133.

González-Ibáñez, A., Aymami, M. N., Jiménez, S., Domenech, J. M., Granero, R., & Lourido-Ferreira, M. R. (2003). Assessment of pathological gamblers who use slot machines. *Psychological Reports, 93*, 707–716.

Grant, J. E., & Steinberg, M. A. (2005). Compulsive sexual behavior and pathological gambling. *Sexual Addiction & Compulsivity, 12*(2/3), 235–244.

Gupta, R., & Derevensky, J. L. (1998). An empirical examination of Jacobs' general theory of addictions : Do adolescent gamblers fit the theory? *Journal of Gambling Studies, 14*(1), 17–49.

Gupta, R., Derevensky, J. L., & Ellenbogen, S. (2006). Personality characteristics and risk-taking tendencies among adolescent gamblers. *Canadian Journal of Behavioural Science, 38*, 201–213.

Hardoon, K., Gupta, R., & Derevensky, J. L. (2004). Psychosocial variables associated with adolescent gambling. *Psychology of Addictive Behaviors, 18*(2), 170–179.

Huang, J. H., Jacobs, D. F., Derevensky, J. L., Gupta, R., & Paskus, T. S. (2007). Gambling and health risk behaviors among U.S. college student-athletes: Findings from a national study. *The Journal of Adolescent Health, 40*(5), 390–397.

Jacobs, D. F. (2000). Juvenile gambling in North America: An analysis of long-term trends and future prospects. *Journal of Gambling Studies, 16*(2), 119–152.

Kausch, O. (2003). Patterns of substance abuse among treatment-seeking pathological gamblers. *Journal of Substance Abuse Treatment, 25*(4), 263.

Kuley, N. B., & Jacobs, D. F. (1988). The relationship between dissociative-like experiences and sensation seeking among social and problem gamblers. *Journal of Gambling Behavior, 4*(3), 197–207.

Labrador, F. J., & Villadangos, S. M. (2009). Adicciones a nuevas tecnologías en jóvenes y adolescentes [Addictions to new technologies in adolescentes and young adults]. In E. Echeburúa, F. J. Labrador & E. Becoña (Eds.), *Adicción a las nuevas tecnologías en adolescentes y jóvenes* [*Addiction to new technologies in adolescentes and young adults*] (pp. 45–75). Madrid: Pirámide.

MacLaren, V. V., Fugelsang, J. A., Harrigan, K. A., & Dixon, M. J. (2011). The personality of pathological gamblers: A meta-analysis. *Clinical Psychology Review, 31*(6), 1057–1067.

MacLaren, V. V., Fugelsang, J. A., Harrigan, K. A., & Dixon, M. J. (2012). Effects of impulsivity, reinforcement sensitivity, and cognitive style on pathological gambling symptoms among frequent slot machine players. *Personality and Individual Differences, 52*(3), 390–394.

Molde, H., Pallesen, S., Bartone, P., Hystad, S., & Johnsen, B. (2009). Prevalence and correlates of gambling among 16 to 19-year-old adolescents in Norway. *Scandinavian Journal of Psychology, 50*(1), 55–64.

Muñoz-Molina, Y. (2008). Meta-análisis sobre juego patológico 1997–2007 [Meta-analysis of pathological gambling 1997–2007]. *Revista de Salud Pública, 10*(1), 150–159.

Nower, L., & Blaszczynski, A. (2006). Impulsivity and pathological gambling: A descriptive model. *International Gambling Studies, 6*(1), 61–75.

Nower, L., Derevensky, J., & Gupta, R. (2004). The relationship of impulsivity, sensation seeking, coping, and substance use in youth gamblers. *Psychology of Addictive Behaviors, 18*, 49–55.

Pedrero Pérez, E. J., Rodríguez Monje, M. T., Gallardo Alonso, F., Fernández Girón, M., Pérez López, M., & Chicharro Romero, J. (2007). Validación de un instrumento para la detección de trastornos del control de impulsos y adicciones: el MULTICAGE CAD-4 [Validation of a tool for screening of impulse control disorders and addiction: MULTICAGE CAD-4]. *Trastornos Adictivos, 9*(4), 269–278.

Petry, N. M. (2000). Psychiatric symptoms in problem gambling and non-problem gambling substance abusers. *American Journal on Addictions, 9*(2), 163–171.

Petry, N. M. (2006). Internet gambling: An emerging concern in family practice medicine? *Family Practice, 23*, 421–426.

Potenza, M. N., Wareham, J. D., Steinberg, M. A., Rugle, L., Cavallo, D. A., Krishnan-Sarin, S., et al. (2011). Correlates of at-risk/problem internet gambling in adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry, 50*(2), 150–159.

Secades, R., & Villa, A. (1998). *El juego patológico: prevención, evaluación y tratamiento en la adolescencia [Pathological gambling: Prevention, evaluation and treatment in adolescence]*. Pirámide: Madrid.

Shead, N. W., Derevensky, J., & Gupta, R. (2010). Risk and protective factors associated with youth problem gambling. *International Journal of Adolescent Medicine and Health, 22*(1), 39–58.

Slutske, W. S., Caspi, A., Moffitt, T. E., & Poulton, R. (2005). Personality and problem gambling: A prospective study of a birth cohort of young adults. *Archives of General Psychiatry, 62*, 769–775.

Tang, C., & Wu, A. S. (2012). Impulsivity as a moderator and mediator between life stress and pathological gambling among Chinese treatment-seeking gamblers. *International Journal of Mental Health and Addiction, 10*(4), 573–584.

Vitaro, F., Arseneault, L., & Tremblay, R. E. (1999). Impulsivity predicts problem gambing in low SES adolescent males. *Addiction, 94*, 565–575.

Volberg, R. A., Gupta, R., Griffiths, M. D., Ólason, D. T., & Delfabbro, P. (2010). An international perspective on youth gambling prevalence studies. *International Journal of Adolescent Medicine and Health, 22*(1), 3–38.

Walther, B., Morgenstern, M., & Hanewinkel, R. (2012). Co-occurrence of addictive behaviours: Personality factors related to substance use, gambling and computer gaming. *European Addiction Research, 18*(4), 167–174.

Winters, K. C., & Anderson, N. (2000). Gambling involvement and drug use among adolescents. *Journal of Gambling Studies, 16*, 175–198.

Winters, K. C., Stinchfield, R. D., Botzet, A., & Anderson, N. (2002). A prospective study of youth gambling behaviors. *Psychology of Addictive Behaviors, 16*(1), 3–9.

Young, K. S. (1998). Internet addiction: The emergence of a new clinical disorder. *CyberPsychology & Behavior, 1*(3), 237–244.

Zuckerman, M. (1979). *Sensation seeking: Beyond the optimal level of arousal*. Hillsdale, NJ: Erlbaum.

Zuckerman, M. (1994). Impulsive unsocialized sensation seeking: The biological foundations of a basic dimension of personality. In J. E. Bates & T. D. Wachs (Eds.), *Temperament: Individual differences at the interface of biology and behavior* (pp. 219–255). Washington, D.C.: APA.