Jiménez-Murcia S, Granero R, Tárrega S, Angulo A, Fernández-Aranda F, Arcelus J, Fagundo AB, Aymamí N, Moragas L, Sauvaget A, Grall-Bronnec M, Gómez-Peña M, Menchón JM. (2016). Mediational role of age of onset in gambling disorder, a path modeling analysis. *Journal of Gambling Studies, 32(1),* 327-340. doi: 10.1007/s10899-015-9537-y.

Abstract

The aim of the study is to assess a mediational pathway which includes patients' sex, personality traits, age of onset of gambling disorder (GD) and gambling-related variables. **Method:** the South Oaks Gambling Screen (SOGS), the Symptom Checklist (SCL-90-R) and the Temperament and Character Inventory-R (TCI-R) were administered to a large sample of 1,632 outpatients attending a specialized outpatient GD unit. Sociodemographic variables were also recorded. A Structural Equation Model (SEM) was adjusted to assess the pathway. **Results**: age of onset mediated between personality profile (novelty seeking and self-transcendence) and GD severity and depression symptoms (measured by SCL-90-R). Sex had a direct effect on GD onset and depression symptoms: men initiated the GD disorder earlier and reported fewer depression symptoms. **Discussion**: age of onset is a mediating variable between sex, personality traits, GD severity and depression symptoms. These empirical results provide new evidence about the underlying etiological process of dysfunctional behaviors related to gambling, and may help to guide the development of more effective treatment and prevention programs aimed at high-risk groups such as young men with high levels of novelty seeking and self-transcendence.

Key words:

Age of onset, gambling disorder, mediational variables, pathways, personality traits, SEM.

Introduction

Gambling disorder (GD) is defined as a persistent and recurrent problematic behavior leading to clinically significant impairment or distress [1]. Many studies have identified gambling behavior at early ages as a powerful risk factor for the development of GD [2–5]. Recent epidemiological studies stress that although the age of onset in GD varies widely [6], gamblers are getting younger [7]. This trend is accentuated by the advent of new technologies which young people are particularly prone to use and the legalization of online gambling in different countries [8–10].

These data are especially significant due to their association with later development of GD in adulthood [3,11], higher GD severity [12,13] and specific clinical profiles [14,15].

Many studies have sought to identify variables associated with age of onset in gambling behavior (for instance, personality traits, sex, disorder severity, psychopathological features, motivations for gambling, etc.). Regarding personality, two main temperament dimensions have achieved statistical predictive capacity: impulsivity and negative affectivity [16]. These dimensions, also called novelty seeking and harm avoidance following Cloninger's model [17], show strong associations with early gambling onset [18]. Similarly, recent studies suggest that a higher level novelty seeking may be a risk factor for the development of problems at earlier ages [2,13,19,20].

In the relationship between personality traits and gambling-related behavior, certain differences have been found associated with sex: women who presented GD reported higher harm avoidance and cooperativeness levels than female controls [21]. Moreover, when comparing men and women diagnosed with gambling disorder, Granero et al. [22] observed that men scored higher on harm avoidance and lower on self-directedness. However, there were no differences in novelty seeking; nor was there a positive association between gender and disorder severity.

Likewise, sex differences are also observed in the age of onset of gambling behavior. Men begin gambling during their youth, whereas in women the age of onset is later [22–25]. Early GD onset is also predictive of a higher risk of severity and socio-family impairment or distress [14,26] and higher psychiatric comorbidity, such as anxiety [15], substance use [14,26] and affective disorders [27]. However, the results are sometimes contradictory; some authors have found no differences regarding age of onset and gambling severity [15].

Research based on clusters and latent class analyses indicates that patients diagnosed with GD are far from being a homogeneous group. Several different empirical subgroups have been defined based on sociodemographics, clinical profile, personality traits, severity and age of onset [28–33]. From the earliest classifications of subtypes [34–36] to the most recent ones [29,30,32,37,38], the empirical validation of the typologies described has advanced considerably. In general, the majority of these studies point to the existence of a subtype characterized by early age of onset, greater severity and more dysfunctional psychopathological and personality profiles, with a notable involvement of the neurological risk factors [28-32].

In short, the evidence accumulated suggests that the presence and evolution of GD is related to age of onset, sex and personality profile. And this set of variables also seems to be associated with GD severity and comorbidity. However, to identify the main risk/protective factors for a specific disorder it is not enough to establish the inter-relational set of relations for the underlying etiological-causal process involving dysfunctional behaviors. Few researchers have analyzed the mechanism and pathways underlying the beginning and development of GD. The aim of this study is to assess the role of patients' sex and personality traits in the pathways explaining the age of onset of GD and its clinical profile (severity of gambling behavior and depression symptoms) through Structural Equation Modeling (SEM) reference ?, in a large sample of outpatients receiving treatment for

gambling problems. SEM constitute a power statistical technique for testing "causal relationships", that is, the underlying mechanism of an outcome throught the modeling of the global set of interrelations between the variables implied in the phenomenon under study. This work concretely uses path-analysis, a special case of SEM applied to describe-assess the directed and mediated dependences among the set of variables, which has demonstrated usefulness and validity in complex modeling areas like biology, medicine, psychology or sociology (Rabe-Hesketh et al. 2004).

Based in the above theoretical framework, we hypothesized that male sex, high novelty seeking and low self-transcendence scores would be predictive of a younger age of onset, and that early age of onset would be associated with greater severity of gambling behavior and greater levels of depression symptoms.

Method

Participants

The sample consisted of 1,632 patients with a GD consecutively receiving assessment and outpatient treatment at a Pathological Gambling Unit in the Psychiatric Department of a public hospital (University Hospital of Bellvitge, Barcelona, Spain) between May 2004 and July 2012. All participants were diagnosed by psychologists and psychiatrists with extensive experience in GD, using the Diagnostic Questionnaire for Pathological Gambling according to DSM-IV criteria [39].

Descriptive data for the sample are shown in Table 1. Participants' mean age was 40.9 years-old (SD=12.4). Most participants were male (91.5%), Spanish (93.4%), with an educational level of primary school or less (54.4%) and were married or living with a partner (51.1%). The mean age of onset was 35.9 years (SD=12.4) and the mean number of addictive behaviors was 1.01 (SD=0.15).

- Insert Table 1 -

Measures

South Oaks Gambling Screen (SOGS) [40], Spanish validation by Echeburúa, Báez, Fernández & Páez [41]. This screening self-report questionnaire contains 20 items that identify probable GD, problematic gambling and non-problematic gambling. The total score ranges from 0 to 20; scores over 4 are indicative of GD. The Spanish validation of this questionnaire shows adequate psychometric properties (test-retest reliability, 0.98; internal consistency, 0.94; and convergent validity, 0.92). In this study, only the total scale score was used for analyses.

Temperament and Character Inventory-Revised (TCI-R), Spanish adaptation by Gutiérrez-Zotes et al. [42]. This is a 240-item questionnaire with a five-point Likert scale format used to measure four temperament (Harm Avoidance, Novelty Seeking, Reward Dependence and Persistence) and three character dimensions (Self-Directedness, Cooperativeness and Self-Transcendence) of personality. The Spanish adaptation has shown acceptable reliability of the seven dimensions (ranged between 0.77 and 0.84). For the structural equation model we used only the total score dimensions that showed greater association with other indicators analyzed in this study.

Symptom Check List–90 items-Revised (SCL-90-R) [43], Spanish validation by Martínez-Azumendi, Fernández-Gómez, & Beitia-Fernández [44]. This multidimensional self-report questionnaire includes 90 items with a five point scale format and evaluates nine primary symptom dimensions: somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. It also includes three global indices: a global severity index (GSI), for measuring overall psychological distress; a positive symptom distress index (PSDI) for measuring symptom intensity; and a positive symptom total (PST), which records the total self-reported symptoms.

This questionnaire has been validated in a Spanish population, obtaining adequate internal consistency of the items (ranging between .81 and .90) and an acceptable mean internal consistency of 0.75. Primary symptom dimensions scores were evaluated, but only those that showed a strong association with the other indicators analyzed in this study were finally selected for the structural equation model.

Procedure

This study was carried out in accordance with the latest version of the Declaration of Helsinki. The Ethics Committee of the Bellvitge University Hospital (Barcelona) approved the study and written informed consent was obtained from all final participants. The assessment was conducted prospectively at baseline in a single session (with a mean duration of 90 min), during which the tests mentioned above were administered by trained clinical psychologists with more than 15 years of clinical experience in this disorder. In addition to the assessment battery, the patients were explored through a semi-structured face-to-face interview regarding their GD, psychopathological symptoms and personality traits [45]. The same interview also assessed sociodemographic data (e.g., education, occupation, marital status) and additional clinical information.

Statistical Analysis

The mediational hypotheses were tested through Structural Equation Models (SEM) with STATA13 for Windows. Overall goodness-of-fit statistics were assessed through the χ^2 test, the Root Mean Squared Error of Approximation (RMSEA), baseline comparison indices (Comparative Fit Index CFI and Tucker-Lewis Index TLI) and residual size (Standardized Mean Squared Residual SMSR). A fit was considered to be good if [46]: a non-significant result (p>.05) was achieved for the χ^2 test, the RMSEA was lower than .08, the CFI-TI coefficients were higher than .90 and SRMR was limited to 0.08. The equation level

goodness-of-fit and the effect sizes were also estimated through R^2 coefficients for each equation and for the global model (these coefficients assessed the fraction of the variance explained by indicator/s), multiple correlation (mc) and Bentler-Raykov multiple correlation (mc^2) [47]. These last two coefficients report the relatedness of each dependent variable with the model's linear prediction (in non-recursive models, mc^2 is computed to avoid the problem of achieving inconsistent negative multiple correlations).

Results

Table 2 shows the results of correlation analysis between SCL90-R scales, TCI-R scales, GD age of onset, SOGS-total score and sex. Male sex showed a moderate-weak negative association with almost all SCL90-R scales and a weak negative association with TCI-R Harm Avoidance and GD age of onset. GD age of onset presented a moderate negative correlation with TCI-R Novelty Seeking, SOGS-total score, and positive low correlation with TCI-R Self-transcendence. SOGS-total score showed a moderate positive correlation with all SCL90-R scale scores and TCI-R Novelty Seeking, and a moderate negative correlation with TCI-R Cooperativeness and TCI-R Self-directedness.

--- Insert Table 2 ---

Figure 1 and Table 3 show the final SEM obtained to explain the pathways between patients' sex, TCI-R scales, GD age of onset, SOGS-total score (GD severity) and comorbid depression. Due to the large set of scales in the TCI-R and SCL-90-R questionnaire, several previous models were tested to assess the most relevant variables and the ones that obtained the best fit. The final selected model achieved a very good fit (χ^2=1.60, p=.210; RMSEA=0.02, CFI=0.999, TLI=0.99 and SRMR=0.01) and global predictive capacity (R^2=0.318). Men had a younger GD age of onset and lower SCL-90-R depression score. High scores on TCI-R novelty seeking were associated with early GD age of onset, and higher

SOGS-total score and SCL-90-R depression score. High scores on TCI-R self-transcendence predicted older GD onset, high SOGS-total score and high SCL-90-R depression. Young GD onset predicted high SOGS-total score, whereas high GD severity predicted high SCL-90-R depression.

--- Insert Table 3 ---

--- Insert Figure 1 ---

Discussion

This study aimed to test the role of patients' sex and personality traits in the pathways explaining the age of onset of GD and its clinical profile (severity of gambling behavior and depression symptoms). Younger age of onset was associated with male sex, high novelty seeking and low self-transcendence scores. Onset mediated the association between sex and personality, GD severity and depressive symptoms.

Sex, personality traits, age of onset of the GD and GD severity

As hypothesized, the results of this study indicated that younger ages of onset were associated with higher disorder severity. These findings are consistent with those of previous research on GD age of onset [6,12,13,48,49].

However, previous studies found no association between sex and severity [22,24], whereas the strong relationship with GD age of onset is well established [25]. Multiple studies have reported that men begin to gamble earlier in life than women [22–24,50,51]. Our results support the notion that GD onset mediates between sex and GD severity: in agreement with other studies [52,53], we found that males reported higher GD severity scores associated with their early onset of problematic gambling behavior.

Also coinciding with other authors, high scores on self-transcendence were associated with older age at onset [18], which was also inversely related to severity. These results, in agreement with other studies [54], suggest that self-transcendence has a protective effect, by delaying age of onset and thus reducing the level of severity. At the same time, high scores for self-transcendence, a character trait associated with GD [55] which tends to increase with age [56], were associated with high scores on GD severity [54]. Therefore, when the gambling behavior has already started, high self-transcendence may increase the severity of the disorder. Cloninger, Svrakic, Bayon & Przyback [57] postulated that high levels of self-transcendence may respond to attenuated forms of mood disorders. In fact, several studies have shown a high degree of comorbidity between mood or anxiety disorders and GD [4,5,58–60], often predating the development and persistence of problem gambling behavior [6]. This may also be a maladaptive way of regulating negative emotional states [29,30,32].

Previous studies have found a relationship between GD and higher novelty seeking [54,55,61–63]. High scores on novelty seeking are associated with early GD onset, which in turn is related with severity [13,18,29,64]. However, other authors have found that GD tends to be more severe in novelty seekers regardless of the age of onset [62,65].

Sex, personality traits and depressive symptoms

Males with GD in our sample reported fewer depressive symptoms, in agreement with some previous studies [22,66] though not with others (Potenza et al. [67] found similar rates of depressive and anxiety disorders among men and women with gambling problems). Age of onset and severity in GD present a mediational relationship. Sex (specifically, male sex) was associated with early age of onset which in turn was associated with higher severity and higher depression scores on the SCL-90-R. This finding corroborates the results of other studies which establish a relationship between the severity of the gambling problem, its

consequences (economic, legal, family, professional, etc.) and the intensity of depressive and anxiety symptoms [68, 69].

The two personality traits novelty seeking and self-transcendence were found to follow three different pathways to depressive symptoms. First, a direct association was observed: high scores on these two personality traits were related to higher depression scores. Second, their effect was mediated by GD severity: high scores on these two scales were associated with high GD severity, which it turn was associated with depression scores. In other words, novelty seeking and self-transcendence increase depression scores by increasing the mediational variable of GD severity. Third, novelty seeking and self-transcendence are indirectly associated with depression scores by affecting GD age of onset, which in turn is associated with severity.

In this pathway, higher novelty seeking remains a risk factor of perceived depressive symptoms. However, when GD age of onset and severity are taken into account, high self-transcendence is associated with older age of onset, which in turn is associated with a lower level of severity, and thus with lower levels of depressive symptoms.

Overall, the SEM tested in the current study partially supported the relationships suggested between personality traits, GD age of onset and severity in studies which aimed to characterize GD subgroups. Specifically, the subgroup characterized by the traits impulsivity, novelty seeking, higher mysticism and emotionally unstable profile, had the earliest ages of onset, the most severe gambling behavior and the most severe clinical and gambling profile. This subtype appears to be the most dysfunctional and presents a marked biological and emotional vulnerability [29,30,32,33]. Our study, besides supporting previous findings, also proposed different pathways in which personality traits and sex may impact on severity and perceived depressive symptoms, and highlights the mediational role of GD age of onset.

To our knowledge, this is the first study to examine the mediational role of onset between personality traits, GD and depressive symptoms in a European country. The results are clinically relevant, since they provide new empirical evidence regarding the underlying etiological process of GD. They may be of use not only in the design of education and prevention programs focused on young people (especially males) with certain personality traits, but also for developing suitable therapeutic programs that take into account the role of GD age of onset and severity as a mediator between personality traits and depressive symptoms.

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Figure 1. Structural Equational Model evaluating the mediational role of age of onset between personality and GD outcomes. (*n*=1,632).

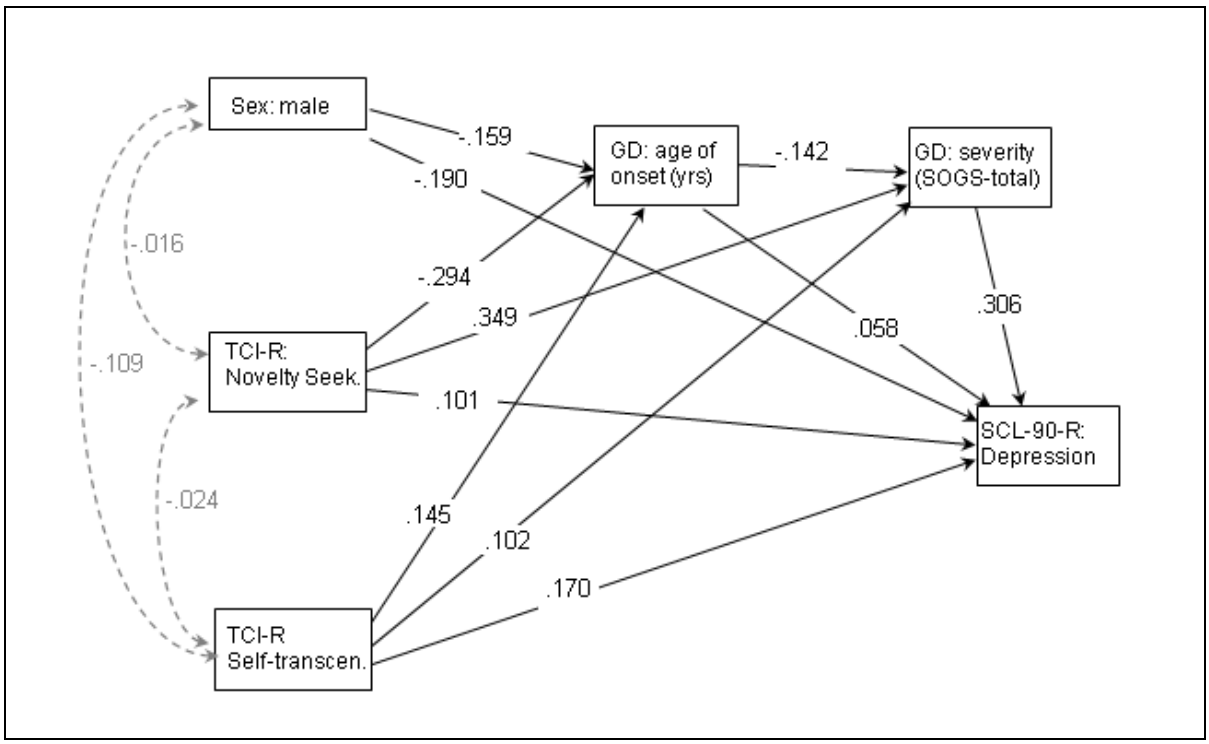

Table 1. Descriptives for the sample.

Age (years); *mean (SD)*		40.9 (12.4)
Gender; *%*	*Males*	91.5
	Females	8.46
Origin; *%*	*Spain*	93.4
	Europe (East)	0.67
	Europe (West)	1.41
	America (South)	3.25
	Africa (North)	1.10
	Asia	0.12
Education level; *%*	*Lower than primary*	1.00
	Primary	53.4
	Secondary	40.1
	University	5.48
Civil status; *%*	*Single*	34.7
	Married - lives with partner	51.1
	Divorced - separated	14.2
Age of onset for GD (years); *mean (SD)*		35.89 (12.4)
Number of addictive behaviors; *mean (SD)*		1.01 (0.15)

SD: standard deviation. (*n*=1,632).

Table 2. Bivariate correlations for the variables of the study.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
SCL: Somatizat.	1	--																				
SCL: Obs/comp.	2	.71	--																			
SCL: Sensitivity	3	.63	.77	--																		
SCL: Depressive	4	.70	.76	.78	--																	
SCL: Anxiety	5	.79	.78	.76	.82	--																
SCL: Hostility	6	.59	.66	.65	.65	.71	--															
SCL: Phobia	7	.62	.64	.66	.62	.75	.53	--														
SCL: Paranoia	8	.56	.66	.75	.62	.66	.65	.56	--													
SCL: Psychotic	9	.67	.76	.78	.78	.80	.69	.67	.72	--												
SCL: GSI	10	.83	.88	.87	.91	.93	.78	.76	.77	.89	--											
SCL: PST	11	.74	.81	.80	.81	.82	.69	.66	.72	.80	.89	--										
SCL: PSDI	12	.67	.68	.67	.78	.73	.60	.57	.57	.70	.80	.52	--									
TCI-R: NS	13	.13	.16	.14	.21	.20	.24	.08	.14	.19	.21	.17	.21	--								
TCI-R: HA	14	.32	.41	.43	.40	.40	.25	.34	.25	.32	.41	.42	.28	-.11	--							
TCI-R: RD	15	-.06	-.14	-.19	-.11	-.09	-.15	-.09	-.15	-.16	-.14	-.14	-.10	.02	-.24	--						
TCI-R: PS	16	.00	-.11	-.05	-.06	-.02	.00	-.02	.07	.00	-.03	-.06	.00	-.02	-.40	.22	--					
TCI-R: SD	17	-.36	-.52	-.54	-.52	-.49	-.46	-.38	-.46	-.52	-.55	-.55	-.40	-.32	-.41	.25	.16	--				
TCI-R: CO	18	-.20	-.31	-.33	-.23	-.27	-.39	-.23	-.37	-.32	-.32	-.34	-.20	-.18	-.22	.54	.18	.55	--			
TCI-R: ST	19	.25	.27	.23	.23	.27	.20	.26	.28	.30	.29	.30	.20	.02	-.04	.22	.36	-.22	.02	--		
SOGS-total	20	.26	.33	.29	.35	.35	.34	.23	.25	.34	.36	.37	.27	.39	.08	-.05	-.01	-.36	-.22	.09	--	
Onset	21	.04	-.02	-.06	.02	-.01	-.09	.00	.00	.00	-.01	.00	.03	-.29	.07	.08	-.02	.06	.10	.16	-.23	--
Sex (male)	22	-.26	-.16	-.16	-.23	-.22	-.08	-.23	-.13	-.13	-.21	-.15	-.20	-.02	-.16	-.10	.06	.11	-.08	-.11	-.02	-.17

TCI-R: Novelty Seeking, Harm Avoidance, Reward Dependence, Persistence, Self-directedness, Cooperativeness, Self-Transcendence.

(*n*=1,632).

Table 3. Results for the SEM.

Standardized coefficients	Coefficient	SE	z	P>z	95%CI(coef)
Depression level					
GD age of onset	.058	0.024	2.44	.015	.011; .105
GD severity (SOGS-total)	.306	0.023	13.01	<.001	.260; .352
TCI-R: novelty seeking	.101	0.025	4.14	<.001	.053; .149
Sex: male	-.190	0.022	-8.54	<.001	-.233; -.146
TCI-R: self-transcendence	.170	0.022	7.62	<.001	.126; .214
GD age of onset					
TCI-R: novelty seeking	-.294	0.022	-13.31	<.001	-.337; -.251
Sex: male	-.159	0.023	-6.95	<.001	-.204; -.114
TCI-R: self-transcendence	.145	0.023	6.31	<.001	.100; .190
GD severity (SOGS-total)					
GD age of onset	-.142	0.024	-6	<.001	-.188; -.095
TCI-R: novelty seeking	.349	0.022	15.74	<.001	.306; .393
TCI-R: self-transcendence	.102	0.023	4.52	<.001	.058; .147
cov(NoveltySek., Sex-male)	-.016	0.025	-0.63	.526	-.064; .033
cov(NoveltySek., Self-tran.)	.024	0.025	0.99	.324	-.024; .073
cov(Sex-male,Self-tran.)	-.109	0.024	-4.48	<.001	-.157; -.062

Equation level fit	Var.Fitted	Var.Predict.	Residual	R^2	mc	mc^2
Depression level	0.81	0.17	0.64	.208	0.46	0.21
GD age of onset	152.9	20.5	132.3	.134	0.37	0.13
GD severity (SOGS-total)	9.96	1.78	8.18	.178	0.42	0.18

SE: Standard error; mc: correlation between dependent variable and its prediction.

mc^2: Bentler-Raykov squared multiple correlation. (*n*=1,632).