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## Abstract

The aims of this study are: to explore empirical clusters in a sample of individuals with a gambling disorder (GD) according to the presence of illegal behaviors, to describe the subgroups at a clinical level and to examine whether a temporal change has taken place across the last 9 years. The sample consisted of 378 patients with a GD who consecutively received outpatient treatment, and who reported the presence of the DSM-IV criteria “presence of illegal behavior”. Two-step clustering procedure revealed the existence of four empirical groups, which differed in both sociodemographic and clinical profiles. The patients, who have committed illegal acts due to their gambling behavior, are a heterogeneous group in which it is possible to identify different subtypes, based on sociodemographic, psychopathological, clinical and personality characteristics.

**Keywords** Gambling disorder: Illegal acts ; Pathways ; Subtypes ; Clusters

## Introduction

The latest edition of the diagnostic and statistical manual of mental disorders (DSM 5, APA 2013) contemplates pathological gambling, now termed gambling disorder (GD), as an addictive disorder, thus placing it in the chapter Substance-Related and Addictive Disorders. This new classification is based on the empirical evidence currently available, which demonstrates that pathological gambling activates brain reward systems; thus mimicking the effects of substance addictions (APA 2013). It also enhances behaviors similar to those observed in substance abuse disorders. Other significant changes include: the elimination of the criterion “illegal acts”, a reduction in the cutoff criteria for diagnosis (from meeting 5 to 4 criteria) and the possibility to specify the severity and state (episodic, persistent or in early or sustained remission) of the disorder, based on the number of diagnostic criteria met. These can be considered as notable changes, both from a clinical and a research perspective, given that they will advantageously decrease the variability in the disorder-related concepts and methodologies employed in the study of this psychopathology.

The existence of a relationship between GD and criminality has been demonstrated (Folino and Abait 2009), as well as the association between GD and greater severity of the disorder (Toce-Gerstein et al. 2003; Strong and Kahler 2007). In fact, criminal behavior rarely occurs as an isolated symptom (Petry et al. 2013). In general, the types of illegal acts committed by individuals with GD are related to the need to obtain money, thus fraud or theft are the most common (Folino and Abait 2009). Some of the factors associated with illegal conduct are an early age of onset of gambling problems and conflicts that arise from the gambling behavior (Abait and Folino 2008).

The prevalence of illegal acts in individuals with GD ranges from 14 to 30 % approximately (Granero et al. 2014; Ledgerwood et al. 2007; McBride et al. 2010), although it may be higher among patients with severe gambling problems (Toce-Gerstein et al. 2003). Illegal behavior in subjects with GD is associated with a specific profile (Potenza et al. 2000). Individuals who commit illegal acts are often younger, play various types of gambling games, have significant debts, and report suicide attempts as well as an abuse of alcohol and other psychoactive substances (Potenza et al. 2000). According to these authors, the pathological gamblers who display illegal behavior constitute a differentiated group, characterized by greater GD severity, compared with the rest of pathological gamblers. Additionally, they suggest that it may be possible to identify distinct subtypes within this cluster; not all gamblers who have committed crimes have the same characteristics. For example, Potenza et al. (2000) observed differences between subjects associated with whether or not they had been imprisoned as consequence of the committed crime. Grant and Potenza (2007) argue that analyzing subtypes based on criminal conduct will establish more defined phenotypes, and help to identify endophenotypes that facilitate the understanding of the underlying neurobiological mechanisms in order to ultimately improve the therapeutic, pharmacological and psychological treatments available at present. However, the exact prevalence of illegal acts across GD

individuals, especially in the more severe cases, has not been clearly identified, along with empirical clusters based on clinical characteristics and their stability over time.

The primary aim of this study was to explore empirical clusters in a sample of subjects attending outpatient GD treatment, and who have committed illegal acts as a result of their gambling behavior. Moreover, we examined the evolution over the years of the clusters obtained. From the current empirical evidence, we hypothesized that it would be possible to identify clinically relevant subgroups of GD patients who have reported illegal behavior based on psychopathology and personality traits. Furthermore, online gambling is currently the fastest growing type of gambling, attracting a significant proportion of all gambling expenditure (Bonnaire 2012; Planzer et al. 2014). It is also particularly common in youth (Gainsbury et al. 2012). Research shows substantially higher rates of problem gambling in internet compared to land-based gambling, ranging between 1 and 13 %, and more severe gambling behavior (Petry 2006; Wood and Williams 2011). Given the relationship between GD severity and illegal acts (Toce-Gerstein et al. 2003), we expected that one of the clusters would comprise younger GD patients, with a shorter evolution of the disorder and higher rates of internet gambling.

In summary, we expected to identify at least three subgroups, all characterized by severe gambling problems given the link between disorder severity and illegal behavior, similar personality profiles comprising high sensation seeking, low self-direction and cooperation, but different levels of overall psychopathology.

### Participants

The sample consisted of 378 patients with a GD who consecutively received assessment and outpatient treatment at a Pathological Gambling Unit in the Psychiatric Department of a public hospital (University Hospital of Bellvitge, Barcelona, Spain), between 2004 and 2012, and who reported meeting the DSM-IV (APA 1994) criterion “presence of illegal behavior”. All participants were diagnosed by psychologists and psychiatrists extensively experienced in GD, using the Diagnostic Questionnaire for Pathological Gambling according to DSM-IV criteria (Stinchfield 2003). The registered data for illegal acts was classified into two groups: falsification or stealing to finance gambling ( $n = 349$ ,  $p = 92.3$  % in the sample) and assaults or frauds to keep the gambling behavior ( $n = 151$ ,  $p = 39.9$  %). The simultaneous presence of both behaviors (falsification-stealing and assaults-frauds) was observed in  $n = 122$  participants ( $p = 32.3$  %).

### Measures

South Oaks Gambling Screen (SOGS; Lesieur and Blume 1987)—Spanish version by Echeburúa et al. (1994). This is a 20-item screening-questionnaire with a total score ranging from 0 to 20. It discriminates between probable pathological gamblers (total score over 4), problematic gamblers (total score between 3 and 4) and non-problematic gamblers (total score lower than 3). The Spanish validation of this self-reported questionnaire showed high reliability and validity (test–retest reliability was 0.98, internal consistency 0.94 and convergent validity 0.92).

Diagnostic questionnaire for Pathological Gambling according to DSM-IV criteria (Stinchfield 2003). Spanish adaptation by Jimenez-Murcia et al. (2009). This 19-item questionnaire assesses the DSM-IV diagnostic criteria for pathological gambling. Internal consistency ranged between 0.81 for the general population and 0.77 for gambling treatment samples. Convergent validity with the SOGS scores was very good:  $r = .77$  for the general population and  $r = .75$  for gambling treatment groups (Stinchfield 2003).

Symptom Check List-90 items-Revised (SCL-90-R; Derogatis 1994) was administered to evaluate a broad range of psychological problems and symptoms of psychopathology. This test contains 90 items and measures nine primary symptom dimensions: somatization, obsession–compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. In addition, it includes three global indices: a global severity index (GSI), which measures overall psychological distress; a positive symptom distress index (PSDI) to measure the intensity of the symptoms; and a positive symptom total (PST), which provides the total self-reported symptoms. The GSI can be used as a summary of the test. This scale has been validated in a Spanish population, obtaining an acceptable mean internal consistency of 0.75 (Martinez-Azumendi et al. 2001).

Temperament and Character Inventory-Revised (TCI-R; Cloninger 1999). This is a 240-item questionnaire

with a five-point Likert scale format. Like the original TCI version (Cloninger et al. 1993), this questionnaire is a reliable and valid measure of seven dimensions of personality: four of temperament (harm avoidance, novelty seeking, reward dependence and persistence) and three of character (self-directedness, cooperativeness and self-transcendence). Performances of the Spanish versions of both the original questionnaire (Gutierrez et al. 2001) and the revised version (Gutierrez-Zotes et al. 2004) have been well-documented. Reliability of the different temperament and character dimensions in the Spanish adaptation ranged between 0.77 and 0.84.

Additional demographic, clinical and socio-familial variables related to gambling were examined using a semi-structured clinical interview, described elsewhere (Jiménez-Murcia et al. 2006, 2007).

### Procedure

Assessment was conducted prospectively from baseline and entailed a single session (with a mean duration of 90 min) during which the above mentioned tests were administered by trained clinical psychologists. Data were evaluated at intake.

This study was carried out in accordance with the latest version of the Declaration of Helsinki. The Ethics Committee of the hospital approved the study, and informed consent was obtained from all participants.

### Statistical Analysis

Analyses were carried out with SPSS20 for Windows. Homogeneous sub-groups were identified via the two-step clustering procedure, a technique useful for the mixture of continuous and categorical variables. It assigns cases into pre-clusters in the first step and then treats these previous groups as single cases/entities with a standard hierarchical algorithm to identify the proper number of clusters. The number of groups were created defining as incomes the sociodemographic features (sex, origin, studies level, civil status and employment status), gambling measures (age, age of onset and evolution of the gambling problem), general psychopathology scores (SCL-90-R broad scales) and personality traits (TCI-R scales). Log-likelihood was defined as distance measure, Bayesian was defined as the clustering criterion (BIC) and the number of clusters was free (the algorithm selected the most optimal number).

To achieve a detailed profile of the patients included into each cluster and to obtain evidence of the validity of the clusters, Chi square tests (for categorical variables) and analysis of variance (ANOVA, for quantitative variables) were conducted to compare the results from the two-step clustering.

### Results

#### Two-Step Clustering Results

Table 1 shows the results of the two-step automatic clustering. The maximum number of clusters was 15 and the optimal number was 4, which was the value that achieved the lowest BIC coefficient and change in BIC between the adjacent number of clusters. The largest cluster comprised 72 subjects (19 %) and the lowest included 138 (36.5 %), therefore the ratio of group sizes (largest to smallest cluster) was 1.92. Table 2 shows the profiles of the clusters, with the centroids of all the variables used to create the empirical groups.

#### Comparison Between Clusters

Table 3 shows the comparison of the four clusters in relation to sociodemographic characteristics. As a whole, cluster 1 was the most differentiated compared to the other three empirical groups, with statistically significant differences in all the variables (except for the variable family incomes, which did not differ between clusters 1 and 2). Cluster 1 was characterized by the elevated percentage of females in the group, which was the highest among the clusters. All individuals were Spanish and had completed primary or secondary school studies. About 40 % were in a live-in relationship at time of assessment or were separated/divorced. Almost all of them were unemployed and reported the lowest incomes. Cluster 2 and 4 only differed in educational level and in marital status. Both clusters represented the lowest percentage of females, of individuals who were of Spanish origin and who were unemployed, and the highest mean for the variables measuring personal and family incomes. All individuals in cluster 4 completed secondary studies whereas the majority in cluster 2 only completed primary school studies or less. All individuals in

cluster 4 were in (or had been in) a live-in relationship. As a whole, the composition of cluster 3 was similar to clusters 2 and 4, but some differences were observed: cluster 3 had the highest percentage of individuals with a university level education and marital status and represented a lower mean for own income but higher for family income.

When clinical variables were compared across empirical clusters (Table 4), cluster 1 was the most distinct from the others. Patients included in cluster 1 were the most likely to present or have a history of comorbid disorders, to display alcohol abuse and to smoke. Clusters 1, 2, and 4 represented the older participants, with a higher mean age, and those who had the oldest age of onset and the longest GD evolution. No statistical differences between the clusters appeared in the mean number of previous consultations for gambling behavior, nor for the maximum and average amount of money that is gambled. Differences were found only in the mean cumulated debts, which was lower in cluster 2. The severity of the gambling problem, measured by the DSM-IV-total criteria, was highest in cluster 1. The means for the SOGS-total score were statistically equal in the four clusters, except for cluster 3 compared to 4 (the latter with the highest mean). The SCL-90-R mean scores were highest for cluster 1 compared to the other empirical groups. Cluster 1 was also the most unique in terms of the TCI-R profile, with the highest means for novelty-seeking and harm-avoidance, and the lowest means for reward-dependence, persistence, self-directedness and cooperativeness. Cluster 3 had the lowest mean score for TCI-R self-transcendence.

The comparison of each SOGS-item between clusters (Table 5) showed that similar scores were obtained by the four clusters. In all clusters, a high proportion of the participants played in lotteries and slot machines, returned to win back lost money, recognized the existence of a problem, gambled more than planned, were criticized and felt guilty for their behavior, were unable to stop gambling, hid signs of gambling and had discussions with family/friends. All mainly got the money from home, banks and credit cards. The main differences between the clusters were: (a) cluster 4 represented the participants who had the greatest GD severity in terms of the percentage of people playing numbers/lotteries/bingo/slot-machines. They were the most criticized for their gambling behaviors, hid signs of gambling (in a similar way to cluster 1), had frequent discussions with the family due to game-related behaviors, skipped work to go gambling and used money from property sales; (b) cluster 3 was the group with the highest percentage of casino gamblers but lowest slot-machine gamblers, and had the lowest percentage of participants who were criticized for gambling, obtained money from family with the aim to gamble or used money from property sales; (c) cluster 2 comprised the lowest proportion of bingo players (many individuals in this group gambled specifically via number-lotteries and slot-machines), and those participants less likely to hide signs of gambling or have discussions with families and friends due to their gambling; (d) cluster 1 showed the most impaired profile, with the highest prevalence rates in many of the SOGS-items. The main distinctive characteristics of each cluster are resumed in Table 6.

Regarding the progress of the empirical clusters across the years (Table 7 and Fig. 1), clusters 1 and 2 seem to be those with greater changes over time. Whereas a positive linear trend in the prevalence of cluster 1 ( $p = 0.009$ ) was found over the duration of the recruitment period (an increase in the prevalence emerged), a substantial decrease and a negative linear trend were found for cluster 2 ( $p = 0.030$ ). Although cluster 3 showed a slightly positive trend, this was not statistically significant (this result must be interpreted with caution due to the small sample size of the cluster to model the progress of the long-term follow-up and the consequent decrease in statistical power).

## Discussion

The GD phenotype may present itself in different forms, depending on various factors: the involvement of a series of individual, psychological and neurobiological variables and the environmental context. In this line, several studies have shown the existence of at least three distinct subtypes of GD (Blażczynski and Nower 2002; Alvarez-Moya et al. 2010; Jiménez-Murcia et al. 2013). However, there is no empirical evidence regarding the classification of subgroups of GD patients who have committed illegal acts as a consequence of their GD. Hypothesizing that these patients would present a serious gambling problem (Toce-Gerstein et al. 2003), we wanted to explore whether it would be possible to establish differentiated subtypes in a clinical population of GD patients who were in professional treatment and had committed illegal acts as a result of their disorder.

The main finding of this study was the identification of four possible subtypes of GD patients who commit illegal acts. From a sociodemographic point of view, the subtype 1 had the highest percentage of females and this group of patients had primary or secondary school studies, quite high unemployment rates and minor personal or familial income. Focusing on the clinical characteristics, these patients presented more comorbid disorders, current and lifetime, higher psychopathology levels and emotional distress, and a dysfunctional personality profile characterized by high novelty seeking and harm avoidance, low reward dependence and cooperativeness, and particularly low levels of the character trait self-directedness compared to the general population. This profile is suggestive of an impulsive personality, excitable, thoughtless, prone to pessimism and apprehension, poorly integrated socially, with little empathy, tolerance or altruism. Other features were the lack of self-direction in setting and meeting targets and objectives, ineffective problem solving and, often, feelings of general dissatisfaction.

The subtypes 2 and 4 were formed by subjects with psychopathological symptoms of moderate intensity. Regarding personality traits, both subtypes presented the characteristic configuration of GD subjects described in previous studies, comprising high levels of novelty-seeking and low self-directedness and cooperativeness (Alvarez-Moya et al. 2010; Janiri et al. 2007). This profile has also been associated with an increased risk or vulnerability to the development of the disorder (Alvarez-Moya et al. 2007; Saez-Abad and Bertolin-Guillen 2008). However, the subtypes 2 and 4 differed in educational level and the latter group also presented a more severe gambling problem, as expressed through the symptoms (e.g. accumulated debts), played various types of gambling games and the disorder had a greater impact on their personal and professional lives. Taking into account the observed differences, we established that the subtype 4 patients presented greater GD severity and corresponding consequences, although the intensity of general psychopathology symptoms and the dysfunctional personality profile are moderate and similar to the ones of subtype 2. Finally, subtype 3 was clearly differentiated from the rest of the clusters because it consisted of young patients, with university level studies, who were single, reported an earlier age of onset and minor alcohol abuse and presented moderate psychopathology. A clinically interesting factor, and expected given the age of the patients, is the high rate of gambling via internet in this group which differs significantly from the other three.

Previous studies in alcoholism have linked the personality profile of high novelty-seeking, low self-directedness and low cooperativeness with the presence of personality disorders (Lee et al. 2014). Furthermore, low scores in reward dependence are associated with the antisocial personality disorder (APD) (Benito et al. 2012; Samuel et al. 2002). Various studies describe more severe substance dependence and poorer evolution when these two conditions coincide (Cecero et al. 1999; Goldstein et al. 2007; King et al. 2001), alongside with greater illegal activity (Cacciola et al. 1994). The APD is highly prevalent in populations of substance abusers (Ruiz et al. 2008), who also tend to have high comorbid psychopathology, both in Axis I and II of the DSM. In fact, the probable existence of shared vulnerability traits (Grant et al. 2004) could explain the high concurrence of the two disorders. In the field of GD, personality disorders are frequent conditions in the most severe cases (Ibáñez et al. 2001), and constitute a probable risk factor for the development and maintenance of gambling problems (Johansson et al. 2009). This study shows that crime and illegal behavior are well-established risk factors for the development of a gambling problem. Taking all these findings into consideration, our results are consistent with studies that describe a link between antisocial personality traits, greater severity and evolution of the disorder and the associated psychopathology both in substance dependencies (Cecero et al. 1999; Goldstein et al. 2007; King et al. 2001) and GD (Strong and Kahler 2007; Toce-Gerststein et al. 2003). Furthermore, our study shows that women with GD and illegal conduct would be mainly grouped in the most severe subtype.

Regarding the progress of subtypes over years, findings could be understood in terms of the economic and social changes that have taken place in the last decade. Since 2008, Europe, and especially the Mediterranean countries such as Greece, Spain and Italy, has been hit by an unprecedented economic and financial crisis. Much of the population, especially the young and the less educated, has lost their jobs and has seen their purchasing power reduced to minimum. This fall in income and private consumption has had a negative effect on gambling behavior (Dirección General del Juego, Informe Anual, 2011, General Direction of Gambling Regulation, Annual Report) (Jimenez-Murcia et al. 2014). A decrease in gambling has been observed in the general population, but may also occur in less severe GD cases, for example cluster

2 in this study.

Nonetheless, according to this annual report, even though the amount of money invested in gambling has decreased, there has been a significant rise in the money spent on online gambling, which could justify the expansion of the subtype 3 in recent years. The option to obtain credit and bank loans, however, is now being strictly limited (Chóliz and Mazón 2011). With no money available, gamblers are obliged to cut back, but it is possible to hypothesize that people with more severe symptoms of gambling behavior, high psychopathology and dysfunctional personality profiles have continued gambling. They therefore have to try to get money by other means, which could include illegal activity. This phenomenon could explain the increase in the GD subtypes 1 (severe) and 4 (moderate, but less educated and with serious consequences of gambling behavior).

Thus, our results partially confirm the initial hypothesis, in that we were able to identify distinct subtypes, all with severe gambling problems, although not with the same intensity. In addition, as we expected, significant differences were found between the clusters in terms of the psychopathology and personality profiles, identifying a subgroup (subtype 1) with greater GD severity and impairment in all dimensions explored. An interesting finding was the very high rate of women grouped in this subtype.

The therapeutic implications of these findings suggest that there is a need to design specific intervention programs, not exclusively symptomatic but aimed at treating a broad range of problems related to negative emotion regulation, the management and reduction of impulsivity, the acquisition of conflict solving skills, the improvement of planning abilities and social integration. Moreover, we can consider whether subtype 1, with higher disorder severity, is the group that presents a more consistent neurobiological substrate, and thus both psychological and pharmacological treatments should be combined at the time of treatment.

#### Limitations

These results should be considered within the context of several limitations. Firstly, our patients were treatment-seeking GD patients, thus our results might not be generalizable to non-treatment seeking GD individuals. Secondly, there is lack of more specific assessment measures (e.g. structured interview for Axis II comorbid disorders). Several studies have shown an association between personality disorders and the severity of GD (Pietrzak and Petry 2005). Future studies should therefore evaluate this link. Thirdly, the cross-sectional design of this study does not allow us to determine the causality of the variables assessed.

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Figure 1

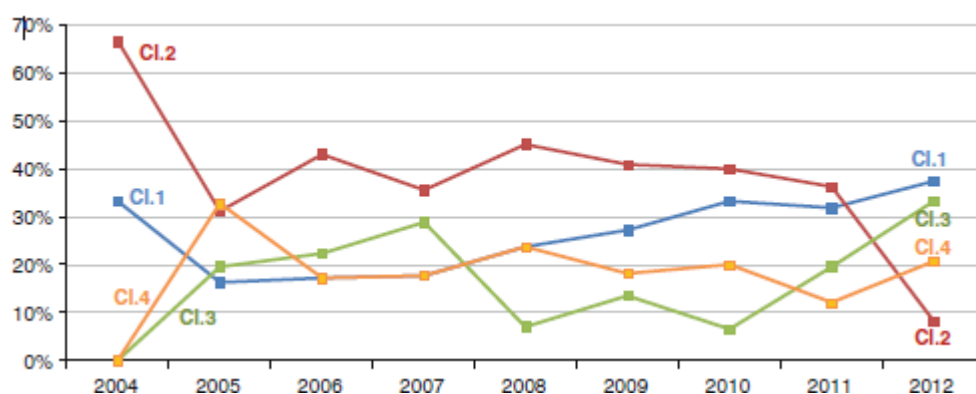


Table 1

# of Clusters	BIC	BIC change <sup>a</sup>	Ratio of BIC changes <sup>b</sup>	Ratio of distance measures <sup>c</sup>
1	5,952.869			
2	5,759.640	−193.230	1.000	1.047
3	5,584.191	−175.449	0.908	1.385
4**	5,513.702	−70.488	0.365	1.362
5	5,515.522	1.819	−0.009	1.428
6	5,577.229	61.707	−0.319	1.052
7	5,645.829	68.600	−0.355	1.173
8	5,734.068	88.239	−0.457	1.063
9	5,828.999	94.931	−0.491	1.110
10	5,934.560	105.561	−0.546	1.118
11	6,050.270	115.710	−0.599	1.053
12	6,170.348	120.078	−0.621	1.001
13	6,290.548	120.200	−0.622	1.013
14	6,411.790	121.242	−0.627	1.065
15	6,537.971	126.181	−0.653	1.076

Table 2

	Cluster 1 (n = 91)	Cluster 2 (n = 138)	Cluster 3 (n = 72)	Cluster 4 (n = 77)	Combined
<i>Age (years-old)</i>					
Mean	39.55	37.36	28.67	37.22	36.20
SD	11.46	10.45	6.50	8.54	10.39
<i>Evolution addictive behavior (years)</i>					
Mean	15.37	13.39	8.35	14.58	13.15
SD	9.08	8.36	5.82	7.59	8.31
<i>Evolution addictive problem (years)</i>					
Mean	7.37	5.94	3.75	6.26	5.93
SD	5.99	5.58	3.19	5.73	5.46
<i>TCI-R: novelty seeking</i>					
Mean	118.60	113.41	116.24	117.39	116.01
SD	13.73	13.86	13.16	13.49	13.73
<i>TCI-R: harm avoidance</i>					
Mean	112.52	100.50	98.67	95.10	101.94
SD	18.10	14.86	14.51	16.57	17.11
<i>TCI-R: reward dependence</i>					
Mean	92.98	99.78	97.49	101.78	98.11
SD	15.83	14.64	13.72	13.88	14.91
<i>TCI-R: persistence</i>					
Mean	99.86	113.19	104.65	113.69	108.46
SD	20.32	19.13	17.02	22.06	20.46
<i>TCI-R: self-directedness</i>					
Mean	107.37	126.75	123.36	122.92	120.66
SD	19.12	18.74	20.39	20.84	20.96
<i>TCI-R: cooperativeness</i>					
Mean	116.12	130.08	128.63	131.40	126.71
SD	21.46	16.87	14.83	17.77	18.84
<i>TCI-R: self-transcendence</i>					
Mean	66.54	67.58	57.54	63.21	64.53
SD	14.09	15.31	12.51	12.33	14.38
<i>SCL-90-R: GSI</i>					
Mean	1.81	1.05	0.96	1.02	1.21
SD	0.67	0.65	0.57	0.68	0.73
<i>SCL-90-R: PST</i>					
Mean	66.73	46.75	43.88	46.22	50.90
SD	15.50	21.03	18.96	22.39	21.62
<i>SCL-90-R: PSDI</i>					
Mean	2.39	1.93	1.83	1.88	2.01
SD	0.60	0.62	0.49	0.61	0.63
<i>Sex</i>					
Females					
Frequency	19	3	2	5	29
Percent	65.5	10.3	6.9	17.2	100.0

	Cluster 1 (n = 91)	Cluster 2 (n = 138)	Cluster 3 (n = 72)	Cluster 4 (n = 77)	Combined
<b>Males</b>					
Frequency	72	135	70	72	349
Percent	20.6	38.7	20.1	20.6	100.0
<i>Origin</i>					
<b>Spanish</b>					
Frequency	91	126	68	66	351
Percent	25.9	35.9	19.4	18.8	100.0
<b>Immigrant</b>					
Frequency	0	12	4	11	27
Percent	0.0	44.4	14.8	40.7	100.0
<i>Studies level</i>					
<b>Less primary</b>					
Frequency	0	1	3	0	4
Percent	0.0	25.0	75.0	0.0	100.0
<b>Primary</b>					
Frequency	58	127	0	0	185
Percent	31.4	68.6	0.0	0.0	100.0
<b>Secondary</b>					
Frequency	33	0	60	77	170
Percent	19.4	0.0	35.3	45.3	100.0
<b>University</b>					
Frequency	0	10	9	0	19
Percent	0.0	52.6	47.4	0.0	100.0
<i>Civil status</i>					
<b>Single</b>					
Frequency	53	38	71	0	162
Percent	32.7	23.5	43.8	0.0	100.0
<b>Married/in couple</b>					
Frequency	19	90	0	56	165
Percent	11.5	54.5	0.0	33.9	100.0
<b>Divorced</b>					
Frequency	19	10	1	21	51
Percent	37.3	19.6	2.0	41.2 %	100.0
<i>Employed</i>					
<b>No</b>					
Frequency	83	36	28	11	158
Percent	52.5	22.8	17.7	7.0	100.0
<b>Yes</b>					
Frequency	8	102	44	66	220
Percent	3.6	46.4	20.0	30.0	100.0

Table 3

		Cluster 1	Cluster 2	Cluster 3	Cluster 4		Post-hoc comparison between clusters					
		(n=91)	(n=138)	(n=72)	(n=77)	p	1vs2	1vs3	1vs4	2vs3	2vs4	3vs4
Gender; %	Females	20.9	2.2	2.8	6.5	<.001	*	*	*			
	Males	79.1	97.8	97.2	93.5							
Origin; %	Spain	100	91.3	94.4	85.7	.003	*	*	*			
	Immigrant	0	8.7	5.6	14.3							
Education level; %	Primary or less	63.7	92.7	4.2	0	<.001	*	*	*	*	*	*
	Secondary	36.3	0	83.3	100							
	University	0	7.2	12.5	0							
Civil status; %	Single	58.2	27.5	98.6	0	<.001	*	*	*	*	*	*
	Married/couple	20.9	65.2	0	72.7							
	Divorced/separated	20.9	7.2	1.4	27.3							
Employment stat.; %	Employed	8.8	73.9	61.1	85.7	<.001	*	*	*			*
	Unemployed	91.2	26.1	38.9	14.3							
Own incomes; mean		610	1304	962	1405	<.001	*	*	*	*		*
Family incomes; mean		1615	2078	2753	2522	<.001		*	*	*		

Table 4

	Clus.1 (n=91)	Clus.2 (n=138)	Clus.3 (n=72)	Clus.4 (n=77)	p	Post-hoc comparison between clusters					
						1vs2	1vs3	1vs4	2vs3	2vs4	3vs4
Present comorbid disorders; %	55.6	29.7	38.9	28.6	<.001	*	*	*			
Previous comorbid disorders; %	63.3	42.3	47.2	34.2	.002	*	*	*			
Smoker (yes); %	84.5	77.0	83.1	70.3	.119						
Alcohol abuse (yes); %	25.8	16.2	8.5	20.0	.034		*				*
Other drugs abuse (yes); %	15.7	14.0	19.7	13.3	.686						
Age (years); mean	39.55	37.36	28.67	37.22	<.001		*		*		*
Age of onset (years); mean	32.18	31.42	24.92	30.96	<.001		*		*		*
Evolution gambling beh. (years); mean	15.37	13.39	8.35	14.58	<.001		*		*		*
Evolution gambling probl. (years); mean	7.37	5.94	3.75	6.26	<.001		*		*		*
Previous treatments for gambling; mean	1.86	0.95	0.53	1.40	.255						
Maximum bets (euros); mean	1482.7	1084.2	1247.6	1829.9	.626						
Mean bets (euros); mean	168.5	408.8	129.8	331.8	.636						
Cumulate debts (euros); mean	11591.2	8845.5	10611.9	22814.4	.011					*	
Severity of gambling; DSM-IV-total; mean	9.13	8.27	8.38	8.36	<.001	*	*	*			
Severity of gambling; SOGS-total; mean	12.58	11.77	11.38	12.79	.008						*
SCL-90: Somatization; mean	1.62	0.95	0.79	0.90	<.001	*	*	*			
SCL-90: Obsessive/compulsive; mean	1.98	1.17	1.07	1.06	<.001	*	*	*			
SCL-90: Interpersonal sensitivity; mean	1.87	0.95	1.01	1.00	<.001	*	*	*			
SCL-90: Depressive; mean	2.32	1.47	1.42	1.47	<.001	*	*	*			
SCL-90: Anxiety; mean	1.78	1.03	0.90	1.05	<.001	*	*	*			
SCL-90: Hostility; mean	1.72	1.01	0.78	0.95	<.001	*	*	*			
SCL-90: Phobic anxiety; mean	1.00	0.49	0.36	0.47	<.001	*	*	*			
SCL-90: Paranoid ideation; mean	1.59	0.88	0.73	0.77	<.001	*	*	*			
SCL-90: Psychotic; mean	1.66	0.87	0.78	0.86	<.001	*	*	*			
SCL-90: GSI score; mean	1.81	1.05	0.96	1.02	<.001	*	*	*			
SCL-90: PST score; mean	66.73	46.75	43.88	46.22	<.001	*	*	*			
SCL-90: PSDI score; mean	2.39	1.93	1.83	1.88	<.001	*	*	*			
TCIR: Novelty seeking; mean	118.60	113.41	116.24	117.39	.029	*					
TCIR: Harm avoidance; mean	112.52	100.50	98.67	95.10	<.001	*	*	*			
TCIR: Reward dependence; mean	92.98	99.78	97.49	101.78	.001	*		*			
TCIR: Persistence; mean	99.86	113.19	104.65	113.69	<.001	*		*	*		
TCIR: Self-directedness; mean	107.37	126.75	123.36	122.92	<.001	*	*	*			
TCIR: Cooperativeness; mean	116.12	130.08	128.63	131.40	<.001	*	*	*			
TCIR: Self-Transcendence; mean	66.54	67.58	57.54	63.21	<.001		*		*		



Table 5

	Clus.1	Clus.2	Clus.3	Clus.4	p	Post-hoc comparison between clusters					
	(n=91)	(n=138)	(n=72)	(n=77)		1vs2	1vs3	1vs4	2vs3	2vs4	3vs4
1a-Playing cards; %	48.4	37.0	50.0	49.4	.152						
1b-Playing horse races; %	3.30	0.00	5.56	5.19	.907						
1c-Playing sports; %	3.30	1.45	2.78	1.30	.743						
1d-Playing numbers/lotteries; %	84.6	87.7	79.2	94.8	.050			*			*
1e-Playing casino; %	24.2	26.1	43.1	36.4	.026		*		*		
1f-Playing bingo; %	64.8	48.9	51.4	70.1	.007	*				*	*
1g-Stock market; %	5.56	2.92	6.94	3.95	.576						
1h-Playing slot machines; %	90.1	95.6	84.7	94.7	.044				*		*
1i. Other bets; %	20.2	13.8	23.6	26.0	.050					*	
2-Amount money spent: ≥ 300 euros; %	63.3	62.3	70.8	72.7	.334						
3-Family antecedents of gambling; %	30.2	27.9	16.7	30.7	.187						
4-Going back to win back lost money; %	98.9	95.7	94.4	94.8	.505						
5-Claimed winning when loosing; %	58.2	54.3	48.6	45.5	.342						
6-Problem recognition; %	98.9	98.6	98.6	98.7	.997						
7-Gambling more than planned; %	98.9	97.1	100.0	98.7	.781						
8-Being criticized; %	80.2	74.6	73.6	87.0	.050					*	*
9-Feeling guilty; %	95.6	93.5	95.8	100.0	.866						
10-Unable to stop gambling; %	94.5	94.2	87.5	96.1	.176						
11-Hiding signs of gambling; %	92.2	81.8	84.7	93.5	.040	*				*	
12-Discussions with family/friends; %	92.3	80.3	86.1	90.8	.048	*				*	
13-Discussions and fights; %	83.7	73.3	71.2	64.0	.046	*	*	*			
14-Borrowing money, not paying back; %	81.3	71.0	68.1	74.0	.228						
15-Skipping work due to gambling; %	71.1	59.9	63.9	76.6	.050					*	
16a-Money from home; %	77.4	80.0	75.0	84.0	.577						
16b-Money from couple; %	50.6	45.8	44.8	50.0	.853						
16c-Money from family; %	63.6	52.8	49.1	69.4	.047					*	*
16d-Money from banks; %	73.4	61.5	55.6	67.6	.129						
16e-Credit cards; %	60.0	65.9	64.4	72.9	.050			*			
16f-Money from money lender; %	14.7	13.0	15.5	20.0	.669						
16g-Money from financial papers; %	7.69	3.77	8.93	6.25	.581						
16h-Money from property sales; %	29.2	20.7	9.3	22.1	.050		*		*		*
16i-Money from falsified checks; %	3.08	5.61	1.85	4.62	.700						
16j-Money from credit account casino; %	1.56	0.96	3.70	6.15	.295						
SOGS: total score; mean	12.58	11.77	11.38	12.79	.008						*

Table 6

Cluster 1; n = 91	Cluster 2; n = 138	Cluster 3; n = 72	Cluster 4; n = 77
<p><i>Sociodemographics</i></p> <p>▲Female*</p> <p>Spanish*</p> <p>▲Unemployed*</p> <p>▼Own incomes*</p> <p><i>Clinical profile</i></p> <p>▲Previous comorbidity*</p> <p>▲Current comorbidity*</p> <p>▲GD severity (DSM-IV)*</p> <p>▲SCL-90 all scales*</p> <p><i>Personality traits</i></p> <p>▲TCI-R novelty seeking*<sup>2</sup></p> <p>▲TCI-R harm avoidance*</p> <p>▼TCI-R: reward dependence*<sup>2,4</sup></p> <p>▼TCI-R: persistence*<sup>2,4</sup></p> <p>▼TCI-R: self-directedness*</p> <p>▲TCI-R cooperativeness*</p> <p><i>Gambling profile (SOGS)</i></p> <p>▲Discussions and fights*</p>	<p><i>Sociodemographics</i></p> <p>▲Primary studies*</p> <p><i>Gambling profile</i></p> <p>▼Cumulate debts (euros)*<sup>4</sup></p> <p>▼Other bets*<sup>4</sup></p> <p>▼Hiding signs of gambling*<sup>1,4</sup></p> <p>▼Discussions with family/friends*<sup>1,4</sup></p> <p>▼Skipping work*<sup>4</sup></p>	<p><i>Sociodemographics</i></p> <p>▲University studies*</p> <p>▲Single*</p> <p>▼Own incomes*<sup>2,4</sup></p> <p>▲Family incomes*<sup>1,2</sup></p> <p><i>Clinical profile</i></p> <p>▼Alcohol abuse*<sup>1,4</sup></p> <p>Youngest*</p> <p>Youngest onset*</p> <p>Shortest evolution*</p> <p><i>Personality traits</i></p> <p>▼TCI-R Self transcendence*<sup>2,1</sup></p> <p><i>Gambling profile (SOGS)</i></p> <p>▲Playing Casino*<sup>2,1</sup></p> <p>▼Playing slot machines*<sup>2,4</sup></p> <p>▲Money from property sales*<sup>2,4</sup></p>	<p><i>Sociodemographics</i></p> <p>Secondary studies*</p> <p>None single*</p> <p><i>Gambling profile</i></p> <p>▲SOGS-total*<sup>3</sup></p> <p>▲Playing numbers-lotteries*<sup>1,2</sup></p> <p>▲Playing bingo*<sup>2,3</sup></p> <p>▲Being criticized*<sup>2,3</sup></p> <p>▲Money from family*<sup>2,3</sup></p> <p>▲Credit cards*<sup>1</sup></p>

Table 7

	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total	LT
CL1	1 (33.3 %)	10 (16.4 %)	10 (17.2 %)	8 (17.8 %)	10 (23.8 %)	12 (27.3 %)	10 (33.3 %)	21 (31.8 %)	9 (37.5 %)	91 (24.4 %)	0.005
CL2	2 (66.7 %)	19 (31.1 %)	25 (43.1 %)	16 (35.6 %)	19 (45.2 %)	18 (40.9 %)	12 (40.0 %)	24 (36.4 %)	2 (8.3 %)	137 (36.7 %)	0.030
CL3	0 (0 %)	12 (19.7 %)	13 (22.4 %)	13 (28.9 %)	3 (7.1 %)	6 (13.6 %)	2 (6.7 %)	13 (19.7 %)	8 (33.3 %)	70 (18.8 %)	0.402
CL4	0 (0 %)	20 (32.8 %)	10 (17.2 %)	8 (17.8 %)	10 (23.8 %)	8 (18.2 %)	6 (20.0 %)	8 (12.1 %)	5 (20.8 %)	75 (20.1 %)	0.275