Addictive Behaviors 157 (2024) 108092

Contents lists available at ScienceDirect

Addictive Behaviors

journal homepage: www.elsevier.com/locate/addictbeh

Cluster analysis based on gambling variables and mental health in a clinical population of gamblers

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ARTICLE INFO

Keywords:
Clusters
Gambling
Mental health
Motives
Severity

ABSTRACT

Background: Interest in characterizing individuals involved in addictive behaviors has been growing, which allows tailoring prevention and intervention strategies to the gambler's needs. The study aimed to 1) identify clusters of gamblers according to gambling-related characteristics and mental health; and 2) analyze differences in psychological variables between the clusters. **Methods**. A total of 83 participants undergoing treatment for gambling disorder (M_{age} = 45.52, 51.8 % female) completed a set of questionnaires. Hierarchical cluster analysis was performed to classify gambling based on gambling variables (i.e., gambling severity and gambling motives) and mental health (i.e., depression, anxiety, and hostility). Several ANOVAs were conducted to illustrate the distinguishing features of each cluster, encompassing both the variables included in the cluster analysis and other relevant psychological variables. **Results**. Findings suggest that gamblers can be classified into three clusters based on these variables: 1) "high gambling severity and good mental health," 2) "high gambling severity and poor mental health," and 3) "low gambling severity and good mental health." These clusters were differentiated as a function of psychological variables, such as emotional dependence, alexithymia, and stressful life events. **Conclusions**. Classifying gamblers according to their profile provides a better understanding of their needs and problems, allowing for a more tailored approach in terms of prevention and intervention strategies.

1. Introduction

Gambling is a widespread social activity worldwide, wherein participants risk money or other valuables in an event or activity with an uncertain outcome, hoping to achieve profits. In recent years, gambling has increased exponentially, including both online and offline modalities, along with an increase in gambling expenditure, gambling-related problems, and the emergence of the gambling disorder (Dirección General de Ordenación del Juego, 2023; Plan Nacional sobre Drogas, 2023).

Although gambling may serve as a form of entertainment for many individuals, it is crucial to understand gambling from a public health perspective, considering the associated personal and social risks of this activity (Hofmarcher et al., 2020; Latvala et al., 2019). One of the most studied consequences of gambling involvement concerns its impact on mental health (Dowling et al., 2017). Other addictive behaviors have been linked to gambling, including high nicotine dependence, increased alcohol consumption, cannabis use, and the use of other illegal drugs (e.g., cocaine or heroin), as well as other non-substance addictive behaviors (Allami et al., 2021; Bonnaire et al., 2017; Williams et al., 2021). It is noteworthy that the impact of gambling extends beyond the gamblers themselves, significantly impacting social aspects such as the family (Dighton et al., 2018; Uwiduhaye et al., 2021), loneliness (Sirola et al., 2023), academic performance (Espadafor & Martínez, 2021), and finances (Muggleton et al., 2021).

According to epidemiological data, *meta*-analyses indicate heterogeneous prevalence rates of gambling disorder, ranging from 0.1 % to 3.4 % in Europe (Calado & Griffiths, 2016), and between 0.2 % and 3 % worldwide (pooled prevalence 1.3 %) (Gabellini et al., 2023). Considering help-seeking gamblers, prevalence rates are set at 0.8 % (ranging from 0.4 % to 1.9 %) (Bijker et al., 2022). The high heterogeneity found across studies may be attributed to the different conceptualizations of gambling (e.g., gambling disorder, problematic gambling, gambling behavior, etc.), as well as the various ways of assessing gambling disorder (e.g., diagnostic criteria, questionnaires).

In recent years, there has been growing interest in characterizing individuals involved in addictive behaviors (see e.g., Cerniglia et al., 2019; Green et al., 2023; Halladay et al., 2022; Nelon et al., 2019). This

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https://doi.org/10.1016/j.addbeh.2024.108092
Received 19 February 2024; Received in revised form 10 June 2024; Accepted 13 June 2024
Available online 14 June 2024

approach aims to identify predictive variables or risk factors related to a group that shares some characteristics, rather than treating all individuals engaged in the behavior as a homogeneous group. Concerning gambling, although individuals with gambling disorder are assessed with the same diagnostic criteria, previous literature has indicated that there is no homogeneous group of gamblers with identical clinical characteristics or risk factors (Milosevic & Ledgerwood, 2010). Previous attempts to classify gamblers have been focused on gambling-related variables, such as gambling severity (Chamberlain et al., 2017; James et al., 2016), age of onset (Guillou-Landreat et al., 2020), cognitions (Devos et al., 2020), or gambling type (Sanscartier et al., 2018; Wall et al., 2021); whereas other studies have focused on psychological variables (Black & Allen, 2022; Çıtak, 2023; Nower et al., 2022).

It is worth noting that psychopathology presents the greatest relative importance when classifying gamblers into clusters (Jiménez-Murcia, Granero, Fernández-Aranda, Stinchfield et al., 2019). One of the most well-known frameworks to explain gamblers' heterogeneity is the pathways model (Blaszczynski & Nower, 2002). This model groups gamblers into three subtypes: behaviorally conditioned, emotionally vulnerable, and antisocial impulsivist. These three subtypes differ in gambling-related variables (e.g., severity, motives) and psychological characteristics (e.g., mental health) (Barrault & Varescon, 2023; Bonnaire et al., 2022; Nower et al., 2022). However, this theoretical model has not been confirmed by previous research, as some studies found more than three subtypes (Devos et al., 2020), and also, variables such as substance use, depressive symptomatology, or gambling severity are probably not unique to a particular subtype (Kurilla, 2021; Nower et al., 2022). Inconsistencies in the findings may arise from the heterogeneity of measures, statistical analyses, and the utilized samples, as they are largely unbalanced in terms of gender or include both the general population and individuals without gambling disorder (Barrault & Varescon, 2023; Devos et al., 2020; Hearn et al., 2021).

In addition to research grounded in the pathways model, other studies have endeavored to classify gamblers based on variables of gambling behavior and psychopathology (e.g., Granero et al., 2018; Granero, Jiménez-Murcia et al., 2020; Jiménez-Murcia, Granero, Fernández-Aranda, Stinchfield, et al., 2019; Lara-Huallipe et al., 2022). However, these studies present some shortcomings, such as including only a sample of women (Granero et al., 2018; Lara-Huallipe et al., 2022) or gamblers of a specific type of game (Barrault & Varescon, 2023; Granero, Jiménez-Murcia, et al., 2020), which hinders the extrapolation of outcomes to the entire gambler population. Another limitation is related to the inclusion of a large number of variables to form the subgroups, making it difficult to extrapolate findings to clinical practice (e.g., Jiménez-Murcia, Granero, Fernández-Aranda, Stinchfield, et al., 2019).

In addition to mental health, previous studies have identified significant differences among gamblers in several psychological variables. The evidence suggests that higher gambling severity is associated with lower scores on alexithymia and emotional regulation (Marchetti et al., 2019), higher emotional dependence (Macía, Jauregui, & Estevez, 2023), an increased likelihood of experiencing violence (Hing et al., 2022), and more dysfunctional cognitive schemas (Aloi et al., 2020; Estévez, Macía, Aonso-Diego, et al., 2023). Similarly, gamblers with poorer mental health experience greater difficulties in alexithymia and emotional regulation (Macía, Jauregui, Herrero, et al., 2023), intimate partner violence (Dowling et al., 2014, 2016), and stressful life events (Bristow et al., 2022).

By categorizing gamblers based on psychological and gambling-related variables, we can gain a better understanding of their needs and provide appropriate support. Integrating both sets of variables (i.e., gambling and psychological) allows us to understand group differences and adapt the therapeutic process (i.e., assessment and intervention) to that clinical population's characteristics and needs. This approach provides a more holistic framework of the observed variability, not only enhancing the effectiveness of treatment programs but also promoting a more individualized response to individuals with gambling disorder (Milosevic & Ledgerwood, 2010).

Within this background, the present study aimed to identify clusters of gamblers according to their gambling-related characteristics (i.e., gambling severity and gambling motives) and mental health (i.e., depression, anxiety, and hostility). Furthermore, the study aimed to provide additional evidence of differences between clusters in other psychological variables known to be associated with gambling and mental health (i.e., addictive behaviors, emotional dependence, psychological abuse, stressful life events, and alexithymia).

2. Methods

2.1. Participants and procedure

The sample included a total of 83 individuals with a diagnosis of gambling disorder who were currently in outpatient treatment for gambling, regardless of the patient's treatment phase (i.e., treatment vs. recovery). It is noteworthy that, in both treatment phases, participants were required to abstain from gambling.

Recruitment was carried out in associations belonging to the Spanish Federation of Rehabilitated Gamblers (FEJAR). The participants' age ranged from 21 to 79 years ($M_{age} = 45.52$; $SD = 12.13$), and 51.8 % were female. Regarding marital status, 35 % of the participants were married, 33.7 % were single, 16.9 % were divorced, 9.6 % were in a domestic partnership, and 4.8 % were widowed. Concerning employment status, the majority (56.6 %) were working, 14.5 % were unemployed and the remaining 28.8 % were students (2.4 %), retired (12 %), working and studying (1.2 %), on sick leave (6 %), or other (7.2 %). Finally, most of the participants were in vocational training studies (41 %), followed by university studies (19.3 %), primary studies (18.1 %), high school (9.6 %), secondary studies (6 %), no studies (4.8 %) and other (1.2 %). Participants were in treatment for an average of 15.47 months in outpatient treatment for gambling ($SD = 22.05$, range between 1 and 132 months). Notably, there were no significant differences in gambling severity between individuals in treatment and those in recovery (respectively, $M = 9.14$, $SD = 2.54$ and $M = 9.88$, $SD = 1.61$, $t = -1.140$, $p = 0.258$).

All participants provided written informed consent. We assure participants of the confidentiality and anonymity of their responses and their voluntary participation. No compensation was provided for participation in this study. The research obtained the ethics committee's approval from the first author's university (ref.: ETK-40/21–22) and was performed following the principles of the Declaration of Helsinki.

2.2. Instruments

Participants completed a total of 10 questionnaires assessing gambling severity, gambling motives, mental health, addictive behaviors, emotional dependence, hopelessness, psychological abuse, stressful life events, early maladaptive schemas, and alexithymia. All measurements were collected specifically in the indicated treatment phase.

The South Oaks Gambling Screen [SOGS; Lesieur & Blume, (1987), adapted to Spanish by Echeburúa et al., (1994)] is a screening tool designed to identify gambling disorder. Its 20 items are responded to on a dichotomous scale (Yes/No). The optimal cutoff for gambling disorder is set at 8 points, according to criteria (Goodie et al., 2013). In terms of reliability, the SOGS demonstrated optimal internal consistency, as indicated by a Cronbach's alpha coefficient of 0.68 in our sample.

The Gambling Motives Questionnaire [GMQ; Stewart & Zack, (2008), adapted to Spanish by Jauregui et al., (2018)], assesses 15 reasons for gambling, divided into three subscales of five items each: 1) Enhancement motives, referring to internal positive reinforcement to increase positive emotions; 2) Coping motives, referring to internal negative reinforcement, aiming at avoiding or ameliorating negative emotions; and 3) Social motives, referring to external positive

reinforcement, mainly social affiliation. The GMQ items are rated on a 4-point Likert-type (1 = never/almost never, 4 = almost always). In the present study, Cronbach's alpha was 0.54 for Coping motives, and 0.85 for Enhancement and Social motives.

The Symptom Check-List [SCL-90; Derogatis et al., (1976), adapted to Spanish by González de la Rivera et al. (1989)] is a 90-item scale assessing psychopathology symptoms. Respondents rate their experience on a 5-point Likert scale (0 = *no symptom-related distress*; 4 = *maximum distress*). The questionnaire evaluates 90 symptoms organized into nine dimensions: Somatization, Obsession-Compulsion, Interpersonal Sensitivity, Depression, anxiety, hostility, Phobic Anxiety, Paranoid Ideation, and Psychoticism. For this study, only three dimensions were used—specifically, Depression (13 items), Anxiety (10 items), and Hostility (6 items). Normative scores for each subscale are provided in T-score format ($M = 50$, $SD = 10$). In our sample, Cronbach's alpha values ranged from 0.94 for Depression to 0.87 for Hostility.

The MULTICAGE CAD-4 (Pedrero Pérez et al., 2007) was employed to measure addictive behaviors or compulsive behaviors, with and without substances. The instrument consists of 32 dichotomous items organized in 8 subscales (4 items each) concerning the use of alcohol, drugs, gambling, Internet, videogames, compulsive buying, eating disorder, and sex. In this study, only the scales for drug and alcohol use were used. The test reliability was deemed adequate, as Cronbach's alpha was 0.85 in the Alcohol Use dimension and 0.93 in the Drug Use.

Emotional dependence was assessed using the "Cuestionario de Dependencia Emocional" (CDE) [Emotional Dependency Questionnaire, Spanish acronym; Lemos Hoyos & Londoño Arredondo, (2006)]. The questionnaire comprises 23 items, each rated on a 6-point Likert scale (1 = *completely false*; 6 = *describes me perfectly*), further divided into 6 factors: 1) separation anxiety (i.e., excessive and persistent preoccupation with the possible loss and separation of a bonded figure); 2) partner's affection expression (i.e., constant demand for expressions of affection); 3) plan modification (i.e., changes in activities or plans to please your partner and share more time together); 4) fear of loneliness (i.e., fear of not having a relationship or feeling unloved); 5) borderline expression (i.e., impulsive expressions and behaviors of self-injurious behavior); and 6) attention-seeking (i.e., psychological need for attention to ensure their permanence in the relationship). Internal consistency ranged between 0.62 and 0.84 in the original version and between 0.68 and 0.82 in our study (α = 0.933 in the total scale).

For the assessment of received violence, we used the "Inventario para evaluar el Abuso Psicológico en Relaciones de Pareja (IAPRP)" [Psychological Abuse in Partner Relationships Inventory, Spanish acronym) was utilized (Calvete et al., 2005)]. This unidimensional 17-item instrument was developed from the 17 categories of emotional abuse. Respondents indicate to what extent each type of abuse has occurred in the last year. Responses are rated on an 8-point Likert scale (1 = *once last year*, 2 = *twice last year*, 3 = *3 to 5 times last year*, 4 = *6 to 10 times last year*, 5 = *11 to 20 times last year*, 6 = *more than 20 times last year*, 7 = *never last year but before*, 0 = *never happened*). The scale exhibits high reliability in the original validation (α = 0.99) and the present study (α = 0.94).

Stressful life events were assessed using the Centrality of Event Scale (Berntsen & Rubin, 2006), adapted to Spanish by Fernández-Alcántara et al. (2015). This scale consists of 20 items, with responses ranging from 1 (*completely disagree*) to 5 (*completely agree*). Before completing the scale, participants were asked to recall the most traumatic or stressful event in their lives and to rate the scale based on this event. It has good psychometric properties, as evidenced by a Cronbach's alpha of 0.92 in the Spanish validation and in our sample (α = 0.94).

Alexithymia was assessed using the Toronto Alexithymia Scale-20 [TAS-20; Bagby et al., (1994), adapted to Spanish by Martínez-Sánchez, (1996)]. This scale contains 20 items, rated on a 6-point Likert-type scale (0 = *strongly disagree;* 5 = *strongly agree*), which are grouped into three dimensions: 1) difficulty in identifying feelings; 2) difficulty in describing feelings; and (3) externally oriented thinking. The scale shows adequate internal consistency both in the Spanish adaptation (α = 0.72) and in our sample (α = 0.82).

2.3. Data analysis

Firstly, total scores for the scales and subscales and their reliability were computed using Cronbach's alpha coefficient (Cronbach, 1951), with an optimal cutoff point typically set at 0.80 (Doval et al., 2023).

Hierarchical cluster analysis was performed to identify homogeneous profiles of individuals with gambling disorder. To create the clusters, we included both gambling-related variables (i.e., gambling severity and gambling motives) and mental health variables, specifically depression, anxiety, and hostility. The number of clusters was optimized according to the mean Silhouette Coefficient and Schwarz's Bayesian Information Criterion (BIC). The Silhouette index ranges between 0 and 1, serving as an indicator of cohesion and separation—namely, how closely individuals align with their respective clusters compared to other clusters. As proposed by Rousseeuw (1987), values below 0.30 are deemed poor fits, those falling between 0.30 and 0.50 are considered fair, and those exceeding 0.50 are regarded as good. The BIC uses the within-cluster sum of squares, the number of generated clusters, the number of dimensions, and the sample size to optimize the clustering output. Lower values represent better clustering outputs.

Following the clustering procedure, we examine the characteristics of each group to better understand the profile of the gamblers assigned to each cluster. For this purpose, a set of ANOVAs were calculated to identify any significant differences between clusters in gambling severity, gambling motives (i.e., social, coping, and enhancement motives), and mental health (i.e., depression, anxiety, and hostility).

Additionally, with the aim of providing a more comprehensive characterization of the clusters, differences between the clusters in other variables of interest were analyzed. Therefore, chi-square and ANOVAs were calculated to examine the differences in other qualitative (i.e., sex) and quantitative variables (i.e., addictive behaviors, emotional dependence, psychological abuse, stressful life events, and alexithymia), respectively. All effect sizes were calculated using omega squared and Cramer's V, as appropriate. Bonferroni post-hoc comparisons were carried out to identify pair-wise differences between clusters.

All statistical analyses were conducted using the JASP package (version 0.18.3). To control for Type I error rate for the hypothesis testing, a Bonferroni correction was applied by dividing the significance level by the number of tested hypotheses (i.e., $p < 0.05/9$, or $p < 0.0056$).

3. Results

The analysis yielded three clusters based on the Silhouette index and Schwarz's BIC. This solution achieved the highest measure of separation (Silhouette = 0.330) and lower BIC (450.66). The Dunn index, that is, the division of minimum separation by maximum diameter, was 0.112 (0.848 / 7.568). The model explained 24.6 % of the variance.

Cluster A comprises 30 individuals who are characterized by high gambling severity, with enhancement motives being the most prevalent, followed by coping motives. Additionally, they exhibit low levels of depressive, anxious, and hostility symptomatology. We called cluster A "high gambling severity and good mental health.".

Cluster B comprises 39 individuals with high gambling severity and a coping gambling motive. Individuals in Cluster B exhibit elevated depressive symptomatology, as well as anxiety and hostility. We called it "high gambling severity and poor mental health.".

Finally, Cluster C includes 14 individuals characterized by a low severity of gambling. Their primary motive for gambling is coping, followed by enhancement. Additionally, they exhibit low depressive and anxious symptomatology and moderate levels of hostility. Therefore, we called Cluster C "low gambling severity and good mental health" (see Table 1).

Table 1
Characterization of clusters based on gambling and mental health variables.

	Total ($n = 83$)	Cluster A ($n = 30$)	Cluster B ($n = 39$)	Cluster C ($n = 14$)	F	p-value	ω^2
Gambling severity	9.30 (2.36)	10.23 (1.74)[a]	9.82 (1.64)[a]	5.86 (2.25)[b]	31.809	< 0.001	.426
Gambling motives							
Enhancement	11.67 (4.22)	14.50 (3.08)[a]	10.59 (3.79)[b]	8.64 (4.16)[b]	15.832	< 0.001	
Social	6.78 (1.89)	7.30 (2.00)[a]	6.03 (1.90)[b]	7.79 (2.61)[a]	7.125	0.001	.129
Coping	11.85 (4.20)	11.40 (3.94)	11.97 (4.36)	12.50 (1.19)	0.352	0.705	0
Depressive symptoms*	49.96 (10.25)	43.58 (6.34)[a]	56.40 (8.12)[b]	45.93 (10.60)[a]	23.883	< 0.001	.355
Anxious symptoms*	49.78 (9.97)	44.83 (5.26)[a]	54.76 (9.43)[b]	47.82 (13.21)[a]	10.876	< 0.001	.192
Hostility*	50.65 (10.02)	45.56 (5.11)[a]	54.02 (10.71)[b]	48.33 (11.85)[a,b]	7.267	< 0.001	.131

Note. Different superscript letters indicate statistical significance. In a given row, entries with superscript (a) have significantly different means from entries with superscript (b). *T scores (mean = 50, standard deviation = 10).

3.1. Relationship between clusters and psychological variables

The results revealed statistically significant differences in emotional dependence, alexithymia, and stressful life events, whereas there were no group differences in substance consumption or psychological abuse by their partners. After adjustment with the Bonferroni correction, no significant group differences in emotional dependence were observed.

Participants assigned to Cluster B ("high gambling severity and poor mental health") exhibited higher scores in emotional dependence, greater difficulties in alexithymia, and more frequent stressful life events. Conversely, Cluster C ("low gambling severity and good mental health") obtained the lowest scores in all three mentioned variables. Individuals in Cluster A ("high gambling severity and good mental health") had average scores, falling between those of the other two clusters (see Table 2).

4. Discussion

The purpose of this preliminary study was to examine subgroups based on gambling characteristics (i.e., severity and motives) and mental health variables, including depression, anxiety, and hostility. The findings indicated that a three-cluster solution provided the best account of the data. Also, the aforementioned clusters were differentiated based on psychological variables, including emotional dependence, alexithymia, and stressful life events, whereas there were no differences in substance use.

Individuals with gambling disorder were classified into three subgroups based on the severity of their gambling, gambling motives (i.e., social, enhancement, and coping), and their mental health, specifically depression, anxiety, and hostility. Previous studies have shown that individuals engaged in addictive behaviors can be grouped according to their severity and mental health, as seen in substance use (Green et al., 2023; Halladay et al., 2022; Nelon et al., 2019), gaming (Cerniglia et al., 2019), smartphone use (Chang et al., 2022), as well as in gamblers (Granero et al., 2018; Horváth et al., 2023). The three emerging clusters were as follows: Cluster A had high gambling severity and good mental health, Cluster B presented high gambling severity and poor mental health, and Cluster C had low gambling severity and good mental health.".

These results are partially in line with one of the most widely used theoretical models in gambling, the pathways model (Blaszczynski & Nower, 2002).

Our Cluster B aligns with the definition of emotionally vulnerable subtype, which includes individuals with highly associated psychopathology and coping with distress as their main gambling motive. Furthermore, the classic emotionally vulnerable subtype is also characterized by childhood trauma, problematic family background, and stressful life events, which is consistent with our findings. Although no statistically significant differences were found, Cluster B displayed higher problematic alcohol and drug consumption and experienced greater psychological abuse by their partners. However, previous studies have pointed out that the emotionally vulnerable subtype is the most problematic and inconsistent (Kurilla, 2021).

Cluster C bears some resemblance to the behaviorally conditioned subtype, as both of them present low gambling severity and low depressive and anxious symptomatology. Lastly, Cluster A shares similarities with the antisocial impulsivist subtype, as they both primarily exhibit motives of enhancement (Kurilla, 2021) and coping (Nower et al., 2022). However, unlike previous evidence (Ledgerwood & Petry, 2010), our Cluster A presented good mental health and low rates of substance use.

Additionally, the secondary aim of the study was to examine differences in specific psychological variables that have been shown to be related to gambling disorder but have hardly been studied to gambler profiles or clusters.

Findings showed that the three above-mentioned clusters were differentiated as a function of emotional dependence and alexithymia. A large body of research has previously examined the relationship between gambling disorder and emotional dependence (Macía, Jauregui, & Estevez, 2023) and alexithymia (Bonnaire et al., 2017; Macía,

Table 2
Characterization of clusters based on sociodemographic characteristics and psychological variables.

	Total ($n = 83$)	Cluster A ($n = 30$)	Cluster B ($n = 39$)	Cluster C ($n = 14$)	F	p-value	Effect size
Months in treatment	15.48 (22.05)	15.13 (23.19)	12.59 (12.65)	23.63 (36.42)	1.099	.340	.003
Sex (female)*	43 (51.81 %)	12 (40 %)	23 (58.97 %)	8 (57.14 %)	2.637	.268	.178
Age	45.52 (12.13)	46.67 (13.53)	43.28 (10.74)	49.29 (12.24)	1.490	.232	.012
Alcohol use	1.15 (1.50)	1.1 (1.52)	1.36 (1.49)	0.79 (1.48)	.801	.452	0
Drug use	1.16 (1.64)	0.93 (1.53)	1.21 (1.64)	1.14 (1.74)	.246	.783	0
Psychological abuse in partner relationships	36.55 (33.78)	39.92 (37.63)	41.15 (32.27)	15.09 (20.55)	2.790	.069	.049
Emotional dependence	63.33 (23.67)	58.00 (20.31)[a]	73.35 (23.72)[b]	47.86 (18.83)[a]	8.354	< .001	.155
Alexithymia	68.87 (15.71)	61.93 (17.03)[a]	77.26 (10.75)[b]	61.77 (13.53)[a]	11.723	< .001	.218
Stressful life events	73.19 (15.68)	68.33 (19.08)[a]	78.15 (10.94)[b]	68.38 (16.49)[a,b]	4.174	.019[±]	.074

Note. Different superscript letters indicate statistical significance. In a given row, entries with superscript (a) have significantly different means from entries with superscript (b).
*frequency (percentage).
[±]p > 0.0056 (nonsignificant after correcting α-level for multiple comparisons)

Jauregui, Herrero, et al., 2023). Concerning stressful life events, previous evidence has studied the association with gambling disorders (Russell et al., 2022; Wang et al., 2020). However, after correcting the alpha level, there were no found statistical differences between clusters. Although statistically significant differences were not found, it is clinically relevant to highlight the differences in problematic alcohol and drug consumption, consistent with previous studies (Ford & Hakansson, 2020; Secades-Villa et al., 2023). The relationship between gambling and other psychological variables underscores that gamblers deal with problems other than gambling. Understanding and correctly addressing these related problems allows us to offer them a therapeutic alternative adapted to their needs.

These findings have significant implications for clinical and research purposes. Concerning research, results suggest that gamblers undergoing treatment for gambling disorder could be categorized according to their gambling profile and mental health issues. Hence, future studies should investigate whether grouping gamblers according to these characteristics enhances the cost-effectiveness of the treatment and the therapeutic outcomes. For instance, previous evidence has pointed out that cognitive-behavioral therapy leads to different treatment outcomes (e.g., dropouts, relapse rates) based on gamblers' profiles (Granero, Valero-Solis, et al., 2020; Jiménez-Murcia, Granero, Fernández-Aranda, Aymamí, et al., 2019; Lara-Huallipe et al., 2022).

In terms of clinical implication, classification into the three proposed subgroups is quick and straightforward, as only three questionnaires are used (i.e., SOGS, GMQ, and SCL90). Additionally, gamblers may benefit from differential interventions depending on their profile. For instance, Cluster A, characterized by the high severity of gambling but good mental health, could benefit from a treatment exclusively directed at gambling, including stimulus control and cognitive modification, among others. Cluster B, which presents high gambling severity and poor mental health, as well as higher substance use, may benefit from more intensive interventions in terms of number of sessions, duration, and frequency (Murphy et al., 2007). A feasible option to address both mental health and addictive behaviors could be to incorporate transdiagnostic treatments, such as behavioral activation (May et al., 2022; Pott et al., 2022) or emotion-regulation strategies (Månsson et al., 2022; Sancho et al., 2018), which have shown promising results in both issues. Finally, participants assigned to cluster C, who present a less severe profile, could benefit from less intensive and, therefore, more cost-effective treatments.

Finally, recent literature consistently points out the importance of implementing a gender perspective in gambling disorder intervention (Prever et al., 2023). This is because female gamblers' profiles are different from males' profiles in terms of gambling severity and prevalence of gambling disorder (Chóliz et al., 2021; Merkouris, Thomas, Shandley, et al., 2016; Mora-Salgueiro et al., 2021), associated psychological problems (Estévez, Macía, & Macía, 2023; Jiménez-Murcia et al., 2020; Lelonek-Kuleta, 2021), type of games (Grant, Chamberlain, et al., 2012), gambling motives (Macía, Estévez, et al., 2023), age of onset (Grant, Odlaug, et al., 2012), and treatment success (Merkouris, Thomas, Browning, et al., 2016). Consequently, the literature indicates a need for conducting distinct intervention strategies tailored to the specific needs of men and women. Nevertheless, our findings revealed no significant gender-based differences across the three clusters, with approximately 50 % women in each cluster. Inconsistencies found in previous studies regarding gender may be due to the lack of representativeness of women in the sample (Kurilla, 2021). This suggests, on the one hand, the importance of balancing the sample in relation to gender in the research studies; and on the other hand, the potential for an alternative approach to gambling-related interventions, wherein individuals could be categorized according to their specific profiles and therapeutic needs rather than being segregated into treatment groups based solely on gender.

These results should be interpreted under several limitations. Firstly, the relatively limited sample size may have implied insufficient statistical power for our analysis. Further, given the cross-sectional design of our study, causal relationships between variables cannot be established. Third, the study participants were undergoing treatment for gambling in associations for rehabilitation from gambling disorder, where each treatment facility had a different approach. Therefore, the results should not be generalized to other clinical samples, such as public centers or other evidence-based treatments (e.g., cognitive-behavioral therapy). Regarding instruments, note that although the SOGS shows adequate validity with DSM-5 criteria, it is based on DSM-III criteria. Finally, the study did not include some variables that are relevant to the study of gambling, both psychological (e.g., impulsivity, stigma, or other treatments for mental health issues) and gambling-related variables (e.g., financial motives).

In conclusion, the current study identified three distinct clinical subgroups of gamblers by analyzing gambling and mental health characteristics. Grouping gamblers provides a more comprehensive assessment to better understand gambling behavior, which would, in turn, allow tailoring prevention and intervention strategies to the gambler's needs. Thus, treatment-seeking individuals with gambling disorder could benefit from different therapeutic approaches depending on their gambling severity profile and mental health problems.

CRediT authorship contribution statement

G. Aonso-Diego: Writing – original draft, Methodology, Formal analysis, Conceptualization. **L. Macía:** Writing – review & editing, Supervision, Data curation. **M. Montero:** Supervision, Methodology, Formal analysis, Conceptualization. **A. Estévez:** Writing – review & editing, Supervision, Resources, Project administration, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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