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Do attention-deficit/hyperactivity symptoms influence treatment outcome in gambling disorder?

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ABSTRACT

Background and aims: Numerous studies point to the comorbidity between gambling disorder (GD) and attention deficit hyperactivity disorder (ADHD). However, there is a lack of research exploring how ADHD symptoms might influence psychological treatment outcomes for GD. Therefore, we aimed to explore differences between patients with GD with and without self-reported ADHD symptoms regarding psychopathology, personality, sociodemographic and treatment outcome measures.

Method: This longitudinal study included 170 patients with GD receiving cognitive behavioral therapy. Multiple self-reported instruments were used to assess clinical variables and sociodemographic measures prior to treatment.

Results: A clinical profile characterized by greater GD severity, higher psychopathology and impulsivity, and less adaptive personality features was observed in patients with self-reported ADHD symptoms compared to those without. No significant differences in treatment response (measured by dropout and relapse rates) were observed between the two groups. However, patients with self-reported ADHD symptoms experienced more severe relapses (i.e., gambled more money) and GD patients who relapsed scored higher on measures of ADHD, particularly inattention.

Conclusion: Individuals with GD and self-reported symptoms of ADHD may experience more severe relapses following treatment, suggesting a need for more vigilant follow-up and interventions for patients with this comorbidity.

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1. Introduction

Gambling disorder (GD) is a characterized by persistent and recurrent maladaptive patterns of gambling behavior leading to clinically significant impairment or distress [1]. Multiple variables may contribute to the development and maintenance of GD, including certain sociodemographic variables, personality features, cognitive distortions or the experience of stressful events [2–4]. GD has been associated with other psychiatric disorders [5] that may influence GD severity and hinder treatment, such as mood and anxiety disorders, substance use disorders [6], and attention-deficit/hyperactivity disorder (ADHD) [7,8].

ADHD is defined by inattentive and/or hyperactive-impulsive symptoms that generate significant impairments in social, academic, or occupational functioning [1]. Risky and impulsive behaviors are widely acknowledged in individuals with ADHD [9,10]. ADHD and GD overlap [11,12]. A hypothesis that may explain this co-occurrence would be that patients with inattention or hyperactivity may experience a sense of boredom that may motivate gambling to seek stimulation [13]. Furthermore, the presence of these two disorders may reflect impaired responses to rewards and punishments, linked to both disorders [14,15]. Impulsivity is also highlighted as a common factor between both diagnoses [16–19]. Difficulties in tendencies to delay gratification [20], impaired inhibitory control [21], suicide attempts [22], illegal acts [23], and academic difficulties [24] are also characteristics of patients with GD and ADHD.

In a study that used structured clinical instruments, approximately 28.8% of individuals with problem gambling had ADHD [22]. Aymamí et al. [25] observed that 23.2% of patients seeking treatment for GD exhibited ADHD symptoms. These percentages are higher than those found in the general population (around 5% in children and 2.5% in the adult population). ADHD symptoms have been linked to disadvantageous personality features related to persistence and self-directedness [25], psychological problems, and severity of GD [26,27]. Similarly, Breyer et al. [28] noted that individuals who reported childhood and current ADHD symptomatology experienced higher problem-gambling severity. Among adults, 13.4% of individuals with ADHD had GD [29]. Similarly, among adolescents, those who screened positive for ADHD were more likely to experience gambling problems [30].

Therefore, ADHD symptoms may constitute a risk factor for developing a behavioral addiction, and specifically GD, and ADHD symptoms should be considered in GD treatment. Whereas cognitive behavioral therapy (CBT) has been found to be efficacious in treating GD [31–33], in treating adults with ADHD, the combination of pharmacological and psychological interventions has been described as potentially optimal [34–36]. Non-pharmacological therapies for adult ADHD, despite having efficacy [37], may require further empirical support [38,39]. So far, studies investigating factors influencing the treatment of GD suggest that comorbidity with other disorders, such as alcohol and substance use [40], and depressive and anxious symptoms [41], are associated with poorer GD outcomes [26].

To the best of our knowledge, prior studies have not systematically investigated how ADHD symptoms may influence GD treatment outcomes. Therefore, the aims of this study were to explore associations between: (a) demographic variables, ADHD symptoms, and clinical features in a sample of patients meeting criteria for GD; and (b) ADHD symptoms and GD treatment outcomes, namely relapse and dropout. We hypothesized that patients with ADHD symptoms would show a greater severity of GD and poorer treatment outcomes.

2. Methods

2.1. Participants and procedure

The sample included 170 patients with GD who were being treated at the Gambling Disorder Unit within the Department of Psychiatry at a University Hospital (city, country). They were classified into two groups according to the presence (ADHD+; $n = 34$) or absence (ADHD–; $n = 136$) of ADHD symptoms, with groupings based on scoring criteria published in a Spanish validation study [42]. Patients voluntarily sought treatment for GD and were consecutive referrals for assessment and treatment from April 2017 to June 2018. Exclusion criteria were the presence of an active psychotic disorder, a neurodegenerative condition such as Parkinson's disease, or intellectual disability.

Two face-to-face clinical interviews were conducted before a diagnosis of GD was given. Additional clinical and sociodemographic information was obtained, and patients individually completed all study instruments before initiating outpatient treatment.

2.2. Measures

2.2.1. GD severity

DSM-5 Criteria [1].

Patients met four or more criteria for GD according to the DSM-5 [1]. Four or more criteria is the threshold for mild GD. The internal consistency in this study sample was $\alpha = 0.80$. GD was assessed through a clinical interview.

South Oaks Gambling Screen (SOGS) [43].

This self-report screening questionnaire with 20 scored items has demonstrated satisfactory psychometric properties and can discriminate between probable pathological, problem and non-problem gambling. The Spanish version [44] used here showed adequate internal consistency ($\alpha = 0.73$).

2.2.2. ADHD symptoms

Adult ADHD Self-Report Scale (ASRS-v1.1) [45].

This scale was used as a severity indicator of self-reported (current) ADHD symptoms in adulthood. It comprises the 6 out of 18 most predictive items of the Adult ADHD Self-Report Scale (ASRS) [46] which is a self-administered scale based on the DSM-IV with appropriate psychometric properties criteria and adjusted to reflect ADHD symptoms as seen in adults [47]. The Spanish validation [42] was used for rating symptom frequencies along 5-point Likert-like scales (0–4). The total score represents the sum of all responses so that a higher score indicates more self-reported symptoms of ADHD. The classification into the positive versus negative screening groups was based on the scoring criteria published in the Spanish adaptation study [42]. In this study, the internal consistency was adequate ($\alpha = 0.74$).

2.2.3. Personality

Temperament and Character Inventory-Revised (TCI-R) [48].

This self-report instrument consists of 240 items measured along 5-point Likert-like scales. It examines 7 personality dimensions, composed of 4 temperament (novelty-seeking, harm-avoidance, reward-dependence, and persistence) and 3 character (self-directedness, cooperativeness, and self-transcendence) dimensions. The Spanish adaptation by Gutiérrez-Zotes et al. [49] was used here, with internal consistency ranging from $\alpha = 0.70$ (reward dependence) to $\alpha = 0.86$ (persistence).

2.2.4. Psychopathology

Symptom Checklist-90-Revised (SCL-90-R) [50].

The SCL-90-R is a self-reported measure including 90 items that assess nine psychopathological dimensions: somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. It also includes three global indices. A Spanish version of this questionnaire has been validated [51]. In this sample, the internal consistency ranged from $\alpha = 0.79$ to 0.98.

2.2.5. Impulsivity

Impulsive Behavior Scale (UPPS-P) [52].

The UPPS-P is a self-report 59-item Likert-type scale that assesses

five subscales: lack of planning lack of perseverance, sensation-seeking, negative urgency, and positive urgency. In the present study, the Spanish validation of this questionnaire was used [53], with internal consistency ranging between $\alpha = 0.76$ to 0.92.

In this work, the raw scores for each questionnaire were obtained according to the scoring method described in the validation-adaptation studies.

2.3. Treatment

Patients participated in group CBT at a University Hospital. Treatment consisted of 16 weekly outpatient sessions lasting 90 min each and a follow-up period. The current study also assesses data from the first 3 months of follow-up. This treatment protocol has been described elsewhere [54] and its short and medium-term efficacy has been reported [55,56]. The goal of the treatment was to train patients to implement cognitive behavior strategies to achieve complete gambling abstinence. Multiple topics were addressed in sessions such as psychoeducation regarding GD (diagnostic criteria, phases, vulnerability factors, etc.), stimulus control (self-exclusion programs, money management, avoidance of potential triggers, etc.), response prevention (alternative behaviors), cognitive restructuring, and relapse prevention techniques.

Treatment outcome was assessed on the basis of relapses and dropouts from treatment (considered as reflecting poor outcomes). A relapse implies gambling behavior after a period of abstinence during treatment. As a measure of severity of relapses, the sum of euros registered in all gambling episodes reported during treatment was calculated. We considered the higher the number of relapses and the greater the amounts of bets in these episodes as reflecting worse outcomes. On the other hand, a dropout entails the absence of a minimum of three consecutive treatment sessions without prior notice or justification.

2.4. Ethics

The present study was conducted in accordance with the latest version of the Declaration of Helsinki. The University Hospital Clinical Research Ethics Committee approved the study, and signed informed consent was obtained from all participants.

2.5. Statistical analysis

The statistical analysis was performed with Stata17 for Windows [57]. Comparisons between study groups were made using chi-square tests (χ^2) for categorical variables, *T*-Test tests for quantitative variables, and negative binomial regression for count data type variables (these tests were found to meet application requirements). The effect sizes of differences in proportions and means were obtained with standardized Cohen-h and Cohen-d coefficients, respectively, using the following criteria to consider relevance: $|h| > 0.50$ or $|d| > 0.50$ for moderate-medium effect sizes and $|h| > 0.80$ or $|d| > 0.80$ for large-high effect sizes [58].

The associations between ASRS total scores and clinical variables were assessed with Pearson's correlations. Given the strong association between this coefficient and the sample size (among large groups, low |R| coefficients may achieve high statistical significance, and vice versa), the following thresholds were used in this study for considering effect sizes: $|R| > 0.24$ for moderate-medium and $|R| > 0.37$ for large-high (0.24 and 0.37 being the equivalents of 0.50 and 0.80 for the Cohen's-*d* and *h*) [59].

The incidences of relapses and dropouts during the treatment were analyzed with survival analysis. This statistical method assesses times between an initial event (in this work the beginning of the treatment) and a final one (in this study, the presence of relapses or dropouts), and it consists of estimating the probability of the defined event occurring for a certain period [60]. The Kaplan-Meier function was calculated, and the corresponding accumulated curves were compared using the Log-Rank test.

In this study, the control in the increase of the Type-I risk that occurs because of the application of multiple tests of statistical significance has been conducted with Finner's method, a stepwise procedure included in the familywise error rate procedures [61].

3. Results

3.1. Sample characteristics

Table 1 displays sociodemographic variables among the total sample ($n = 170$). Most patients were men, with low education levels, single or married, within low social position indexes and employed. Mean age for the sample was 41.0 years-old (SD = 12.6).

3.2. Associations between ADHD symptoms and sociodemographic and clinical measures at baseline

Comparisons between patients screening positive versus negative on the ASRS yielded no statistical differences for sociodemographic measures (Table 1).

Table 2 shows comparisons for mean scores on clinical measures between patients stratified according to ASRS positive or negative status. All mean differences with effect sizes within the range of mild-moderate to good-large are highlighted with bold font and the symbol "†". The presence of ASRS symptoms was statistically associated with higher GD severity, worse psychopathology, higher impulsivity and a more disadvantageous personality profile (higher scores of novelty-seeking, harm-avoidance and self-transcendence, and lower scores of persistence, self-directedness and cooperativeness). Most effect sizes for these mean comparisons were at least into the moderate range.

Table 2 shows the correlation matrix between ASRS symptoms factor scores and other clinical measures. Correlations with moderate to large effect sizes are highlighted with bold font. Higher scores on the ADHD hyperactivity dimension were associated with lower age and earlier age of onset of GD.

3.3. Association between ADHD symptoms and treatment outcomes

No differences were found between GD patients with and without ADHD symptoms with respect to dropout and relapses nor in numbers of sessions attended (Table 3). Between-group statistical differences were observed for total bets during relapses, with ADHD+ patients reporting higher mean bets (calculated as the sum of euros registered in all relapses during treatment, although with a low effect size for this mean difference). Interestingly, the adjusted comparison for the mean bets including GD severity at baseline as a covariate (number of DSM-5 criteria for GD) remained statistically significant and achieved large effect size (adjusted means: 75.6 versus 210.2, $p < 0.001$, $|d| = 0.84$).

No differences were found for the comparison of the means obtained in the ASRS factor scores between patients with and without relapses (Table 4). However, patients who reported relapses during treatment showed statistically higher mean scores on the ASRS inattention and total scales (low effect sizes for these mean differences). Quite similar results were obtained including GD severity level at baseline (number of DSM-5 criteria for GD): a) for the ASRS inattention scale, adjusted means were equal to 5.31 versus 6.73 ($p = 0.011$, $|d| = 0.46$); b) for the ASRS total scale, adjusted means were 8.63 versus 10.56 ($p = 0.007$, $|d| = 0.49$).

Fig. 1 shows the survival cumulative functions for rates of dropout and relapses. No between-group differences were obtained using the Long Rank tests for times to dropout ($\chi^2 = 0.01$, $p = 0.90$) or relapse ($\chi^2 = 1.97$, $p = 0.16$).

Table 1
Comparison between the groups on sociodemographic measures.

		Total sample (*n* = 170)		ASRS screening group ADHD- (*n* = 136)		ADHD+ (*n* = 34)			
		n	%	*n*	%	*n*	%	*p*	|*h*|
Gender	Women	13	7.6%	9	6.6%	4	11.8%	0.312	0.18
	Men	157	92.4%	127	93.4%	30	88.2%		
Education	Primary	85	50.0%	63	46.3%	22	64.7%	0.073	0.38
	Secondary	78	45.9%	67	49.3%	11	32.4%		0.35
	University	7	4.1%	6	4.4%	1	2.9%		0.08
Civil status	Single	85	50.0%	69	50.7%	16	47.1%	0.577	0.07
	Married	64	37.6%	52	38.2%	12	35.3%		0.06
	Divorced	21	12.4%	15	11.0%	6	17.6%		0.19
Social Index	Average-high	3	1.8%	3	2.2%	0	0.0%	0.087	0.21
	Average	14	8.2%	12	8.8%	2	5.9%		0.11
	Average-low	65	38.2%	55	40.4%	10	29.4%		0.23
	Low	88	51.8%	66	48.5%	22	64.7%		0.33
Employment	Unemployed	58	34.1%	45	33.1%	13	38.2%	0.571	0.11
	Employed	112	65.9%	91	66.9%	21	61.8%		

Note. ADHD: attention deficit/hyperactivity disorder. ASRS: Adult ADHD Self-Report Scale. SD: standard deviation.

Table 2
Associations between ADHD and clinical variables at baseline.

	ASRS screening group						ASRS factor scores		
	ADHD- (*n* = 136)		ADHD+ (*n* = 34)				Correlation (R)		
	Mean	*SD*	*Mean*	*SD*	*p*	|*d*|	Inattention	Hyperactive	Total
Age (years-old)	41.40	12.46	39.50	13.24	0.434	0.15	−0.093	**−0.289**†	−0.197
Onset of GD (years-old)	29.28	12.35	28.41	11.02	0.708	0.07	−0.080	**−0.240**†	−0.165
Duration of GD (years)	6.07	6.47	5.71	5.52	0.766	0.06	0.053	0.027	0.052
DSM-5 criteria for GD	6.76	2.02	7.91	1.24	**0.002***	**0.68**†	**0.408**†	**0.256**†	**0.426**†
SOGS-total	10.56	3.33	12.03	2.70	**0.018***	**0.51**†	**0.335**†	**0.239**†	**0.361**†
SCL-90-R Somatization	0.83	0.69	1.65	0.88	**<0.001***	**1.04**†	**0.462**†	**0.359**†	**0.511**†
SCL-90-R Obsessive-comp.	0.98	0.71	2.10	0.81	**<0.001***	**1.47**†	**0.656**†	**0.273**†	**0.624**†
SCL-90-R Sensitivity	0.87	0.76	1.82	0.73	**<0.001***	**1.28**†	**0.560**†	**0.386**†	**0.599**†
SCL-90-R Depression	1.38	0.84	2.34	0.93	**<0.001***	**1.08**†	**0.495**†	**0.333**†	**0.525**†
SCL-90-R Anxiety	0.87	0.64	1.70	0.92	**<0.001***	**1.05**†	**0.516**†	**0.378**†	**0.561**†
SCL-90-R Hostility	0.79	0.77	1.54	1.01	**<0.001***	**0.82**†	**0.410**†	**0.346**†	**0.466**†
SCL-90-R Phobic anxiety	0.36	0.50	0.99	0.87	**<0.001***	**0.89**†	**0.440**†	**0.253**†	**0.449**†
SCL-90-R Paranoia	0.79	0.72	1.65	0.84	**<0.001***	**1.09**†	**0.504**†	**0.431**†	**0.575**†
SCL-90-R Psychotic	0.75	0.60	1.59	0.87	**<0.001***	**1.12**†	**0.521**†	**0.357**†	**0.556**†
SCL-90-R GSI	0.93	0.58	1.79	0.75	**<0.001***	**1.28**†	**0.585**†	**0.403**†	**0.625**†
SCL-90-R PST	43.10	21.00	64.82	17.37	**<0.001***	**1.13**†	**0.555**†	**0.404**†	**0.603**†
SCL-90-R PSDI	1.81	0.54	2.39	0.58	**<0.001***	**1.03**†	**0.396**†	**0.322**†	**0.444**†
Lack of premeditation	24.22	5.93	27.06	6.60	**0.016***	0.45	0.188	0.130	0.201
Lack of perseverance	22.12	4.94	25.82	5.51	**<0.001***	**0.71**†	**0.462**†	0.140	**0.417**†
Sensation-seeking	27.79	8.77	28.79	8.63	0.552	0.11	0.106	**0.252**†	0.191
Positive urgency	29.76	9.71	36.56	9.76	**<0.001***	**0.70**†	**0.366**†	**0.265**†	**0.396**†
Negative urgency	30.39	7.46	36.68	6.20	**<0.001***	**0.92**†	**0.391**†	**0.318**†	**0.439**†
Impulsivity total	134.06	23.71	154.88	23.60	**<0.001***	**0.88**†	**0.445**†	**0.343**†	**0.492**†
TCI-R Novelty-seeking	107.54	13.86	114.24	11.62	**0.010***	**0.52**†	0.179	**0.323**†	**0.277**†
TCI-R Harm-avoidance	97.93	17.97	114.50	17.07	**<0.001***	**0.95**†	**0.462**†	0.181	**0.434**†
TCI-R Reward-dependence	97.24	15.04	95.12	10.74	0.439	0.16	−0.168	−0.200	−0.216
TCI-R Persistence	107.47	19.13	98.09	19.89	**0.012***	**0.51**†	**−0.328**†	0.086	−0.216
TCI-R Self-directedness	133.83	20.83	107.62	17.99	**<0.001***	**1.35**†	**−0.616**†	**−0.442**†	**−0.666**†
TCI-R Cooperativeness	132.34	16.73	126.12	14.13	**0.048***	0.40	**−0.281**†	−0.194	**−0.301**†
TCI-R Self-transcendence	60.24	14.24	66.53	12.18	**0.019***	**0.52**†	0.228	0.187	**0.256**†

Note. ADHD: attention deficit/hyperactivity disorder. ASRS: Adult ADHD Self-Report Scale. DSM: Diagnostic and Statistical Manual of Mental Disorders. GD: gambling disorder. GSI: Global Severity Index. PSDI: Positive Symptom Distress Index. PST: Positive Symptom Total. SCL-90-R: Symptom Checklist-90-Revised. SD: standard deviation. SOGS: South Oaks Gambling Screen. TCI-R: Temperament and Character Inventory-Revised.
*Bold: significant comparison. †Bold: effect size within the ranges mild-moderate to high-large.

4. Discussion

The primary objective of this study was to compare treatment outcomes between patients with GD with and without self-reported ADHD symptomatology. It also aimed to analyze differences between both groups in terms of sociodemographic and clinical variables.

Similar to previous studies [22,25,62–65], the percentage of patients with GD who had reported ADHD symptomatology in the present work was 20%. Regarding sociodemographics, our results showed no significant between-group differences relative to ADHD symptom status. Similarly, Waluk et al. [64] did not find an association between ADHD and gender, nor significant differences in ADHD symptoms by age. These findings are partially in line with Aymamí et al. [25], who did not find significant gender differences with respect to mean ADHD scores. However, this last study observed higher scores in an ADHD screening tool in younger sample versus older adults. Specifically, our study

Table 3
Comparisons between groups for CBT outcomes.

		ASRS screening group					
		ADHD- *(n = 136)*		ADHD+ *(n = 34)*			
		n	%	*n*	%	*p*	|*h*|
Dropout	Present	65	47.8%	17	50.0%	0.818	0.04
	Absent	71	52.2%	17	50.0%		
Relapses	Present	35	25.7%	13	38.2%	0.148	0.27
	Absent	101	74.3%	21	61.8%		
		Mean	*SD*	*Mean*	*SD*	*p*	|*d*|
Number sessions		10.14	5.61	10.18	5.55	0.973	0.01
Number relapses		0.53	1.24	0.79	1.23	0.270	0.21
[1]Euros in relapses		79.83	350.71	262.85	746.36	**0.038***	0.31

Note. [1]Calculated as the sum of euros for all relapses reported during treatment.
The comparison for the number of sessions, relapses and euros in relapses was done with negative binomial regression.
ADHD: attention deficit/hyperactivity disorder. ASRS: Adult ADHD Self-Report Scale. SD: standard deviation. *Bold: significant comparison.

Table 4
Comparisons between groups defined by treatment outcomes and the ASRS scales.

Dropout →	No *(n = 88)*		Yes *(n = 82)*			
	Mean	*SD*	*Mean*	*SD*	*p*	|*d*|
ASRS Inattention	5.55	3.29	5.89	3.87	0.531	0.10
ASRS Hyperactivity	3.66	1.84	3.26	2.15	0.190	0.20
ASRS Total	9.20	4.14	9.15	5.14	0.935	0.01
Relapses →	No *(n = 122)*		Yes *(n = 48)*			
	Mean	*SD*	*Mean*	*SD*	*p*	|*d*|
ASRS Inattention	5.30	3.46	6.75	3.68	**0.017***	0.41
ASRS Hyperactivity	3.32	2.04	3.83	1.87	0.132	0.26
ASRS Total	8.62	4.55	10.58	4.60	**0.013***	0.43

Note. ASRS: Adult ADHD Self-Report Scale. SD: standard deviation. *Bold: significant comparison.

showed that the hyperactive subtype predominates in patients who are younger and present with gambling problems earlier. This result dovetails with other research reporting that older people with ADHD have a predominantly inattentive profile, and that hyperactivity and impulsivity tend to decrease over time [27].

Sensation-seeking, risky decision-making, and engaging in potentially maladaptive behaviors in response to intense emotions have been found in GD and ADHD [62,66] and may represent risk factors for the development and maintenance of GD [67]. In addition, some impulsive tendencies, especially urgencies (i.e., tendencies to act impulsively in contexts of intense emotions) [52] have been reported to correlate positively with GD severity [18,27,68,69]. In this vein, a main finding of this study, that is also consistent with prior reports [21,27,64,70], is that GD patients with self-reported ADHD symptoms had greater severity of GD and higher levels of impulsivity. Similar conclusions had been reached by Breyer et al. [28] who reported that individuals who experienced ADHD symptoms in adulthood (versus those who did not) had greater severity of gambling concerns. Interestingly, Davtian et al. [71] did not find higher impulsivity in patients with GD and co-occurring ADHD. It should be noted, however, that impulsivity was measured with a subscale of a personality test, so differences in methodologies could explain these findings. As such, future studies investigating impulsivity more thoroughly are warranted.

Regarding other clinical variables, such as personality, more concerning temperaments (i.e., high novelty-seeking and harm-avoidance) and character profiles (i.e., low levels of self-directedness and cooperativeness) were observed in patients with ADHD symptoms, in comparison with those without. Thus, adult patients with GD and co-occurring ADHD symptoms were characterized by being less reflexive and more anxious, pessimistic, and self-centered, as well as presenting with low frustration tolerance and self-esteem [48]. Similar patterns have been described in prior studies [25,71]. Likewise, we identified greater psychopathology in GD patients who presented with ADHD symptoms versus those without, as other authors have previously reported [22,72].

With regard to the longitudinal results, contrary to our hypotheses, this study failed to find significant differences between individuals with GD with and without self-reported ADHD symptoms in terms of relapses and dropouts. Worse treatment outcomes in the ADHD+ group had been expected since higher levels of impulsivity, associated psychopathology, and more concerning personality features have been related to poorer outcomes in patients with GD [55,73–76]. Furthermore, as stated by Dai et al. [77], ADHD symptoms correlate with increased gambling-related irrational cognitions, which may, in turn, be risk factors for relapse [78,79]. Along these lines, the results of the present study lead us to postulate that, given that both GD and ADHD present several common symptoms such as high impulsivity, emotional dysregulation, and cognitive deficits [16–18,80], treatment focused on GD may have a positive influence on the regulation of the impairments characteristic of ADHD. In other words, certain psychological techniques that are applied

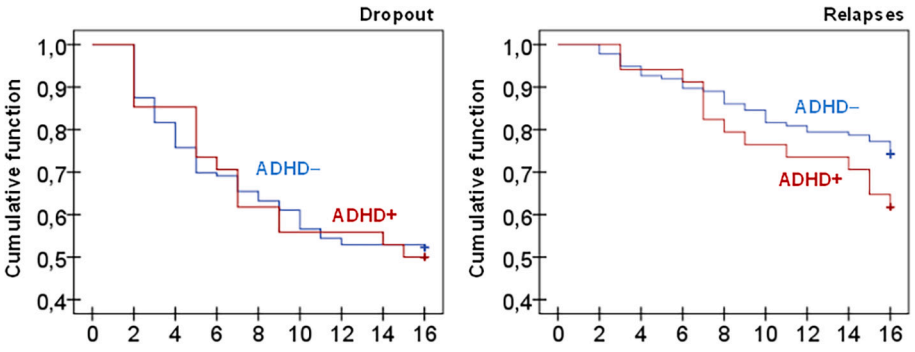

Fig. 1. *Note.* ADHD: attention deficit/hyperactivity disorder

in CBT for GD, such as cognitive restructuring, stimulus control, or emotion-regulation strategies [54,81,82], may also be useful for addressing ADHD symptoms, and this currently speculative possibility warrants further direct examination. Another interpretation may be that there might be a subgroup of patients with GD whose gambling behavior is less driven by factors related to impulsivity and impulse control and where this therapeutic approach is less effective, if accounting for pre-treatment GD severity.

Furthermore, although it could be hypothesized that, as the ADHD+ group may show a worse treatment outcome because it showed greater severity of GD (according to DSM-5 criteria), previous studies did not observe significant differences in treatment response according to DSM-5 severity criteria [83]. Similarly, previous studies observed that not all dimensions of impulsivity have a direct association with relapses/dropouts in the treatment of GD [83]. Therefore, another explanation for the observation of no between-group differences in treatment outcomes may involve the complexity of the severity and impulsivity constructs.

In the present study, there were differences in the amount of money gambled during relapses, being higher in individuals with GD and ADHD symptoms. Therefore, relapses in individuals with co-occurring GD and ADHD symptoms may be more severe than in individuals with GD without ADHD symptoms. It was also observed that those patients who reported relapses during treatment reported more symptoms of inattention alone or together with hyperactivity. This suggests that CBT for GD, by covering emotion regulation and impulsivity control skills [54,81,82], may address aspects of hyperactivity/impulsivity to a greater extent than inattention symptoms, although this possibility too remains currently speculative. Nonetheless, the more severe relapses in individuals with co-occurring GD and ADHD symptoms and greater inattention among GD patients who relapse suggest that targeting more directly ADHD symptoms may reduce severities and frequencies of relapse, and these possibilities should be directly investigated in future studies.

4.1. Limitations

This study has limitations. For instance, both GD and ADHD are more common in men than in women, and ADHD frequency in the study may in part reflect male predominance. Future studies should include more women. It is also recommended to use diagnostic instruments for GD assessment in the initial interviews. Likewise, evaluations were conducted with self-reported instruments, with the inherent limitations that these entail. In this sense, the use of a broader neuropsychological battery to assess ADHD symptoms should be considered, since the ASRS self-report instrument could assess other symptoms related to impulsivity that may be characteristic of other disorders, such as GD [84]. Additionally, no information regarding ADHD treatment and medication use were available and therefore were not considered in analyses. Comorbidity with other disorders (depression, anxiety, substance use, antisocial personality disorder) that may influence treatment was not evaluated either. In this regard, it would be advisable for future research to assess and consider these variables.

5. Conclusions

Our study provides some support and additional information on the co-occurrence between GD and ADHD symptoms, not only in the characteristics of this group but also with respect to potential influences on treatment outcomes. A significant finding to emerge was that there were no significant differences in dropout and relapse rates between GD patients with ADHD symptomatology and those without. We observed differences in the severity of relapses and ADHD features in GD patients who relapsed. Thus, there is a need for additional research into how best to safeguard individuals with co-occurring GD and ADHD symptoms, particularly with respect to reducing frequencies and impacts of gambling relapses.

Declaration of Competing Interest

FFA and SJM received consultancy honoraria from Novo Nordisk. The rest of the authors declare no conflict of interest. The funders had no role in the design of the study, in the collection, analyses or interpretation of data, in the writing of the manuscript or in the decision to publish the results. Dr. Potenza has consulted for Opiant Pharmaceuticals, Idorsia Pharmaceuticals, AXA, Game Day Data, Baria-Tek and the Addiction Policy Forum; has been involved in a patent application with Yale University and Novartis; has received research support (to Yale) from Mohegan Sun Casino and Connecticut Council on Problem Gambling; and has consulted for and/or advised gambling and legal entities on issues related to impulse-control/addictive disorders.

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