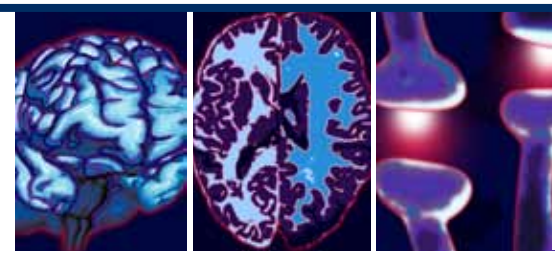
RESEARCH ARTICLE



Investigating facets of personality in adult pathological gamblers with ADHD

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Practice points

- Patients seeking help for pathological gambling often present with co-occurring issues, including disorders associated with mood, anxiety, substance-abuse and adult ADHD.
- Understanding patient characteristics associated with facets of personality can provide meaningful information to assist in case conceptualization and treatment planning among pathological gamblers.
- Pathological gamblers who meet criteria for adult ADHD are more likely to exhibit inattentive symptoms and experience greater emotional dysregulation, interpersonal sensitivity and stress proneness than pathological gamblers without ADHD.
- Pathological gamblers with and without adult ADHD use gambling as a maladaptive way to cope with stressful life situations and to regulate negative affective states.
- Contrary to clinical intuition, the findings in this study suggest that pathological gamblers with adult ADHD are no more impulsive than pathological gamblers without ADHD.
- Treatment strategies targeting emotional regulation, stress management, impulse control and irrational cognitions that precipitate and perpetuate gambling behaviors should be considered when working with pathological gamblers.

SUMMARY The present study explored facets of personality in a sample of pathological gamblers with ADHD (n = 52) and without ADHD (n = 43). Participants were assessed for psychopathology and gambling disorders using the Mini International Neuropsychiatric Interview, the National Opinion Research Center DSM Screen for Gambling Problems, and the Adult ADHD Self-Report Scale. Facets of personality were assessed using the NEO Personality Inventory–Revised. Group differences emerged across several facets of personality when analyzed using multivariate statistics. Although both groups experienced difficulties in several areas compared with norming data (e.g., greater depression, higher impulsivity, lower self-esteem and lower self-discipline), these facets of personality were more pronounced in

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pathological gamblers with ADHD. Most notable among these differences are tendencies for gamblers with ADHD to experience greater levels of emotional instability, interpersonal sensitivity and stress proneness. Pathological gamblers with ADHD also appear to experience lower self-esteem, greater difficulty being assertive and lower levels of self-discipline. Surprisingly, both groups were comparable on facets of impulsivity. These findings suggest that pathological gamblers diagnosed with adult ADHD may experience additional challenges compared with pathological gamblers without ADHD.

Pathological gambling (PG) is characterized by an inability to control gambling behavior despite adverse personal and social consequences. PG is a complex disorder that is often associated with a host of financial, legal and psychological problems [1–3] and significantly interferes with vocational, family and personal pursuits [4]. Studies show that approximately 70–90% of North American adults have participated in some form of gambling [5], yet epidemiological findings indicate that only 1–3% of this population meet criteria for PG [6,7], suggesting that the majority of individuals who gamble do not develop this disorder. Among researchers, there is an effort to understand individual differences in risk for developing PG, including investigations exploring concomitant neuropsychiatric disorders such as ADHD and maladaptive personality characteristics associated with the onset, maintenance and severity of PG.

Since the classification of PG as an impulse control disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) [4], a host of studies have associated PG with various dimensions of impulsivity. Findings using both behavioral measures [8] and personality questionnaires [9–11] have demonstrated elevated impulsivity in pathological gamblers (PGs) compared with non-PG controls. Constructs related to impulsivity, such as risk taking [12,13] and sensation seeking [14,15], have also been associated with PG. Some have suggested that certain subtypes of PGs exhibit impulsivity, thrill and adventure seeking, disinhibition and boredom proneness [16–18]. Taken together, these results suggest that higher impulsivity is associated with more severe gambling consequences [19], such as vulnerability to relapse after treatment [20] and treatment compliance issues [16]. Furthermore, it has been shown that individuals with high levels of trait and behavior impulsivity are at greater risk for developing PG. However, some questions arise about the high frequency of comorbid psychiatric disorders, such as ADHD, that share symptoms of impulsivity common in PGs [6,21] and whether other psychosocial factors may mediate or moderate this relationship [19,22].

According to the DSM-IV, clinicians and researchers diagnosing adult ADHD can distinguish among three subtypes: ADHD combined type (ADHD-C; both inattentive and hyperactive-impulsive symptoms), ADHD predominantly inattentive type (ADHD-I) and ADHD predominantly hyperactive-impulsive type (ADHD-H) [4]. Longitudinal studies investigating the influence of ADHD symptoms across the lifespan contend that the level of impairment, symptoms, associated features, demographics and responsiveness to stimulant medication differentially affect children and adults [23–25]. In particular, studies have documented that hyperactive–impulsive symptoms decrease with increasing age, while inattentive symptoms of ADHD tend to persist [23]. Thus, symptoms associated with inattention not hyperactivity–impulsivity are most common [26,27] and remain prominent in more than 90% of adults with ADHD [28]. As such, symptoms such as procrastination, overreacting to frustration, poor motivation, insomnia and time management difficulties are pervasive complaints of adults with ADHD [29].

Exploratory studies investigating group differences among adult ADHD-C, ADHD-I and ADHD-H subtypes have shown that ADHD-C and ADHD-H, but not ADHD-I types, are associated with more severe psychosocial consequences that are primarily caused by executive function deficits, particularly in inhibitory control [30]. For example, cross-sectional and genetic studies have concurred that ADHD patients with combined subtypes suffer higher rates of substance use disorders [31], and present with a higher number of comorbid psychiatric disorders, eating disorders, oppositional defiant disorders, as well as antisocial and borderline personality disorders compared with adults with ADHD-I subtypes [28,32]. While these differences were not observed in rates of depressive episodes and anxiety disorders, others have

documented the prevalence of internalizing problems such as anxiety and depression, as well as learning impairments in ADHD-I subtypes, whereas ADHD-H type symptoms are associated with externalizing problems such as aggression, antisocial behavior, peer rejection and global functioning impairment [33,34]. Consequently, studies investigating personality differences among the subtypes have reported that patients in the ADHD-C types demonstrate higher novelty seeking behavior, lower cooperativeness and a trend towards lower harm avoidance when compared with inattentive subtype patients [35]. In a study by Power and colleagues, the group displaying predominantly attention problems scored low on the domain of conscientiousness, while the hyperactivity–impulsivity domain was related to high extraversion [36]. Furthermore, the hyperactivity–impulsivity symptoms appeared to have associations with low agreeableness, while inattention–disorganization symptoms were more consistently associated with high neuroticism [36]. Based on these findings, *a priori* predictions of PG vulnerability based on adult ADHD subtype may reason that core symptoms associated with inattention, rather than hyperactivity–impulsivity, are experienced more commonly among this group, resulting in high internalizing problems, low self-concept and self-esteem, and interpersonal difficulties. In the present study, the investigators were specifically curious about how PGs who also exhibit characteristics of ADHD [37,38] might compare to PGs without ADHD symptoms.

Studies have shown that as many as 20–30% of PGs have a history of ADHD [21,22] and that individuals with persistent lifetime ADHD have higher rates of PG and increased gambling severity than individuals without ADHD [39]. Furthermore, studies investigating behavioral and trait impulsivity have found that PGs with ADHD self-report higher levels of trait impulsivity than their non-ADHD PG counterparts [22,40] and perform significantly worse on behavioral tasks measuring impulsivity, such as delayed gratification and inhibitory control [22]. Neurobiological studies support these findings by demonstrating that PGs and individuals with ADHD share analogous deficits in various neurotransmitter systems responsible for behavioral regulation [41–44]. These findings suggest that associated symptoms of ADHD may influence the trajectory, development and severity of PG [21,41,45]. Because a significant percentage of adult PGs exhibit ADHD symptoms, it is plausible that increased impulsivity in PGs may be related to ADHD symptoms rather than PG alone. Furthermore, other personality traits beyond impulsivity might exacerbate PG in patients with comorbid ADHD. To date, however, relatively few studies have explored these possibilities and little is understood about the psychosocial factors that may predispose individuals with ADHD to engage in PG behaviors.

The few studies that have examined the relationship between ADHD and PG have primarily used retrospective data, had insufficient sample sizes, and mainly focused on behavior and trait impulsivity constructs [19], neuropsychological deficits in attention and executive functioning [42], or gambling behaviors and patterns among PGs with reported ADHD symptoms. For example, a recent study investigating ADHD in a sample of treatment-seeking PGs and at-risk gamblers reported that PGs with a history of ADHD had lower levels of education, greater severity of PG, higher levels of gambling-related cognitive distortions, and similar patterns of neurocognitive deficits associated with impulsivity, attention, decision-making and processes related to reward and punishment [46]. While their results are informative about the unique sociodemographic, clinical and gambling characteristics of PGs with comorbid ADHD, their sample of convenience limited their findings [46]. Furthermore, while results from a longitudinal study by Breyer and colleagues demonstrated a positive link between the persistence of ADHD symptoms and gambling severity [37], there is still a dearth of literature exploring facets of personality beyond impulsivity that may influence PG behaviors among ADHD individuals.

Although the assessment of impulsivity in PGs with comorbid ADHD is important, it fails to provide sufficient understanding about the personality correlates of this unique subgroup that may have implications for vulnerability or maintenance of maladaptive gambling behaviors. Furthermore, impulsivity is not a unitary concept [47,48] and its multiple components have not been adequately evaluated among PGs with ADHD. Studies analyzing the influence of impulsivity in other comorbid psychiatric disorders common among PGs have observed diminished predictive variance of impulsivity between PGs with and without such comorbid disorders. For example, when comparing PGs

with and without comorbid substance abuse disorders (SUDs) with control participants, findings indicate that PGs, regardless of SUD history, report higher levels of behavior and trait impulsivity domains than controls. This variance, however, has not been observed between PGs with and without SUD [19]. Similarly, among other populations exhibiting behavioral dysregulation (e.g., hypersexuality), researchers have found that while deficits in impulse control are a primary feature of such disorders, trait impulsivity is eclipsed by other associated features among patients with ADHD (e.g., poor self-concept) in predicting levels of risky decision-making [49]. As such, impulsivity may function in very specific rather than general ways in populations with impulse-control disorders. More importantly, impulsivity as a personality trait appears to provide insufficient insight into the associated features of ADHD that may influence or exacerbate problematic gambling. As a result, a broader perspective on facets of personality among PGs with ADHD has the potential to offer valuable insight into unique challenges faced by this subgroup of PGs.

Previous studies using the Five-Factor Model (FFM) of personality [50–52] among otherwise healthy individuals with ADHD symptoms have reported negative correlations with the domains of Agreeableness and Conscientiousness, and positive correlations with Neuroticism. These domains reflect patterns of interpersonal difficulties, higher conflict, distrust for others, difficulties with self-esteem, lower self-discipline and motivation, and higher levels of emotional dysregulation. Although similar patterns have emerged in studies of PG and facets of personality [53–55], it is unclear what, if any, differences might emerge between a sample of ADHD PGs compared with PGs without ADHD symptoms. Thus, the present study sought to explore whether central characteristics related to ADHD (e.g., impulsivity) or other personality facets were associated more strongly with PG based on comorbid ADHD. Specifically, PGs with and without comorbid ADHD are compared across several facets of personality. Based on previous studies of personality and ADHD and studies examining personality and PG, we hypothesize that the most significant group differences will emerge on the domains of Neuroticism (e.g., emotional dysregulation) and Conscientiousness, with ADHD PGs showing more pronounced deficits across these personality traits. In addition, we predict to see a negative correlation with the Agreeableness domain in PGs with ADHD, based on previous findings.

Method

Participants

The subjects in this study consisted of a sample of adult men and women who participated in gambling studies conducted at the University of California, Los Angeles (CA, USA), from 2008 to 2011. Recruited through advertisements, participants were required to be at least 18 years of age, able to read and write English, and be free from any use of recreational or psychoactive drugs that met criteria for substance-related disorder. The sample demographic characteristics are presented in Table 1.

Measures

Mini International Neuropsychiatric Interview

The Mini International Neuropsychiatric Interview (MINI) is a structured diagnostic clinical interview used to assess DSM-IV-TR psychopathology along the Axis I domains and includes a module that assesses for adult ADHD [56]. It is widely used, and the psychometric properties have been established and reported in the literature. The brief clinical interview for psychiatric disorders takes approximately 15 min to administer and has been validated against other structured clinical interviews [56].

Adult ADHD Self-Report Scale

The Adult ADHD Self-Report Scale (ASRS) is an 18-item self-report scale that evaluates the manifestation of ADHD symptoms in adults [57]. Composed of questions consistent with the DSM-IV criteria for ADHD, the ASRS has demonstrated good reliability and validity, high internal consistency estimates (α = 0.88) [30] and high concurrent validity [58]. In the present sample, the alpha coefficients were high for the inattentive (α = 0.86) and hyperactive/impulsive (α = 0.83) scales. The scale consists of nine items to assess inattentive symptoms and nine items to assess hyperactivity symptoms and is answered on a five-point Likert-type scale ranging from zero (never) to four (very often).

The National Opinion Research Center DSM Screen for Gambling Problems

The National Opinion Research Center DSM Screen for Gambling Problems (NODS) was

Table 1. Sociodemographic characteristics of ADHD, non-ADHD, and both groups of pathological gamblers.

Demographic variables	ADHD PGs, % (n) n = 52	Non-ADHD PGs, % (n) n = 43	Total, % (n) n = 95
Age			
Mean (standard deviation)	42.4 (12.1)	44.1 (10.2)	43.2 (11.2)
Gender			
Male	67.3 (35)	74.4 (32)	70.5 (67)
Female	32.7 (17)	25.6 (11)	29.5 (28)
Race			
White	47.1 (24)	39.5 (17)	43.6 (41)
African–American	15.7 (8)	32.6 (14)	23.4 (22)
Asian	21.6 (11)	14 (6)	18.1 (17)
Hispanic	13.7 (7)	11.6 (5)	12.8 (12)
Other	2 (1)	2.3 (1)	2.1 (2)
Employment status			
Full-time	33.3 (17)	44.2 (19)	38.3 (36)
Part-time	19.6 (10)	18.6 (8)	19.1 (18)
Unemployed	29.4 (15)	25.6 (11)	27.7 (26)
Student	2 (1)	2.3 (1)	2.1 (2)
Other	15.7 (8)	9.3 (4)	12.8 (12)
Marital status			
Married	19.6 (10)	20.9 (9)	20.2 (19)
Separated	3.9 (2)	4.7 (2)	4.3 (4)
Single	60.8 (31)	46.5 (20)	54.3 (51)
Divorced	15.7 (8)	27.9 (12)	21.3 (20)

PG: Pathological gambling.

used to assess all participants for gambling-related disorders [59]. The NODS is a 17-item brief, valid and reliable structured interview scored against the DSM-IV criteria for PG, providing a composite score between zero and ten [60,61]. Participants who answer positively on five or more items are classified as PGs.

NEO Personality Inventory–Revised

The NEO Personality Inventory–Revised (NEO-PI-R) is a 240-item self-report questionnaire designed to measure the FFM of personality: Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness [62]. The NEO is answered on a five-point Likert-type scale ranging from strongly disagree to strongly agree and assesses 30 facets within each of the five dimensions of the FFM. NEO has been shown to have good reliability and validity [63] as well as convergent and discriminant validity [62]. The FFM traits have high reliability, stability, cross-cultural replicability and heritability [64].

Procedure

All participants completed a demographic survey, study measures and a diagnostic interview, and provided a urine toxicology screen. Subjects were assessed for psychopathology by a doctoral-level clinician using the MINI, NODS and ASRS. Participants were diagnosed with PG disorder, ADHD and other psychopathology based on the results of the structured interviews, psychological assessment measures and clinical judgment. For the present study, we attempted to match non-ADHD PGs with our sample of ADHD PGs based on age and gender. The study procedures were approved by the Institutional Review Board for Human

Subject Research, and all participants signed informed consents prior to participating. Each subject received US$40.00 in grocery store gift certificates for participation.

Data analysis & results

First, dependent variables that were conceptually related (e.g., facets of personality were grouped together) were subject to multivariate analyses of variance (MANOVA) to examine group differences. When significant differences were found, univariate *F* values were computed to determine which of the individual dependent variables showed group differences. We first examined whether there were group differences between subjects based on their age and their scores on the ASRS. Comparisons were also made for NODS to assess the degree of similarities across symptoms of PG. We next conducted a separate MANOVA comparing group differences on facets of personality within each of the five domains (i.e., Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness).

When we compared groups on ADHD symptoms and severity of gambling, as measured by the ASRS and NODS, respectively, differences emerged between ADHD PGs and non-ADHD PGs (Wilks' $\gamma = 0.39$; $F(2,92) = 72.1$; $p < 0.001$). As shown in Table 2, univariate analyses revealed that scores on both the ASRS and the NODS differed significantly between ADHD PGs and non-ADHD PGs. Although the effect sizes were large for symptoms of ADHD on the ASRS as we expected, differences between gambling symptoms as measured by the NODS yielded small effect sizes, suggesting the groups were somewhat comparable on their respective level of gambling severity. The means on the NODS scores suggest that both groups endorsed approximately seven out of ten possible symptoms for PG. The groups were not significantly different based on age (ns; $p = 0.474$). Finally, both groups had similar compositions of ratios based on gender.

Group comparisons on facets of personality within each of the five domains were conducted first at the domain level of the NEO-PI-R, and domains yielding significant differences were further examined at the facet level with univariate comparisons for each respective domain. Using this approach, group differences emerged for the domains Neuroticism, Openness and Conscientiousness (Wilks' $\gamma = 0.778$, $F[5,89] = 5.07$; $p < 0.001$]). Table 3 contains the scores for the facets of these domains with their respective means, standard deviations and effect sizes. Although facets on the domains of Extraversion and Agreeableness are not justified based on the results for our MANOVA, we have presented them in Table 3 for comparison and the interest of readers. As can be seen, some of the most notable group differences emerged on facets of personality associated with emotional instability found on the domain of Neuroticism, with ADHD PGs showing significantly higher scores on Vulnerability, Anxiety, Self-Consciousness and Depression compared with non-ADHD PGs. Several facets on the domain of Conscientiousness also yielded significant group differences, with ADHD PGs showing lower scores on Competence, Order, Achievement-Striving and Self-Discipline. Finally, ADHD PGs showed higher scores on the facets of Fantasy and Aesthetics when compared with non-ADHD PGs.

Our sample size failed to allow for analysis based on gender differences. We suggest that this did not limit our analysis substantially in any way as other studies have found more similarities than differences between men and women on facets of personality among patients with ADHD [49].

Table 2. Means, standard deviations, significance, and effect size for Adult ADHD Self-Report Scale and National Opinion Research Center DSM Screen for Gambling Problems scores.

	ADHD PGs, n = 52		Non-ADHD PGs, n = 43			Effect size
ASRS/NODS scores	**M**	**SD**	**M**	**SD**	**F**	**n^2**
ASRS total	40.62	8.0	22.91	5.9	143.54*	0.61
NODS total	7.96	1.7	7.2	1.7	4.76**	0.04

*$p \leq 0.001$.
**$p \leq 0.05$.
ASRS: Adult ADHD Self-Report Scale; M: Mean; NODS: National Opinion Research Center DSM Screen for Gambling Problems; PGs: Pathological gamblers; SD: Standard deviation.

Discussion

Significant differences emerged across a number of personality characteristics in our sample of PGs with and without ADHD. In particular, several facets reflecting Neuroticism were significantly higher among ADHD PGs, suggesting a greater tendency to experience negative emotions such as anxiety, worry, depression, sadness and loneliness compared with non-ADHD PGs. The ADHD gamblers also experienced greater levels of social discomfort, interpersonal sensitivity, feelings of inferiority and stress proneness. Surprisingly, however, group differences were unremarkable on the facet of Impulsiveness – a

Table 3. Means, standard deviations, significance, and effect size for NEO Personality Inventory–Revised scores.

	ADHD PGs, n = 52		Non-ADHD PGs, n = 43			Effect size
NEO domains/facets	**M**	**SD**	**M**	**SD**	**F**	**n^2**
Neuroticism	67.60	13.87	58.30	8.68	14.58***	0.14
Anxiety	62.56	12.31	54.63	9.92	11.61**	0.11
Angry/Hostility	62.71	12.89	57.93	11.57	3.55	0.04
Depression	65.69	11.12	59.49	10.18	7.9**	0.08
Self-Consciousness	61.12	12.42	53.84	9.43	9.96**	0.10
Impulsiveness	62.15	12.21	59.74	9.48	1.12	0.01
Vulnerability	67.71	15.86	56.98	11.30	13.87***	0.13
Extraversion	49.63	12.15	52.74	10.15	1.78	0.19
Warmth	44.46	13.55	45.91	11.74	0.30	0.00
Gregariousness	47.62	11.09	50.02	8.28	1.39	0.02
Assertiveness	48.10	12.27	55.79	9.47	11.32**	0.11
Activity	50.08	12.21	50.72	10.24	0.08	0.00
Excitement-Seeking	60.33	8.42	56.67	8.98	4.17*	0.04
Positive emotions	46.40	13.40	48.12	11.05	0.45	0.01
Openness	51.88	11.70	46.86	9.99	4.94*	0.05
Fantasy	57.27	10.36	50.42	7.76	12.83**	0.12
Aesthetics	51.40	10.68	46.95	11.01	3.97*	0.04
Feelings	53.81	13.15	49.79	9.38	2.82	0.03
Actions	47.73	11.60	46.84	9.87	0.16	0.00
Ideas	50.00	12.94	48.79	13.17	0.20	0.00
Values	48.81	8.78	48.86	10.32	0.001	0.00
Agreeableness	39.27	10.18	39.16	9.42	0.00	0.00
Trust	35.38	12.81	36.53	10.57	0.22	0.00
Straightforwardness	40.67	13.96	43.93	10.82	1.56	0.02
Altruism	42.52	12.76	47.37	12.36	3.5	0.04
Compliance	38.17	10.73	40.37	10.59	1	0.11
Modesty	49.87	10.06	44.40	11.09	6.35*	0.06
Tender-Mindedness	49.83	10.75	46.60	9.13	2.42	0.03
Conscientiousness	36.27	14.50	44.67	12.57	8.91**	0.09
Competence	35.42	14.08	44.63	11.99	11.49**	0.11
Order	43.23	12.31	48.95	11.97	5.21*	0.05
Dutifulness	36.79	12.18	41.44	10.72	3.82	0.04
Achievement-Striving	40.90	14.91	48.07	12.79	6.17*	0.06
Self-Discipline	31.19	13.42	42.88	12.33	19.22***	0.17
Deliberation	40.60	11.96	42.16	10.21	0.46	0.00

*$p \leq 0.05$.
**$p \leq 0.01$.
***$p \leq 0.001$.
Norming data means are T-scores = 50 with SD of 10.
M: Mean; PGs: Pathological gamblers; SD: Standard deviation.

finding that diverges from results noted in previous studies. One explanation for these differences is that the facet of Impulsiveness on the NEO-PI-R captures elements related to resisting cravings, overindulgence, giving in to impulses and controlling feelings, whereas other studies (especially those using objective tasks) often assess impulsivity associated with risk-taking and rapid decision-making. It is also plausible that gamblers experience a context-specific type of impulsivity in which delayed gratification is compromised in the wake of a gambling cue but otherwise remains intact with nonsalient stimuli. In such a case, both groups may feel equally that

impulsivity is a problem. It is noteworthy that both groups reported higher scores on the facet of Impulsiveness compared with the norming sample data for the NEO-PI-R, which is consistent with findings of greater impulsivity in PGs in general compared with healthy controls.

Group differences also emerged on the domain of Extraversion, with ADHD gamblers exhibiting greater levels of Excitement-Seeking tendencies and lower levels of Assertiveness. These findings suggest that PGs with ADHD crave excitement and enjoy action and doing things for 'kicks or thrills' significantly more than non-ADHD PGs. The lower assertiveness among gamblers with ADHD reflects a pattern of failing to assert oneself, having difficulty taking charge of situations and lacking leadership qualities. This finding has been noted in other studies examining adult ADHD, and this paucity of assertiveness may evolve from patterns of lacking self-confidence among individuals with ADHD [65].

The domain of Openness yielded significant differences for the facets of Fantasy and, to a lesser degree, Aesthetics. These data suggest that gamblers with ADHD, compared with non-ADHD gamblers, have greater tendencies to experience a vivid imagination and active fantasy life and may use daydreaming not only as a form of escape but also as a way to create an interesting inner world for themselves. Although the gamblers with ADHD showed significantly higher levels of appreciation for art, nature and music, as measured by the facet of Aesthetics, than non-ADHD PGs, the mean for both groups fell within an average range.

As noted in other studies of adult ADHD and personality, PGs with ADHD showed significantly lower scores on the domain of Conscientiousness compared with the non-ADHD PGs (although both groups showed lower scores compared with norming data for the NEO-PI-R). Assessment of these differences on the facet level suggests gamblers with ADHD often feel unprepared, lack self-esteem, experience difficulties with organization, and lack ambition in achievement-seeking activities or feel aimless in pursuit of their goals. Not surprisingly, large effect sizes were noted for the facet of Self-Discipline, with ADHD PGs showing greater tendencies to procrastinate, feel easily discouraged and experience difficulty following through on tasks to completion. It is important to note, however, that deficits in the facet of Self-Discipline were common to both groups.

Collectively, the findings from this study suggest that PGs with ADHD symptoms may experience some additional challenges compared with PGs without ADHD. Although both groups experienced difficulties in several areas compared with norming data (e.g., greater depression, higher impulsivity, lower self-esteem and lower self-discipline), these facets of personality were more pronounced in PGs with ADHD. Most notable among these differences are tendencies for gamblers with ADHD to experience greater levels of emotional instability, interpersonal sensitivity and stress proneness. ADHD PGs also appear to experience lower self-esteem, greater difficulty being assertive and lower levels of self-discipline. Thus, gambling for this group may serve as a maladaptive way to cope with stressful life situations and to regulate negative affective states significantly more than these tendencies noted among PGs without ADHD.

One compelling explanation for this behavioral pattern arises from observations of dissociative processes frequently experienced by problem gamblers [66–68]. In light of Jacobs' general theory of addictions [69], dissociation in problem gamblers has been suggested to occur as an emotional reaction to negative mood states, in which the gambler escapes from reality and experiences an altered state of awareness during gambling sessions [70]. Dissociation thus serves the function of detaching the gambler from reality and interrupting the continuity between thought and action; as a result, feelings of euphoria replace negative affect states and the gambler is able to maintain episodes of uncontrolled or excessive gambling without regard for consequences [71]. Such experiences have been described in terms of disengaging from reality or losing track of time [72]. Not surprisingly, Reid *et al.* found a significant positive association between frequency of gambling behaviors associated with escapism and facets of Neuroticism that reflect emotional distress [49]. It is therefore likely that associated characteristics of ADHD may exacerbate these facets of personality beyond those commonly found in PGs without ADHD. It is also probable that adverse financial, personal or vocational consequences of gambling may perpetuate excessive feelings of shame and inadequacy in this group, compounding the challenges of compensating for symptoms of ADHD, further discouraging achievement motivation and deterring them from participating in goal-oriented activities.

While the DSM-IV classifies PG as an impulse-control disorder, findings from our study suggest that additional factors should be considered for ADHD PGs. First, it should not be assumed that ADHD gamblers are significantly more impulsive than gamblers without ADHD. Although impulsivity is a salient feature of ADHD, our results suggest that marked psychological distress and maladaptive coping mechanisms, rather than loss of control over urges to gamble, may exert a disproportionate influence between symptoms of ADHD and PG. These results corroborate the findings among other populations with dysregulated behavior as noted by Reid *et al.* in their study of hypersexual patients with comorbid ADHD [49]. Such findings collectively suggest facets of personality other than impulsivity may exert an effect in precipitating or perpetuating addictive-like disorders. Thus, clinicians working with ADHD PGs should be mindful that some of the common challenges experienced by PGs may be exacerbated by comorbid ADHD. Concurrently, executive dysfunctions that are often demonstrated within adult ADHD populations [73], such as planning, strategizing and executing a task, may frustrate positive treatment outcomes, in addition to deficits in attention and vigilance, and impulsivity [74]. Because PGs with and without ADHD vary in their presentation and motivations for gambling, clinicians should also be aware that the two groups may have different levels of responsiveness to treatment. Therefore, treatment strategies that address both PG behaviors and underlying psychological vulnerabilities (e.g., coping skills) may be needed to optimize therapeutic outcomes for this population. Overall, a therapeutic model focusing on training in methods of time management, organizational skills, communication skills, decision-making, self-monitoring and reward, changing faulty beliefs and cognitions about the self and the world, and targeting anxiety and depressive symptoms may be most effective when treating this group of adults with ADHD.

Although this study was the first to investigate multiple personality facets among PGs with comorbid ADHD, several limitations need to be considered. First, the cross-sectional design of the study prevents us from drawing inferences about causality between ADHD symptoms and PG. Furthermore, our classification of ADHD was limited insofar as retroactive assessment of childhood symptoms was omitted in our samples. However, given that our data yielded similar results between ADHD and facets of personality as found in studies employing more rigorous methods to diagnose ADHD, we do not believe that our approach significantly impacted our findings. Furthermore, studies examining ADHD and personality have noted similar results with subthreshold ADHD samples. Still, future studies should investigate personality features of PGs with ADHD based on the persistence of ADHD longitudinally, using both behavioral and self-reported measures. These results need to be considered in the context of our design which attempted to closely match groups across several variables in order to reduce confounds. This approach allows us to draw stronger inferences about facets of personality based on ADHD as opposed to alternative factors. However, our sample size did not allow for analysis based on gender or ethnicity which should be considered in future studies.

Given that our data was drawn from both treatment-seeking and nontreatment-seeking populations of PGs, some confounds may have been introduced that were not accounted for. For example, personality differences between treatment-seeking and nontreatment-seeking populations have been suggested in the literature, with treatment-seeking individuals typically scoring higher on Neuroticism and lower on Conscientiousness than nontreatment-seeking individuals [75]. Others have also noted that treatment-seeking individuals typically present with higher levels of psychological distress [76]. Thus, it is possible that scores on measures of ADHD, PG and personality may have been affected by whether an individual was seeking treatment for PG or not. However, studies strictly examining facets of personality among PGs (treatment and nontreatment seeking) have noted similar scores on facets of personality. Notwithstanding these limitations, our study provides relatively novel insight about the associated facets of personality experienced to greater degrees by ADHD PGs and may provide hypothesis-generating theories for future consideration in studies examining vulnerability markers associated with the development, onset and severity of problematic gambling behaviors among individuals with ADHD. It would be interesting for future studies to extend these findings by examining how PG is related to the genetic and neurobiological correlates of ADHD. Future research should also consider how other

risk factors, such as environmental or situational stressors, might interact with ADHD dispositions and make some individuals more vulnerable to engage in or continue PG behaviors.

Conclusion & future perspective

Although we have learned a great deal from recent studies investigating personality in PGs, the findings from this study highlight the need to focus on specific subtypes of PGs such as those with co-occurring adult ADHD. These results suggest that PGs with adult ADHD experience unique challenges over and above those encountered by non-ADHD PGs. Future studies might evaluate effective treatment approaches to counter the negative associated characteristics found in this population. For example, studies focusing on pharmacological interventions, behavioral therapies, neurofeedback or mindfulness meditation would probably be useful in PGs with adult ADHD. Studies are also needed to illuminate interactive effects between gambling disorders and the symptoms of adult ADHD. Such research might help provide insight about whether there are developmental factors in ADHD that predispose individuals to developing gambling problems. Finally, neuroimaging studies might help provide greater understanding about the neurobiological mechanisms underlying adult ADHD and PG.

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Ethical conduct of research

The authors state that they have obtained appropriate institutional review board approval or have followed the principles outlined in the Declaration of Helsinki for all human or animal experimental investigations. In addition, for investigations involving human subjects, informed consent has been obtained from the participants involved.

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