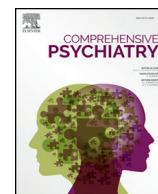Contents lists available at ScienceDirect

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The personality profile of chronic alcohol dependent patients with comorbid gambling disorder symptoms

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ABSTRACT

Background and aims: The importance of personality characteristics in the diagnosis and treatment of gambling disorder (GD) and alcohol use disorder (AUD) is often highlighted in scientific literature. This study aimed to test predictions about the associations of temperament and character in chronic AUD patients with comorbid GD symptoms and without them.

Methods: Chronic AUD patients enrolled from an inpatient clinic were divided in two groups based on cluster analysis, AUD patients with (AUD + GD group: $n = 30$) and without (AUD group: $n = 68$) GD symptoms. Severity of GD symptoms and personality dimensions (Cloninger's Temperament and Character Inventory Revised, TCI-R) were assessed. Associations of tested variables were analysed with analysis of covariance, one-sample and independent sample t-tests.

Results: GD symptoms proved to be a clustering factor in terms of personality, where AUD + GD group expressed a more maladaptive personality profile. Compared to Hungarian normative TCI-R scores, both patient groups showed elevated levels of Harm Avoidance and Novelty Seeking with lower scores of Self-directedness, while the AUD + GD group scored lower on Persistence and Cooperation as well. The AUD + GD group reported significantly higher levels of Harm Avoidance, with lower scores of Reward Dependence compared to the AUD group.

Discussion: Comorbid GD symptom severity is an important factor in chronic AUD, where AUD patients with comorbid GD symptoms exhibited a more maladaptive personality constellation than singular AUD patients. These emphasize the need of special attention for comorbid GD symptoms in AUD, since treatment recommendations and prognosis for them may also differ.

1. Introduction

Alcohol use disorder (AUD) and gambling disorder (GD) are documented to be highly comorbid [1], and are accompanied by shared aetiology, neurobiological features [2], psychiatric comorbidity [3], vulnerability factors and psychological risk factors [4]. Maladaptive personality correlates have also been reported in both disorders, and were hypothesized to convey vulnerability to developing AUD and GD [5–7]. One of the most frequently used frameworks to assess personality is Cloninger's Psychobiological Model of Personality. This model is derived from a cumulative synthesis of psychological, neurobiological and psychopathological knowledge [8–10]. Cloninger developed the Temperament and Character Inventory (TCI) and it was updated as the TCI-R to assess personality described in his model. The

questionnaire comprises of 4 temperament dimensions (Harm Avoidance [HA], Novelty Seeking [NS], Persistence [PS] and Reward Dependence [RD]) considered as the "biological core" of one's personality with heritable traits and childhood manifestation. There are three additional, so-called character dimensions (Self-transcendence [ST], Cooperativeness [CO] and Self-directedness [SD]), which cover traits acquired by social, environmental and cultural learning [8,11].

The model developed by Cloninger is regarded as a cornerstone of recent interpretations of the development, psychopathological factors and treatment directions of addictive behaviour, i.e. AUD and GD [12,13]. It is consistently reported that people who tend to be impulsive, disinhibited and exploratory have an increased risk of developing these disorders. Concerning AUD, Cloninger hypothesized a genetic connection between AUD and underlying neurophysiological processes. He discriminated three temperament dimensions with neurobiological underpinnings: NS, HA and RD, namely behavioural activation, inhibition and maintenance, which proved to be predictive in the development

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of AUD [14,15]. Compared to data from general population, several studies established differences in temperament and character: reporting that AUD patients showed higher NS with reduced scores on SD and CO compared to matched control groups [16–18].

In case of GD, literature is scarce, and findings are inconclusive concerning the personality traits described in Cloninger's model. Studies unanimously reported higher NS in GD; additionally, Kim and Grant [19] reported lower HA, while Martinotti et al. [20] documented higher ST with lower SD and CO scores. Fernández-Aranda et al. [21] indicated lower HA and SD scores in GD patients contrasted with individuals from the healthy population. Del Pino-Gutiérrez et al. [22] explored associations between personality traits and the extent of alcohol consumption in patients diagnosed with GD, and a correlation was found between higher alcohol consumption and lower SD. This underscores the need to better understand the overlap in AUD and GD in terms of personality dimensions.

In our literature search, we could not identify any study that addressed comorbid AUD and GD symptoms in terms of personality characteristics described in the model developed by Cloninger. Based on this, our intention was to explore whether GD symptoms comorbid with chronic AUD were associated with more maladaptive personality domains of Cloninger's psychobiological model than sole AUD patients. We presumed that GD symptom comorbidity was associated with higher NS and HA. We also assumed a difference between AUD patients and AUD patients with comorbid GD symptoms in terms of temperament and character dimensions compared to Hungarian normative sample scores, therefore AUD patients with comorbid GD symptoms presenting even higher NS and HA with lower RD than AUD patients without GD symptoms.

2. Methods

2.1. Participants and procedure

As part of a comprehensive research project, patients receiving inpatient treatment for addictive disorders were assessed for eligibility at the Department of Psychiatry, Faculty of Medicine, University of Szeged, Hungary between 2016 and 2018. Every patient from the department was enrolled who met the inclusion criteria of having an established DSM-5 diagnosis of alcohol use disorder (AUD) [23]. Patients who had a history of progressive neurodegenerative disorders, any psychosis spectrum disorders, neurological diseases or reported acute severe intoxication were excluded from this study. A total of 104 patients were assessed with the Addiction Severity Index [24] for addiction-related and demographic information and were enrolled if their general intellectual level was above intellectual disability (IQ 70+) measured with the Wechsler Adult Intelligence Scale, 4th Edition [25]. For a detailed description of exclusion and inclusion criteria and patient enrolment, see Kovács et al. [26]. One patient was removed from the sample due to untimely termination of treatment, another patient was removed due to the unsuccessful completion of the TCI-R, and four patients were excluded due to scoring low on the validity scale of the TCI-R, so the final sample size for the present analysis was 98. Cluster analysis of variables measuring addiction severity and personality was performed to determine clusters of the total sample. GD symptom severity based on the South Oaks Gambling Scale (SOGS) scores proved to be the dominant clustering variable, based on which two groups were formed: the AUD group ($n = 68$) comprising patients without GD symptoms (scoring 0 on the SOGS), and the AUD + GD group ($n = 30$) incorporating AUD patients with comorbid GD symptoms (scoring 1 or above on the SOGS). The study was conducted in accordance with the Declaration of Helsinki and was approved by the Human Investigation Review Board, University of Szeged (ethical approval number: 49/B-53/2016KK). Prior to enrolment, every patient signed an informed consent form.

2.2. Measures

2.2.1. Addiction-related and demographic variables and intelligence

Addiction Severity Index (ASI): It is a partially structured interview that was developed to assess 7 major problematic areas covering topics of alcohol, drugs, general medical history, employment status, social and familial situation, legal issues and previous psychiatric history, focusing on the details of lifetime and recent addictive problems [27]. The assessment tool was adapted to Hungarian by Rácz et al. [28]. From the ASI interview, the following demographic data were selected: age, gender, education, lifetime alcohol intake in years and age onset of regular alcohol consumption.

Wechsler Adult Intelligence Scale, 4th Edition (WAIS-IV): This assessment tool is the most commonly used assessment test to evaluate cognitive ability and intelligence. It measures four major components of cognitive ability by 10 subtests and 5 supplementary tests. These four domains are Processing Speed, Working Memory, Perceptual Reasoning and Verbal Comprehension [25]. The Hungarian normative standardization was conducted by Rózsa and Kő [29]. The present study utilized the WAIS-IV cumulative score generated from the values of the four subdomains.

2.2.2. Alcohol and gambling severity

Alcohol Use Disorders Identification Test (AUDIT): The AUDIT is a screening test containing 10 items for assessing drinking behaviour, the degree of alcohol intake and the existence of problems connected to excessive alcohol consumption [30]. The Hungarian version was adapted by Gerevich et al. [31].

South Oaks Gambling Screen (SOGS): This tool is developed by core symptoms assessing pathological gambling severity found in the DSM-III [32]. This assessment tool comprises of twenty items, where scores between 1 and 4 indicate problematic gambling. Patients with 1 or 2 points on the SOGS are characterized with minimal or few gambling problems [33]. Schaffer and Hall [34–36] have recommended that participants with any level of gambling symptoms below the diagnostic cut-off point (SOGS scores of 1–4) should belong to the "at risk" or "problematic" gambling group, while Weinstock, Ledgerwood, and Petry [37] suggest that SOGS ≥1 indicate symptomatic gamblers. SOGS scores of 5+ show probable pathological gambling. The Hungarian version of the screening test was made by Gyollai et al. [33]. To evade the identification of false positive results on the SOGS (i.e. scoring above 0 on the SOGS when the underlying condition of clinical and/or subclinical GD is absent), the tool was administered via interview conducted by a trained clinician.

2.2.3. Personality dimensions

Temperament and Character Inventory-Revised (TCI-R): The TCI-R is a self-rated assessment scale, which includes 240 items that can be rated on a scale of 1 to 5 measuring seven dimensions of personality [11]. The questionnaire distinguishes 4 temperament (Persistence [PS], Reward Dependence [RD], Harm Avoidance [HA] and Novelty Seeking [NS]), and 3 character (Self-transcendence [ST], Cooperativeness [CO] and Self-directedness [SD]) factors. Scientific literature reported high validity and reliability for the TCI and its revised adaptation [38–41], while the assessment of the psychometric qualities of the TCI-R in Hungary is currently in progress. In this study, AUD and AUD + GD group scores were compared to Hungarian normative scores.

2.3. Data analysis

To test study variables, IBM SPSS Statistics 24.0 software [42] was used. Cluster analysis of variables measuring addiction severity and personality was performed to determine clusters of the total sample. GD symptom severity based on the SOGS scores proved to be the dominant clustering variable, based on which two groups were formed: the AUD group comprising patients without GD symptoms (scoring 0 on the

SOGS), and the AUD + GD group incorporating AUD patients with co-morbid GD symptoms (scoring 1 or above on the SOGS).

Independent-samples *t*-tests were utilized for determining group differences of continuous variables and Chi-square tests were performed for contrasting categorical demographic data. Clusters of gambling symptom severity and personality dimensions were identified using Two-Step Clustering algorithm, with the use of hierarchical clustering design. The Bayesian information criterion (BIC) was utilized to single out the most applicable cluster solution, where smaller values of the BIC indicate the better model. TCI-R T-scores of patients were calculated based on gender and age groups of the Hungarian normative scores [40,41]. T-scores of the AUD and AUD + GD groups were compared in one-way analysis of covariance (ANCOVA) with the AUDIT score as a covariate, and group scores were contrasted with the T-scores of the Hungarian normative sample (T-Score: 50, SD = 10) in one-sample *t*-tests. Finally, Hedge's g was calculated for exploring the effect sizes of the groups.

3. Results

3.1. Grouping and personality profiles based on cluster analysis of the sample

Two-Step cluster analysis was performed with all temperament and character variables assessed with the TCI-R, severity of alcohol misuse measured by the AUDIT and gambling symptom severity measured with the SOGS as predictor variables. Two clusters were identified, where gambling symptom severity proved to be the most important predictor. Silhouette measure of cohesion and separation was fair (s_i = 0.3). Fig. 1 details profile differences based on the median scores of the two clusters. Therefore, based on the result of the cluster analysis, two groups (AUD and AUD + GD) were formed. Based on the overall median scores of TCI-R dimensions, the AUD group showed higher scores of CO, RD, PS and SD, and lower scores of NS and HA compared to the AUD + GD group.

3.2. Group differences and gambling prevalence in the sample

The AUD and AUD + GD group differed only in the severity of alcohol consumption measured with the AUDIT. The AUD + GD group scored significantly higher on the AUDIT total scores (see Table 1). In the AUD + GD group, the prevalence of patients with problematic gambling symptoms was 53.33% (n = 16), while the prevalence of patients with probable GD was 46.67% (n = 14).

3.3. Comparison of normative sample scores and patient group differences in TCI-R dimensions

The AUD group showed significantly higher NS (t = 2.458, p = 0.018, Hedges' g = 0.294) and HA (t = 3.073, p = 0.003, Hedges' g = 0.384) and lower SD (t = −5.463, p ≤ 0.001, Hedges' g = −0.663) scores than the Hungarian normative sample scores (T-score for each dimension is 50, SD = 10), while the AUD + GD group scored higher on NS (t = 4.160, p ≤ 0.001, Hedges' g = 0.553) and HA (t = 4.319, p ≤ 0.001, Hedges' g = 0.756) and resulted in significantly lower scores of PS (t = −2.205, p = 0.036, Hedges' g = −0.433), CO (t = −2.896, p = 0.007, Hedges' g = −0.687) and SD (t = −4.988, p ≤ 0.001, Hedges' g = 0.928) than the T-scores of the Hungarian normative sample. In case of group comparisons of the AUD and AUD + GD groups, controlled for the AUDIT scores, there was significant difference between HA ($F(82, 14)$ = 6.683, p ≤ 0.001, Hedges' g = 0.409), and significant difference on the level of tendency between RD ($F(70,26)$ = 1.712, p = 0.064, Hedges' g = 0.411) between group scores of AUD and AUD + GD. No differences were found between NS ($F(75, 21)$ = 1.115, p = 0.404), ST ($F(74,22)$ =
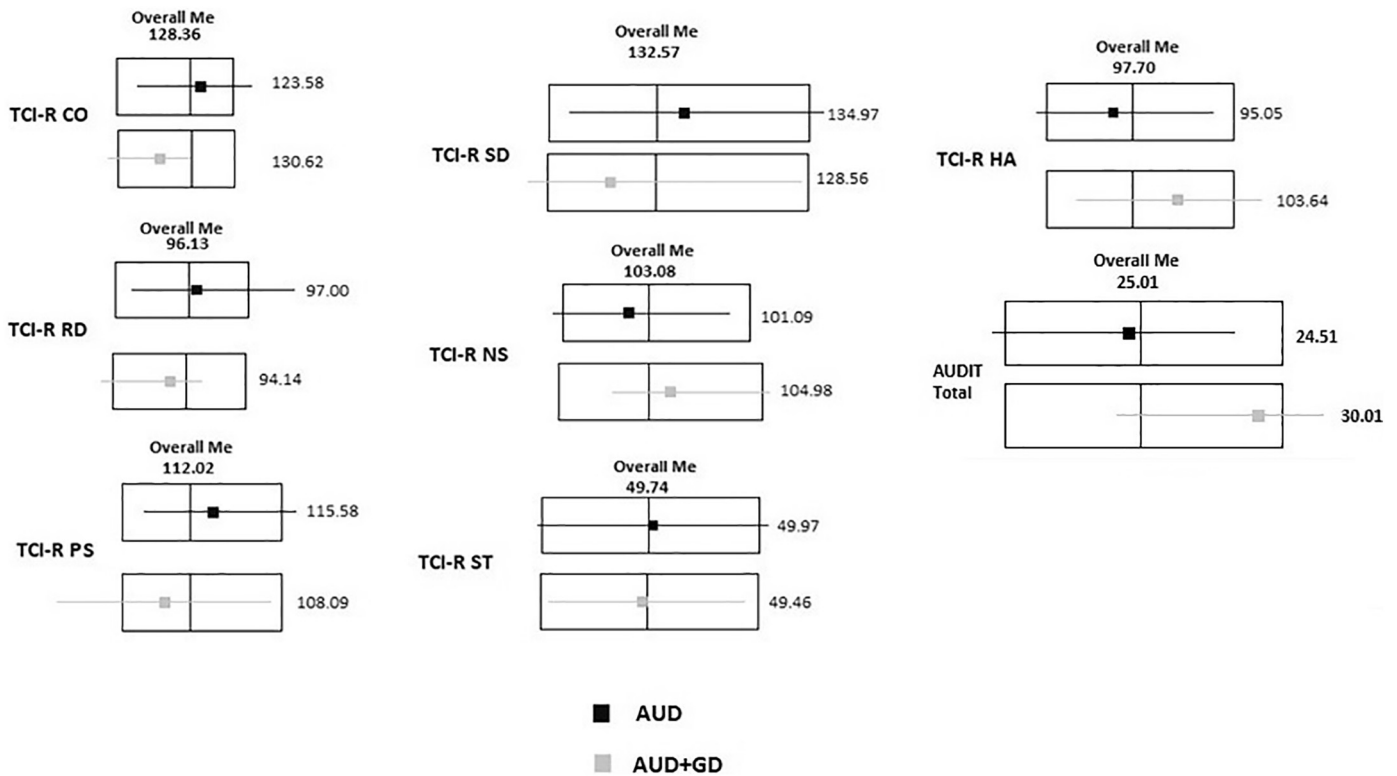

Fig. 1. Differences of median scores of TCI-R dimensions. AUD: alcohol use disorder patients without gambling symptoms; AUD + GD: alcohol use disorder patients with gambling disorder symptoms; Overall Me: overall median score; TCI-R NS: Temperament and Character Inventory Novelty Seeking subscale; TCI-R HA: Temperament and Character Inventory Harm Avoidance subscale; TCI-R RD: Temperament and Character Inventory Reward Dependence subscale; TCI-R PS: Temperament and Character Inventory Persistence subscale; TCI-R SD: Temperament and Character Inventory Self-directedness subscale, TCI-R CO: Temperament and Character Inventory Cooperativeness subscale; TCI-R ST: Temperament and Character Inventory Self-transcendence subscale.

Table 1
Sample characteristics of study groups.

	AUD (n = 68)	AUD + GD (n = 30)	
Age (*SD*)	45.15 (*9.60*)	46.60 (*11.53*)	$t(96) = -0.648, p = 0.615$[b]
Gender (M%)	72.1%	83.3%	$X^2(2) = 0.974, p = 0.244$[a]
Education% (primary/secondary/higher)	5.9%/70.6%/23.5%	10.00%/73.3%/16.7%	$X^2(2) = 1.431, p = 0.232$[a]
Age onset of regular alcohol consumption (*SD*)	25.28(*9.49*)	22.70(*11.72*)	$t(96) = 1.151, p = 0.253$[b]
Lifetime alcohol consumption in years (*SD*)	16.96(*9.86*)	21.40(*11.74*)	$t(96) = -1.928, p = 0.057$[b]
Severity of gambling symptoms	0(*0*)	4.83(*3.54*)	
SOGS Total (*SD*)			
WAIS-IV Ttl IQ (*SD*)	92.57(*14.99*)	90.33(*16.28*)	$t(96) = 0.664, p = 0.508$[b]
AUDIT Total (*SD*)	23.51(*7.43*)	28.03(*6.36*)	**$t(96) = -2.893, p = 0.005$**[b]

AUD: alcohol use disorder patient group, AUD + GD: alcohol use disorder patient group with gambling disorder symptoms; SOGS Total: South Oaks Gambling Scale total score; WAIS-IV Ttl IQ: Wechsler Adult Intelligence Scale IV total score; AUDIT Total: Alcohol Use Disorders Identification Test cumulative score.
[a] Chi-square test, [b]Independent sample *t*-test.

0.887; $p = 0.660$, CO ($F(74.22) = 0.826$; $p = 0.734$), PS ($F(75,21) = 0.940, p = 0.596$) and SD ($F(73,23) = 1.304$; $p = 0.241$) between scores of the AUD and the AUD + GD groups (see Fig. 2).

4. Discussion and conclusion

In this study, chronic AUD patients were assessed in terms of addiction-related symptom severity and personality dimensions. Gambling symptom severity was evaluated by the South Oaks Gambling Scale (SOGS) and personality dimensions were measured by Cloninger's Temperament and Character Inventory (TCI-R) to

identify whether comorbid GD symptoms are related to a more maladaptive personality constellation.

In our sample, GD symptom severity proved to be the dominant clustering factor, based on which patients were divided into AUD and AUD + GD groups to evaluate differences in terms of personality profiles. Compared to Hungarian normative sample, both AUD and AUD + GD groups showed higher Novelty Seeking (NS) and Harm Avoidance (HA) with lower Self-directedness (SD), while the AUD + GD group had lower scores on Persistence (PS) and Cooperation (CO) as well. Cloninger [43] proposed a novel approach to personality disorders, in which he introduced the concept of temperament
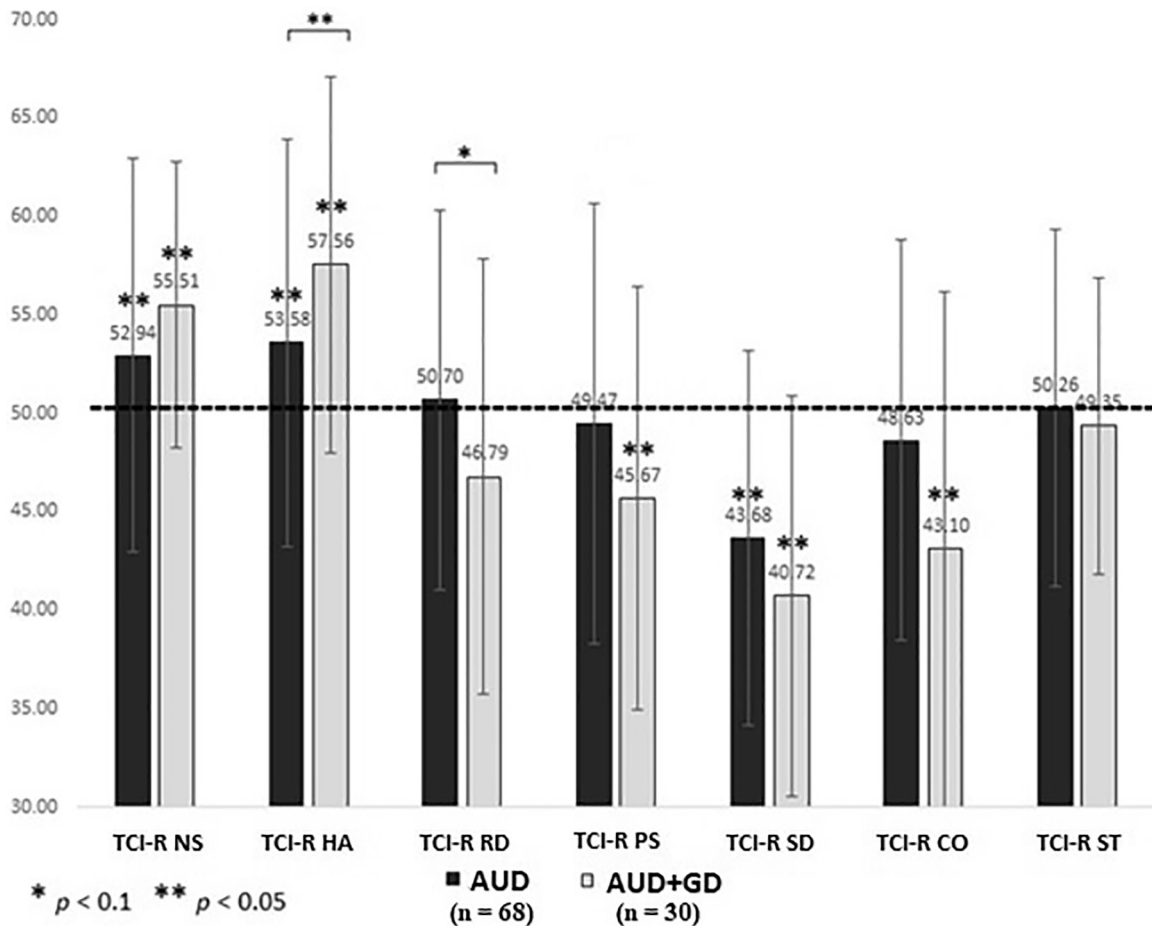

Fig. 2. TCI-R dimensions in AUD and AUD + GD group compared to normative sample T-score. */** indicate difference from normative sample T-scores, brackets with significance sign indicate significant difference between patient groups; AUD: alcohol use disorder patients without gambling symptoms; AUD + GD: alcohol use disorder patients with gambling symptoms; TCI-R NS: Temperament and Character Inventory Novelty Seeking subscale T-scores; TCI-R HA: Temperament and Character Inventory Harm Avoidance subscale T-scores; TCI-R RD: Temperament and Character Inventory Reward Dependence subscale T-scores; TCI-R PS: Temperament and Character Inventory Persistence subscale T-scores; TCI-R SD: Temperament and Character Inventory Self-directedness subscale T-scores; TCI-R CO: Temperament and Character Inventory Cooperativeness subscale T-scores; TCI-R ST: Temperament and Character Inventory Self-transcendence subscale T-scores; dashed line: Hungarian normative sample T-scores.

and character constellations, offering a potential alternative to the previously existing view of utilizing distinct categories of personality disorders. He described that lower SD with lower CO were core features in personality disorders, accompanied by low affective stability and low ST. Low SD is characterized by having difficulties in accepting responsibilities, by chronically low self-esteem and the lack of having long-term goals in life. While low CO is described with poor interpersonal functioning, being intolerant and hostile. Underdeveloped personality traits and the potential of personality disorders elevate the chance of developing addictive disorders; additionally, such psychological factors as maladaptive personality constellations play an important role in the treatment prognosis of AUD and GD as well. It has been documented that maladaptive personality functions are predictors of relapse, while maturing personality can serve as a protective factor against relapse [44–46]. Moreover, AUD patients with comorbid GD symptoms reported more severe alcohol consumption than AUD patients without GD symptoms. This result conforms to previous literature, since extensive scientific data reported that higher rates of alcohol use is connected to concurrent GD [26,47,48].

In our analysis, controlled for the severity of alcohol consumption measured by the AUDIT scores, the AUD + GD group had significantly higher HA accompanied with lower values of RD compared to the AUD group. As previously highlighted, the constellation of these personality traits is considered to be maladaptive, since these are closely linked to personality disorders [43,49], and to being susceptible to developing addictive disorders. Concerning AUD, high NS and lower PS turned out to be the most steady scales linked to Cloninger's model [50]. Cloninger et al. [51] emphasized that these traits together in childhood predicted the chance of excessive consumption of alcohol in later life. There are rich data on RD as a dominant factor associated with AUD. On this notion, Cloninger separated two types of alcoholism based on personality dimensions: Type 1 is considered as "loss of control" drinking, characterized by high HA and low NS, while Type 2 alcoholism is represented with high NS, low HA and RD, with characteristics of spontaneous alcohol-seeking behaviour, more severe problems with abstaining from drinking, associations with antisocial personality and high rate of having first-degree relatives with AD [52,53]. However, findings of GD and TCI personality characteristics are scarce, and results are inconclusive. On one hand, some studies did not document elevated NS as a form of trait impulsivity in GD patients [54], while other scientific reports indicated higher NS and HA as trait-like characteristics in GD [55,56].

Concerning the interpretation of the present study, a number of limitations should be accounted for. While DSM-5 diagnosis of AUD was established, a clinician-confirmed diagnosis of GD was not available for the AUD + GD group, who were evaluated instead by a widely used and validated self-report assessment scale, the SOGS, administered in the form of a clinical interview. Numerous prevalence studies have been conducted in which the SOGS was used as a primary indicator of the existence of GD symptoms, i.e. GD status [57,58]. It is also important to note, that in this study, GD symptoms were considered in case of scoring 1+ on the SOGS. The rationale for that is that the traditional scoring of the SOGS determines a score of 5 or above as probable GD, while subclinical GD symptoms are reflected by the scores above 0. However, some scientists argue that only scores of 5+ should be considered as the presence of GD symptoms [57], and others even argue that the cut-off score should be raised even higher [58].

It also needs to be acknowledged that GD itself is a heterogeneous condition, and the preferred form of gambling activity (e.g. slot machine play or lottery) may certainly impact upon personality. In addition, due to smaller sample size, this study did not make a distinction between potential gambling subtypes, which may present similar cognitive distortions, processes and personality traits, while representing distinct sets of additive risk factors, such as accompanying psychiatric conditions with specific features that may influence GD.

Our results offer a novel insight into the distinct personality constellations presenting an additive maladaptive effect in case of AUD comorbid with GD symptoms. It has been demonstrated that multimodal treatment approaches that focus on developing personality have beneficial effects on relapse prevention and treatment outcomes [44,59]; hence a more extensive understanding of the nature of the connection between temperament and character constellation in AUD comorbid with GD symptoms may provide a greater insight into the development of more effective, target-specific prevention and treatment programs.

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Declaration of competing interest

None.

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