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Research Article

N-acetylaspartate, Gamma-Aminobutyric Acid, and Glutamate in Narcissistic and Antisocial Personality Disorders and Healthy Controls: A Cross-Sectional Comparative Study

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ABSTRACT

Narcissistic and antisocial personality disorders are complex psychological conditions characterized by enduring and maladaptive patterns of thinking, emotions, and behavior, with substantial biological differences. Alterations in N-acetyl aspartate (NAA), gamma-aminobutyric acid (GABA), and glutamate (Glu) may be associated with the neurobiological underpinnings of Narcissistic and Antisocial Personality Disorders. These neurometabolites play crucial roles in emotional regulation and impulse control. The present study aimed to investigate the metabolic differences between individuals with these two personality disorders and healthy controls. In a cross-sectional study, 180 participants, including 60 with narcissistic personality disorder, 60 with antisocial personality disorder, and 60 healthy controls, underwent proton magnetic resonance spectroscopy (1H-MRS) to measure and compare the concentrations of the neurometabolites NAA, GABA, and Glu in the anterior cingulate cortex (ACC) and left orbitofrontal cortex (OFC). Our results indicated significant group differences in the GABA/Cr and Glu/Cr ratios in the OFC region and in the NAA/Cr and GABA/Cr ratios in the ACC ($p < .001$). Specifically, GABA levels were reduced in both personality disorders compared to the control group, whereas glutamate levels were increased. The present study demonstrates that reduction of GABA and the increase of Glu in the OFC, along

with the decrease of NAA and GABA in the ACC, may result in neuronal functioning impairment in patients with narcissistic and antisocial personality disorders, in comparison with the control group. This may contribute to a better understanding of these disorders and improve diagnosis and treatment efficacy.

Keywords: narcissistic personality disorder, antisocial personality disorder, metabolite, proton magnetic resonance spectroscopy

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Introduction

Personality disorders are organized into three clusters (A, B, C) based on shared phenomenological and etiological characteristics, as outlined in the DSM-5 (American Psychiatric Association, 2013). Cluster B disorders, encompassing narcissistic personality disorder (NPD) and antisocial personality disorder (ASPD), are characterized by emotional dysregulation, impulsivity, and interpersonal dysfunction. Contemporary models, such as the Alternative Model for Personality Disorders, emphasize dimensional traits like grandiosity and callousness for NPD and ASPD, respectively, which may stem from shared neurobiological underpinnings (Widiger & McCabe, 2020). Despite their overlap, NPD and ASPD differ in motivational drivers (i.e., self-enhancement versus external reward-seeking), leading to distinct behavioral outcomes (Miller et al., 2009). Prior studies highlight their high comorbidity but also note unique consequences, such as NPD's association with interpersonal hypersensitivity and ASPD's link to aggression (Mancke et al., 2018). These findings suggest that neurobiological differences in regions such as the anterior cingulate cortex (ACC) and orbitofrontal cortex (OFC), implicated in emotion regulation and decision-making, may underlie their distinct profiles, necessitating targeted investigation.

The prominent features of these disorders include impulsivity, aggression, and irritability, which can lead to disregarding the safety of others and engaging in risky lifestyles. These characteristics not only affect the individual but also create medical and psychological problems (e.g., chronic stress, anxiety or depressive disorders, and somatic complaints) for those in their social environment (Douzenis et al., 2012). Overall, these disorders impose significant social consequences and costs on society (Helle et al., 2019).

Narcissistic personality disorder is associated with a sense of grandiosity and a lack of empathy for others. Individuals with this disorder typically feel superior to others and have a strong need for attention and admiration. They may exploit others to achieve their goals (First et al., 2022) and consider themselves above others, expecting others to accept this view. This disorder can lead to unstable relationships and emotional problems (Phillips et al., 2012). Individuals with narcissistic personality disorder often

seek to impress others and may demonstrate arrogant and self-centered behaviors. They are highly dependent on others' admiration, and if this admiration is not forthcoming, they may experience anger or depression. These individuals are also extremely sensitive to criticism and may react strongly (Stoffers-Winterling et al., 2022).

Neuroimaging studies have implicated the ACC and OFC in the pathophysiology of Cluster B disorders, with evidence suggesting altered neurometabolite concentrations in these regions. For instance, reduced N-acetylaspartate (NAA) levels in the ACC have been associated with impaired neuronal integrity in ASPD (Smaragdi et al., 2019), while altered gamma-aminobutyric acid (GABA) and glutamate (Glu) levels in the OFC correlate with impulsivity and emotional dysregulation in NPD (Atmaca et al., 2014). These neurometabolites, measured relative to creatine (Cr) via multi-voxel spectroscopy, reflect neuronal health (NAA), inhibitory control (GABA), and excitatory signaling (Glu). However, few studies have directly compared NAA/Cr, GABA/Cr, and Glu/Cr ratios across NPD, ASPD, and healthy controls, limiting our understanding of their neurochemical distinctions. Building on these findings, this study hypothesizes that differential neurometabolite profiles in the ACC and OFC may elucidate the neurobiological basis of NPD and ASPD, contributing to refined diagnostic and therapeutic approaches.

Personality disorders have biological and environmental roots (Schermer et al., 2020). Identifying these factors and understanding the associated neural mechanisms can lead to the development of accurate diagnoses and new, effective treatment methods. One of the most important biological mechanisms involves neurometabolites and biomarkers, which can be explored using proton magnetic resonance spectroscopy (1H-MRS).

1H-MRS is a unique, non-invasive, and non-radioactive method for measuring the levels of neurometabolites in specific brain regions in living tissue. This technique can provide more accurate information about neural abnormalities at the cellular and metabolic levels compared to relatively general volumetric estimates. The neurometabolites identified by 1H-MRS primarily include N-acetyl aspartate (NAA), choline (Cho), myo-inositol (mI), Creatine (Cr), and others (Du et al., 2023). In a study conducted by researchers using MRS, individuals with antisocial personality disorder

exhibited a significant reduction in the Glu to GABA ratio in the striatum compared to the control group (Tully et al., 2024). Disruption in the Glu/GABA balance in the striatum may be linked to impulsive and aggressive behaviors in these individuals.

As observed, cellular metabolites in the brain can indicate certain behavioral problems and disorders. Since narcissistic and antisocial personality disorders share many similar behavioral characteristics, such as a lack of empathy, aggressive, and impulsive behaviors, they are sometimes misdiagnosed or incorrectly diagnosed simultaneously. Therefore, the current research aimed to investigate the comparison of neurometabolites NAA, GABA, and Glu in narcissistic and antisocial personality disorders and healthy controls. We targeted the left ACC and the left OFC, which play significant roles in regulating behavior and emotions, and examined the ratio of concentrations of the NAA, GABA, and Glu to Cr using multi-voxel spectroscopy in the present cross-sectional study.

Method

Participants

We determined our sample size using a priori power analysis with a desired power of 80%, a significance level (alpha) of 0.05, and an expected effect size of 0.5 based on prior research. This yielded a required sample size of 55 participants per group. Considering a potential 10% dropout rate [or attrition/non-participation, if more accurate], we increased the target sample size to 60 participants per group to ensure adequate statistical power. In this cross-sectional study with a control group, a total of 180 participants were included: 60 individuals with narcissistic personality disorder (NPD), 60 with antisocial personality disorder (ASPD), and 60 healthy controls. The three groups were matched in terms of age, education, and sex.

The clinical subsample (NPD and ASPD) was recruited from multiple psychiatric outpatient clinics in Tehran, Iran, between November 2024 and April 2025 . Individuals presenting for psychiatric assessment and treatment (outpatients) were screened. Participants were assessed using a clinical interview and the Millon Clinical Multiaxial Inventory–III (MCMI-III). We

initially screened 210 individuals. Of these, 193 met the study's eligibility criteria (89 NPD and 104 ASPD). The relatively high number of eligible ASPD cases (104) likely reflects the nature of the recruitment setting (multiple outpatient clinics) and our systematic screening approach over a six-month period (aimed at identifying individuals who met strict inclusion criteria), rather than the general prevalence of ASPD in the outpatient population.

For the clinical groups, inclusion criteria were: (1) a diagnosis of NPD or ASPD confirmed by clinical interview and MCMI-III (base rate score > 85), (2) absence of comorbid psychiatric disorders (assessed via clinical interview and review of existing records where available), (3) no history of psychiatric hospitalization or electroconvulsive therapy, (4) no history of head trauma, brain tumor, or chemotherapy, and (5) no claustrophobia. Exclusion criteria included refusal to undergo the procedure, alcohol/drug/stimulant use within the two weeks prior to assessment, and having received more than five psychotherapy sessions.

Of the 89 eligible individuals with NPD, 60 who were available and willing to take part in the study were selected. Similarly, of the 104 eligible individuals with ASPD, 60 who met the inclusion criteria, were available, and were demographically comparable to the NPD group were selected for the ASPD group.

Healthy controls were recruited via announcements at universities in Tehran. Sixty individuals matched to the patient groups in age, education, and sex were included. Controls had no current or past psychiatric disorders (based on screening interview and MCMI-III scores below 25 across all scales).

The study protocol was approved by the Ethics Committee of Mohaghegh Ardabili University (Approval code: IR.UMA.REC.1403.030) and conducted in accordance with the Declaration of Helsinki. All participants provided written informed consent prior to participation.

Imaging

Both MRI and 1H-MRS were conducted using a Discovery MR 750 MRI scanner with a strength of 3.0 Tesla (General Electric) and a standard gradient system. An 8-channel standard coil was used for transmitting and receiving the MR signal. The participant was positioned supine (lying on their

back), with the nasion marked as a reference point. Earplugs and foam pads were utilized to reduce noise and minimize head movement. T1-weighted MR images with fluid attenuation (T1 FLAIR) were routinely obtained with a repetition time (TR) of 1800 milliseconds and an echo time (TE) of 24 milliseconds, while T2-weighted MR images with fast spin echo were acquired with a TR of 4500 milliseconds and a TE of 120 milliseconds to confirm the absence of any structural or signal abnormalities in the brain.

The magnetic resonance imaging protocol in axial plane was performed using a T2-weighted fast spin-echo (FSE) sequence with a repetition time (TR) of 5000 milliseconds, echo time (TE) of 113 milliseconds, number of excitations (NEX) of 2, slice thickness of 5 millimeters, slice gap of 0 millimeters, totaling 18 slices, with a field of view (FOV) of 24 centimeters and a matrix size of 256 × 256 to provide an anatomical template for the placement of MRS voxels.

The volume of interest (VOI) for analysis was determined by an experienced spectroscopy specialist, using anatomical reference points in the left ACC and OFC to ensure accurate and consistent placement. All VOIs were positioned away from the lateral ventricles and cerebrospinal fluid found in the sulci or skull. The VOI size included 50 nominal voxels (7.5 × 7.5 × 10 cubic millimeters).

The imaging parameters were as follows: TR = 1000 milliseconds; TE = 144 milliseconds; Number of excitations = 1; Spatial matrix = 18 × 18; Field of view = 240 × 240 mm^2; Slice thickness = 10 mm; Nominal voxel size = 7.5 × 7.5 × 10 cubic millimeters.

Additional saturation bands were placed outside the VOI to minimize lipid contamination from the scalp. Before each spectroscopy scan, an automatic pre-scan was performed to achieve an optimal maximum full width at half maximum of 10 Hertz. The imaging time for the 1H-MRS sequence was 5 minutes and 28 seconds.

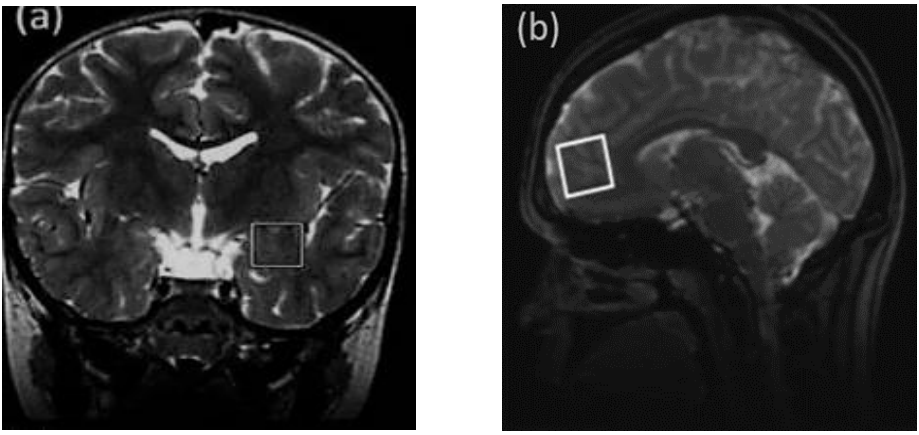
Spectral data analyses were conducted using the GE 3.0 T tool in the workstation (Sun, Advantage Windows ADW4.5). Distribution maps of various metabolites were obtained, and these maps were then merged with MRI images to produce the 1H-MRS curves. The software automatically

performed phase correction, frequency encoding, and baseline correction for the spectrum.

The internal MRI scanner software automatically calibrated the baseline, averaged the signal, and identified the metabolites, measuring the peak areas of NAA, GABA, and Glu in the ACC and OFC, and calculating the ratios of NAA/Cr, GABA/Cr, and Glu/Cr. A trained radiologist, unaware of each patient's diagnosis, conducted the placement of voxels for spectroscopy and all data analyses (Figure 1).

Figure 1

Location of Magnetic Resonance Spectroscopy Voxels in the OFC and ACC



Note. The MRI scan (a) shows the location of Magnetic Resonance Spectroscopy (MRS) in the left OFC and the area of voxel placement. The MRI scan (b) shows the location of Magnetic Resonance Spectroscopy (MRS) in the ACC and the area of voxel placement.

Statistical Analysis

Statistical analyses were performed using SPSS version 20, with a significance level set at .05 (two-tailed). Variables were assessed for normal distribution using the Kolmogorov-Smirnov goodness-of-fit test. Groups that differed in demographic, clinical, and metabolic variables were examined using parametric tests (t-test or one-way analysis of variance [ANOVA]) if the continuous variables were normally distributed, or non-parametric tests (Mann-Whitney test or Kruskal-Wallis test) if the continuous variables were

skewed. One-way ANOVA, along with Bonferroni correction, determined which groups were responsible for the differences. Correlation coefficients between abnormal neurotransmitter ratios and clinical data were calculated using Pearson correlation (for normally distributed variables) or Spearman correlation (for skewed variables).

Results

The chi-square test showed no significant group differences in the women-to-men ratio. Moreover, the results of one-way ANOVAs showed no significant group differences in years of age and years of education (for details, see Table 1).

Table 1

Demographic Characteristics of the Study Groups

Variable	NPD	ASPD	Control	*p*
Sex (Male/Female)	41/19	45/15	43/17	.72
Age, *M* (*SD*)	26.95 (4.39)	27.43 (5.22)	27.16 (5.19)	.86
Education, *M* (*SD*)	18.67 (7.63)	18.16 (8.99)	18.59 (6.44)	.93

Note. NPD = Narcissistic Personality Disorder; ASPD = Antisocial Personality Disorder.

The group differences in neurometabolite ratios (i.e., NAA/Cr, GABA/Cr, and Glu/Cr) in the OFC and ACC were examined using a series of one-way ANOVAs.

Regarding OFC, the results showed significant group differences in the concentrations of GABA/Cr and Glu/Cr, while no significant differences in NAA/Cr concentration were found (for details, see Table 2). The Bonferroni test was used to further examine the significant group differences in GABA/Cr and Glu/Cr. The results showed statistically significant differences in GABA/Cr ratio between the narcissistic personality disorder group and the control group ($p < .0167$), between the antisocial personality disorder group and the control group ($p < .0167$), and also between the two personality disorder groups ($p < .0167$). Moreover, statistically significant differences in the Glu/Cr ratio were also found between the narcissistic personality

disorder group and the control group ($p < .0167$), the antisocial personality disorder group and the control group ($p < .0167$), and between the narcissistic and antisocial groups ($p < .0167$).

In the left ACC region, on the other hand, significant group differences were found in the concentrations of NAA/Cr and GABA/Cr but not Glu/Cr (Table 2). According to the results of the Bonferroni test, the NAA/Cr ratio was significantly different between the narcissistic personality disorder group and the control group ($p < .0167$), and between the antisocial personality disorder group and the control group ($p < .0167$). The GABA/Cr ratio also showed significant differences between the narcissistic group and the control group ($p < .0167$), the antisocial group and the control group ($p < .0167$), and between the narcissistic and antisocial groups ($p < .0167$).

Table 2

Neurometabolite Ratios in the OFC and ACC Across Groups

Brain region	Metabolite ratio	HC, *M* (*SD*)	NPD, *M* (*SD*)	ASPD, *M* (*SD*)	*F*	*p*
OFC	NAA/Cr	0.011 (0.002)	0.010 (0.003)	0.010 (0.005)	1.27	.291
	GABA/Cr	0.028 (0.007)	0.019 (0.005)	0.015 (0.008)	62.52	< .0001
	Glu/Cr	0.010 (0.003)	0.014 (0.005)	0.017 (0.004)	44.41	< .0001
ACC	NAA/Cr	0.040 (0.005)	0.035 (0.003)	0.035 (0.007)	15.23	< .0001
	GABA/Cr	0.031 (0.008)	0.021 (0.007)	0.013 (0.006)	7.281	< .0001
	Glu/Cr	0.016 (0.002)	0.017 (0.003)	0.014 (0.008)	0.475	.689

Note. HC = healthy controls; ASPD = Antisocial Personality Disorder; NPD = Narcissistic Personality Disorder; OFC = orbitofrontal cortex; ACC = anterior cingulate cortex; NAA = N-acetyl aspartate; Cr = creatine; GABA = gamma-aminobutyric acid; Glu = glutamate.

Discussion

Based on our knowledge, this is the first study to investigate the levels of neurometabolites and biological differences between the two personality disorders, especially within a single class. To date, no studies have compared narcissistic personality disorder and antisocial personality disorder at these two points using 1H-MRS with a 3.0 T multi-voxel approach. This allows for a better definition and differentiation of these two disorders through biochemical mechanisms, ultimately leading to more specific psychotherapy and pharmacotherapy. While no previous research has directly compared these two disorders so far, a study conducted on individuals with antisocial personality disorder and healthy individuals found that the levels of GABA and Glu were significantly lower in those with antisocial personality disorder, which is consistent with our findings (Tully et al., 2024). The research by Basoglu et al. (2008) indicated that the level of Glu in the ACC axis was significantly reduced in antisocial patients compared to healthy individuals. Overall, in most studies, disorders have been compared with healthy individuals, and according to our analysis and comparison, the average levels of these metabolites differ compared to healthy individuals, with Glu increasing and GABA and N-acetylaspartate decreasing in antisocial personality disorder.

In a study by Basoglu et al. (2008) investigating antisocial behavior, psychopathy, and violent crimes among conscripted soldiers using MRS, no significant differences in metabolite ratios (NAA/Cr and Cho/Cr) between the two groups in the dorsolateral prefrontal cortex, ACC, and the amygdala-hippocampus were reported. The NAA/Cr ratio in the ACC had a significant negative correlation with overall psychopathy scores (PCL-R) and interpersonal/emotional problems. In another study examining the differences in the biomarker glutamate and glutamine (Glx), which are effective in aggressive behaviors in Bipolar and antisocial disorders, the ASPD group had higher levels of Glx in the dorsolateral prefrontal cortex (dlPFC) compared to the BD group and controls, with no significant differences in Glx levels between the BD group and controls. Regarding biomarkers associated with narcissism, all reviewed studies relied on genetic testing, with several notable examples. Lee et al. (2020) proposed

that personality disorders characterized by interpersonal sensitivity are associated with high concentrations of 8-hydroxy-2'-deoxyguanosine (8-OH-DG), an oxidized form of guanine and a biological marker of oxidative stress burden. In this study, participants underwent semi-structured diagnostic interviews and completed questionnaires regarding social cognition and emotional attribution. Blood samples were collected to measure levels of 8-OH-DG. The results indicated that narcissistic and borderline personality disorders independently predicted 8-OH-DG levels, regardless of age, sex, recent alcohol and cigarette use, current severe depression, and post-traumatic stress disorder, and that both narcissistic and borderline personality disorders independently predicted oxidative stress burden, irrespective of potential confounding factors.

Furthermore, Cheng et al. (2013) examined the levels of biological markers related to stress in response to emotional distress among narcissistic individuals. They showed that individuals with high narcissism exhibit a significant increase in cortisol and alpha-amylase levels when confronted with negative emotions, whereas no correlation was observed between these markers and negative emotions in individuals with low narcissism. These findings suggested that narcissism is associated with increased sensitivity to stress and physiological costs.

On the other hand, based on the literature reviewed, narcissistic personality disorder has not been examined using 1H-MRS; instead, it has mostly been studied metabolically through genetic evaluations and saliva tests. According to these findings, participants with higher scores on vulnerable narcissism exhibited stronger cortisol and emotional responses compared to those with higher scores on grandiose narcissism. Conversely, vulnerable narcissism positively correlates with schizotypal traits, while grandiose narcissism positively correlates with psychopathic traits (Borráz-León et al., 2023). Another study examining the brain structures of narcissistic individuals found a reduction in thickness in the anterior insular cortex, which plays a role in understanding social intentions and empathy; reduced brain volume in this area was also found. Moreover, decreased functional connectivity in these regions predicted changes in the concentrations of brain metabolites in these individuals (Griffith, 2021).

Therefore, it can be generally stated that the present research is consistent with previous studies.

According to the literature, the left orbitofrontal region is part of the prefrontal cortex and is involved in emotional processing, behavior control, decision-making, and reward and punishment learning (Rolls, 2023). In our study, there were significant differences in the concentrations of GABA/Cr and Glu/Cr among the three groups: narcissistic personality disorder, antisocial personality disorder, and the control group, while there was no significant difference in the concentration of NAA/Cr. The concentration of GABA/Cr was reduced in both the narcissistic and antisocial groups compared to the control group. Gamma-aminobutyric acid (GABA) is the primary inhibitory neurotransmitter in the brain, playing a crucial role in reducing neural activity, controlling anxiety, and impulsivity (Sideraki & Drigas, 2024). Decreased GABA levels are associated with increased neuronal excitability, anxiety, and impulsivity (Wang et al., 2023). Such neurobiological alterations may explain the impulsive and aggressive responses observed in our NPD and ASPD groups when facing simple stimuli—reactions that are typically well-regulated in healthy individuals. This inability in both personality disorders leads to social problems for them (Kolla et al., 2021). On the other hand, Glu is the primary excitatory neurotransmitter in the brain and plays a fundamental role in learning, memory, and the transmission of nerve signals (Niciu et al., 2012). An increase or imbalance in Glu levels can lead to neuronal excitability, anxiety, and neural damage (McGrath et al., 2022). The increase in Glu/Cr in the narcissistic and antisocial groups in the OFC region compared to the control group may indicate increased neuronal excitability and impulsive behaviors of these two groups relative to healthy individuals. NAA is considered a marker of neuronal health and integrity (Rebelos et al., 2022). The lack of significant difference in the concentration of NAA/Cr in the OFC region suggests that neuronal damage or dysfunction in this area may not be as apparent as the changes in GABA and Glu.

Additionally, according to the findings of the present study, in the left anterior cingulate cortex, which plays a vital role in behavioral regulation, cognitive control, emotional processing, and decision-making, there were significant differences in the concentrations of NAA/Cr and GABA/Cr

between individuals with narcissistic personality disorder, antisocial personality disorder, and the control group, as well as between the two personality disorders. The reduction in NAA/Cr in both the NPD and ASPD groups compared to the control group may indicate neuronal damage or dysfunction in this area. Furthermore, the decrease in NAA/Cr in the ACC region may be associated with cognitive and emotional problems in narcissistic and antisocial disorders, such as difficulties in decision-making, attention control, and emotional functioning. The reduction of GABA in both personality disorders in this area may also indicate decreased neural inhibition and increased aggression towards healthy individuals. The decrease in GABA aligns with the increase in behavioral and emotional issues in both narcissistic and antisocial personality disorders (Mazza et al., 2025). The difference in Glu/Cr concentration in the ACC region is at the threshold of significance. It is possible that a larger sample size could yield significant results, which might indicate the challenges faced by individuals with these personality disorders in learning social relationships, neural inhibition, and impulsive behaviors.

Overall, the results of this study suggest that there are neurochemical differences between narcissistic and antisocial personality disorders, as well as between these personality disorders and healthy individuals, in the orbitofrontal and anterior cingulate cortex regions. However, this study has limitations. While our sample size was determined by a priori power analysis to ensure sufficient statistical power, participants were recruited exclusively from clinical settings in Tehran. This recruitment approach might limit the generalizability of our findings to more diverse or global populations. Additionally, due to the cross-sectional nature of the present study, causal relationships cannot be evaluated. Lastly, the collection method used relative levels of metabolites rather than absolute levels, as most brain regions contain Cr. Generally, Cr is considered an internal reference as it is relatively stable among individuals. However, recent studies have shown that Cr is not as stable as previously expected (Sundgren et al., 2009). Therefore, a comparison of Cr levels among the three groups was conducted, and no differences in this measurement were observed. Overall, in this study, using Cr as an internal reference did not significantly affect the results. A suggestion for future research is to consider examining metabolites directly and longitudinally – across different time points. Conducting longitudinal

rather than cross-sectional studies could help investigate metabolic changes over time, as well as their relationship with the progression or improvement of personality disorders. Future research could also consider studying additional brain regions and additional metabolites.

Conclusion

This study found no significant differences in sex, age, or education level among the narcissistic personality disorder, antisocial personality disorder, and control groups, indicating these factors did not influence the results. Significant differences were observed in the left OFC for GABA/Cr and Glu/Cr ratios, with pairwise comparisons showing distinctions between narcissistic and control, antisocial and control, and narcissistic and antisocial groups. In the ACC, significant differences were noted in NAA/Cr and GABA/Cr ratios between the personality disorder groups and controls, and between the two disorders. These findings suggest distinct neurometabolite profiles in personality disorders, particularly in the OFC and ACC regions, warranting further investigation. This study's findings advance our understanding of the neurobiological underpinnings of Cluster B personality pathology. These results suggest that NPD and ASPD may involve unique disruptions in excitatory and inhibitory neurotransmission, potentially reflecting differential deficits in emotion regulation and impulse control. By identifying region-specific neurometabolite differences, this study informs dimensional models such as the Alternative Model for Personality Disorders, encouraging future research to explore targeted neuroimaging and therapeutic interventions, including neuromodulation, to address these neurochemical imbalances in personality disorders.

Conflict of interest

We have no conflicts of interest to disclose.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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