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ACADEMIC BURNOUT AND DEPRESSION: THE MODERATING ROLES OF SELF-ESTEEM AND AUTISTIC TRAITS

Wypalenie akademickie i depresja: moderująca rola samooceny i cech autystycznych

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Abstract

Academic burnout is a significant risk factor for mental health disorders, particularly depression, among students at secondary and tertiary education levels. Self-esteem plays a mediating or moderating role between personal resources and mental health status, influencing satisfactory functioning through its regulatory properties. The increasing prevalence of autism spectrum disorder among school and university students indicates that autistic traits may also substantially affect students' mental health. This study examined the mediating influence of self-esteem and subclinical autism spectrum conditions, characterized by less pronounced abnormalities in social communication and interaction. A sample of 252 Polish students was assessed using the Polish versions of the Oldenburg Burnout Questionnaire - Student Version, Beck's Depression Inventory (BDI-I), Rosenberg Self-Esteem Scale, and the Short Autism Spectrum Quotient. The findings demonstrate that low self-esteem and elevated autistic traits are significant psychological predictors of depression and academic burnout among university students, highlighting potential targets for intervention. Recommended interventions include strategies to enhance general self-esteem and social skills training to reduce autistic traits.

Keywords: academic burnout, tertiary education, depression, autistic traits, self-esteem.

Streszczenie

Wypalenie akademickie może stanowić czynnik ryzyka zaburzeń zdrowia psychicznego, w szczególności depresji, wśród osób uczących się na poziomie szkolnictwa średniego i wyższego. Samoocena, ze względu na swoją regulacyjną rolę, może pełnić funkcję mediującą lub moderującą między osobistymi zasobami jednostki a jej zdrowiem psychicznym oraz satysfakcjonującym funkcjonowaniem. Ponieważ w ostatnim czasie zaobserwowano wzrastającą częstość występowania zaburzeń ze spektrum autyzmu wśród uczniów szkół i studentów, czynnik ten może być również silnie związany ze zdrowiem psychicznym uczniów. W badaniu oceniono moderacyjną rolę samooceny oraz cech ze spektrum autyzmu, które nie spełniają jeszcze pełnych kryteriów diagnostycznych, a obejmują jedynie mniej wyraźne trudności w komunikacji i interakcjach społecznych. Badanie przeprowadzono w grupie 252 polskich studentów, którzy wypełnili polskie wersje następujących kwestionariuszy: Oldenburski Kwestionariusz Wypalenia – wersja dla studentów, Inwentarz Objawów Depresji Becka (BDI-I), Skala Samooceny Rosenberga oraz Kwestionariusz AQ-10. Wyniki badania wskazują, że niska samoocena oraz bardziej nasilone cechy autystyczne są istotnymi psychologicznymi predyktorami depresji i wypalenia akademickiego wśród studentów, wskazując na potencjalne cele interwencji. W szczególności interwencje mogą przynieść korzyści z zastosowania strategii mających na celu poprawę ogólnej samooceny, a także treningu społecznego skoncentrowanego na redukcji cech autystycznych.

Słowa kluczowe: wypalenie akademickie, szkolnictwo wyższe, depresja, cechy autystyczne, samoocena.

Introduction

Academic education is a key developmental milestone in early adulthood, supporting long-term cognitive goals and career development. For most young people, it offers intellectual growth and skill development and requires mobilizing personal resources (Saddique et al., 2021). Studying away from home and adapting to new environments can create emotional challenges that affect mental health and social functioning. Post-COVID university students have faced psychological issues that impact academic performance. Meta-analyses report high rates of emotional disturbances (Li et al., 2021; Son et al., 2020; Jia et al., 2022; Chang et al., 2021) and an increase in suicidal tendencies among adolescents, especially during the pandemic (Bersia et al., 2022).

Chronic mental and emotional fatigue results from ongoing stress caused by an imbalance between personal resources and university demands (Demerouti et al., 2001; Fernández-Castillo, 2021). This condition, known as academic burnout, is a widespread issue among students across disciplines and countries (Neumann et al., 1990; Zhang et al., 2007; Boudreau et al., 2004; Clark et al., 2009; Łoza, 2015, 2016; Zarobkiewicz et al., 2018). One large study found that 34.2% of students experienced burnout, 51% felt overburdened, and 80% or more showed moderately high exhaustion (Portoghese et al., 2018). Burnout negatively affects academic performance and engagement, and can lead to dropout (Dyrbye et al., 2010; Marôco et al., 2020; Mostert & Pienaar, 2020) and suicidal thoughts (Dyrbye et al., 2008). It also harms personal relationships, reduces motivation, and undermines self-efficacy for future goals. Therefore, academic burnout may be conceptualized as a risk factor for mental health disorders, including depression.

The relationship between academic burnout and depression is the subject of intense debate in the contemporary psychological literature. Theoretical approaches position these constructs along a continuum from complete identity to distinct separation (Bianchi, et al., 2015; Madigan & Curran, 2021). One of the most important arguments in favour of a close link between depression and academic burnout is their shared affective core. Both constructs encompass symptoms, such as chronic fatigue, low mood, reduced motivation, and cognitive difficulties, including problems with concentration and memory (Bianchi et al., 2015), and the high correlations between burnout indices and depressive symptoms observed across numerous groups suggest a significant co-occurrence of these phenomena (Madigan & Curran, 2021).

At the psychological mechanism level, both depression and academic burnout relate to chronic stress and resource deficits. High demands and lacking resources lead to exhaustion and reduced well-being (Bakker & Demerouti, 2017). Losing resources or fearing that loss is a key factor in developing both burnout and depression (Hobfoll et al., 2018).

Many studies confirm that burnout and depression frequently co-occur. Burnout increases the risk of depression, and depression can also make burnout more likely (Dyrbye et al., 2020). This relationship is typically bidirectional.

Despite significant similarities, depression and academic burnout differ in aetiology, scope, and diagnostic status. Academic burnout is directly linked to chronic stress from educational demands, such as pressure to achieve, academic overload, or lack of support (Salanova, et al., 2010). Depression is multifactorial and involves biological, psychological, and social factors (APA, 2022). A key difference is scope: depression impairs overall functioning, including social, family, or daily activities. Academic burnout is a contextual construct, limited to educational functioning (Schaufeli et al., 2002).

The differences also concern the symptomatic structure. Academic burnout is most often described as a syndrome comprising three components: emotional exhaustion, cynicism (or detachment from learning), and a reduced sense of academic efficacy (Schaufeli et al., 2002). Depression, on the other hand, according to the DSM-5-TR classification, includes, amongst other things, depressed mood, anhedonia, sleep and appetite disturbances, feelings of worthlessness, and suicidal thoughts (American Psychiatric Association, 2022). Thus, the range of depressive symptoms is broader and also includes somatic and existential components, which are not central to the concept of burnout.

Theoretically, depression is a clear diagnosis. Academic burnout is only a research concept, not a recognized mental disorder. Like job burnout, which ICD-11 defines as work-related, academic burnout is a reaction to stress in a specific setting (World Health Organization, 2019).

Contemporary literature most often adopts an intermediate position, according to which depression and academic burnout are partially overlapping constructs. Bianchi

and colleagues (2015) suggest that burnout can be treated as a context-specific manifestation of depression; however, most researchers emphasise the importance of distinguishing between these phenomena due to their differing determinants and scope (Bakker & Demerouti, 2017; Madigan & Curran, 2021).

In summary, depression and academic burnout have similar symptoms and psychological mechanisms, but differ in scope, context, and diagnostic status. They should be viewed as related but distinct constructs that can co-occur and influence each other. Therefore, it is important to examine how personal resources, such as self-esteem mediate or moderate the relationship between mental health and functioning.

General self-esteem reflects a person's judgments about themselves and results from a process of self-evaluation (Rosenberg, 1965). As a valuable component of self-knowledge, it refers to one's personal emotions and feelings. It is an important factor that regulates the development of various competences, the level of performance, and the individual's efficiency and functioning in the world. Furthermore, it also regulates engagement and effective learning, which leads to adequate educational achievement. Higher self-esteem is associated with better academic performance, while low self-esteem among adolescents is a risk factor for failure in important areas of their lives. Hence, it can lead to poor mental and physical health and has been associated with lower socio-economic status in adolescence. Low self-esteem is also a predictor of anti-social and delinquent behaviors, depressive disorders, suicidal thoughts and behavior (McGee & Williams, 2000; Donnellan et al., 2005) or student burnout (Tomaszek et al., 2024).

Self-esteem is a significant predictor of life satisfaction in both adolescents (Zhang & Leung, 2002; Gilman & Huebner, 2006) and adults (Chen et al., 2006). It can also mediate the relationship between variables with similar conceptual content, such as life satisfaction, general well-being, perceived happiness, and other personal (e.g., personality traits) or social (e.g., social support) resources (Furnham & Cheng, 2000). Furthermore, it may act as a mediator in the relationships between loneliness and depression, or between loneliness and life satisfaction (Çivitci & Çivitci, 2009), or between loneliness and academic efficacy and depression (Achmad et al., 2023). Previous studies reported an association between self-esteem and loneliness (Mahon et al., 2006; McWhirter et al., 2016) and between self-esteem and life satisfaction (Huebner & Gilman, 2006; Zhang & Leung, 2002) among adolescents.

Importantly, self-esteem is not only a predictor of depressive symptoms but is also recognized as one of their defining features (ICD-11; DSM-5). This dual role suggests a complex, potentially bidirectional relationship between self-esteem and depression, which has important implications for conceptualizing self-esteem in research models. Considering this complexity, the present study conceptualizes self-esteem as a moderator rather than a mediator of the relationship between academic burnout and depression. In other words, the effect of academic burnout on depression is moderated by self-esteem, such that the impact of burnout on depressive symptoms is stronger

among individuals with low self-esteem compared to those with high self-esteem. This approach is supported by empirical evidence from Chinese adolescents, where school burnout mediated the relationship between academic stress and depression, and the effect of burnout on depression was moderated by self-esteem (Jiang, et al., 2021). Based on these findings, it is hypothesized that self-esteem will moderate the relationship between academic burnout and depression among college students.

Autism spectrum disorder (ASD) is a type of neurodevelopmental disorder with a multifactorial etiology (Taylor et al., 2020). It manifests through deficits in verbal and non-verbal communication and qualitative difficulties in social communication, which makes it difficult for individuals with ASD to establish and maintain relationships with other people at a level appropriate to their mental age. Individuals with ASD exhibit restricted or specific patterns of behavior and interests, including stereotyped motor and verbal behaviors, eccentric sensory preferences, and excessive attachment to routines (American Psychiatric Association, 2013). ASD is a significant factor in the co-occurrence of other psychiatric disorders occurring much more frequently than in the general population (Lai et al., 2019; Eaves & Ho, 2008; Rim et al., 2023), with depression being a common observed complaint (Gillott & Standen, 2007; Hollocks et al., 2019).

Autism Spectrum Conditions (ASC) (Baron-Cohen et al., 2008), increasing manifestations among the contemporary population of school and university students that do not yet meet the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) or International Classification of Diseases, Eleventh Revision (ICD-11), boil down to the presence of less pronounced abnormalities in social communication and interaction. However, despite their non-clinical nature and intensity, they may be associated with a high burden caused by the tendency to camouflage one's own difficulties to meet social expectations (Tubío-Fungueiriño et al., 2021). Among university students in many countries, individuals with ASD are becoming more prevalent owing to educational inclusion efforts and opportunities offered by early intervention and intensive therapy (HESA, 2021; Cage & McManemy, 2022; Pisula et al., 2024). However, students with ASD often face difficulties during their studies and graduate significantly less often than their peers with neurotypical development (Anderson et al., 2016). Previous studies indicated that students on the autism spectrum scale experienced high levels of anxiety, feelings of loneliness, and depressive symptoms. In addition, they had an increased prevalence of suicidal behavior (Jackson et al., 2018), which was dictated by inadequate university adaptation to their needs.

The intensity of autistic traits significantly impacts students' academic performance and social functioning. McLeod and Anderson's (2023) study with 2736 participants found that the intensity of autistic traits (irrespective of a clinical diagnosis) was correlated with academic (failing courses, lower average grade point) and social difficulties (lack of a trusted person, friendships, social exclusion). Particularly, the negative effects of autistic traits were more pronounced among students without a diagnosis

(compared to those with a diagnosis) and more prevalent in females than in males (McLeod & Anderson, 2023). Another study compared students with a clinical diagnosis of ASD to students without and found that those with an ASD diagnosis experienced higher levels of academic burnout and were more likely to think of dropping out of university than students with neurotypical development. Furthermore, higher severity of autistic traits was also a predictor of academic burnout among students with neurotypical development (Moneta, 2011; Cage & McManemy, 2022).

Although numerous studies have investigated academic burnout and its impact on young adults' mental health, the moderating roles of self-esteem and autistic traits in the relationship between academic burnout and depressive symptoms remain less understood. To address this gap, the present study proposes a conceptual framework (see Figure 1) and outlines the following research hypotheses:

H1. Academic burnout is significantly and positively associated with students' depressive symptomatology,

H2. Self-esteem has a significant and negative association with students' depressive symptomatology,

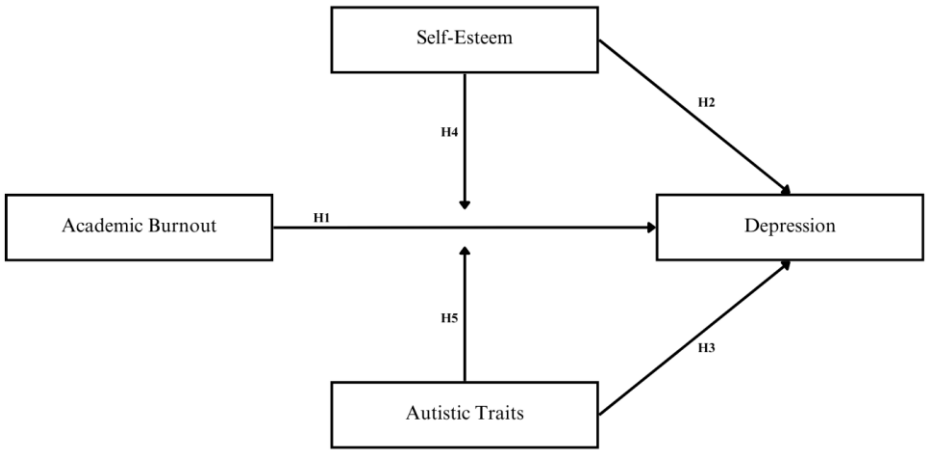
H3. Autistic traits have a significant and positive association with students' depressive symptomatology,

H4. Self-esteem moderates the relationship between academic burnout and depression,

H5. Autistic traits moderate the relationship between academic burnout and depression.

Figure 1

Research model



Methods

Participants

This study included 252 students. The sample size was deemed sufficient to detect expected effects, based on conventional recommendations for statistical power in regression analyses. Participants' mean age was 20.6 years (SD = 1.69). The total study group comprised 50.79% women (n = 128) and 49.21% men (n = 124). Most participants were full-time students (92.86%, n = 234), while 7.14% (n = 18) were part-time students. Regarding participants' distribution by year of study, 47 (18.65%), 140 (55.56%), 40 (15.87%), 14 (5.56%), and 11 (4.37%) were in their first, second, third, fourth, and fifth years, respectively. Those in their first and second years of a supplementary master's degree (which usually lasts 2 years in Poland) were assigned to the fourth- and fifth-year groups, respectively.

Measures

A background questionnaire, which included closed-ended questions in alternative (yes/no) and conjunctive (multiple-choice) formats, was designed to obtain detailed information on participants' sociodemographic data.

The Oldenburg Burnout Questionnaire - Student Version (OLBI-S; Reis et al., 2015), in a Polish adaptation by Strzelecki (2023), was used to measure academic burnout. This tool comprised 16 items that addressed two dimensions of academic burnout: exhaustion and disengagement. According to the original guidelines, an overall burnout score was not calculated; scores were interpreted separately for the two subscales. Each dimension comprised 8 statements rated on a 4-point Likert scale ranging from 1 (strongly agree) to 4 (strongly disagree). Its reliability in the Polish adaptation was $\alpha = 0.83$ and 0.77 for the exhaustion and disengagement factors, respectively.

Depressive symptoms were examined via **Beck's Depressive Symptoms Inventory (BDI-I) (Beck et al., 1961) via Parnowski and Jernajczyk's Polish adaptation (1977**). This tool comprised 21 items related to specific symptoms of depression. Respondents used a 4-point scale ranging from 0 (no symptoms at all) to 3 (high symptom severity) to indicate the extent to which they agreed with a given statement. The overall score ranged from 0 to 63 points, with higher scores indicating greater depression. Its reliability coefficient was 0.91.

To measure self-esteem, the Polish adaptation of the **Rosenberg Self-Esteem Scale** (Dzwonkowska et al., 2008) was used. This scale measured general self-esteem. It comprised 10 items related to emotions, beliefs, and self-perceptions. Participants responded on a 4-point Likert scale ranging from 1 (strongly agree) to 4 (strongly disagree). Cronbach's alpha coefficients for different age groups ranged from 0.81 to 0.83.

To measure the severity of autistic traits, the **Short Autism Spectrum Quotient** (AQ-10; Allison et al., 2012), Polish version developed by Pisula et al. (2013), was used.

The AQ-10 assessed autistic traits across five areas: social skills, attention to detail, difficulty switching attention, imagination, and communication. It comprised 10 statements rated on a 4-point Likert scale that ranged from 1 (strongly agree) to 4 (strongly disagree). Items are scored dichotomously (i.e., combining "strongly agree" and "slightly agree" into "agree" and "strongly disagree" and "slightly disagree" into "disagree"), with one point assigned for each response indicative of autistic traits. Total AQ-10 scores therefore range from 0 to 10, with higher scores reflecting greater severity of autistic traits. The reliability of the original English version was $\alpha = 0.85$.

Procedure

The survey was conducted online and allowed participants to access the test battery via a link. Participants were recruited through social media groups, where the study link was distributed to reach students willing to participate. Prior to the study, the participants read a cover letter that detailed the study, its voluntary nature, guarantee of anonymity, and right to opt out at any stage. Subsequently, participants were asked to sign a consent form. Only those who consented were allowed to proceed to the next stage, which included the demographic questions and OLBI-S, BDI-I, AQ-10, and SES questionnaires. The survey was conducted in October 2024.

Statistical analyses

Statistical analyses were performed via Jamovi software (The Jamovi Project, 2022). Before data analysis, a statistical description was conducted, including a normality test. Sociodemographic variation of the study variables was examined via Student's t-test for independent samples. Effect sizes (Cohen's d) and 95% confidence intervals (CIs) were calculated. Associations between variables were examined via Pearson's correlation. Simple and multiple linear regressions were used to assess the hypotheses, and moderated regression analysis (MRA) was used for hypotheses 4 and 5. Prior to regression analyses, multicollinearity among the independent variables was assessed using variance inflation factors (VIFs) and tolerance statistics. All predictors had VIF values between 1 and 5 and tolerance values above 0.2, indicating moderate, acceptable multicollinearity.

Results

Descriptive statistics were first analyzed, including gender differences. Correlational analyses were then conducted, followed by testing the research hypotheses.

Group distribution analysis revealed deviations from normality for five variables. However, since the skewness values fell within ±2 (Table 1), the distributions were not characterized by significant asymmetry around the mean (cf. George & Mallery, 2019). Therefore, parametric tests were used for statistical analyses.

Table 1

Descriptive statistics of the variables studied

	M	*Me*	*SD*	*Min.*	*Max.*	*Sk.*	*Kurt.*	Shapiro-Wilk test	
								W	*p*
Disengagement	20.17	20.0	3.56	11.00	32.00	0.240	0.097	0.983	0.004
Exhaustion	21.94	22.0	4.03	11.00	32.00	-0.056	-0.438	0.988	0.037
Depression	12.40	10.2	10.10	0	50.00	1.234	1.234	0.890	< .0001
Self-esteem	27.44	27.5	6.15	10.00	40.00	-0.167	-0.312	0.989	0.045
AQ	3.65	3.2	1.84	0	10.00	0.723	0.373	0.936	< .0001

Note. *M*: mean; *Me*: median; *SD*: standard deviation; *Sk.:* skewness; *Kurt.:* kurtosis; *Min*: minimum value; *Max*: maximum value; *W*: Shapiro-Wilk test result; *p*: *p-value* for the Shapiro-Wilk test.

Next, to examine gender differences in academic burnout, depression, self-esteem, and severity of autistic traits, Student's t-tests for independent samples were used. The results of these analyses are presented in Table 2.

Table 2

Comparison between men and women in the variables – Student's t test for independent samples

	Women (*n* = 128)		Men (*n* = 124)		*t(250)*	*p*	95% CI		*d* Cohen's
	M	*SD*	*M*	*SD*			*LL*	*UL*	
Disengagement	19.80	3.67	20.55	3.42	-1.68	0.094	-1.63	0.13	-0.21
Exhaustion	22.49	3.90	21.37	4.09	2.23	0.027	0.13	2.11	0.28
Depression	13.82	10.29	10.94	9.73	2.28	0.023	0.40	5.37	0.29
Self-esteem	26.43	6.11	28.49	6.05	-2.69	0.008	-3.57	-0.55	-0.34
AQ	3.45	1.76	3.86	1.91	-1.74	0.084	-0.86	0.05	-0.22

Note.. *n*: number of observations; *M*: mean; *SD*: standard deviation; *t*: value of the test statistic; *p*: *p-value* for the *t-test*; *CI*: confidence interval for the difference between the means; *LL* and *UL*: lower and upper limits of the confidence interval.

Based on Student's t-test, significant differences were observed between the genders in levels of exhaustion (t(250) = 2.23; p = 0.027; d = 0.28) and depression (t(250) = 2.28, p = 0.023, d = 0.29). Women had significantly higher levels of exhaustion (M = 22.49) and depression (M = 13.82) than men (M = 21.37 and M = 10.94,

respectively). In addition, men achieved higher levels of self-esteem (M = 28.49) than women (M = 26.43; t(250) = -2.69; p = 0.008; d = -0.34). However, the effects were all weak. No statistically significant differences were observed in levels of disengagement (t(250) = -1.68; p = 0.094; d = -0.21) and autistic traits (t(250) = -1.74; p = 0.084; d = -0.22).

Table 3 presents the correlations among the variables.

Table 3

Pearson's correlation matrix

Variables	Disengagement	Exhaustion	Self-esteem	Autistic traits
Disengagement	-			
Exhaustion	0.525***	-		
Self-esteem	-0.226***	-0.478***	-	
Autistic traits	0.116	0.217***	-0.185**	-
Depression	0.404***	0.604***	-0.746***	0.319***

Note. *** $p < 0.001$; ** $p < 0.01$

Depressive symptomatology was positively and significantly related to exhaustion ($r = 0.604$; $p < 0.001$) and disengagement ($r = 0.404$; $p < 0.001$); the higher the levels of exhaustion and disengagement, the higher the severity of depressive symptoms. The relationship between depression and self-esteem ($r = -0.746$; $p < 0.001$) was significant and negative, which indicated that the higher the students' self-esteem, the lower their levels of depressive symptoms. Notably, the relationship between depression and autistic traits ($r = 0.319$; $p < 0.001$) was significant and positive, which suggested that the higher the severity of autistic traits a student presented, the higher the severity of depression they experienced. The articulated relationships between the severity of autistic traits and academic burnout were noteworthy. Lack of a significant linear relationship between disengagement and autistic characteristics ($r = 0.116$; $p = 0.067$) suggest that typical challenges that resulted from an autistic pattern of functioning (i.e., difficulties in social interactions) were not associated with intrinsic motivation to study (i.e., study). In contrast, the significant correlation between exhaustion and autistic traits ($r = 0.217$; $p < 0.001$) suggests that a higher severity of sensory processing or social communication difficulties leads to excessive academic strain.

To verify hypotheses 1–3, multiple linear regression was performed. Table 4 presents the possibility of predicting depression severity based on academic burnout scores.

Table 4

Predicting depression severity from academic burnout - a multiple linear regression analysis

Variables	*B*	*SE*	95% CI for *B*		*β*	*t*	*p*	$r^2_{a(b,c)}$
			LL	*UL*				
Disengagement	0.34	0.17	0.01	0.67	0.12	2.04	0.043	0.010
Exhaustion	1.36	0.15	1.07	1.65	0.54	9.20	<0.001	0.212
Model Summary	$F(2, 249) = 74.86$; $p < 0.001$; $R = 0.61$ $R^2_{adj.} = 0.37$							

Note. *B* - non-standardized regression coefficient; *SE* - standard error; *β* - standardized regression coefficient; *t* - *t-test* result; *F* - analysis of variance result; $R^2_{adj.}$ - adjusted R-square.

Results indicated that disengagement (β = 0.12; t = 2.04; p = 0.043) and exhaustion (β = 0.54; t = 9.20; p < 0.001) were significant and positive predictors of depression. Higher levels of disengagement and exhaustion predicted higher levels of depression. These two components of academic burnout accounted for 37.5% of the variance in depression. The model was statistically significant (adj. $R^2 = 0.37$; F(2, 249) = 74.86; p < 0.001). These results supported H1, which indicated that both disengagement and exhaustion were important predictors of depression, and exhaustion had a particularly strong effect.

Table 5 presents the possibility of predicting depression severity from global self-esteem scores.

Table 5

Predicting severity of depression based on level of self-esteem - simple linear regression analysis

Variables	*B*	*SE*	95% CI for *B*		*β*	*T*	*p*
			LL	*UL*			
Self-esteem	-1.23	0.07	-1.36	-1.09	-0.75	-17.72	<0.001
Model Summary	$F(1, 250) = 314.14$; $p < 0.001$; $R = 0.75$ $R^2 = 0.56$						

Note. *B* - non-standardized coefficient of the regression; *SE* - standard error; *β* - standardized coefficient of the regression; *t* - *t-test* result; *F* - analysis of variance result; R^2 - value of the R-square statistic.

Results indicated that self-esteem (β = -0.75; t = -17.72; p < 0.001) was a significant and negative predictor of depression. This suggested that higher self-esteem was a protective factor against depression. The model was statistically significant and accounted for 55.7% of the variance in depression ($R^2 = 0.56$; F(1, 250) = 314.14; p < 0.001).

These results strongly supported H2, which confirmed that higher levels of self-esteem were associated with lower levels of depression.

Table 6 presents the possibility of predicting depression severity based on the intensity of autistic traits.

Table 6

Predicting depression severity based on the level of severity of autistic traits – a simple linear regression analysis

Variables	*B*	*SE*	95% CI for *B*		*β*	*t*	*p*
			LL	*UL*			
Autistic traits	1.75	0.33	1.10	2.39	0.32	5.32	<0.001
Model Summary	$F(1, 250) = 28.27$; $p < 0.001$; $R = 0.32$ $R^2 = 0.10$						

Note. *B*: non-standardized coefficient of the regression; *SE*: standard error; *β*: standardized coefficient of the regression; *t*: *t-test* result; *F*: analysis of variance result; R^2: value of the R-square statistic.

Results indicated that autistic traits ($\beta = 0.32$; $t = 5.32$; $p < 0.001$) were a significant and positive predictor of depression. Although the model only explained 10.2% of the variation in depression, it suggests that autistic traits among students with typical development were a predictor of depressive symptoms ($R^2 = 0.10$; $F(1, 250) = 28.27$; $p < 0.001$). Data obtained indicated that higher levels of autistic traits were associated with increased levels of depressive symptomatology. These results supported H3.

To assess H4 (the moderating effect), an MRA was conducted. Data from 252 students were analyzed to determine whether the relationship between disengagement (Model 1), exhaustion (Model 2), and depression was moderated by self-esteem levels. Before the main analyses, the quantitative independent variables and moderators were centered by subtracting their means from the scores, and interaction terms were created (Bedyńska & Książek, 2012). To examine the presence of a moderating effect, a hierarchical regression was conducted in the first model, with self-esteem and disengagement in the first step and self-esteem × disengagement as the interaction term in the second step. When both predictors were included simultaneously, they explained 61.5% of the variance in the dependent variable (adj. $R^2 = 0.61$; $F(2,249) = 199.03$; $p < 0.001$). Change in the coefficient of determination after introduction of the moderator was 2.3% and statistically significant ($R^2 = 0{,}02$; $F(1,248) = 15{,}61$; $p < 0{,}001$). The overall model explained 63.8% of the variation in depressive symptomatology ($R^2 = 0.64$; $F(3, 248) = 145.67$; $p < 0.001$) (Table 7).

Similarly, Model 2 included exhaustion, a second factor for academic burnout. When both predictors were included together, they explained 63.6% of the variation in depressive symptomatology (adj. $R^2 = 0.63$; $F(2,249) = 217.85$; $p < 0.001$). Inclusion of

the interaction factor (self-esteem x exhaustion) in the second step explained 6.6% of the variance (R^2 = 0.07; F(1, 248) = 54.20; p < 0.001). The overall model explained 70.2% of the variance in depressive symptomatology (R^2 = 0.70; F(3, 248) = 194.33; p < 0.001) (Table 7).

Table 7

Results of the moderated multiple regression analysis for predicting depression based on level of exhaustion and disengagement, moderated by level of self-esteem

Variables	***B***	***SE***	**95% CI for *B***		***β***	***t***	***p***	$r^2_{a(b,c)}$
			LL	*UL*				
Self-esteem	-1.15	0.07	-1.28	-1.02	-0.70	-17.80	<0.001	-0.462
Disengagement	0.67	0.11	0.45	0.89	0.24	5.96	<0.001	0.052
Self-esteem x Disengagement	-0.06	0.02	-0.09	-0.03	-0.15	-3.95	<0.001	-0.023
Model Summary	F (3, 248) = 145.67; p < 0.001; R = 0.80; R^2 = 0.64; R^2_{change} = 0.02							
Self-esteem	-0.92	0.07	-1.05	-0.79	-0.56	-14.08	<0.001	-0.238
Exhaustion	0.86	0.10	0.66	1.05	0.34	8.65	<0.001	0.090
Self-esteem x Exhaustion	-0.10	0.01	-0.13	-0.08	-0.26	-7.36	<0.001	-0.065
Model Summary	F (3, 248) = 194.33; p < 0.001; R = 0.84; R^2 = 0.70; R^2_{change} = 0.07							

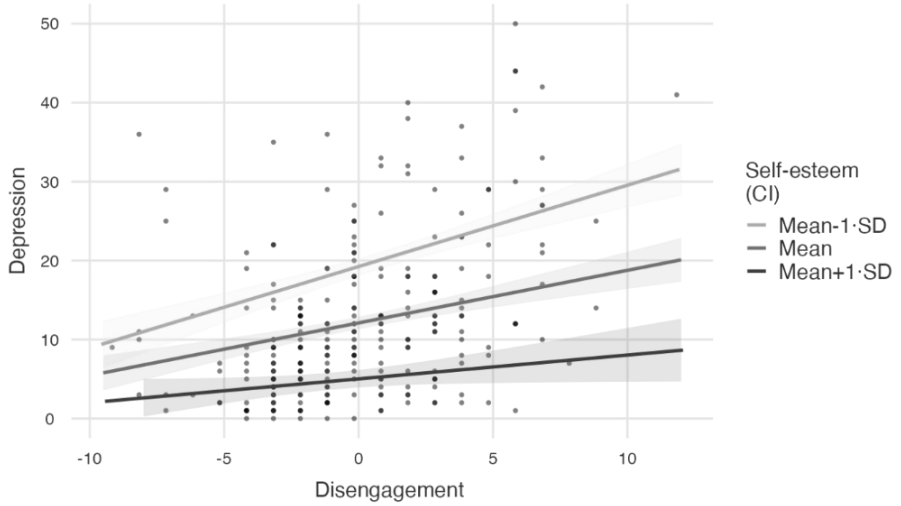
Analyses of the results of the predictors in the two models indicated that self-esteem and the two aspects of academic burnout were significant risk factors for the development of depression. In Model 1, lower self-esteem (β = -0.70; p < 0.001) was associated with higher levels of depression. Similarly, higher levels of academic burnout regarding disengagement (β = 0.24; p < 0.001) were positively correlated with higher levels of depression. Furthermore, a significant interaction between disengagement and general self-esteem was observed (β = -0.15; p < 0.001). These results suggest that self-esteem moderates the relationship between disengagement and depression. Since this interaction was significant, a simple-slopes regression was conducted to characterize it (Aiken & West, 1991).

The Linear Models module (GAMLj3) in Jamovi was used to calculate the interaction. Self-esteem was divided into three levels: mean -1 SD, average, and mean +1 SD (Figure 2). Results indicated that the relationship between disengagement and

depression was positive and strengthened as self-esteem decreased. In particular, at mean self-esteem –1 SD, the slope coefficient in the simple regression was significant, with B = 1.03, p < 0.001, 95% CI [0.76; 1.30]. This suggested that people with lower self-esteem experienced a stronger positive effect of disengagement on depression. At the medium level, the effect remained statistically significant (B = 0.67, p < 0.001, 95% CI [0.45; 0.89]). However, when mean self-esteem was 1 SD above the mean, the association weakened significantly, although it remained statistically significant (B = 0.30, p = 0.047, 95% CI [0.00, 0.60]). These results highlighted the importance of self-esteem as a moderator and revealed that higher self-esteem reduces the effect of disengagement on depression.

Figure 2

Simple regression slope coefficient for the relationship between disengagement and depression according to level of self-esteem



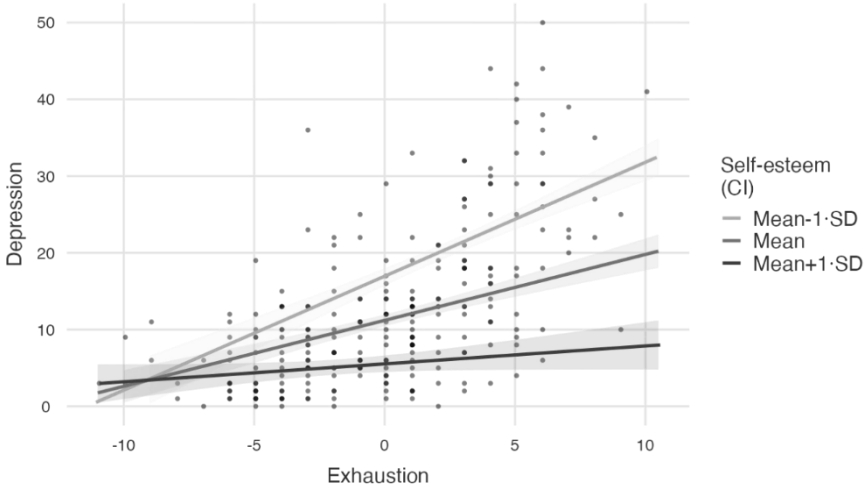
In Model 2, which included exhaustion, lower self-esteem (β = -0.56; p < 0.001) was associated with higher levels of depression. In contrast, higher levels of exhaustion (β = 0.34; p < 0.001) were positively correlated with higher levels of depression. The interaction between exhaustion and self-esteem was statistically significant (β = -0.26; p < 0.001). This suggests that self-esteem moderated the relationship between exhaustion and depression, similar to Model 1.

A simple regression slope analysis was conducted to examine the moderating effect of self-esteem on the relationship between exhaustion and depression (Figure 3). Results indicated that the association between exhaustion and depression was positive and strengthened as self-esteem decreased. Specific data revealed that at a mean self-esteem

-1 SD, the slope coefficient of the simple regression was significant, with B = 1.48, p < 0.001, 95% CI [1.22; 1.75]. This suggested that people with lower self-esteem experienced a stronger positive effect of exhaustion on depression. At the medium level, the effect remained significant, with B = 0.86, p < 0.001, 95% CI [0.66; 1.05]. However, when self-esteem was at +1 SD, the association weakened significantly and was no longer statistically significant, with B = 0.23, p = 0.065, 95% CI [-0.01; 0.48]. This implies that those with higher self-esteem do not experience a significant effect of exhaustion on their psychological well-being. In practice, this suggests that sufficiently high global self-esteem acts as a protective factor (buffer) that attenuates the negative impact of exhaustion on depression.

Figure 3

Simple regression slope coefficient for the relationship between exhaustion and depression as a function of level of self-esteem



A moderation analysis was conducted to verify H5 (Table 8). In the first model, step one included autistic traits and disengagement as predictors of depression, and step two added an interaction factor: autistic traits x disengagement. In step one, both variables explained 23.8% of the variance in depression levels (adj. $R^2 = 0.23$; $F(2,249) = 38.91$; $p < 0.001$). Addition of the interaction factor increased the explained variance by an additional 4% ($R^2 = 0.04$; $F(1,248) = 13.82$; $p < 0.001$), which indicated that the total model explained 27.8% of the variance in depression ($R^2 = 0.28$; $F(3,248) = 31.89$; $p < 0.001$). In the second model, which considered exhaustion in the first step, the predictors explained 40.2% of the variance in depression levels (adj. $R^2 = 0.40$; $F(2,249) = 83.75$; $p < 0.001$). Introduction of an interaction factor (autistic traits x exhaustion) in step two contributed only 1.4% to the explained variance ($R^2 = 0.01$; $F(1,248) = 5.94$; $p < 0.05$).

Although the interaction factor was statistically significant, autistic traits had a relatively weak effect on the strength of the relationship between student exhaustion and depression. The overall model explained 41.6% of the variance in depression ($R^2 = 0.42$; $F(3,248) = 58.92$; $p < 0.001$).

Table 8

Moderated multiple regression results for predicting depression based on levels of exhaustion and disengagement, moderated by autistic traits

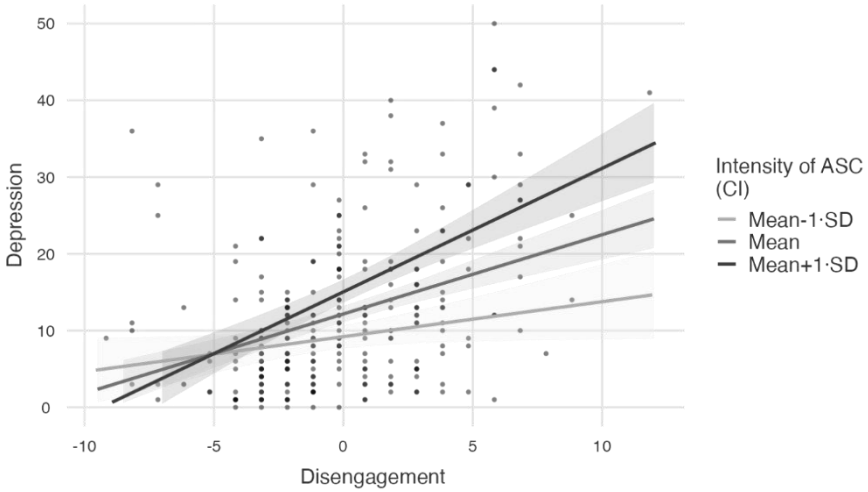
Variables	*B*	*SE*	95% CI for *B*		*β*	*t*	*p*	$r^2_{a(b,c)}$
			LL	*UL*				
Autistic traits	1.62	0.30	1.03	2.21	0.30	5.42	<0.001	0.085
Disengagement	1.03	0.15	0.72	1.34	0.36	6.70	<0.001	0.131
Autistic traits x Disengagement	0.31	0.08	0.15	0.48	0.20	3.72	<0.001	0.040
Model Summary	F (3, 248) = 31.89; $p < 0.001$; $R = 0.53$; $R^2 = 0.28$; $R^2_{change} = 0.04$							
Autistic traits	1.05	0.27	0.52	1.59	0.19	3.87	<0.001	0.035
Exhaustion	1.34	0.13	1.08	1.59	0.53	10.44	<0.001	0.256
Autistic traits x Exhaustion	0.15	0.06	0.03	0.27	0.12	2.44	0.016	0.014
Model Summary	F (3, 248) = 58.92; $p < 0.001$; $R = 0.65$; $R^2 = 0.42$; $R^2_{change} = 0.01$							

Analyses of the predictors of depression in two models indicated that autistic traits, disengagement, and exhaustion are significant risk factors for the development of depression. In Model 1, higher levels of autistic traits ($\beta = 0.30$; $p < 0.001$) were associated with higher levels of depression. Furthermore, higher levels of disengagement ($\beta = 0.36$; $p < 0.001$) were positively correlated with higher levels of depression. A significant interaction was observed between disengagement and autistic traits ($\beta = 0.20$; $p < 0.001$). These results suggest that autistic traits moderate the association between disengagement and depression. A simple regression slope analysis was conducted to examine the moderating effect of autistic trait severity (AQ) on the association between disengagement and depression (Figure 4). Results indicated that the relationship was positive and strengthened with autistic trait severity. Specifically, at 1 SD below the mean AQ, the slope coefficient was significant, with an estimate of $B = 0.46$ ($p = 0.042$;

95% CI [0.02; 0.90]). This suggested that individuals with lower intensities of autistic traits experience a weaker positive effect of disengagement on depression. At the mean AQ level, the effect remained significant, with B = 1.03, p < 0.001, 95% CI [0.73; 1.34], which indicated a moderately positive association. However, when autistic traits were 1 SD above the mean, the association strengthened significantly, with B = 1.61, p < 0.001, 95% CI [1.19; 2.03]. Results indicate the importance of autistic trait severity as a moderating factor, and revealed that higher severity of autistic traits significantly increases the effect of disengagement on depression levels.

Figure 4

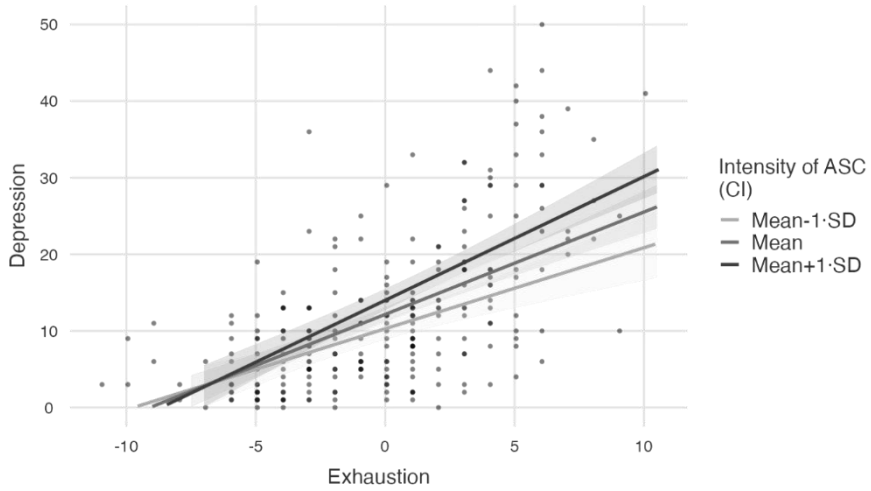
Simple regression slope coefficient for the relationship between disengagement and depression according to the intensification of autistic traits



In Model 2, which included a second factor of academic burnout, higher intensification of autistic traits (β = 0.19; p < 0.001) and higher levels of exhaustion (β = 0.53; p < 0.001) were positively correlated with higher levels of depression. The interaction between exhaustion and the severity of autistic traits was statistically significant (β = 0.12; p = 0.016). This suggests that autistic traits moderated the relationship between exhaustion and depression, similar to in Model 1. Simple regression slope analysis revealed that the relationship between exhaustion and depression was positive and strengthened as the intensity of autistic traits increased (Figure 5).

Figure 5

Simple regression slope coefficient for the relationship between exhaustion and depression in relation to the intensification of autistic traits



As shown in Figure 5, at -1 SD, the mean autistic trait intensity, the slope coefficient for exhaustion on depression was significant, with an estimate of B = 1.06 ($p < 0.001$; 95% CI [0.68, 1.43]). This suggested that individuals with lower autistic trait intensity experienced a moderate positive effect of exhaustion on depression. At the medium level, the effect remained significant and was slightly stronger, with B = 1.34, $p < 0.001$, 95% CI [1.08; 1.59]. At +1 SD above the mean of ASC, the association strengthened further, with B = 1.62, $p < 0.001$, 95% CI [1.32; 1.91]. These results highlighted the moderating role of autistic traits in the relationship between exhaustion and depression, which suggests that higher intensification significantly strengthens the effect of exhaustion on depression.

Discussion

This study investigated the roles of general self-esteem and autistic traits in the relationship between academic burnout (disengagement and exhaustion) and depression among Polish students.

Disengagement and exhaustion were significantly and positively correlated with levels of depression (H1). This finding aligns with the results of Njim et al.'s (2019) study among medical students, which also found significant associations between academic burnout and depression. Simultaneously, they noted that exhaustion explained more of the variance in depression than disengagement.

H2 and H3 were also confirmed, as self-esteem was significantly and negatively related to levels of depression (H2), and autistic traits were significantly and positively

related (H3). The finding for H2 is consistent with previous studies indicating that lower levels of self-esteem are strongly associated with higher levels of depressive symptoms among students and young adults (Gao et al., 2022; Sowislo & Orth, 2013). The result for H3 is also consistent with previous research showing that higher levels of autistic traits are associated with greater depressive symptomatology. A study conducted among university students demonstrated a significant positive relationship between autistic traits and depression, indicating that individuals with higher levels of autistic traits reported more severe depressive symptoms (Garcha & Smith, 2024). In addition, a recent study conducted among university students also found a significant positive relationship between autistic traits and depression and showed that this relationship may be partly explained by difficulties in interpersonal competence, as well as increased social avoidance and distress (Wang et al., 2025).

The moderating effect of self-esteem on the relationship between academic burnout and depression was confirmed (H4). The results indicate that disengagement and exhaustion are closely associated with increased levels of depression, particularly among individuals with low self-esteem. This association remained significant for those with moderate self-esteem; however, as self-esteem increased, the relationship between academic burnout and depression weakened substantially. Notably, the relationship between burnout and depression was not observed among those with high self-esteem. These findings suggest that sufficiently high self-esteem may serve a protective role, enabling students to cope with emotional difficulties associated with academic demands and mitigating the impact of burnout on mental health. This result aligns with previous research indicating that self-esteem functions as a protective mechanism (Mèndez et al., 2020). A study of Chinese high school students similarly found that the effect of school burnout on depression was moderated by self-esteem, with a stronger effect observed in students with low self-esteem compared to those with high self-esteem (Jiang et al., 2021). The present study underscores the importance of fostering positive self-image among students across disciplines as a key factor in supporting resilience in the face of academic challenges. Accordingly, a mandatory course focused on developing students' self-esteem across all majors is recommended.

H5 was also confirmed as autistic traits moderated the association between academic burnout and depression. Results revealed significant positive associations between disengagement, exhaustion, and depression, which increased with higher levels of autistic traits. Individuals with lower levels of autistic traits experienced weaker effects of disengagement and exhaustion on depression. At intermediate levels of autistic traits, these associations remained significant and were moderately positive. However, as the intensity increased, the associations between disengagement and exhaustion and depression strengthened significantly, which suggested that individuals with more pronounced autistic behaviors were at higher risk of depression in the context of academic burnout.

These results support the idea of organizing support programs for students with autistic traits, regardless of their diagnostic status (McLeod & Anderson, 2023; Zukerman et al., 2023).

Conclusions

The study verified the proposed hypotheses.

1. Academic burnout was significantly and positively associated with students' depressive symptomatology.
2. Self-esteem had a significant and negative relationship with students' depressive symptomatology.
3. Autistic traits had a significant and positive relationship with students' depressive symptomatology.
4. Self-esteem moderated the relationship between academic burnout and depression.
5. Autistic traits moderated the relationship between academic burnout and depression.

Study Limitations

This study has several limitations. Its cross-sectional design restricts generalizability beyond the current timeframe. Longitudinal studies are needed to establish causality and monitor academic burnout over time. Although demographic data, such as year of study, were collected, they were not used as control variables; future research should consider their influence. The moderating effect of self-esteem should be interpreted with caution, as self-esteem was highly correlated with depression, and some BDI items directly assess self-esteem. Future studies should use separate measures for depression and self-esteem to better distinguish their effects.

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