



Predicting Higher Education Students' Psychosomatic Symptoms with Negative Emotional State, Psychological Resilience and Life Satisfaction

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Authors' contributions

This work was carried out in collaboration among all authors. The authors acknowledge the leadership role of author GP in the conception, coordination, and execution of this research project. All authors read and approved the final manuscript.

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Abstract

Psychosomatic symptoms are an important aspect of student mental health because they reflect the interaction between psychological processes, emotional states, and physical complaints. This study examined whether negative emotional states, psychological resilience, life satisfaction, and demographic characteristics predicted psychosomatic symptoms among higher-education students in Greece. A quantitative cross-sectional study was conducted with 202 participants recruited from seven higher-education institutions in Athens. Participants completed self-report measures of psychosomatic symptoms, depression, anxiety, stress, psychological resilience, and life satisfaction. Data were analysed using descriptive statistics, independent-samples t-tests, correlation analysis, and multiple linear regression. The predictive model significantly explained variation in psychosomatic symptom scores, $F(8, 193) = 46.289$, $p < .001$, $R^2 = .657$, adjusted $R^2 = .643$. Stress ($\beta = .275$, $p < .001$) and anxiety ($\beta = .388$, $p < .001$) were positively associated with psychosomatic symptoms, whereas psychological resilience ($\beta = -.171$, $p < .001$) and life satisfaction ($\beta = -.182$, $p < .001$) were negatively associated. Sex differences were observed: female students reported higher psychosomatic symptoms and negative emotional states, whereas male students reported higher resilience. No significant differences in psychosomatic symptoms were identified by study level, institution type, or age. Overall, the findings are consistent with previous literature and suggest that psychosomatic symptoms among higher-education students are associated with both psychological risk factors and protective resources. Screening for emotional distress and strengthening resilience and life satisfaction may contribute to student mental-health support strategies. However, the findings should be interpreted in light of the cross-sectional design and convenience sample.

Keywords: *Psychosomatic symptoms; negative emotional states; psychological resilience; life satisfaction; Higher-education students; stress; anxiety; depression; biopsychosocial model.*

1. Introduction

Psychosomatics is an interdisciplinary scientific field that examines how psychological processes, such as affect, cognition, and coping, interact with social contexts and biological systems to shape health and illness (Lee, 2022; Schaefer et al., 2022). The field is based on the biopsychosocial model, developed in the late 1970s as a response to the biomedical approach (Engel, 1977; Lee, 2022; Sharpe et al., 2020). Psychosomatics primarily examines how stress-related processes influence bodily sensations and symptom experiences (Ando, 2020; Lee, 2022).

As a result, psychosomatic symptoms are commonly defined as bodily complaints that are meaningfully linked to psychosocial and psychophysiological regulation (Efremov, 2024; Grigorian et al., 2023). Common symptoms include headaches, gastrointestinal discomfort, fatigue, sleep disturbances, and palpitations that fluctuate with stress exposure and emotional states rather than being fully explained by structural disease (Grigorian et al., 2023; Låftman & Östberg, 2025).

Clinical applications of psychosomatics often overlap with consultation–liaison psychiatry and translate psychosomatic science into modern healthcare through the assessment and treatment of the psychological and behavioural dimensions of medical conditions, functional disorders, and symptom burden in healthcare settings (Bronson et al., 2022; Lee, 2022).

Regarding the treatment of psychosomatic symptoms, contemporary practice considers psychosomatic mechanisms involving activation of the hypothalamic–pituitary–adrenal (HPA) axis and the sympathetic response of the central nervous system, while evidence-based interventions aim to reduce symptom burden in stress-sensitive conditions (Efremov, 2024; Funaba et al., 2021; Janson-Schmitt & Rohleder, 2024; Zhao, 2025). This supports the view that symptoms are not imaginary but are real, impairing, and biologically instantiated, as they are shaped by stress, emotions, expectations, and social context (Schaefer et al., 2022; Sperling & Hulett, 2025).

Although modern psychosomatics tends to be evidence-based, this was not always the case at its emergence in the early twentieth century (Deter et al., 2018; Rosendahl et al., 2021; Wei et al., 2023). A key scientific change occurred when research shifted from single-cause theories to multifactorial, testable models—such as the

integrated interplay among stress exposure, psychophysiology, symptom perception, and behavioural responses—which were evaluated in longitudinal and mechanistic research protocols (Grigorian et al., 2023; Låftman & Östberg, 2025).

Another key shift in the field was the investigation of several behavioural theories, including resilience (Kirillov, 2025), life satisfaction (Reiß et al., 2024; van der Laan et al., 2021), and distress (Badaye et al., 2021; Ulyukin et al., 2021), following the adoption of the biopsychosocial model (Apple et al., 2022; Lee, 2022). Fields such as clinical and health psychology contributed as fundamental components of behavioural medicine, an integrated interprofessional field that steadily incorporated psychosomatic medicine (Ando, 2020; Engel, 1986; Schwartz & Weiss, 1977; Yoshiuchi, 2016).

1.1 Psychosomatic Research in Student Populations

Modern empirical evidence identifies additional considerations and pathways for future research in the field. More specifically, a Swedish longitudinal study conducted from 2019 to 2022 examined the effect of perceived stress on psychosomatic complaints in a sample spanning adolescence to early adulthood (N = 2,708; Låftman & Östberg, 2025). The authors concluded that stress contributes to psychosomatic complaints and that social initiatives may reduce stress and, consequently, psychosomatic complaints. Another Swedish study examined, at three time points between 2017 and 2022, the comorbidity between psychosomatic symptoms and distress in a sample spanning adolescence to early adulthood (N = 2,779; Grigorian et al., 2023). The results showed that psychosomatic complaints during the early phase of data collection were associated with symptoms of depression and anxiety in early adulthood, while females were more prone to developing these conditions. These findings provide preliminary evidence that psychosomatic symptoms in mid-to-late adolescence may serve as early indicators of psychological distress in adulthood. Furthermore, a third study with a large sample from Nordic countries between 2002 and 2022 (N = 48,320) clearly showed that the level of psychosomatic symptoms significantly increased with age (Thorsteinsson et al., 2025). Altogether, psychosomatic symptoms may have developmental consequences, as they may indicate stress load and vulnerability (Grigorian et al., 2023; Wahlström et al., 2023).

Regarding emerging adulthood, empirical evidence suggests that the interaction among HPA-axis activation, cortisol levels, and sex is associated with differences in stress, anxiety, and depression (Chong et al., 2026). In parallel, two large studies—one in China (Zhang et al., 2022; N = 1,309) and another across six Ibero-American countries (Jiménez-Villamizar et al., 2023; N = 58,750)—suggest that cognitive-affective pathways are relevant to the escalation of emotional symptoms among university students with comorbid somatic complaints. Both studies reported higher symptom levels among females and further indicated that these symptoms were associated with poorer academic performance. A notable limitation is that the Ibero-American study collected data during the coronavirus disease 2019 (COVID-19) pandemic (Jiménez-Villamizar et al., 2023), which may limit generalisability.

From an epidemiological perspective, psychosomatic symptoms show developmental variation across adolescence and early adulthood. According to a Scottish study spanning 1998–2018 (Inchley et al., 2023; N = 29,250) and a Swedish study using data from 1985 to 2018 (Högberg et al., 2023; N = 12,186), psychosomatic symptoms are widely used as public-health indicators of well-being. Thus, research on and early detection of psychosomatic symptoms contribute to the development of health policies (Sperling & Hulett, 2025), access to healthcare services (Hahn et al., 2025), and therapy (Bronson et al., 2022). Preventing the further escalation of psychosomatic symptoms later in life and any substantial decrease in well-being may also provide economic benefits to the public (Bronson et al., 2022; Kurisu et al., 2023).

1.2 Sociodemographic Patterns in Psychosomatic Research

According to the literature, it is currently well established that sex and age patterns play a significant role in psychosomatics (Bergh & Giota, 2022; Grigorian et al., 2023; Reiß et al., 2024), while study level may also play a significant role among university students (Al-Jayyousi et al., 2025; Santiago et al., 2024).

Regarding sex, females report significantly more psychosomatic complaints; therefore, modelling sex as a key demographic predictor and stratifier in psychosomatic research is justified (Bergh & Giota, 2022; Låftman & Östberg, 2025). Similarly, research among university students shows that sex predicts mental-health

impairment, and these outcomes extend to psychosomatic symptoms under academic strain (Bermejo-Franco et al., 2022; Rubach et al., 2022). Moreover, recent findings suggest that sex may moderate the links between achievement goals, stressors, or social context and psychosomatic complaints, highlighting the importance of testing interaction effects (Bergh & Giota, 2022; Chong et al., 2026).

Regarding age, longitudinal studies indicate that psychosomatic complaints may escalate from adolescence to early adulthood, underscoring the importance of examining developmental changes and age-related differences in social experiences (Grigorian et al., 2023, 2024). In addition, academic demands may be linked to distress and psychosomatic symptoms, with age and educational level functioning as covariates or moderators in student samples (Al-Jayyousi et al., 2025; Santiago et al., 2024).

1.3 Institutional Characteristics

Beyond sociodemographic characteristics, differences in psychosomatic symptoms have been observed between institutions. Existing literature from the UK (El Ansari et al., 2013; N = 3,706) and Germany (Chu et al., 2015; N = 3,306) shows that when institutions within a country are compared, no differences emerge. However, cross-cultural comparisons have shown significantly different results between institutions located in different countries (Chu et al., 2015; El Ansari et al., 2014a).

It is noteworthy that differences in psychosomatic symptoms have also been reported between private and public higher-education institutions. For example, two South Asian studies showed that public-university students had significantly higher symptom levels (Ovi et al., 2024; Rahman et al., 2022). However, this issue may be under-investigated in the global literature, and comparisons and outcomes in other regions remain unclear.

1.4 Harmful Factors in Psychosomatics

Among university-student populations, academic demands, financial strain, social transition, and identity development are common stressors experienced worldwide (Cage et al., 2021; Ruiz-Camacho et al., 2025). A systematic review and meta-analysis of 64 studies (Li et al., 2022; N = 100,187) showed that college students experience symptoms of depression and anxiety. Additionally, an umbrella review of systematic reviews and meta-analyses spanning all world regions (N = 1,264,132) reported that the prevalence of anxiety among college and university students was higher among females, students in Asia, and undergraduates (Tan et al., 2023). Notably, both studies highlighted the need for targeted interventions for college and university students (Li et al., 2022; Tan et al., 2023). Beyond purely psychological interpretations, symptoms of anxiety and depression are also associated with physiological and health-related complaints, supporting the view that psychosomatic symptoms may arise from overall academic stress and social expectations (Jiménez-Villamizar et al., 2023; Khan et al., 2025).

Furthermore, a recent cross-cultural study with samples from France, Germany, Turkey, Greece, Peru, Pakistan, and Poland (N = 2,113) reported that (i) university students experience psychosomatic problems that are common across cultures, (ii) females report more somatic symptoms, and (iii) psychosomatic difficulties may be age-specific, with sex and culture playing significant roles (Seiffge-Krenke & Sattel, 2024). In support of these findings, another study concluded that student groups require specifically designed interventions, especially when the patient is female and younger than 24 years (Santiago et al., 2024), while a Polish study reported that students' existing distress may increase the intensity of psychosomatic symptoms (Stanisławska-Kubiak et al., 2023; N = 594).

Indeed, meta-analytic evidence involving more than one million participants shows that stress, anxiety, and depression are commonly experienced in student populations, thereby justifying the modelling of distress as a proximal predictor of psychosomatic symptom burden (Li et al., 2022; Tan et al., 2023). The association between distress and psychosomatic symptoms is well documented in global research on student populations (Jiménez-Villamizar et al., 2023; Stanisławska-Kubiak et al., 2023). Evidence further suggests a reciprocal process whereby academic pressure contributes to distress, which may, in turn, exacerbate psychosomatic symptoms (Khan et al., 2025; Zhang et al., 2022). Moreover, recent longitudinal and epidemiological evidence indicates an increase in psychosomatic symptoms during adolescence that extends into adulthood, supporting the view that distress may predict psychosomatic symptoms in early adulthood, including among university students (Låftman & Östberg, 2025; Thorsteinsson et al., 2025). This is consistent with literature reviews

suggesting that interventions targeting psychosomatic symptoms should also address distress to improve overall well-being in university populations (Aloufi et al., 2021; Mofatteh, 2021).

Recent intervention evidence also indicates that structured stress-management programmes can reduce stress among university students, although heterogeneity and methodological limitations require cautious interpretation (Juniar et al., 2025).

1.5 Protective Factors in Psychosomatics

In addition to the detrimental effects of distress that may contribute to psychosomatic symptoms, recent research has identified protective factors that could buffer against their development. One such factor is life satisfaction. Satisfaction with life is a person's overall cognitive judgement of their life as a whole (Diener et al., 1985; López-Guerra et al., 2025; Zhang et al., 2025). It is currently considered a cognitive component of subjective well-being that differs from emotional well-being and affective states (Fors Connolly & Gärling, 2024; Pretorius & Padmanabhanunni, 2022). In psychosomatic research involving university students, life satisfaction is linked to mental-health status, making it a theoretical protective factor (Liu & Wang, 2024; Sujan et al., 2023). Psychosomatic models indicate that stress increases symptoms, whereas life satisfaction strengthens coping mechanisms that may reduce stress-related conditions (del Pino & Matud, 2024; Låftman & Östberg, 2025). Furthermore, life satisfaction has been shown to be useful for identifying protective factors without including distress and negative emotion regulation (Liu & Wang, 2024; Seiffge-Krenke & Sattel, 2024). Hence, international research has identified life satisfaction as a protective factor for overall well-being (Sujan et al., 2023; Troncone et al., 2025). In Serbia, life satisfaction predicted psychosomatic and health complaints in 1,605 adolescents (Skoric et al., 2023). These results are consistent with those of a large Scandinavian study (Stattin et al., 2025; N = 7,860). Evidence specific to student populations also comes from Greece (Katsikidou et al., 2024), where lower life satisfaction was associated with a greater burden of complaints, including both health-related and psychosomatic symptoms.

Recent studies have also linked student well-being with life satisfaction and identified social support as a resource associated with lower stress and greater resilience and life satisfaction (Frederica & Rathore, 2026; Li et al., 2025).

Another key protective factor against the development of psychosomatic symptoms is psychological resilience (Pilafas et al., 2021b; Pilafas & Lyrakos, 2021; Sydorenko et al., 2025). Historically, resilience was conceptualised as a cluster of protective factors against psychiatric disorders (Rutter, 1985) and later evolved into a positive adaptive system (Luthar et al., 2000; Masten, 2001). In modern research, psychological resilience is defined as a dynamic and adaptive process of maintaining or recovering mental health when a person is exposed to stressors, including trauma, life challenges, transitions, and acute or severe illness (Abate et al., 2024; Bergeman & Nelson, 2024; Hill et al., 2025). It also concerns overall positive adaptation over time and may include periods of instability during the escalation and aftermath of stressful events (Farchi & Peled-Avram, 2025). In clinical practice, patients with psychosomatic conditions benefit from resilience (Arlud et al., 2025; Sobhani et al., 2024), while research in student populations shows that stress-related conditions and psychological resilience are negatively correlated (Gong et al., 2023). A recent systematic review and meta-analysis (Ansari & Iqbal, 2025; N = 32,613) found that psychological resilience is a protective factor against stress among college students. The study showed that psychological resilience is a promising moderator of stress, as highly resilient students presented fewer stress-related symptoms and less symptom escalation when exposed to high pressure and stress. In Greece, a newly designed intervention reduced psychosomatic symptoms by strengthening psychological resilience in a cohort of healthcare professionals and students (Pilafas, Louka et al., 2024). Similarly, an Iranian study of medical students (N = 267) found that resilience played a mediating role in psychosomatic complaints (Hashemi Mohammadabad et al., 2024).

Further evidence from university samples supports the relevance of resilience: positive thinking was positively associated with academic resilience, while psychological resilience was negatively associated with anxiety and depression (Alabdullah et al., 2025; Wang et al., 2025).

1.6 Evidence Gaps and Importance of the Current Study

Considering the limitations and gaps in the current psychosomatic literature, many reviews focus primarily on distress outcomes; consequently, psychosomatic symptoms among university students remain less well

researched (Li et al., 2022; Mofatteh, 2021). Even when psychosomatic symptoms are examined, researchers often emphasise single domains, such as trauma and internet use, rather than testing integrated multivariable prediction models in which negative emotional states, life satisfaction, and resilience are combined as predictors within a robust model (Stanisławska-Kubiak et al., 2023; Stiglic et al., 2022). In Greece, existing psychosomatic research has largely focused on general-population samples (Pilafas et al., 2021b), providing some research infrastructure. Nevertheless, evidence specific to Greek university students remains limited. Additionally, relevant Greek research often emphasises general well-being and mental health, while psychosomatic symptoms remain comparatively underexplored and fragmented in university samples (Yotsidi et al., 2023). Although evidence gaps remain in university samples, modern literature supports investigating students' psychosomatic symptoms from a biopsychosocial perspective by testing distress, life satisfaction, resilience, and key demographic characteristics to clarify risk and protective factors and to support the development of specifically designed interventions (Ansari & Iqbal, 2025; Låftman & Östberg, 2025).

Regarding the expected contributions, this study integrates risk and protective factors within a single predictive model of psychosomatic symptoms by examining negative emotional states and positive resources simultaneously. This may help disentangle their unique and shared associations with psychosomatic symptoms. The study also shifts the focus from anxiety and depression as primary outcomes to psychosomatic symptoms as the central outcome. In addition, it provides evidence specific to students in Greece, thereby supporting future cross-sectional comparisons. Finally, by testing sex, study level, and private versus public enrolment as potential risk factors, the results may inform targeted interventions and clarify whether reducing distress or strengthening positive resources is more closely associated with a lower psychosomatic burden among Greek higher-education students.

1.7 Research Hypothesis

Based on previous literature, stress, anxiety, depression, life satisfaction, psychological resilience, and demographic characteristics are expected to jointly predict psychosomatic symptoms in the sample. Higher levels of stress, anxiety, and depression, as well as female sex, are expected to be associated with more symptoms (risk factors), whereas life satisfaction, psychological resilience, and age are expected to be associated with fewer symptoms (protective factors). Psychosomatic symptoms are also expected to differ by sex (with higher levels among females), study level, institution, and public versus private enrolment. Finally, risk factors are expected to correlate positively with one another and with psychosomatic symptoms, while protective factors are expected to correlate positively with one another and negatively with risk factors and psychosomatic symptoms.

1.8 Aim of the Current Study

Therefore, the present study investigates whether negative emotional states (stress, anxiety, and depression), life satisfaction, and psychological resilience predict psychosomatic symptoms among Greek students attending higher-education institutions.

2. Materials and Methods

2.1 Participants

The present study used a convenience sample recruited through a conventional convenience-sampling technique.

The inclusion and exclusion criteria for participation were as follows. At the time of responding, participants had to be adults (≥ 18 years), able to provide informed consent independently, fully proficient in Greek, enrolled in and actively attending a university or college programme, and available to complete the full battery of self-report questions. Exclusion criteria included not understanding or signing the consent form, being unable to understand the scope or individual items of the self-report questionnaires, and not completing the full battery of items.

Regarding the required sample size, an a priori test was conducted using the G*Power calculator (Faul et al., 2007, 2009). The results indicated that 89 participants were needed for the study to achieve a power of .95.

Of the 246 individuals approached and given the questionnaires, 202 (82.1%) returned complete responses and did not meet any exclusion criteria. The final sample comprised 202 participants ($M_{age} = 23.78$, $SD = 5.55$, range = 18–47). Further demographic details are presented in Table 1.

Table 1. Summary of demographic details of the participants of the study

Main Variable	Variable's Subcategories	Total (%) $N^a = 202$	Males (%) $n = 48$, (23.8%)	Females (%) $n = 154$, (76.2%)
Level^b				
	Undergraduate Degree	144, (71.3%)	37, (77.1%)	107, (69.5%)
	Postgraduate Degree	58, (28.7%)	11, (22.9%)	47, (30.5%)
Institution^c				
	UWA ^d	34, (16.8%)	4, (8.3%)	30, (19.5%)
	NKUA ^e	72, (35.6%)	21, (43.8%)	51, (33.1%)
	HUA ^f	26, (12.9%)	3, (6.3%)	23, (14.9%)
	AUEB ^g	18, (8.9%)	4, (8.3%)	14, (9.1%)
	NTUA ^h	27, (13.4%)	8, (16.7%)	19, (12.3%)
	UCLAN (Greece) ⁱ	2, (1%)	-	2, (1.3%)
	UoD (Greece) ^g	23, (11.4%)	8, (16.7%)	15, (9.7%)
Type^k				
	Public sector (University)	177, (87.6%)	40, (83.3%)	137, (89%)
	Private sector (College)	25, (12.4%)	8, (16.7%)	17, (11%)

Notes:

^a N = total amount of participants

^b Participants were asked to declare the level of studies they were attending at that juncture

^c Name of the higher education institution the participants were taking the course

^d UWA = University of West Attica

^e NKUA = National Kapodistrian University of Athens

^f HUA = Harokopio University of Athens

^g AUEB = Athens University of Economic and Business

^h NTUA = National Technical University of Athens

ⁱ UCLAN (Greece) = University of Central Lancashire in affiliation with private college in Athens, Greece

^g UoD (Greece) = University of Derby in affiliation with private college in Athens, Greece

^k In Greece, higher education is divided in two main categories: autonomous Universities (public institutions) and Colleges that collaborate with public Universities from abroad (private sector institutions)

2.2 Design

The study employed a quantitative, non-experimental, predictive/correlational, cross-sectional design. Its main purpose was to predict psychosomatic symptoms from sex, age, study level, stress, anxiety, depression, life satisfaction, and psychological resilience among university and college students in Greece.

2.3 Materials

2.3.1 Demographic & Institution Questionnaire

Participants completed a questionnaire that included questions about their sex, age, level of study, and the institution at which they were enrolled.

2.3.2 Psychosomatic Symptoms

Psychosomatic symptoms were measured using the 29-item Psychosomatic Symptoms Scale Questionnaire (PSSQ-29), which was initially developed in Greek to measure psychosomatic symptoms as a single factor (Pilafas et al., 2021a). The PSSQ-29 includes 29 self-report items assessing individual psychosomatic symptoms

on a Likert scale ranging from 0 (not at all) to 10 (very often). The PSSQ-29 has been used exclusively in Greek samples, and its α values indicate excellent reliability, ranging from .955 to .959 in previous studies (Pilafas, Lyrakos et al., 2024).

2.3.3 Negative Emotional State

Negative emotional state and distress were measured using the Greek version of the 21-item Depression Anxiety Stress Scale (DASS-21; Lyrakos et al., 2011). The original scale was developed in English with 42 items and includes three subscales measuring depression, anxiety, and stress (Lovibond & Lovibond, 1995). The Greek version was translated by Lyrakos and colleagues (2011) and, as in the original, comprises three factors: depression, anxiety, and stress. The DASS-21 is the abbreviated version and measures self-reported levels on a Likert scale from 0 (never) to 3 (almost always). The Greek version has been tested for validity and reliability in the Greek population, with excellent results (Lyrakos et al., 2011). Specifically, the α values are .968 for the overall scale, .941 for the depression subscale, .906 for the anxiety subscale, and .942 for the stress subscale (Lyrakos et al., 2011).

2.3.4 Psychological Resilience

Psychological resilience was measured using the abbreviated Greek version of the Nicholson–McBride Resilience Questionnaire (NMRQ; Pilafas et al., 2020). The original scale was developed in English and has one factor (Clarke & Nicholson, 2010). A 12-item short version of the original scale was produced by NHS England – North West (n.d.). This short version was adapted into Greek (Pilafas et al., 2020). The scale measures self-reported psychological resilience on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The Greek version showed high reliability, with an α value of .800 and a one-factor structure (Pilafas et al., 2020).

2.3.5 Life Satisfaction

Life satisfaction was measured using the Greek version of the Satisfaction With Life Scale (SWLS; Lyrakos et al., 2013). The original scale was developed in English and has one factor (Diener et al., 1985). The instrument consists of five self-report items rated on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) (Lyrakos et al., 2013). The Greek adaptation of the SWLS has demonstrated excellent validity and reliability in the Greek population, with an α value of .831 (Lyrakos et al., 2013).

2.3.6 Software

Raw data were coded and analysed using IBM SPSS Statistics for Windows, version 31 (IBM Corp., 2025).

2.4 Procedure

After receiving ethical approval, the researcher printed hard copies of the study materials. Data collection took place between late 2025 and early 2026 at seven higher-education institutions in Athens, Greece. Potential participants were approached by the researcher in publicly accessible facilities. Participants received an information sheet explaining the aim of the study; the participation process; anonymity and confidentiality; and their right to withdraw, including the withdrawal procedure. It was explained that the risk of distress was minimal. Those who agreed to participate signed a consent form and then completed the self-report questionnaires. Finally, a debriefing form summarised information about the study and included contact email addresses for data withdrawal and a helpline for psychological support if needed. Participants returned the completed hard copies to the researcher and were asked to retain the debriefing form. No deception was used for research purposes. Anonymity and confidentiality were ensured, and the data were stored in encrypted form on a password-protected device accessible only to the researcher. The raw data were then transferred to SPSS and coded. Statistical analyses were conducted, after which the results were considered in relation to the research questions. Finally, the present manuscript was prepared and submitted for consideration.

3. Results

3.1 Analytical Strategy and Assumptions

Regarding the operational and statistical plan, raw data were analysed using IBM SPSS Statistics for Windows, version 31 (IBM Corp., 2025). The raw data were coded according to the study's design and analytical requirements.

Based on the exclusion criteria, no missing data were observed. All outliers were retained in the final analysis because they were not considered to contribute significantly to violations of the assumptions of the final multiple regression analysis (Altman & Krzywinski, 2016).

The normality of the distributions was assessed. However, skewness and kurtosis were not expected to affect the multiple regression analysis substantially (Ernst & Albers, 2017). Normality tests can be overly sensitive in samples with more than 100 participants (Field, 2024). Thus, normality was evaluated through graphical checks, including histograms and normal P-P/Q-Q plots, and by inspecting skewness and kurtosis values converted to z-scores. Absolute values greater than 2.58, given the relatively large sample, were treated as indicating notable departures from zero (Field, 2024). No clear indication that non-parametric analysis was required was found (Appendix 11). Given these results and the number of observations, parametric analyses were conducted (Field, 2024).

Descriptive statistical analyses were conducted for all variables, both overall and by sex, to present means, standard deviations, and ranges.

The internal consistency of all scales and subscales was assessed using Cronbach's alpha. It was specified in advance that α values below .70 would be interpreted cautiously, whereas values between .80 and .95 would generally be considered acceptable (Tavakol & Dennick, 2011). Factor analysis and item-loading analyses were not performed because the subscales were predetermined by the original scale designs.

For all analyses in this study, $p \leq .05$ was specified in advance as the threshold for statistical significance.

An independent-samples t-test with Levene's test for equality of variances was used when the dependent variable was continuous and the independent variable was binary. Welch's test was used when the assumption of equal variances was significantly violated (Delacre et al., 2017).

Similarly, when the dependent variable was continuous and the independent categorical variable had more than two levels, a one-way ANOVA with Bonferroni post hoc tests was employed. Welch's ANOVA was used when the assumption of equal variances was violated (Delacre et al., 2019).

For the correlation analysis, r values below .10 were considered negligible, whereas values approaching .90 were considered likely to indicate that variables measured the same or an almost identical outcome (Field, 2024).

Lastly, the assumptions of multiple regression were carefully assessed, including linearity, normality of residuals, homoscedasticity, independence of errors, and multicollinearity (Ernst & Albers, 2017). The analysis used the Enter method, whereby predictors were entered simultaneously without manipulating their order of entry (Field, 2024). To avoid violations, variables in the predictive model were restricted to continuous variables, binary categorical variables, and dummy variables (Field, 2024). Furthermore, regression diagnostics were examined using standardised residuals, with values of approximately ± 2.5 flagged for further inspection and values greater than approximately ± 3 treated as extreme. Casewise diagnostics and indicators of influence were also examined, together with residual plots (ZRESID against ZPRED) to evaluate linearity and homoscedasticity, a normal probability plot (P-P plot) to assess normality (Ernst & Albers, 2017), the Durbin-Watson statistic to assess independence of errors, and variance inflation factors ($VIF < 5$) and tolerance values ($> .20$) to assess multicollinearity (Kim, 2019).

3.2 Descriptive Statistics and Internal Consistency

Descriptive statistics and Cronbach's alpha values for all scales and subscales are presented in Table 2.

Table 2. Variable details of the final sample. N= 202

Outcome	Measurement	M	(SD)	Range, [Min.–Max.]	SE	α
Psychosomatic Symptoms						
	PSSQ-29	80.8	(± 58.75)	260, [0 - 260]	4.13	.956
Negative Emotional State						
	DASS-21, Overall	18.6	(± 13.73)	53, [0 - 53]	.97	.942
	DASS-21, Stress subscale	7.7	(± 5.33)	20, [0 - 20]	.37	.883
	DASS-21, Anxiety subscale	4.8	(± 4.5)	17, [0 - 17]	.31	.846
	DASS-21, Depression subscale	6	(± 5.37)	21, [0 - 21]	.37	.892
Psychological Resilience						
	NMRQ	40	(± 7.94)	38, [22 - 60]	.56	.808
Life Satisfaction						
	SWLS	22	(± 6.92)	29, [6 - 35]	.48	.89

Notes.

N= Amount of participants

M= Mean score

SD= Standard deviation

SE= Standard Error

α = Cronbach's alpha score

The Cronbach's alpha values for the NMRQ ($\alpha = .808$) and SWLS ($\alpha = .89$) were interpreted as indicating very good internal consistency, whereas those for the PSSQ-29 ($\alpha = .956$), DASS-21 ($\alpha = .942$), and all DASS-21 subscales ($\alpha_{\text{stress}} = .883$; $\alpha_{\text{anxiety}} = .846$; $\alpha_{\text{depression}} = .892$) were interpreted as indicating excellent internal consistency (Lubiano et al., 2023).

3.3 Independent-Samples t-Tests

The independent-samples t-test results for sex differences across all variables are presented in Table 3.

Table 3. Results of independent samples t-test for Equality of Means between sexes. N= 202

	Males (n = 48)		Females (n = 154)		t-test ^a	95% CI		d
	M	SD	M	SD		Lower	Higher	
PSSQ-29	65.8	± 59.3	85.5	± 58	-2.04*	-38.66	-.66	-.34
DASS-21, Overall	13.3	± 12.4	20.3	± 13.7	-3.17**	-11.42	-2.66	-.52
DASS-21, Stress subscale	5.3	± 5	8.5	± 5.2	-3.7***	-4.85	-1.48	-.61
DASS-21, Anxiety subscale	3.8	± 4.3	5.2	± 4.5	-2*	-2.93	-.02	-.33
DASS-21, Depression subscale	4.2	± 4.5	6.6	± 5.5	-2.73**	-4.12	-.67	-.45
NMRQ	42	± 8	39.3	± 7.8	2.02*	.06	5.2	.33
SWLS	21.3	± 7.7	22.2	± 6.7	-.83	-3.21	1.31	-.14

Notes.

^adf= 200

N= sum of participants

M= Mean score

SD= Standard Deviation

CI= Confidence Interval of the independent samples t-test

d= Cohen's d (point estimates) for effect size

* $p < .05$

** $p < .01$

*** $p < .001$

Significant values are highlighted in bold.

The independent-samples t-test results for differences between levels of study across all measures are presented in Table 4.

Table 4. Results of independent samples t-test for Equality of Means between educational levels. N= 202

	Undergraduates (n = 144)		Postgraduates (n = 58)		t-test ^a	95% CI		d
	M	SD	M	SD		Lower	Higher	
PSSQ-29	82.1	± 58.5	77.6	± 59.9	-.49	-13.56	22.54	.08
DASS-21, Overall	18.7	± 13.8	18.5	± 13.6	.11	-4	4.44	.02
DASS-21, Stress subscale	7.8	± 5.5	7.7	± 5	.13	1.53	1.74	.02
DASS-21, Anxiety subscale	5	± 4.4	4.6	± 4.7	.48	-1.05	1.72	.07
DASS-21, Depression subscale	6	± 5.4	6.2	± 5.3	-.26	-1.87	1.43	-.04
NMRQ	40	± 8	39.9	± 7.8	.05	-2.38	2.51	.01
SWLS	22.1	± 7.3	21.9	± 5.9	.2 ^b	-1.75	2.14	.03

Notes.

^a df= 200

^b Levene's test shows significant violation of equal variances (p= .039). Welch's test is reported. df= 130.545

N= sum of participants

M= Mean score

SD= Standard Deviation

CI= Confidence Interval of the independent samples t-test

d= Cohen's d (point estimates) for effect size

Differences in all variables between students attending public universities and private colleges are presented in Table 5.

Table 5. Results of independent samples t-test for Equality of Means between public and private institutions. N= 202

	Public (n = 177)		Private (n = 25)		t-test ^a	95% CI		d
	M	SD	M	SD		Lower	Higher	
PSSQ-29	82.9	± 58.4	66	± 60.1	1.35	-7.75	41.66	.29
DASS-21, Overall	19.1	± 13.8	15.4	± 13	1.27	-2.06	9.47	.27
DASS-21, Stress subscale	7.9	± 5.2	6.7	± 5.9	1.07	-1.03	3.46	.23
DASS-21, Anxiety subscale	5	± 4.5	4.2	± 4.4	.8	-1.12	2.67	.17
DASS-21, Depression subscale	6.3	± 5.5	4.5	± 4.6	1.51	-.53	3.99	.32
NMRQ	39.5	± 7.7	43.3	± 8.9	-2.23*	-7.06	-.436	-.48
SWLS	22.2	± 6.6	20.8	± 8.8	.77 ^b	-2.34	5.16	.2

Notes.

^a df= 200

^b Levene's test shows significant violation of equal variances (p= .021). Welch's test is reported. df= 27.951

N= sum of participants

M= Mean score

SD= Standard Deviation

CI= Confidence Interval of the independent samples t-test

d= Cohen's d (point estimates) for effect size

*p < .05

Significant values are highlighted in bold.

3.4 One-Way ANOVA

The one-way ANOVA showed no differences in psychosomatic symptoms among the seven higher-education institutions, $F(6, 195) = .752$, $p = .608$, $\eta^2 = .023$, 95% CI [.000, .046].

3.5 Correlational Analysis

The results of the correlational analysis are presented in Table 6.

Table 6. Correlation Matrix between the variables, using Pearson's r correlation analysis. N= 202

No. Variable name	1	2	3	4	5	6	7	8	9	10
1. PSSQ-29	-									
2. Sex	.143*	-								
3. Age	.008	.200**	-							
4. Public vs. Private	-.095	-.073	.387***	-						
5. DASS, Overall	.748***	.219**	-.026	-.089	-					
6. DASS, Stress	.685***	.253***	-.014	-.075	.902***	-				
7. DASS, Anxiety	.729***	.140*	-.013	-.057	.892***	.709***	-			
8. DASS, Depression	.621***	.190**	-.043	-.106	.913***	.718***	.740***	-		
9. NMRQ	-.426***	-.141*	.106	.156*	-.321***	-.257***	-.327***	-.290***	-	
10. SWLS	-.417***	.058	-.056	-.067	-.271***	-.292***	-.274***	-.173*	.226***	-

Notes

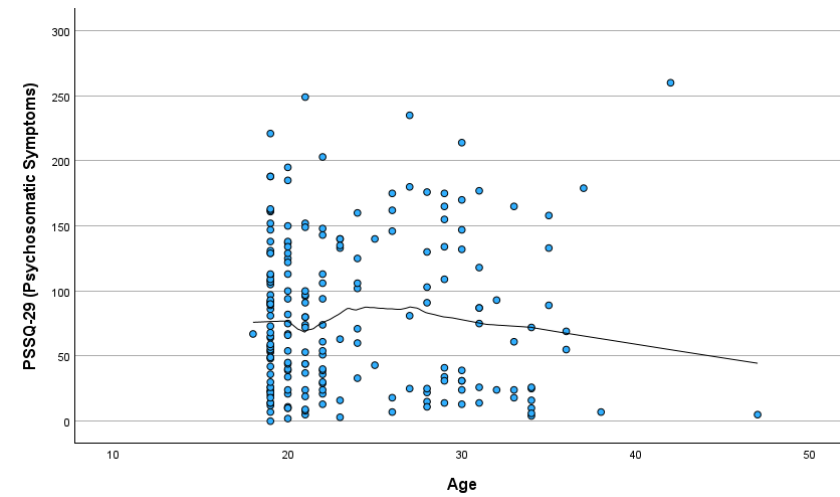
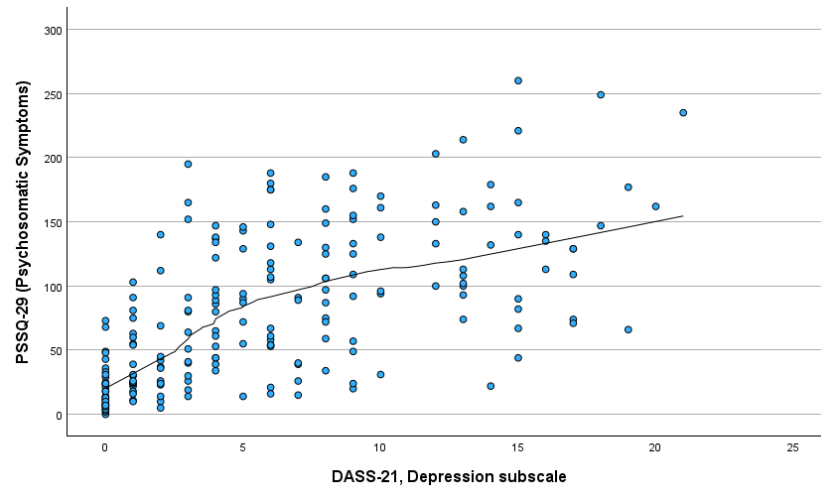
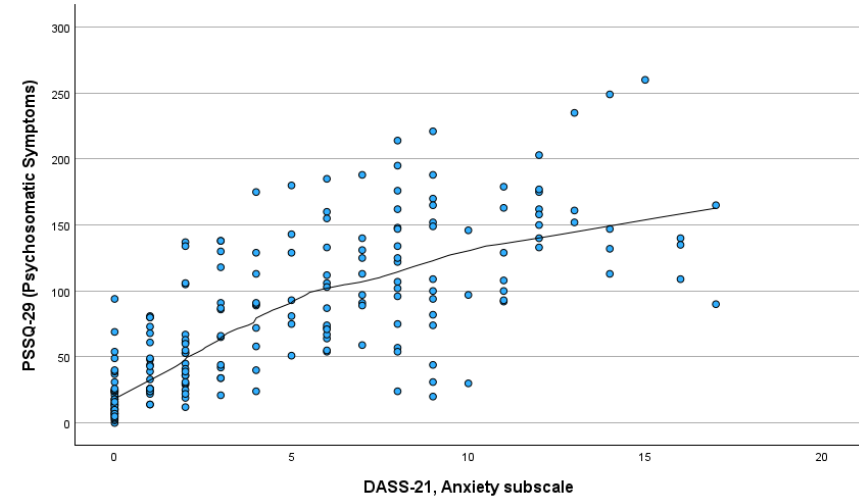
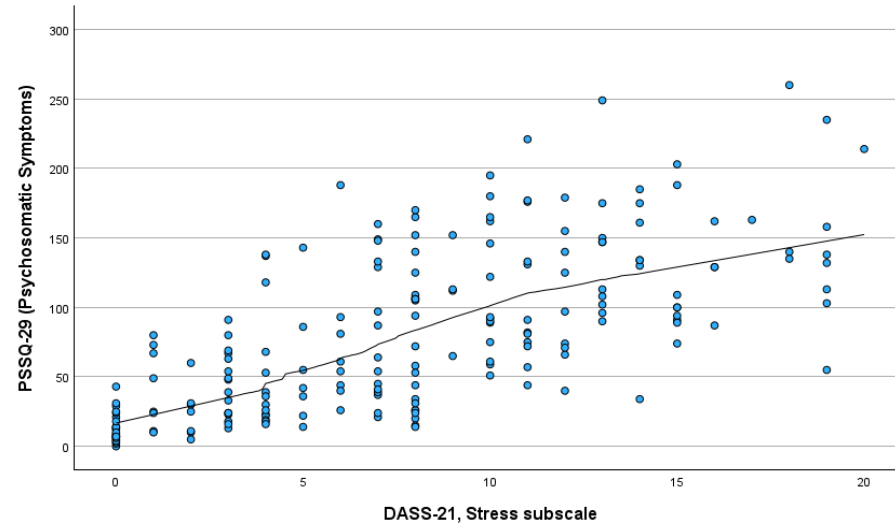
N= Total amount of participants

* $p \leq .05$ level

** $p \leq .01$ level

*** $p \leq .001$ level

Significant p values have been bolded.



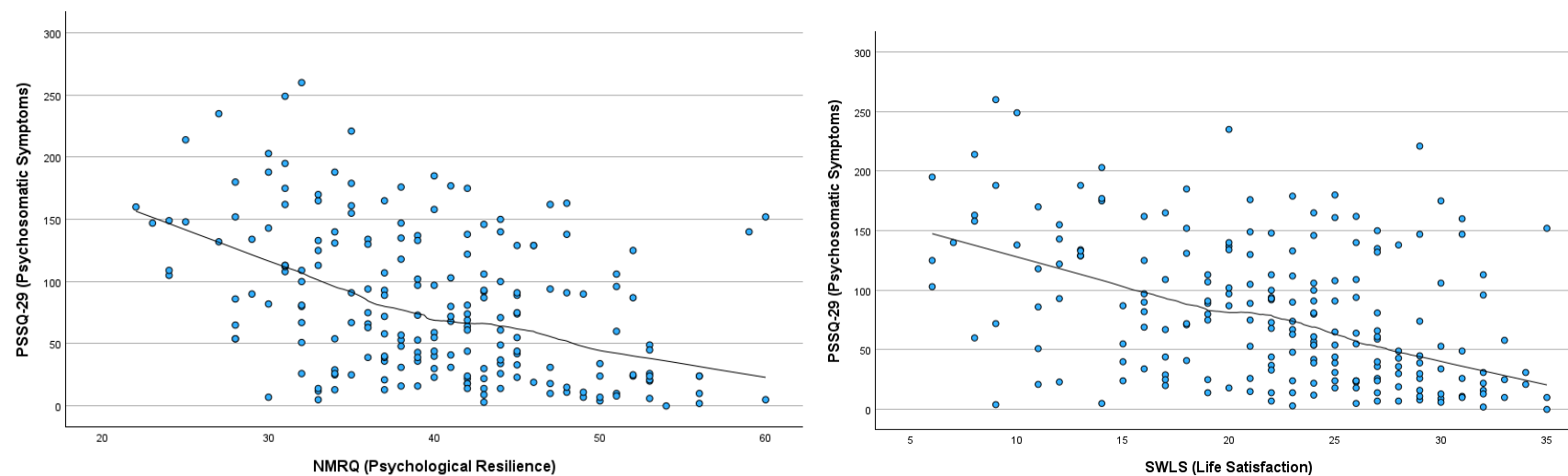


Fig. 1. Correlation Graphs of Linearity of individual variables of the predictive model with the criterion. N= 202

Notes.

N= Total amount of participants

Loess line was used to show any linearity.

The graphs suggest that the assumption of linearity is not be violated.

All correlation graphs suggest potential outliers.

Variables significantly correlated with the PSSQ-29 at $r < .800$ were used as predictors because these findings suggested a possible linear relationship without indicating that the variables measured the same outcome (Field, 2024). Age (a continuous variable), sex (a binary variable), and private versus public attendance (a binary variable) were also included as theory-driven variables.

Fig. 1 illustrates the linear relationship between the PSSQ-29 and each continuous variable included in the predictive model.

3.6 Regression Analysis

Multiple linear regression was conducted using the Enter method, with the PSSQ-29 as the criterion variable.

The final predictive model included sex, age, public versus private attendance, the DASS-21 stress subscale, the DASS-21 anxiety subscale, the DASS-21 depression subscale, the NMRQ, and the SWLS.

The ANOVA showed that the overall model was significant, $F(8, 193) = 46.289$, $p < .001$, $R^2 = .657$, adjusted $R^2 = .643$, indicating that the predictive model explained 64.3% of the variance in the outcome (Field, 2024). In the behavioural sciences, an explained variance between 20% and 26% is considered satisfactory; as a predictive model approaches 100%, it may increasingly measure the same outcome as the criterion (Miles, 2014).

The independence-of-errors assumption was supported, with no violation indicated by the Durbin–Watson statistic of 1.845.

Further details of the regression analysis are presented in Table 7.

Table 7. Results of the Multiple Linear Regression Coefficients Analysis. N= 202

	Unstandardized Coefficients		Standardized Coefficients		<i>t</i>	<i>p</i>	Toleranc e	VIF
	B	Std. Error (SE)	Beta (β)					
Constant	104.007	19.719			5.274	<.001		
Sex	-2.681	6.344	-.019		-.423	.673	.836	1.196
Age	.545	.503	.052		1.083	.280	.785	1.273
Public vs. Private	-9.541	8.319	-.054		-1.147	.253	.812	1.231
DASS, Stress subscale	3.024	.750	.275		4.032	<.001	.383	2.612
DASS, Anxiety subscale	5.060	.904	.388		5.596	<.001	.370	2.702
DASS, Depression subscale	.616	.758	.056		.812	.418	.368	2.714
NMRQ	-1.266	.343	-.171		-3.692	<.001	.827	1.209
SWLS	-1.548	.391	-.182		-3.959	<.001	.837	1.194

Notes:

N= total number of participants in the analysis

Criterion variable is PSSQ-29

Adjusted R^2 is found at .643

Beta weighting scores of the significant predictors to the model are bolded

No violations were observed in the coefficient analysis, as indicated by the tolerance and VIF values.

The coefficient analysis showed that the DASS-21 stress subscale ($\beta = .275$, $p < .001$) and DASS-21 anxiety subscale ($\beta = .388$, $p < .001$) were risk factors, whereas the NMRQ ($\beta = -.171$, $p < .001$) and SWLS ($\beta = -.182$, $p < .001$) were protective factors. Moreover, a backward-elimination analysis would indicate that these significant predictors should not be removed from the model (Field, 2024).

4. Discussion

4.1 Summary of Results

The present study recruited a cohort of Greek higher-education students and examined whether psychosomatic symptoms could be predicted by demographic characteristics (sex, age, and study level), institutional characteristics (public or private status and institution attended), self-reported negative emotional states (stress,

anxiety, and depression), and positive resources (psychological resilience and life satisfaction). Overall, the predictive model was significant, with stress, anxiety, psychological resilience, and life satisfaction emerging as key predictors, as expected in the research hypothesis. Notably, sex, age, public or private attendance, and depression did not contribute significantly to the model, contrary to the corresponding hypotheses. Sex differences were observed: men reported lower psychosomatic symptoms, negative emotional states, stress, anxiety, and depression than women. Men also reported higher psychological resilience, whereas life satisfaction did not differ between the sexes. Overall, these findings supported the relevant hypotheses concerning sex differences. No differences in psychosomatic symptoms were found between undergraduate and postgraduate students, between students attending public and private institutions, or among institutions. These outcomes did not support the corresponding hypotheses concerning study level and type or institution of attendance. Lastly, the correlational analysis showed that psychosomatic symptoms were associated with sex, negative emotional state, stress, anxiety, depression, resilience, and life satisfaction, but not with age or public versus private attendance. Thus, the research hypothesis was only partly supported because age and type of attendance were expected to be associated with psychosomatic symptoms.

4.2 Comparison with Previous and Current Literature

Overall, the results of previous studies are consistent with those of the current study, with minor exceptions.

4.2.1 Gender Differences in Psychosomatics

First, the study showed that women reported significantly higher levels of psychosomatic symptoms than men, supporting a pattern repeatedly observed in large student samples over the past two decades. For instance, Stock and colleagues (2008; $N = 5,317$) reported higher psychosomatic complaint scores among women in a multi-ethnic sample from Denmark, Spain, Lithuania, Bulgaria, Poland, and Turkey. Comparable findings have also been reported in single-country studies. El Ansari and colleagues (2014b; $N = 3,271$) found that female students at an Egyptian university reported more psychosomatic complaints. More recently, results from Central Europe again showed the same pattern (Gavurova et al., 2022; $N = 3,099$).

However, it is important to acknowledge that contextual factors may alter symptom levels. For example, Gavurova and colleagues (2022) conducted their research during the COVID-19 period; therefore, pandemic-related disruption may have influenced both emotional burden and health complaints. Nevertheless, sex differences persist across time and cultural settings, with women consistently reporting a greater burden.

Differing findings are less common and derive from smaller samples. For example, Chinawa and colleagues (2016; $N = 385$) reported no sex differences in psychosomatic symptoms among Nigerian medical students, and Hahn et al. (2025; $N = 104$) similarly found no differences in a small German student sample. These findings may reflect limited statistical power, sample-specific characteristics such as medical-student cohorts, or differences in how psychosomatic complaints were operationalised. In any case, the balance of evidence, particularly from larger and more heterogeneous samples, supports the conclusion that sex differences in student cohorts may be well established.

4.2.2 Gender Differences in Negative Emotional State

Women reported higher levels of overall distress, as well as higher stress, anxiety, and depression. This pattern is consistent with existing literature across Western and international contexts. Specifically, in Verona, Italy, female students aged 18–25 years demonstrated higher distress (Nosè et al., 2025; $N = 1,766$). Similarly, female university students enrolled in exercise courses in the USA reported higher stress (Graves et al., 2021; $N = 488$). This pattern also appeared during the COVID-19 period, when overall distress increased among university students. For instance, a Mexican study observed sex differences in distress, stress, anxiety, depression, and somatic symptoms (Vuelas-Olmos et al., 2023; $N = 935$). Under non-COVID conditions, comparable findings were reported in undergraduate samples from the United Arab Emirates (Alalalmeh et al., 2024; $N = 332$) and Ghana (Haruna et al., 2025; $N = 688$), suggesting higher distress-related symptoms among women across cultures.

However, the evidence is more mixed when depression is examined specifically. For instance, student samples from Jeddah, Saudi Arabia (Malebari et al., 2024; $N = 728$), and King Khalid University in Abha (Al-Garni et

al., 2025; N = 1,700) showed no sex differences in depressive symptoms. In Ethiopia, no sex differences were found in anxiety or depression among medical students (Mengesha et al., 2025; N = 450). These inconsistencies may reflect contextual differences, such as cultural norms concerning the reporting of emotional symptoms, sampling factors, such as the use of medical-student cohorts, and variation in measurement across studies.

4.2.3 Gender Differences in Psychological Resilience

Moreover, men reported higher resilience scores. This finding generally aligns with empirical evidence from student populations, suggesting that men tend to report greater resilience resources that may buffer stress-related symptom escalation. In particular, a Chinese study reported significant sex differences, with men scoring higher in resilience (Yuan et al., 2025; N = 1,436). Supporting findings have also been reported in European samples, including a German study (Yalcin-Siedentopf et al., 2021; N = 503) and a Greek study among nursing and dentistry students (Mangoulia et al., 2025; N = 271). These findings support the view that resilience is a protective resource that may differ by sex in student samples.

Contradictory results were reported in a Turkish study that found no significant differences (Demir & Barut, 2020; N = 306). It is noteworthy that Sojer and colleagues (2024) reported a more nuanced pattern, with women scoring higher on certain subscales rather than on the overall construct. These inconsistencies may indicate that resilience is not uniformly higher in one sex across all settings and that any differences may depend on how resilience is conceptualised and measured.

From a critical perspective, these mixed findings may be explained by measurement heterogeneity. Specifically, some studies may consider resilience a broad behavioural or coping resource, whereas others may operationalise it through specific dimensions, including control, persistence, or self-efficacy. In any case, the present study adds to the evidence that men report higher resilience in higher-education student samples in Greece.

4.2.4 Gender Differences in Life Satisfaction

With regard to life satisfaction, no differences were observed between men and women. However, the existing literature remains mixed, with no clear consensus across higher-education student populations.

Consistent findings have been reported in large studies, including samples from Ecuador (López-Guerra et al., 2025; N = 4,524) and Saudi Arabia (Ali et al., 2025; N = 1,401). In contrast, some studies have reported higher life satisfaction among women, including a small study conducted in Madrid, Spain (Caballero-García & Sánchez Ruiz, 2021; N = 162). Similarly, sex differences were observed in a larger Spanish-speaking university sample from Peru and Spain (Vilca Pareja et al., 2023; N = 1,220), in which the authors reported that cultural differences between the two countries did not explain variations in life satisfaction.

Considering the mixed results of previous studies and those of the present study, factors such as economic conditions and academic stressors may have been overlooked despite their potential to moderate sex differences in life satisfaction among students.

4.2.5 Study-level Differences in Psychosomatics

With regard to study level, no differences in psychosomatic symptoms were found between undergraduate and postgraduate students. This finding partly aligns with prior evidence. For example, Dadaczynski and colleagues (2022; N = 916) found no differences between bachelor's and master's students in Germany. Nevertheless, the same study found small but significant differences by field of study, while differences between undergraduate and postgraduate groups may disappear when psychosomatic burden is controlled for sex distribution, stress exposure, social position, and coping resources (Dadaczynski et al., 2022).

In contrast, Gavurova et al. (2022; N = 3,099) found differences in somatic symptoms between undergraduate and postgraduate students in a Czech and Slovak sample, although they found no differences by subject of study or year of enrolment. In addition, the authors suggested that higher levels of study may be associated with a greater somatic burden because of time pressure, uncertainty, financial strain, and academic pressures that differ from undergraduate life.

A major limitation is that data collection occurred during the COVID-19 pandemic; therefore, the results of both studies (i.e., Dadaczynski et al., 2022; Gavurova et al., 2022) may not reflect typical student conditions. Another limitation is that post-pandemic studies either use age as an indicator of study level or divide students into small groups according to year of study, which may yield small effects. Consequently, these studies may face analytical limitations because larger groups increase the likelihood of detecting statistical differences, whereas smaller group sizes reduce the likelihood of identifying differences between groups.

4.2.6 Attendance Differences in Psychosomatics

Another null finding was that students' psychosomatic symptoms did not differ among the seven institutions. Because all institutions were located in Athens, Greece, the study did not permit international or cross-cultural comparisons. Nevertheless, the results align with earlier work suggesting that symptom patterns may be shaped more by individual than by institutional factors.

Evidence for this conclusion derives from several international studies. El Ansari and colleagues (2013; N = 3,706) compared students enrolled at seven universities in England, Wales, and Northern Ireland and found no significant differences in health-related symptoms between institutions. Likewise, Chu and colleagues (2015; N = 3,306) found no differences in health-related symptoms across 16 German universities. Hence, institutional effects may be difficult to detect unless universities differ substantially in context.

Differences do, however, emerge when institutions in different countries are compared. In the study by Chu and colleagues (2015), no differences were observed among the German institutions, but significant differences emerged when German students were compared with Chinese students from two Chinese universities (n = 1,853). Similarly, El Ansari et al. (2014a) reported cross-national differences in health-related symptoms when UK-based students were compared with Egyptian students (N = 3,271), whereas no within-country institutional differences were observed.

Taken together, the outcome of the present study is consistent with previous findings. However, these results suggest that institutional comparisons within a single location or country may provide limited variability, whereas cross-national comparisons may reveal differences related to broader cultural, educational, and socioeconomic conditions.

4.2.7 Between-institutions Differences in Psychosomatics

Additionally, no differences in psychosomatic symptoms were found between students enrolled at public universities (UWA, NKUA, HUA, AUEB, and NTUA) and those enrolled at private colleges (UCLAN Greece and UoD Athens). Previous findings contradict the present results; however, they derive from a single South Asian country, which limits direct comparability with the Greek context.

More specifically, differences between public and private institutions have been reported in Bangladesh. Rahman et al. (2022; N = 677) found significant differences in health-related and somatic symptoms, while Ovi et al. (2024; N = 2,036) similarly reported significantly poorer outcomes among public-university students than among private-university students.

A key consideration is that the Bangladeshi studies recruited nationwide samples, whereas the present study recruited participants only from Athens. When students share the same urban environment, common living conditions and environmental stressors may reduce between-institution variability and make differences difficult to detect. Furthermore, beyond cultural differences from Greece, Bangladesh may differ in structural conditions such as socioeconomic background, tuition burden, competitiveness, and employment pressure.

4.2.8 Age and Psychosomatics

Regarding age, no association was found between age and psychosomatic symptoms. Although psychosomatic frameworks imply a linear relationship between age and psychosomatic symptoms (Ando, 2020), studies involving university-student samples have reported outcomes consistent with those of the present study.

For example, a Greek study at Democritus University of Thrace found that age was not a significant predictor of complaint outcomes (Katsikidou et al., 2024; $N = 1,234$). Correspondingly, a Peruvian study of 3,218 undergraduate students from Lima reported that age was not significantly associated with somatic symptoms (Zegarra-López et al., 2022).

Contrasting evidence is limited. Gavurova and colleagues (2022; $N = 3,099$) divided students into ‘younger’ and ‘older’ groups and found higher odds of somatic symptoms among younger students. One possible interpretation is that age effects are more detectable across wider age ranges or when age captures meaningful developmental and contextual differences. In typical university samples, the age range is relatively narrow, which may explain the inconsistency between the present study and the background evidence.

4.2.9 Predicting Psychosomatics

Turning to the main outcome, the present study showed that the combined model—including sex, age, private or public attendance, stress, anxiety, depression, psychological resilience, and life satisfaction—predicted psychosomatic symptoms among university students. Stress and anxiety were identified as risk factors for psychosomatic symptoms, whereas psychological resilience and life satisfaction were identified as protective factors. An interesting finding was that depression, together with sex, age, and public or private attendance, did not have a significant role in the predictive model, suggesting that these variables might be excluded from further analysis.

The literature provides both converging and conflicting evidence. A directly inconsistent finding comes from a Peruvian study in which resilience, life satisfaction, stress, and depression were not significant in the predictive model (Zegarra-López et al., 2022; $N = 3,218$). In other studies, however, stress and anxiety tend to be significant risk factors, with depression also included among these negative affective states. In a quasi-experimental study at the University of Marburg, Germany, negative stress beliefs at baseline predicted more somatic symptoms at follow-up (Fischer et al., 2016). Furthermore, Gavurova and colleagues (2022; $N = 3,099$) reported that mild or higher self-reported levels of anxiety and depression were common among students reporting somatic complaints, indicating substantial comorbidity. Sex and age were also included in that study’s model. Moreover, a German study of medical and dental students (Feussner et al., 2022; $N = 271$) showed that depression was positively associated with multiple risk factors and somatic symptoms, while several resilience factors were negatively associated with depression. Previous studies therefore frequently identify associations between depression and psychosomatic or somatic symptoms at the bivariate level, but depression’s individual contribution to a multivariable predictive model may diminish when anxiety and stress are included simultaneously. Thus, the present result may indicate shared variance rather than the absence of a relationship.

With regard to protective factors, the present findings are consistent with previous evidence showing that psychological resilience is associated with fewer somatic symptoms and higher life satisfaction, thereby indicating the protective role of both factors (Julian et al., 2022). Nonetheless, resilience research in student populations currently shows small effects and has several limitations. More specifically, several studies align with the present findings, including a small study at a single German university (Feussner et al., 2022; $N = 271$ medical and dental students) and a Greek study at NKUA (Antoniadou et al., 2024; $N = 271$ nursing and dentistry students). During the COVID-19 period, resilience was associated with effective coping strategies against psychosomatic symptoms among undergraduates at a college in the north-eastern USA (Guardino et al., 2025; $N = 193$). In contrast, Zegarra-López and colleagues (2022; $N = 3,218$) reported that resilience predicted somatic symptoms, but it was no longer significant in a multivariable model. Beyond student research, larger population studies that included substantial numbers of students and young adults have similarly found resilience to be protective against psychosomatic burden, although many were conducted during the COVID-19 pandemic (Ran et al., 2020; $N = 1,770$; Pilafas et al., 2021b; $N = 1,156$).

Finally, life satisfaction showed the most consistent protective pattern in relation to psychosomatic symptoms, and the present results are consistent with previous evidence from different settings. A study of 910 Honduran students showed a negative association between life satisfaction and somatic burden (Landa-Blanco et al., 2025). In addition, a recent study of 979 Saudi students found that life satisfaction was a protective well-being indicator against somatic complaints (Ali et al., 2025). The strongest support, however, comes from a Norwegian study (Veddegjærde et al., 2025; $N = 59,536$; age range = 18–35 years), in which students with an elevated somatic burden had a higher risk of low life satisfaction.

4.3 Application in Clinical Practice

Regarding clinical applications, psychosomatic complaints among Greek higher-education students may be treated as clinically meaningful indicators within the biopsychosocial model rather than as ‘medically unexplained’ or ‘secondary’ complaints (Ando, 2020). The literature shows that psychosomatic symptoms are real and stress-sensitive, while the present model aligns with recent studies showing that stress and anxiety are associated with increased psychosomatic symptoms and that resilience and life satisfaction are protective factors (Grigorian et al., 2023; Låftman & Östberg, 2025; Lee, 2022; Schaefer et al., 2022). Therefore, when psychologists formulate relevant cases, they may benefit from screening students for stress and anxiety and assessing resilience and life satisfaction. Furthermore, the non-significant role of depression in the final model may indicate that stress- and anxiety-related processes share variance in psychosomatic burden, suggesting that intervention planning should not assume that all dimensions of distress contribute equally (Feussner et al., 2022). In practice, the results support brief, low-threshold interventions to reduce distress and strengthen protective resources through psychoeducation and resilience-oriented support, consistent with mental-health reviews and resilience research (Aloufi et al., 2021; Ansari & Iqbal, 2025; Mofatteh, 2021).

4.4 Limitations

Several limitations should be considered. First, although the sample size met the *a priori* requirement for the analysis, it remained modest for subgroups based on sex, institution, and type of attendance. This concern was increased by unequal group sizes, with women overrepresented and relatively few private-college students. Therefore, some null findings may reflect limited sensitivity rather than an absence of differences (Field, 2024). Moreover, convenience sampling was used, and recruitment was limited to institutions in Athens. Thus, the results may have limited external validity because students from other regions were excluded, restricting cross-regional and cross-cultural conclusions (Memon et al., 2025). The study was also limited by its cross-sectional design and the use of self-report measures collected at a single time point. Consequently, the direction of effects cannot be established (Field, 2024; Setia, 2016), and causal claims that stress and anxiety produce psychosomatic symptoms or that resilience and life satisfaction directly reduce them cannot be supported. Additionally, shared-method variance and construct overlap between stress-related conditions and psychosomatic symptoms may have inflated the associations and contributed to the high R^2 value (Miles, 2014). Finally, the PSSQ-29 measures psychosomatic burden broadly, unlike instruments that assess a narrower somatisation construct (Pilafas et al., 2021a). Therefore, direct comparisons with other psychosomatic studies should be made cautiously.

4.5 Future studies

Future studies should replicate the present research using broader and more diverse samples, as the literature suggests that within-country differences are often limited and that cross-national comparisons reveal more meaningful variation (Chu et al., 2015; El Ansari et al., 2014a). Future research could also include additional variables, such as study mode, employment status, and academic pressure, because previous studies have discussed the interplay among student distress, psychosomatic burden, and academic and financial demands (Al-Jayyousi et al., 2025; Cage et al., 2021; Ruiz-Camacho et al., 2025). Finally, researchers could use mediation, moderation, and longitudinal designs to test whether resilience buffers the effects of stress and whether the role of depression is reduced when stress and anxiety are modelled simultaneously (Ansari & Iqbal, 2025; Grigorian et al., 2023; Hashemi Mohammadabad et al., 2024).

5. Conclusion

This study examined whether psychosomatic symptoms among Greek higher-education students could be predicted by negative emotional states, psychological resilience, life satisfaction, and selected demographic and institutional characteristics. The regression model explained a substantial proportion of the variance in psychosomatic symptoms. Stress and anxiety were positively associated with symptom burden, whereas psychological resilience and life satisfaction were negatively associated with it. Depression, sex, age, and public versus private attendance did not make significant independent contributions to the final model. Although female students reported higher psychosomatic symptoms and negative emotional states and male students reported greater resilience, psychosomatic symptoms did not differ significantly by study level, institution, or institution type. These findings support the simultaneous consideration of psychological risk and protective

factors when assessing student psychosomatic health. Student-support services may benefit from screening for stress and anxiety while also promoting resilience and life satisfaction.

Consent

As per international standards or university standards, Participants' written consent has been collected and preserved by the author(s).

Ethical Approval

The study received ethical approval by the Ethics Committee of ICPS - College of Humanistic Studies in Athens, Greece. The Ethics Committee follows the domestic Greek law regarding research that involves human subjects, the European Union law on General Data Protection Regulation (GDPR), and the Code of Human Research Ethics of the British Psychological Society (BPS).

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Declaration of AI Use

This manuscript was prepared through the combined contributions of all author(s), including contributions to the study design, data, content development, results, interpretation, and related scholarly work. The author(s) acknowledge the use of Grammarly and ChatGPT to assist with grammar checking, language refinement, reference formatting. These AI-assisted tools were not used as authors and did not replace the intellectual contributions or scholarly judgment of the author(s). All AI-assisted outputs, including content, references, and interpretations, were carefully reviewed, revised, verified, and approved by the author(s). The author(s) accept full responsibility for the accuracy, integrity, and final content of the manuscript.

Competing Interests

Authors have declared that no competing interests exist.

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