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Academic Stress and Mental Health in University Students: Parallel Risk and Protective Pathways Involving Rumination, Sleep, Coping and Self-Efficacy

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Abstract

Academic stress is a pervasive challenge in university settings and is strongly associated with mental health problems of students. However, less is known about the simultaneous risk and protective mechanisms through which academic stress translates into psychological distress. This study examined these pathways linking academic stress to mental health problems among university students. Using a correlational design, data was collected from 272 students (aged 19–24 years) recruited through stratified purposive sampling from public and private universities. Standardized self-report measures were used to assess all variables. Results indicated that academic stress has a strong total effect on mental health problems which is largely mediated through parallel risk and protective pathways. Significant serial pathways indicated that academic stress increased rumination which exacerbated sleep problems and reduced coping skills undermined self-efficacy which collectively contribute to mental health problems. Student mental health reflects the balance between risk-enhancing and buffering processes.

Keywords: Academic stress, mental health, university students, Risk and Protective factors, rumination, sleep, coping, self-efficacy

Introduction

Mental health problems in university students are one of the major global concerns with a growing body of evidence indicating elevated levels of anxiety, depression and stress leading to complications in higher education settings (Ramón-Arbués et al., 2020; Sheldon et al., 2021). University years coincide with emerging adulthood which is a developmental period characterized by significant academic demands along with identity exploration and need for autonomy which in return increase vulnerability to psychological distress (Arnett, 2018; Beiter et al., 2015). Importance of mental health of the students for academic functioning, retention of knowledge and long-term well-being make it important for the researchers and practitioners to understand the mechanisms that contribute to mental health problems in this population.

University students encounter a number of stressors among which academic stress has emerged as one of the most salient and pervasive factors effecting the wellbeing of the students (Pascoe et al., 2020). Academic stress encompasses pressure related to examinations, coursework, performance evaluation and future career concerns which are often experienced as chronic rather than episodic and acute (Khadka, 2024; Lakshmanarao et al., 2025). A substantial body of research has

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demonstrated strong associations between academic stress and mental health problems among students (e.g. Córdova Olivera et al., 2023; Ibda et al., 2023). However, exposure to academic stress does not uniformly result in psychological distress which suggest that academic stress alone is insufficient to explain variability in mental health outcomes of students (Limone & Toto, 2022). This variability highlights the need to examine the processes through which academic stress is experienced, interpreted and managed.

Contemporary stress theories like transactional and stress process models emphasize that stressors influence mental health through the interplay of cognitive, physiological and psychological mechanisms (Candeias et al., 2024; Lazarus &Folkman, 1984). Within this framework, academic stress may initiate vulnerability pathways that amplify distress and disrupt protective resources which usually buffer against stress-related harm. One well-documented cognitive mechanism is rumination which is characterized by repetitive and passive focus on stressors and their potential consequences (Wong et al., 2023). Academic stress has been linked to increased rumination among students which in turn is associated with heightened psychological symptoms (Zuo et al., 2024) as rumination prolongs stress-related cognitive activation and prevents recovery by exacerbating emotional difficulties (Sloan et al., 2020; Vandevala et al., 2017).

In addition to cognitive mechanisms, physiological dysregulation represents a critical pathway through which academic stress may affect mental health of the individuals (Teixeira et al., 2022). Sleep problems are particularly prevalent among university students and are consistently associated with academic stress (Waqas et al., 2015; Zhang et al., 2020). Stress-related sleep disturbance undermines emotional regulation, cognitive functioning and psychological resilience which increase the vulnerability of individuals to mental health problems. Cognitive processes such as rumination may further intensify sleep disruption by maintaining heightened arousal (Dressle & Riemann, 2023) which indicate the potential for serial pathways linking academic stress, rumination, sleep problems and mental health outcomes.

Along with the vulnerability pathways, psychological resources play an important role in shaping response of the students to academic stress in a better way (Qi et al., 2025). Coping skills are the strategies that individuals use to manage stressors and their emotional impact which are associated with reduced psychological distress and better adjustment in student populations (Bondarchuk et al., 2024; Folkman & Moskowitz, 2004). Similarly, self-efficacy as beliefs in one's ability to manage challenges successfully is identified as a key protective factor for mental health (Ruotolo et al., 2023). This indicates that students with better coping skills and higher self-efficacy are generally better equipped to navigate academic demands and maintain psychological well-being throughout their academic journey. However, sustained academic stress undermine these resources and reduce their protective capacity which increase vulnerability of the students to mental health problems.

Despite extensive research on both vulnerability and protective factors, the existing literature remained fragmented as risk-enhancing mechanisms such as rumination and sleep problems are often examined independent of protective resources such as coping skills and self-efficacy. Moreover, protective factors are frequently conceptualized as static moderators rather than dynamic processes that may themselves be influenced by academic stress. Overall, a limited attention has been given to explore that how academic stress simultaneously activates risk

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pathways and uses protective resources to bring a balance between opposing processes which determine mental health outcomes of students.

Addressing these limitations, the present study adopts an integrated process-based approach to examine the relationship between academic stress and mental health problems among university students. Drawing on stress process and resource-based frameworks, this study tests a comprehensive serial–parallel mediation model in which academic stress influences mental health through cognitive (rumination), physiological (sleep problems) and psychological resource-based (coping skills and self-efficacy) pathways operating concurrently. This approach allows for the examination of both direct and indirect effects of academic stress, as well as the identification of serial mechanisms linking cognitive and resource-based processes to mental health outcomes.

Hypotheses

Based on stress process and resource-based frameworks, the following hypotheses were tested:

H1: Academic stress will be positively associated with mental health problems among university students.

H2a: Academic stress will be positively associated with rumination, which will in turn be positively associated with mental health problems.

H2b: Academic stress will be positively associated with sleep problems, which will in turn be positively associated with mental health problems.

H3: Rumination will be positively associated with sleep problems, forming a serial indirect pathway from academic stress to mental health problems via rumination and sleep problems.

H4a: Academic stress will be negatively associated with coping skills, which will in turn be negatively associated with mental health problems.

H4b: Academic stress will be negatively associated with self-efficacy, which will in turn be negatively associated with mental health problems.

H5: Coping skills will be positively associated with self-efficacy, forming a serial indirect pathway from academic stress to mental health problems via coping skills and self-efficacy.

H6: The indirect effects of academic stress on mental health problems through risk pathways (rumination and sleep problems) and protective pathways (coping skills and self-efficacy) will operate in parallel, such that mental health outcomes in students reflect the combined influence of vulnerability-enhancing and resource-based processes.

Method

Research Design

The present study employed a correlational research design to examine the associations between academic stress and mental health problems among university students, as well as the underlying

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cognitive, physiological and psychological mechanisms through which these relationships operate. This design was considered appropriate for testing complex indirect pathways involving multiple mediators operating in serial and parallel forms.

Participants and Sampling

Participants were recruited using stratified purposive sampling from Higher Education Commission (HEC) recognized public and private universities. Stratification was applied to ensure representation across institution type (government and private), geographical background (rural and urban) and gender (male and female students). This approach allowed for greater heterogeneity within the sample and enhanced the representativeness of the student population. The inclusion criteria consisted of: (a) young adults aged 19–29 years, (b) enrollment in undergraduate (BS) or postgraduate (MS) degree programs and (c) current registration as a full-time university student. Students were excluded if they reported (a) a diagnosed severe mental health condition, (b) a severe or chronic physical health condition or (c) experiencing a current major life stressor (e.g., bereavement, serious illness in the family or major financial crisis) that could confound stress and mental health responses.

Measures

A self-constructed demographic information sheet was used to collect data on age, gender, academic semester, degree program and type of institution of the participants (public or private). This information was used to describe the sample characteristics.

Perceived Stress Scale–10 (PSS-10; Cohen et al., 1983) was used to assess academic stress. The scale consists of 10 items measuring the degree to which situations in life are appraised as stressful by the individual. Items are rated on a 5-point Likert scale ranging from 0 (*never*) to 4 (*very often*) and higher scores indicate greater perceived academic stress. The PSS-10 has demonstrated good reliability and validity in student populations.

Ruminative Response Scale (Brose et al., 2022) consisting of 8 items was used to measure rumination. This version captures within-person variation in ruminative thinking and is suitable for assessing repetitive cognitive focus on stress-related thoughts. Items are rated on a 4-point Likert scale ranging from 1 (*almost never*) to 4 (*most of the time*). Higher scores indicated greater rumination.

Jenkins Sleep Evaluation Questionnaire (Jenkins et al., 1988) was used to assess sleep problems. This measure includes 4 items assessing common sleep difficulties such as trouble falling asleep, night awakenings and non-restorative sleep. Items are rated on a scale ranging from 0 (*not at all*) to 5 (*23-31days*) with higher scores indicating greater sleep disturbance.

Depression Anxiety Stress Scale–9 (DASS-9), a shortened version validated by Orellana and Orellana (2025) was used to measure mental health problems. The scale consists of 9 items assessing symptoms of depression, anxiety and stress. Items are rated on a 4-point Likert scale ranging from 0 (*did not apply to me*) to 3 (*applied to me very much*), with total scores ranging from 0 to 27. Higher scores reflect greater psychological distress.

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Coping Scale developed by Hamby, Grych and Banyard (2015) was used to measure adaptive coping. The scale comprises 13 items assessing constructive coping strategies. Responses are rated on a 4-point Likert scale ranging from 1 (*not true about me*) to 4 (*mostly true about me*) with higher scores indicating more effective coping skills.

General Self-Efficacy Scale (GSE; Schwarzer & Jerusalem, 1995) was used to measure self-efficacy. The scale includes 10 items rated on a 4-point Likert scale from 1 (*not at all true*) to 4 (*exactly true*) and higher scores reflect stronger beliefs in own ability to handle difficult situations and challenges.

Procedure

After obtaining institutional permission, participants were approached in classroom and university settings. The purpose of the study was explained and informed consent was obtained prior to data collection. Participants were assured of confidentiality, anonymity and their right to withdraw at any stage without penalty. Questionnaires were administered in a paper-and-pencil or online format and completion required approximately 20–25 minutes.

Ethical Considerations

All the ethical principles for research involving human participants were followed in this study. Participation was voluntary and no identifying information was collected during the process of data collection. Students who reported distress during data collection were allowed to quit their participation and were provided with information about available counseling services.

Results

Sample of the study consisted of 272 university students with a mean age of 21.76 years (*SD* = 1.64; range = 19–28 years). Female students (*n* = 162) comprised 59.6% of the sample, while male students (*n* = 110) accounted for 40.4%.

Table 1 Means, Standard Deviations and Pearson Correlations Among Study Variables (N=272)

Variable	*M*	*SD*	*α*	MHP	AS	RM	SP	CS	SE
MHP	8.92	4.95	.91	—					
AS	22.94	6.61	.87	.65***	—				
RM	18.16	4.76	.88	.38***	.25***	—			
SP	10.65	2.41	.85	.85***	.55***	.30***	—		
CS	27.26	6.51	.90	-.58***	-.47***	-.25***	-.46***	—	
SE	21.87	5.27	.86	-.67***	-.43***	-.23***	-.61***	.35***	—

Note. MHP=Mental Health Problems, AS=Academic Stress, RM=Rumination, SP=Sleep Problems, CS=Coping Strategies, SE=Self-Efficacy; *M*=Mean, *SD*=Standard Deviation, α=internal consistency of scale

***$p<.001$

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Pearson correlation analyses revealed a coherent pattern of associations among academic stress, psychological processes and mental health outcomes (*Table 1*). Mental health problems were strongly and positively correlated with academic stress ($r = .65$, $p < .001$), rumination ($r = .38$, $p < .001$) and sleep problems ($r = .85$, $p < .001$). In contrast, mental health problems were significantly and negatively associated with coping skills ($r = -.58$, $p < .001$) and self-efficacy ($r = -.67$, $p < .001$). Academic stress demonstrated moderate positive correlations with rumination ($r = .25$, $p < .001$) and sleep problems ($r = .55$, $p < .001$) and moderate negative correlations with coping skills ($r = -.47$, $p < .001$) and self-efficacy ($r = -.43$, $p < .001$). Rumination was positively associated with sleep problems ($r = .30$, $p < .001$) and negatively related to both coping skills ($r = -.25$, $p < .001$) and self-efficacy ($r = -.23$, $p < .001$). Coping skills and self-efficacy were positively correlated ($r = .35$, $p < .001$). All correlations were significant at the .01 level, providing preliminary support for the proposed mediation pathways.

Mediation Analyses

A serial–parallel multiple mediation model (PROCESS Model 82; Hayes, 2022) was tested to examine the indirect effects of academic stress on mental health problems through rumination, sleep problems, coping skills and self-efficacy. Bootstrapping was conducted using 5,000 samples with 95% confidence intervals.

Table 2 shows that academic stress significantly predicted rumination ($\beta = .25$, $p < .001$), accounting for 6% of the variance in rumination. Academic stress and rumination jointly predicted sleep problems explaining a variance of 33% where academic stress emerged as a strong predictor ($\beta = .50$, $p < .001$) and rumination contributed an additional significant effect ($\beta = .18$, $p < .001$). Academic stress also significantly predicted coping skills in a negative direction ($\beta = -.47$, $p < .001$) accounting for approximately 22% of the variance which indicate that higher academic stress was associated with poorer coping capacity among university students. Academic stress was negatively associated with self-efficacy ($\beta = -.34$, $p < .001$) while coping skills were positively related to self-efficacy ($\beta = .19$, $p = .003$) in the subsequent model predicting self-efficacy. Together, these variables explained 21% of the variance in self-efficacy.

Table 2 shows that the full model predicting mental health problems was statistically significant and demonstrated excellent explanatory power ($R^2 = .83$, $F(5, 266) = 251.78$, $p < .001$). Academic stress was a significant predictor of mental health problems ($\beta = .18$, $p < .001$) even after controlling all mediators. Rumination was positively associated with mental health problems ($\beta = .08$, $p = .002$) where coping skills ($\beta = -.17$, $p < .001$) and self-efficacy ($\beta = -.18$, $p < .001$) were negatively associated with mental health problems. Sleep problems emerged as the strongest predictor of mental health problems ($\beta = .54$, $p < .001$) which indicated that sleep disruption played a central role in explaining psychological distress among university students

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Table 2 Regression Coefficients, Standard Error and Model Summary Information for Family Cohesion, Interpersonal Difficulties, Self-Esteem and Emotional Behavioral Problems of Adolescents (N=272)

Antecedents	Consequences														
	RM *(M1)*			SP *(M2)*			CS *(M3)*			SE *(M4)*			MHP *(Y)*		
	B	***SE***	***p***	***B***	***SE***	***P***	***B***	***SE***	***p***	***B***	***SE***	***p***	***B***	***SE***	***p***
AS (*X*)	.18	.04	.000	.18	.02	.000	-.46	.05	.000	-.27	.05	.000	.14	.02	.000
RM (*M1*)				.09	.03	.001				.15	.05	.003	.09	.03	.002
SP (*M2*)													1.10	.08	.000
CS *(M3)*													-.13	.02	.000
SE *(M4)*													-.17	.03	.000
	R^2 = .06 $F(1,270)$ = 17.39, p<.001			R^2 = .33 $F(2,269)$ = 66.43, p<.001			R^2 = .22 $F(1,270)$ = 76.04, p<.001			R^2 = .21 $F(2,269)$ = 35.65, p<.001			R^2 = .83 $F(5,266)$ = 251.78, p<.001		

Note. MHP=Mental Health Problems, AS=Academic Stress, RM=Rumination, SP=Sleep Problems, CS=Coping Strategies, SE=Self-Efficacy

**p<.01, ***p<.00

Table 3 Indirect effect of Academic Stress on Mental Health Problems (N=272)

Effect	**Product of coefficients**		**Bootstrapping 95% Bias-Corrected and Accelerated Confidence Interval**	
	B	*SE*	Lower	Upper
Total indirect effect	.35	.03	.30	.41
AS→RM→MHP	.02	.01	.01	.03
AS→SP→MHP	.20	.02	.15	.25
AS→CS→MHP	.06	.01	.04	.08
AS→SE→MHP	.05	.01	.02	.07
AS→RM→SP→MHP	.02	.01	.01	.04
AS→CS→SE→MHP	.01	.01	.00	.02

Note. MHP=Mental Health Problems, AS=Academic Stress, RM=Rumination, SP=Sleep Problems, CS=Coping Strategies, SE=Self-Efficacy

Table 3 shows that total effect of academic stress on mental health problems was significant (β = .65, p < .001). When mediators were included in the model, the direct effect was substantially reduced but remained significant (B = .13, p < .001), indicating partial mediation. Total indirect effect of academic stress on mental health problems was significant (β = .47, 95% *CI* [.40, .54]). Among specific indirect pathways, the strongest effect was observed through sleep problems alone (β = .27). Additional significant indirect effects were observed through coping skills (β = .08), self-efficacy (β = .06) and rumination (β = .02). Significant serial mediation effect was found for the serial effects through Rumination with Sleep Problems and Coping with Self-Efficacy on the association of academic stress and Mental Health Problems indicated that both cognitive–

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physiological problems and resource-based mechanisms contributed to mental health outcomes in students.

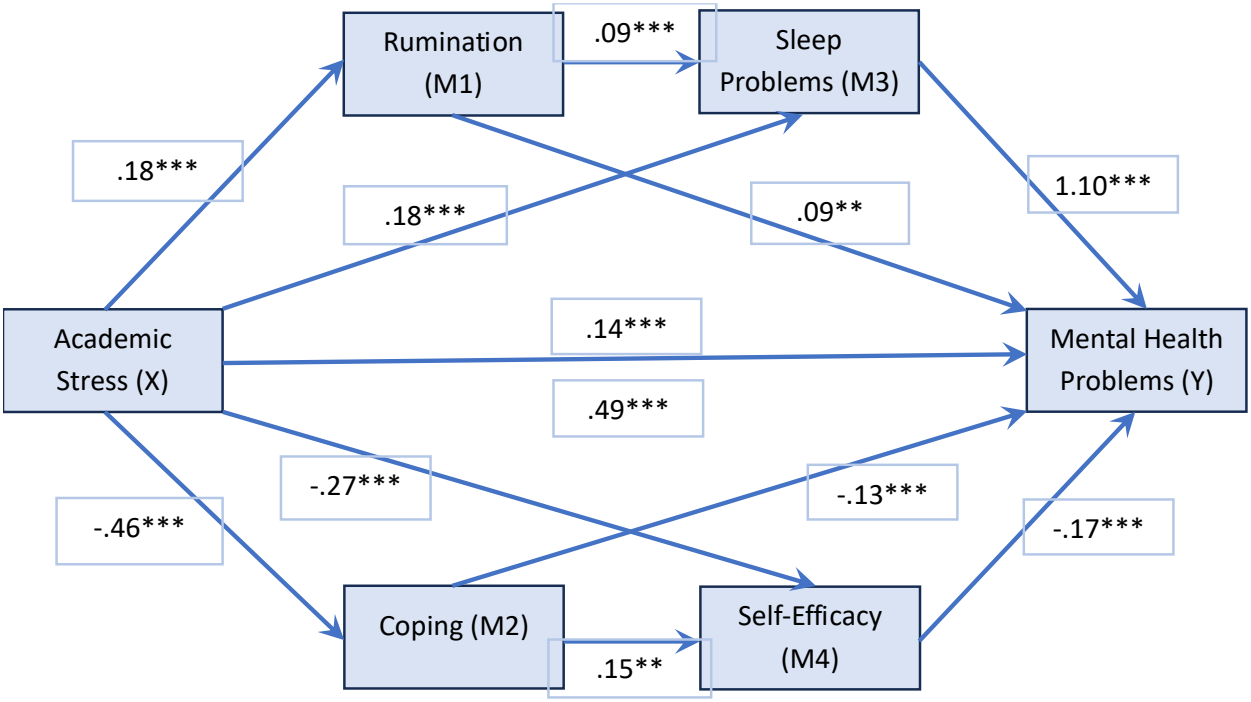


Figure 1: Statistical Diagram of Serial–Parallel Mediation Model (PROCESS Model 82)

Overall, the results indicate (*Figure 1*) that academic stress is a significant determinant of mental health problems among university students through indirect pathways. Sleep problems functioned as the most influential proximal mechanism along with rumination, coping skills and self-efficacy to explain that how academic stress translates into psychological distress. These findings highlight the multidimensional nature of mental health of the students and indicate towards the combined roles of cognitive vulnerability, sleep regulation and psychological resources that collectively contribute to their mental health outcomes.

Discussion

The present study examined how academic stress contributes to mental health problems among university students by testing a serial–parallel process model that incorporated both risk-enhancing and protective mechanisms relating academic stress to mental health problems. The findings indicate that academic stress is a strong determinant of mental health of the students; however, its effects are not transmitted through vulnerability pathways alone. Instead, academic stress simultaneously activates cognitive and physiological risk processes while undermining psychological resources, with mental health outcomes in students reflecting the net balance between these competing pathways. This integrated pattern provides a more nuanced understanding of why exposure to academic stress results in varying levels of psychological distress among university students, consistent with prior evidence that academic stress is a

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pervasive determinant of student well-being (Pascoe et al., 2020; Córdova Olivera et al., 2023; Ibda et al., 2023).

Consistent with stress process and transactional models (Lazarus & Folkman, 1984; Candeias et al., 2024), academic stress functioned as a central distal stressor, exerting a substantial total effect on mental health problems. Although this effect was partially attenuated after accounting for mediators, it remained significant, suggesting that academic stress continues to influence mental health through additional unmeasured mechanisms. This finding reinforces the conceptualization of academic stress as a chronic and pervasive demand in university contexts (Khadka, 2024; Lakshmanarao et al., 2025), rather than a transient or manageable challenge.

Sleep problems emerged as the most prominent proximal mechanism linking academic stress to mental health problems. Academic stress strongly predicted sleep disturbances, which in turn showed the largest association with psychological distress. These findings position sleep disruption as a key pathway through which academic stress "gets under the skin," translating sustained academic demands into emotional dysregulation and psychological symptoms. The centrality of sleep problems aligns with prior evidence demonstrating strong links between academic stress and sleep disturbance (Waqas et al., 2015; Zhang et al., 2020), as well as theoretical accounts emphasizing physiological dysregulation in stress-related mental health outcomes (Teixeira et al., 2022). Furthermore, hyperarousal and stress–sleep frameworks suggest that stress-related activation may compromise restorative processes essential for emotional regulation in students (Dressle & Riemann, 2023).

Rumination functioned as a complementary cognitive risk pathway. Higher academic stress was associated with greater ruminative thinking, which directly contributed to mental health problems and indirectly intensified distress through increased sleep problems. This serial pattern highlights how repetitive negative thinking may prolong stress-related activation beyond academic demands themselves, maintaining cognitive arousal that interferes with sleep and amplifies psychological symptoms. These findings are consistent with prior research linking academic stress to rumination (Wong et al., 2023; Zuo et al., 2024) and with cognitive vulnerability models suggesting that rumination exacerbates emotional difficulties and impairs recovery from stress (Sloan et al., 2020; Vandevala et al., 2017).

Importantly, the findings demonstrate that academic stress does not operate solely through risk mechanisms. Coping skills and self-efficacy emerged as protective processes that worked in parallel with vulnerability pathways. Higher academic stress was associated with poorer coping skills and reduced self-efficacy, both of which were linked to greater mental health problems. These findings align with prior evidence that coping skills buffer psychological distress in student populations (Bondarchuk et al., 2024; Folkman & Moskowitz, 2004) and that self-efficacy functions as a key protective factor for mental health (Kristensen et al., 2023; Ruotolo et al., 2023). The serial pathway from coping skills to self-efficacy suggests that stress-related depletion of coping resources may erode confidence of the students in their ability to manage academic challenges, thereby increasing psychological vulnerability. Conversely, stronger coping skills and self-efficacy appear to buffer the adverse effects of academic stress, partially offsetting the influence of risk-enhancing processes.

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Taken together, these findings support a dual-process model of academic stress, in which mental health problems among university students emerge from the simultaneous activation of risk pathways (rumination and sleep disruption) and the erosion or preservation of protective resources (coping skills and self-efficacy). Psychological distress is therefore not an inevitable outcome of academic stress but reflects the dynamic interplay between vulnerability and resilience processes operating in parallel. This perspective extends contemporary stress theories (Lazarus & Folkman, 1984; Candeias et al., 2024) by empirically demonstrating how cognitive, physiological and psychological mechanisms jointly shape mental health outcomes in university contexts.

Implications of the study

The findings advance theoretical understanding of student stress models by demonstrating that how academic stress influences mental health through the concurrent operation of risk-enhancing and protective pathways and how the psychological outcomes reflect the balance between psychological vulnerabilities and resources rather than a unidirectional stress-to-pathology process. The results suggest that interventions aiming to improve mental health of the students should move beyond reducing academic stress alone and should target sleep regulation and ruminative thinking to reduce key vulnerability pathways along with strengthening coping skills and self-efficacy to enhance resilience to academic demands in students. Multidimensional interventions that address both sides of the stress process can therefore be more effective in university settings.

Limitations of the study

This study has several limitations that should be acknowledged. The cross-sectional nature of the data collection limits firm conclusions about causality among variables. The exclusive reliance on self-report measures to assess variables of the study might have introduced response biases due to social desirability. Future research should employ longitudinal or experimental designs to clarify temporal sequencing and consider intervention-based approaches that simultaneously target vulnerability-enhancing and protective mechanisms to reduce mental health problems in young adults.

Conclusion

Academic stress emerged as a significant determinant of mental health problems in university students which operates through parallel vulnerability and protective pathways. Sleep problems and rumination amplify risk of mental health problems and coping skills and self-efficacy serve buffering roles. The balance between these processes ultimately determines mental health outcomes in students which highlight the importance of integrative and resource-informed approaches for the well-being of students.

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