

## HOW DOES PERCEIVED SOCIAL SUPPORT MEDIATE THE RELATIONSHIP BETWEEN ACADEMIC STRESS AND MENTAL HEALTH STATES AMONG MEDICAL STUDENTS?

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**Abstract:** Medical students are vulnerable to psychological distress, yet few seek professional help. The objectives of this study were (1) to identify the relationship between academic stress and mental health problems and (2) to explore the mediating role of social support in the relationship between academic stress and mental health among Ningxia medical students in China. We conducted a cross-sectional study over five months, starting in May 2023, using a convenience sample of 2,206 respondents. Consequently, we collected data via self-administered questionnaires and analysed them using SPSS version 29. The results of logistic regression analysis revealed that social support had a significant negative impact on depression, anxiety, and stress levels. Additionally, perceived academic stress was negatively associated with mental health. Furthermore, the PROCESS macro analysis demonstrated that social support was discovered to mediate the link between academic stress and mental health, underscoring its importance for student well-being. Friends, family, and counselling services help students manage mental health issues, reduce loneliness, and foster a sense of belonging. Encouragement from others can also boost motivation and improve academic performance. Therefore, universities should enhance their support systems to provide necessary resources for students' academic, personal, and professional success.

Keywords: Academic stress, social support, mental health, depression, anxiety, stress, medical student.

### Introduction

In the context of rapid socio-economic development, university students were undoubtedly one of the high-stress groups (Zeng *et al.*, 2019). The mental health of university students is a public health issue of growing concern (Müller *et al.*, 2022). The World Health Organisation (WHO) conducted a mental health survey in 21 countries and discovered that 20.3% of university students had mental health issues. As many as 87% of university students consider education their main source of stress (Barbayannis *et al.*, 2022).

Medicine has always been considered one of the most stressful and demanding disciplines (Zhang *et al.*, 2022). Undergraduate medical students, as a special group of students, suffered from increased mental health problems due to the

longer total time required to learn professional knowledge and skills than students in other disciplines, heavy academic loads, difficult specialised courses, high clinical workloads, and stressful environments (Moir *et al.*, 2018). A previous study observed that medical training posed significant challenges to the mental health of medical students, who had higher levels of anxiety, depression, and perceived academic stress compared to their age-matched non-medical student peers (McKerrow *et al.*, 2020).

The global prevalence of depression among medical students was 27.2%, a disturbing figure that hovered at more than three times the rate compared to non-medical students of the same age (Seo *et al.*, 2021). Besides, previous studies

have also reported a high prevalence of anxiety symptoms among medical students (Yusoff *et al.*, 2021). In Europe, about 30% of medical students suffer from anxiety (Moutinho *et al.*, 2017). The most stressful situations that medical students reported were lack of study time, lack of sleep, excessive self-stress to achieve excellent grades, and lack of leisure time (Damiano *et al.*, 2020). These study-related stressors impacted their well-being. According to Zeng *et al.* (2019), medical research is significantly more psychologically and physiologically stressful than other subject areas.

Compared with liberal education in developed Western countries, the Chinese education model is more inclined toward the pursuit of attractive academic results and has neglected the healthy psychological development of students (Wang *et al.*, 2022). The medical education system and working environment in China are different from those in Western or other Asian countries. Chinese medical students face extremely high expectations from themselves, their families, their schools, and society due to the influence of traditional Chinese culture and the specific social roles assigned to them by the times (Zeng *et al.*, 2019; Shao *et al.*, 2020). As a result, Chinese medical students suffer from frequent psychological problems, particularly depression. Therefore, social support becomes crucial in identifying the association between academic stress and mental health among Chinese medical students (Chen, 2023).

Social support refers to the mental or material resources an individual obtains or perceives from external social organisations or individuals. These resources can help enhance stress resistance, relieve tension, and improve adaptability. These resources can play a mitigating role between negative life events and depression and anxiety, ensuring that an individual's mental health remains in a stable state (Wang *et al.*, 2023). Other than that, many studies on social support have shown that social relationships are associated with the onset, course, and remission of depressive symptoms across age groups and social contexts. Lack

of social support has a predictive value for the emergence of depressive symptoms.

The lower the level of social support, the higher the incidence of depressive symptoms (Martínez *et al.*, 2016). University students with high levels of social support are able to utilise the support and backing around them to adjust their state more quickly and reduce anxiety and other adverse psychological symptoms (Lu *et al.*, 2023). A previous study determined that social support also effectively reduces the negative effects of stressful life events. Social support can buffer the negative effects of stress by increasing an individual's self-esteem, confidence, and self-efficacy. When the number of negative life events is high such as stressful academic events, the greater the social support, the lower the level of depression (Ibarra *et al.*, 2011).

Although there is a lot of literature on the high prevalence of mental health problems among medical students and potential risk factors, fewer studies focus on the mental health problems of Chinese medical students and their association with social support (Lan *et al.*, 2023). Academic stress among medical students is caused by the total amount of time required to learn specialised knowledge and skills compared to students in other majors. This is due to the heavy academic load, difficult specialised courses, high clinical workload, and stressful environments (Moir *et al.*, 2018) while perceived social support is an important dimension to cope with stressful situations. Therefore, this study investigated the moderating effect of social support on the relationship between academic stress and mental health among students at Ningxia Medical University, China.

The practical purposes of this study include evaluating the trends of mental health problems among university students by measuring the level of mental health (depression, anxiety, and stress) among respondents and investigating to what extent perceived academic stress will influence the level of mental health. Thus, it is important to measure the role of social support from various parties (family, colleagues,

lecturers) through the effects of social support on the relationship between perceived academic stress and mental health.

The findings of this study will add to the body of knowledge, with the potential to improve student well-being and academic outcomes. Understanding the link between academic strain and mental health can assist in identifying specific stressors impacting students, emphasise the significance of social support, and lead to more tailored solutions. This research enables institutions to build supportive settings, adopt effective coping strategies and support services, and eliminate the stigma associated with mental health disorders. Finally, managing academic stress can improve students' resilience, academic performance, and general quality of life, resulting in healthier learning environments.

## Literature Review

### *Mental Health Problems of University Students*

University is a period of particular vulnerability to mental health problems (Hamza *et al.*, 2021). In the context of rapid socio-economic development, university students are undoubtedly one of the high-stress groups (Zeng *et al.*, 2019). A cross-national study showed that about one-third of university students reported psychological distress in the last 12 months (Auerbach, 2019). According to a World Health Organisation survey of 21 nations' mental health, 20.3% of university students experienced mental health issues (Barbayannis *et al.*, 2022). The mental health of university students is an increasing concern for the public (Müller *et al.*, 2022).

### *Academic Stress and Mental Health*

At the university level, university students primarily focus on learning. University students are particularly vulnerable to stressors directly linked to their academic pursuits (Guo *et al.*, 2023). According to a study by Barbayannis (2022), 87% of university students consider education their primary cause of stress. The relationship between academic achievement,

future professional prospects, and employment status is well established. Given the heightened competition and the abundance of college graduates, university students are encountering escalating levels of academic rivalry (Jones *et al.*, 2023). The detrimental impact of excessive academic stress on university students' overall well-being and academic performance, including potential dropout and severe mental health issues has been well-documented (Zhang *et al.*, 2022).

On the other hand, Yang (2022) discovered a strong correlation between elevated academic stress in university students and the experience of adverse emotions, including fear, despair, anxiety, shame, and wrath. Barker (2018) also highlighted that excessive academic stress has a detrimental impact on the academic performance, mood, and physical and mental well-being of university students. University students experience heightened levels of anxiety and tension in reaction to academic stress such as class load, peer competition, faculty-student relationships, and other associated factors.

Medical students, as a special group have an increased number of mental health problems due to the total time required to learn specialised knowledge and skills compared to students in other majors, heavy academic load, difficult specialised courses, high clinical workload, and stressful environments (Moir *et al.*, 2018). A study at a medical school revealed that medical students viewed academic stress as the primary source of distress, citing high information levels and the demanding nature of the medical curriculum as the primary causes (Azim *et al.*, 2019). At the same time, medical training poses significant challenges to medical students' mental health, with higher levels of anxiety, depression, and perceived stress among medical students compared to their age-matched non-medical student peers (McKerrow *et al.*, 2020).

The global prevalence of depression among medical students is 27.2%, a disturbing figure that hovers at more than three times that of non-medical students of the same age (Seo *et al.*, 2021). In addition to depression, many

studies have reported a high prevalence of anxiety symptoms among medical students. In Europe, about 30% of medical students suffer from anxiety or depression (Tian *et al.*, 2019). There is no doubt that studying in the medical profession is a stressful process (Shao *et al.*, 2020). The most stressful situations reported by medical students are lack of study time, lack of sleep, excessive self-stress to achieve excellent grades, and lack of leisure time (Damiano *et al.*, 2020). These study-related stressors impact their well-being. Therefore, compared to other subject areas, medical studies are significantly more stressful in terms of psychological and physical stress. University should pay attention to the mental health status of medical students (Zeng *et al.*, 2019).

#### ***Academic Stress and Mental Health Status of Chinese Medical Students***

China has a high number of university students. Nevertheless, its education system prioritises academic achievements over the mental well-being of students, unlike the more balanced approach in developed Western countries (Wang *et al.*, 2022). The medical education system and work environment in China differ from those in Western and other Asian countries. Chinese medical students face immense stress because of traditional Chinese culture and the specific social roles assigned to them. Expectations from themselves, their families, schools, and society are high. This leads to multiple stressors, including demanding study tasks and rigorous assessment sessions (Zeng *et al.*, 2019; Shao *et al.*, 2020).

In recent years, the occurrence of mental health issues among Chinese medical students has increased. Studies have shown that the average prevalence of depression is 32.74% and anxiety is 27.22% among these students (Mao *et al.*, 2019). Furthermore, compared to students in other fields, Chinese medical students exhibit a higher prevalence of depression, anxiety, and suicidal thoughts. This situation can have a detrimental effect on both the medical students themselves and their future patients. Therefore, it is crucial to address this issue promptly by

implementing widespread attention, screening, and intervention measures (Zeng *et al.*, 2019; Chen, 2023).

#### ***Social Support and Mental Health***

Social support refers to the mental or material resources that individuals acquire or perceive from external social organisations or individuals. These resources can assist in enhancing stress resilience, reducing tension, and improving adaptability. Social support is critical in mitigating the impact of negative life events on depression and anxiety, as well as maintaining stable mental health for individuals (Wang *et al.*, 2023). Social support promotes a feeling of ease, enabling individuals to perceive themselves as valued, cherished, and protected (Umayyah *et al.*, 2018). Researchers have determined that during maturity, social support mitigates the negative effects of upsetting experiences (Cohen & Wills, 1985) and reduces the psychological strain individuals face when coping with stressful life events, preserving their mental well-being (Feng, 2022).

Research has observed that university students who feel more supported adjust more smoothly to college life (Jones *et al.*, 2023). This may be due to the fact that social support provides emotional adjustment (Larose & Boivin, 1998), which in turn leads to greater academic dedication and efficiency as well as reduced test anxiety (Budescu & Silverman, 2016). Therefore, social support is useful when an individual experiences stress and is very effective regardless of the strategy used to cope with stress (Umayyah, 2018). Research reveals a positive correlation between social support and the mental health of medical students, as well as its potential to mitigate academic burn out. On the contrary, a social environment with a low level of social support over a long period of time is prone to various psychological problems. Therefore, we can consider social support as a “protective factor” for mental health, with a high level of social support effectively maintaining the mental health of medical students (Huang, 2021).

## Materials and Methods

### *Research Design and Procedure*

We employed a cross-sectional correlational research design to examine the formulated research objectives. Note that we collected data within five months, from January to May 2023, using a printed copy of the questionnaire and self-administered to the respondents. This study's sampling frame was based on the number of medical students at Ningxia Medical University and the population was 10,760. We distributed a total of 2,488 questionnaires, excluding consecutive answers and short answer time questionnaires, and received 2,206 valid questionnaires with a response rate of 88.65%.

We limited the characteristics of the respondents in this study to full-time medical students at Ningxia Medical University. Consequently, we guided the students who volunteered to participate in the questionnaire to complete it independently. The UiTM Research Ethics Committee [REC/11/2023 (MR/968)] and Ningxia Medical University (No. 2023-2294). The committee issued an authorisation letter allowing the researchers to collect the data. The researchers assured participants of informed consent, confidentiality, and privacy for the study.

We adapted the questionnaire from previous studies and translated it from the original English to Chinese language. We used the Perceived Academic Stress Scale (PAS) to assess academic stress factors, the DASS-21 to gauge depression, anxiety, and stress levels and the Social Support Scale to gauge respondents' perceived social support. Previous studies have widely used these established questionnaires in various settings and authorities like the American Psychological Association (APA) and other psychology studies have endorsed them.

### *DASS-21 Scale*

Lovibond developed the DASS-21 in 1995. Mirza (2021) has demonstrated the validity and reliability of the DASS-21 in independently evaluating the various aspects of depression,

anxiety, and stress, as well as serving as a broader indicator of psychological distress. The scale comprises three subscales that assess the degree to which individuals encounter negative emotions, including depression, anxiety, and stress. Each subscale consists of seven distinct question and respondents score their responses on a 4-point scale ranging from 0 to 3. The scale anchors include "does not meet" and "always meets". Gong (2010) developed the DASS-21 instrument, which this study adopted. His research on a population of Chinese university students revealed an internal consistency coefficient of 0.89 for the DASS-21 total scale and 0.77, 0.79, and 0.76 for the depression, anxiety, and stress subscales. The validated factor analysis indicated that the DASS-21 had strong structural validity, which means that its internal structure matched up with theoretical ideas.

The interpretation of scores on the depression, anxiety, and stress subscales of the DASS-21 is as proposed by Lovibond (1995). This interpretation helps to categorise individuals based on the severity of their symptoms across the three subscales. The DASS-21 scale categorises scores for depression into five levels. According to Lovibond, scores indicate the severity of symptoms for depression, anxiety, and stress. For depression, 0 to 9 is normal, 10 to 13 is mild, 14 to 20 is moderate, 21 to 27 is severe, and 28 to 42 is extremely severe. For anxiety, 0 to 7 is normal, 8 to 9 is mild, 10 to 14 is moderate, 15 to 19 is severe, and 20 to 42 is extremely severe. For stress, 0 to 14 is normal, 15 to 18 is mild, 19 to 25 is moderate, 26 to 33 is severe, and 34 to 42 is extremely severe. Higher scores reflect more intense symptoms that may increasingly interfere with daily life and may require clinical attention.

### *Perceived Academic Stress Scale (PAS)*

The study utilised the PAS scale to assess participants' subjective identification of factors

contributing to academic stress (Bedewy & Gabriel, 2015). The scale consists of 18 items, divided into three primary components: The subscale of academic expectations, the subscale of exam and study stress, and the subscale of academic self-perception. The academic expectations subscale assesses the stress students perceive to their parents' and teachers' expectations of their academic performance.

The tests and studying subscales measure students' perceptions of the level of effort required for studying, completing assignments, and taking exams. The academic self-perception subscale evaluates students' self-confidence and competence in completing their schoolwork. We measured the items using a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The overall internal consistency reliability of the scale was 0.7 and factor analysis yielded a significant and theoretically meaningful correlation between the factors (Bedewy & Gabriel, 2015). This study used the Chinese-translated version of PAS as developed by Jiang *et al.* (2023). They conducted a study using this scale among 128 students at 13 different universities in China. The results indicated that subscale 1, academic expectations had an internal consistency of 0.54, subscale 2, exam and study stress had an internal consistency of 0.69, and subscale 3, academic self-perception had an internal consistency of 0.67.

### ***Social Support Scale for University Students***

The current study used Ye and Dai's (2008) adolescent social support scale. This scale consists of 17 questions and primarily evaluates variations in individuals' access to social resources and their utilisation of these resources. Subjective support, objective support, and the support utilisation subscale comprise the three dimensions of the measure. We assess the scale using a 5-point scoring system: 1 denotes nonconformity, 2 partial nonconformity, 3 uncertainty, 4 partial conformity, and 5 complete conformity. Higher scores indicate greater levels of social support for the individual. A study by Li (2023) used this scale among 610 Chinese

university students. It demonstrated that the Cronbach  $\alpha$  of the scale was 0.906, the Cronbach  $\alpha$  of the subjective support subscale was 0.845, the Cronbach  $\alpha$  of the objective support subscale was 0.814, and the Cronbach  $\alpha$  of the support utilisation subscale was 0.874.

### ***Statistical Analysis***

The study employed a descriptive analysis to examine the correlation between academic stress, social support, and mental health among students at Ningxia Medical University. We used SPSS version 29 to analyse the data. Consequently, we summarised categorical data using frequencies, percentages, and continuous data using the mean and standard deviations.

Since the outcome variable for this study was categorical data (mental health), we used binary logistic regression analyses to explore the associations between academic stress, social support, and the three dimensions of mental health (categorical data). We adjusted all demographic data for multivariate analysis using the "input" method. In the regression models, we calculated unadjusted and adjusted Odds Ratios (OR) and 95% Confidence Intervals (CI). Other than that, we used the Hosmer-Lemeshow test to assess the model's goodness of fit, using a *p*-value greater than 0.05 as the criterion to determine the appropriateness of the logistic regression model (Hosmer & Lemeshow, 1980).

The study utilised the PROCESS macro (Wen *et al.*, 2004). It employed a bootstrap sample size of 5,000 to investigate the mediating role of social support on the association between academic stress and mental health. The PROCESS macro facilitates the investigation of whether one or more intermediate variables mediate the effect of an independent variable on a dependent variable. Although mediation analysis could be performed using a traditional Baron and Kenny's approach, the use of such a technique is currently discouraged because of its severe limitations such as low statistical power, inability to test the significance of a specific indirect effect directly, and difficulty in quantifying the magnitude of the medication

effect (Hayes, 2009; Aguinis *et al.*, 2016; Green *et al.*, 2016).

Given these limitations, we opted for the PROCESS macro, which has established itself as a standard for analysing mediation effects. Note that various studies and study settings have documented analyses using this technique and the utility is accessible across multiple statistical software packages. We determined the mediating effect’s effect size by calculating the ratio of the indirect effect to the total effect (Wen & Bao, 2014). When the *p*-value is less than 0.05 or the 95% CI excludes zero, it indicates a statistically significant difference.

**Results**

**Descriptive Statistics**

Table 1 summarises the results of the descriptive analysis of the sociodemographic characteristics of the respondents according to their depression, anxiety, and stress status. The results indicate that out of the 2,206 respondents, 645 (29.2%) were male and 1,561 (70.8%) were female, based on their gender characteristics. The number of university students residing in rural areas was 1,327, accounting for 60% of the total while 879 students or 40%, lived in urban areas. Regarding the respondent’s educational background, 1,486 were undergraduate students (67.36%), 565

Table 1: Status of depression, anxiety, and stress according to sociodemographic characteristics of respondents (*N* = 2,206)

	Depression <sup>a</sup>				Anxiety <sup>b</sup>			Stress <sup>c</sup>		
	<i>N</i>	<i>n</i>	%	<i>p</i>	<i>n</i>	%	<i>p</i>	<i>n</i>	%	<i>p</i>
<b>Gender</b>										
Male	645	204	31.6		211	32.7		130	20.2	
Female	1,561	445	28.5		501	32.1		275	17.6	
Chi-squared			2.14	.14		0.78	.008		1.96	.16
<b>Residence</b>										
City	879	246	28.0		272	31.9		161	18.3	
Rural	1,327	403	30.4		440	33.2		244	18.4	
Chi-squared			1.45	.23		1.18	.028		0.00	.97
<b>Education</b>										
College	565	186	32.9		192	34.0		111	19.7	
Undergraduate	1,486	413	27.8		474	31.9		264	17.8	
Postgraduate	155	50	32.3		46	29.7		30	19.4	
Chi-squared			5.83	.05		1.33	.52		1.08	.58
<b>Salary</b>										
Low	657	189	28.9		204	31.1		545	83.0	
Relatively low	239	77	32.2		77	32.2		191	79.9	
Middle	497	144	29.0		167	33.6		407	81.9	
Higher	508	149	29.3		162	31.9		404	79.5	
High	301	89	29.6		100	33.2		251	83.4	
Chi-squared			1.09	.90		1.01	.91		3.38	.50

<sup>a</sup>DASS-21 depression subscale score ≥ 9, <sup>b</sup>DASS-21 anxiety subscale score ≥ 7, <sup>c</sup>DASS-21 stress subscale score ≥ 14.

were university students (25.61%), and 7.03% were graduate students. Assessing the family income among respondents, a total of 657 individuals had a monthly family income of less than CN3,000 (US\$417), representing 29.84% of the population.

Additionally, there were 239 individuals with an income between CN3,000 (US\$417) and CN4,500 (US\$626) (10.85%), 497 individuals with income between CN4,500 (US\$626) and CN6,000 (US\$834) (22.57%), 508 individuals with monthly income between CN6,000 (US\$834) and CN10,000 (US\$1,390) (23.07%), and 301 individuals with an income above CN10,000 (US\$1,390) (13.67%). When demographic information about medical students' mental health was compared, there was no significant difference in the three dimensions of DASS-21: The presence or absence of depression, anxiety, and stress symptoms. This was true regardless of the student's gender, place of origin, educational level, or monthly income ( $p > 0.05$ ).

Table 2 provides an overview of the mental health of respondents. The proportions of those experiencing depression, anxiety, and stress were 29.40%, 39.08%, and 18.36%, respectively. Among medical students in this study, anxiety has a higher prevalence compared to depression and stress. The presentation of percentiles provides a better visualisation of this study's data distribution. The findings indicate that medical students' depression dimension score was 4, with a range of 0 to 10. The anxiety dimension score was 4, ranging from 2 to 12.

Finally, the stress dimension score was 6, ranging from 2 to 14.

Table 3 presents the data on perceived academic stress levels and social support among medical students, who participated in this study. The aggregate score for perceived academic stress was 60, ranging from 54 to 68. The scores for the subscales of academic expectations, exam and study stress, and academic self-perception were 14 (with a range of 12 to 16), 26 (with a range of 23 to 30), and 21 (with a range of 18 to 24), respectively. The social support score ranged from 57 to 77, for a total of 68. The scores for the three dimensions of subjective support, objective support, and support usage were 20 (with a range of 16 to 23), 24 (with a range of 21 to 29), and 24 (with a range of 19 to 27), respectively.

**Regression Analysis**

This study employs a binary logistic regression analysis to examine the relationship between academic stress, social support, and mental health status among respondents. The findings presented in Table 4 indicate that the social support received by medical students had a noteworthy adverse impact on their levels of depression, anxiety, and stress, as measured by the DASS-21 mental health assessment scale ( $\beta = -0.049$ ;  $\beta = -0.040$ ;  $\beta = -0.036$ ;  $p < 0.001$ ). Additionally, the scores obtained by medical students on the PAS in academics also had a significant negative effect on their levels of depression, anxiety, and stress ( $\beta = -0.062$ ;  $\beta = -0.050$ ;  $\beta = -0.058$ ;  $p < 0.001$ ).

Table 2: Description of the mental health status of medical students (DASS-21) (N = 2,206)

Variables	Status	N	Component Ratio (%)	Theoretical Value Range	M ± SD
Depression	No	1,557	70.58%	0-21	6.66 ± 7.82
	Yes	649	29.42%		
Anxiety	No	1,344	60.92%	0-21	7.10 ± 7.52
	Yes	862	39.08%		
Stress	No	1,801	81.64%	0-21	8.34 ± 8.25
	Yes	405	18.36%		

M = Mean, SD = Standard Deviation.

Table 3: Medical students' scores on perceived academic stress and social support ( $N = 2,206$ )

Variables	Theoretical Value Range	$M \pm SD$
Perceived academic stress total score	18-90	60.85 $\pm$ 11.78
Academic expectations subscale	4-20	13.66 $\pm$ 3.07
Exam and study stress scale	8-40	26.54 $\pm$ 5.94
Academic self-perception scale	6-30	20.65 $\pm$ 4.32
Total social support score	17-85	65.86 $\pm$ 14.12
Subjective support	5-25	19.16 $\pm$ 4.31
Objective support	6-30	23.94 $\pm$ 5.08
Support utilisation	6-30	22.77 $\pm$ 5.51

$M$  = Mean,  $SD$  = Standard Deviation.

Table 4: Regression analysis of academic stress and social support on the mental health status of medical students ( $N = 2,206$ )

Variables	$\beta$	$SE$	OR	95% CI	$\beta$	$SE$	<sup>a</sup> OR	95% CI
<b>Depression</b>								
Social support	-0.048	0.004	0.953***	0.95 – 0.96	-0.049	0.004	0.953***	0.95 – 0.96
Perceived academic stress	-0.062	0.005	0.940***	0.93 – 0.95	-0.062	0.005	0.940***	0.93 – 0.95
<b>Anxiety</b>								
Social support	-0.039	0.004	0.961***	0.95 – 0.97	-0.040	0.004	0.960***	0.95 – 0.97
Perceived academic stress	-0.051	0.005	0.950***	0.94 – 0.96	-0.050	0.005	0.951***	0.94 – 0.96
<b>Stress</b>								
Social support	-0.035	0.004	0.966***	0.96 – 0.97	-0.036	0.004	0.965***	0.96 – 0.97
Perceived academic stress	-0.058	0.006	0.943***	0.93 – 0.95	-0.058	0.006	0.943***	0.93 – 0.96

OR = Odds Ratio; CI = Confidence Interval; SE = Standard Error; <sup>a</sup>OR = Adjusted Odds Ratio for Demographic Variables; \*\*\* $p < 0.001$ .

### Mediation Analyses

The results indicate that the model summary for the three models is significant ( $p < 0.001$ ) and the data fits the models very well. The regression models explain 12% to 16% of the observed variability, according to the r-squared values. As a dependent variable, academic stress directly affects the three dimensions of mental health, according to the results. Specifically, the estimates of direct effects are as follows:

depression ( $\beta = -0.196$ ), which accounts for 72.76% of the total effect; anxiety ( $\beta = -0.160$ ), which accounts for 70.80% of the total effect; and stress ( $\beta = -0.209$ ), which accounts for 75.72% of the total effect.

Furthermore, the indirect effects of academic stress on the three dimensions of mental health via the mediating variable (social support) are also statistically significant. These

indirect effects are as follows: Depression ( $\beta = 0.074$ ), which accounts for 27.24% of the total effect; anxiety ( $\beta = -0.066$ ), which accounts for 29.20% of the total effect; and stress ( $\beta = -0.067$ ), which accounts for 24.28% of the total effect. The mediation effects in Table 5 indicate that social support influences the relationship between academic stress and mental health. Figure 1 illustrates statistical diagrams that analysed the mediating effects of tested variables in three separate models.

### Discussion

The results of mental health problems determined that 29.42% of respondents had depression, 39.08% experienced anxiety, and 18.36% experienced stress. This indicates

that the mental health problems of medical students at Ningxia Medical University are more serious. Depression, anxiety, and stress are considered important indicators of mental health and if left untreated, can have a negative impact on an individual. Evidence from global studies suggests that between 10% and 85% of university students exhibit symptoms of depression about 25% suffer from anxiety disorders and a significant proportion report experiencing chronic stress (Alalalmeh *et al.*, 2024).

The incidence of depression among medical students varies globally, with the prevalence of depression reaching 33.5% (Mirza *et al.*, 2021) and anxiety ranging from 29.2% to 38.7% (Tian-Ci *et al.*, 2019). That number is much higher

Table 5: Analysis of the mediating effect of social support on the relationship between perceived academic stress and mental health ( $N = 2,206$ )

	Coef.	SE	95% CI	<i>p</i>
<b>Depression</b>				
Total effect	-0.270	0.013	-0.300 to -0.024	< 0.001
Indirect effect	-0.074	0.008	-0.090 to -0.059 <sup>a</sup>	
Direct effect	-0.200	0.014	-0.223 to -0.170	< 0.001
R <sup>2</sup>	0.166			
F	72.536			
<b>Anxiety</b>				
Total effect	-0.226	0.013	-0.251 to -0.201	< 0.001
Indirect effect	-0.066	0.008	-0.082 to -0.052 <sup>a</sup>	
Direct effect	-0.160	0.013	-0.186 to -0.134	< 0.001
R <sup>2</sup>	0.124			
F	53.050			
<b>Stress</b>				
Total effect	-0.276	0.014	-0.303 to -0.249	< 0.001
Indirect effect	-0.067	0.008	-0.082 to -0.052 <sup>a</sup>	
Direct effect	-0.209	0.015	-0.237 to -0.180	< 0.001
R <sup>2</sup>	0.157			
F	68.186			

Note: The superscript "a" indicates a 95% bootstrap confidence interval. All models were adjusted to include demographic variables as covariates.

\*\*\* $p < 0.001$ . The superscript "a" indicated that Boot's 95% CI of the indirect effect did not contain zero, so, the indirect effect was significant.

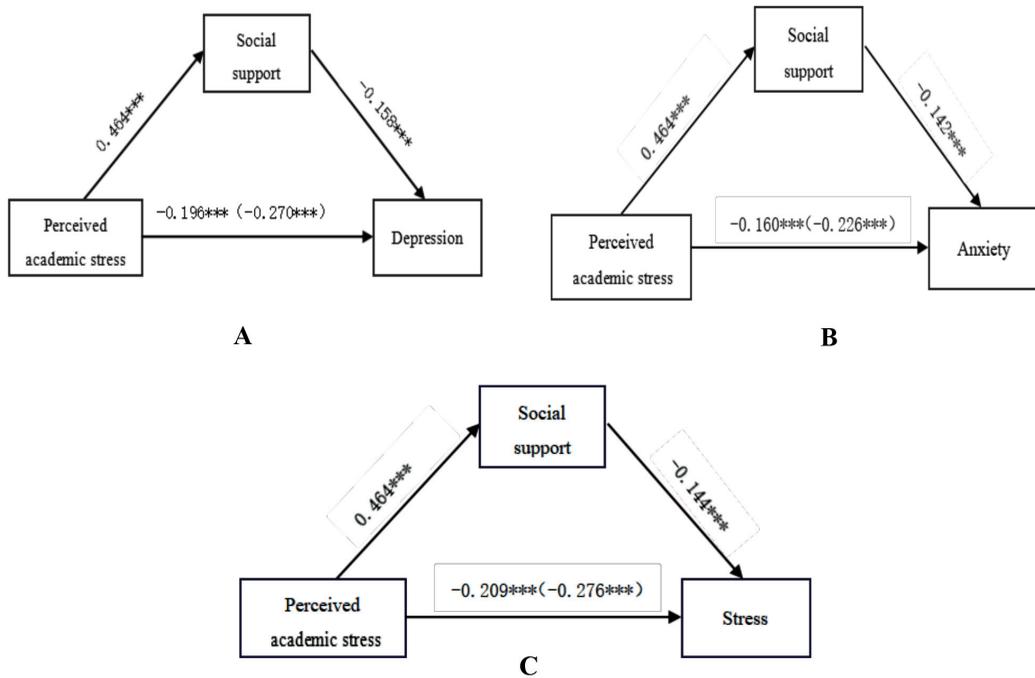


Figure 1: The mediating effect of social support on the relationship between perceived academic stress and depression (A), the mediating effect of social support on the relationship between perceived academic stress and anxiety (B), and the mediating effect of social support on the relationship between perceived academic stress on stress (C). All tested variables are statistically significant ( $p < 0.001$ )

than reported for people in that age group in the general US population. The severity of mental health problems among medical students varies across Asian countries, with the prevalence of anxiety and depression among medical students in Malaysia being 33% and 11%, respectively (Gan *et al.*, 2019). The prevalence of anxiety and depression among Iranian medical students was 38.1% and 27.6%, respectively (Nakhostin-Ansari *et al.*, 2020). Meanwhile, 15.2% of Vietnamese medical students screened positive for depressive symptoms and 7.7% had suicidal ideation (Pham *et al.*, 2019).

This study used the PAS to assess the academic stress levels of medical students at Ningxia Medical University. PAS is a reverse scoring scale in which the lower the score, the higher the level of academic stress. In this study, the scores of medical students' perceived academic stress were  $13.66 \pm 3.07$  for the academic expectations subscale,  $26.54 \pm 5.94$

for the exam and study stress subscale, and  $20.65 \pm 4.32$  for the academic self-perception subscale. Hence, these findings are consistent with those of Ramli *et al.* (2018), who reported similar results in a study of Malaysian university students with scores of  $1.94 \pm 3.11$ ,  $26.66 \pm 4.87$ , and  $19.86 \pm 3.53$ , respectively, for the same subscales.

The study's results show that the perceived academic stress scores of medical students are lower than those of students at Northern Michigan University (69.92), as reported by Stark (2020). This suggests that students in medical programs experience higher levels of academic stress compared to their counterparts in other fields of study (Abdulghani *et al.*, 2020; Wang, 2020). Medical students require a longer period to acquire professional knowledge and skills and face heavier academic demands, more challenging coursework, larger clinical workloads, and greater environmental pressures

than students in other disciplines, leading to higher levels of academic stress (Qin *et al.*, 2023).

Additionally, our observations and previous studies reveal that 32% of students at Ningxia Medical University passively chose the medical field due to family expectations and lacking the mental preparation necessary for medical study. This lack of enthusiasm and motivation contributes to relatively unstable psychological states among Ningxia Medical University students (Ma *et al.*, 2018; Gao *et al.*, 2022). In this study, the Social Support Scale score was  $65.86 \pm 14.12$ , which is higher than the social support scores ( $60.77 \pm 0.27$ ,  $57.50 \pm 0.34$ ) reported by Guo *et al.* (2022) in a mental and physical health survey involving 15,505 adolescents across five provinces in China.

This suggests that medical students at Ningxia Medical University experience higher social support. The findings are also consistent with the results of Yang (2015), who conducted a study on the social support of university students in Ningxia, indicating that overall social support for students in Ningxia is relatively strong. Students can access help from various sources, including society, schools, family, peers, and teachers, with an increasing utilisation of available social support. The growing emphasis on the medical profession in China, in line with the development of the Healthy China initiative and the concept of professional equality, may account for the high level of social support among medical students. Moreover, parents often approve and support their children's pursuit of a medical career due to the growing respect for the medical field and its honourable role in "saving lives" (Qi, 2023).

The results of this study indicate that perceived academic stress and social support are important correlates of mental health issues among medical students. We observed that perceived academic stress serves as a protective factor against depression, anxiety, and stress (OR = 0.940, 95%, CI = 0.93-0.95; OR = 0.950, 95%, CI = 0.94-0.96; OR = 0.943, 95%, CI = 0.93-0.96). This is consistent with the findings

of Ghoshal *et al.* (2021) and Kristensen *et al.* (2023), who reported that academic stress is a significant positive predictor of depression and anxiety, with a strong positive correlation between academic stress and mental health problems.

Previous research has discovered that students spend most of their time on academic activities during university and poor academic performance negatively affects their mental health (Ishii *et al.*, 2018). Undoubtedly, studying medicine is a highly stressful process (Shao *et al.*, 2020). Some medical students struggle to regulate their emotions when faced with the high academic load and practical components required for their degree, leading to negative emotions such as anxiety and stress (Aduli *et al.*, 2020; Wang *et al.*, 2023). A meta-analysis confirmed this, indicating that depressive symptoms increased by 13.5% after students entered medical school (Rotenstein *et al.*, 2023).

This study also identified social support as a risk factor for depression, anxiety, and stress (OR = 0.953, 95% CI = 0.95-0.96; OR = 0.960, 95% CI = 0.95-0.97; OR = 0.965, 95% CI = 0.96-0.97). This aligns with the findings of Hu (2022), who demonstrated that social support positively predicts mental health among university students and can alleviate burn out. Previous research has shown that social support fosters a sense of comfort, helping individuals feel respected, loved, and secure (Umayyah *et al.*, 2018). Conversely, Harahap *et al.* (2024) found that a lack of social support from family, teachers, and peers negatively impacts young people's mental health, leading to increased psychological distress, anxiety, and depression. Thus, social support is a significant negative predictor of mental health issues such as depression and anxiety, playing a positive role in maintaining psychological well-being (Xu *et al.*, 2019).

Medical students often face heavy workloads and demanding academic tasks, leaving them with little time to relax. Strong social support is essential for providing them with the emotional resilience needed to cope

with these challenges (Karaca *et al.*, 2019). Alternatively, Ban *et al.* (2021) established that the more social support medical students receive, the more they feel cared for. Adequate social support helps them resolve difficulties, reducing the likelihood of negative emotions such as depression. Therefore, social support is a crucial psychosocial protective factor (Cassel, 1995) and high levels of it can effectively maintain the mental health of medical students (Cai, 2019).

The results of this study demonstrated that social support mediated the relationship between academic stress and mental health status and that it was able to ameliorate and alleviate the effects of academic stress on medical students' symptoms of depression, anxiety, and stress.

As mentioned above, the academic stress that university students face can affect their emotions. The greater the academic stress, the greater the likelihood of significant negative effects (Teixeira *et al.*, 2022). Social support had a direct and positive impact on university students' physical and mental health and the higher the level of support, the better the individual's physical and mental health (Liu *et al.*, 2022), consistent with this study's results. At the same time, social support can help adolescents cope with stress, alleviate negative emotions, and protect their mental health. This protective role of social support worked directly through the benefits of social relationships or indirectly as a buffer against stressful situations (Zou *et al.*, 2023).

Social support can help a person assess certain events as less stressful. In addition, social support mitigated the effects of the assessed stress (e.g., by providing solutions or diminishing importance) (Broks *et al.*, 2022). Specifically, individuals with higher levels of social support were better able to cope with major stressors and adverse events while maintaining and improving their health outcomes. This is primarily because they can draw on resources (e.g., support, understanding, and encouragement from family and friends) to regulate their emotions and thus, maintain better

mental health. On the contrary, individuals with low levels of social support experience sleep-related problems because they are unable to adopt appropriate ways of eliminating negative emotions (Liu *et al.*, 2023).

Reduced social support, increased academic stress, reduced coping strategies, and limited access to mental health resources may all have adverse neuropsychiatric consequences. Other than that, researchers have now discovered that mediators of social support can mitigate the negative effects of academic stress on university students' physical and mental health, thereby maintaining and improving their physical and mental health (Lee *et al.*, 2004; Zheng, 2021). The results in this study were consistent with previous studies (Jiang *et al.*, 2021; McLean *et al.*, 2023; Yildirim & Green, 2024).

Positive social support specifically plays a crucial role in medical students' psychological adjustment and aids in reducing the harmful effects of stress (Tian *et al.*, 2019). Lack of social support can lead to a decrease in positive emotions and experiences, as well as a decrease in psychological well-being among medical students (Shao *et al.*, 2020). In contrast, medical students reported that their own most effective strategy for reducing the negative effects of stress was social support, including stress reduction through friends and family (Donohoe *et al.*, 2020). As a result, social support is particularly important for medical students in enhancing their well-being (Huang *et al.*, 2021), which mitigates the negative effects of academic stress and improves their mental health, thereby maintaining excellent mental health.

## Conclusions

The psychological well-being of medical students is generally poor and social support plays a beneficial role in helping them cope with academic stress. Medical colleges should implement additional mental health education initiatives and improve psychological counselling services for students to enhance the prevention of mental health issues and

promote their overall well-being. Furthermore, it is crucial for society, schools, and families to provide increased support and care for medical students.

### Limitations of the Study

This study has several constraints. Firstly, the study employed a cross-sectional design, collecting data at a single point in time. Secondly, people tend to choose their sources of social support based on their preferences, often favouring individuals with similar interests and values. The presence of self-selection bias in the study may undermine the validity of the results. Thirdly, the chosen measurement instruments for social support, academic stress, and mental health may have drawbacks. Varied research may employ distinct measurement instruments, resulting in challenges for comparing findings across studies. Fourthly, sample selection bias: The study may have suffered from a limited and non-representative sample, as it only included medical students from a single medical university in the Ningxia area of China. This could potentially limit the applicability of the results.

### Suggestions for Future Research

Longitudinal studies that monitor individuals over prolonged durations may enhance future research. Such research might clarify the onset, progression, and resolution of mental health conditions. This method may also assist in pinpointing critical intervals when individuals are particularly susceptible and could benefit from focused treatments. Future studies may investigate customised therapies for these people to alleviate mental health issues before they intensify. This may encompass community-orientated initiatives, resilience training, and stress management seminars. Hence, engaging in research within these proposed domains enables scholars to gain a more profound understanding of mental health, facilitating the development of more efficacious therapies and support mechanisms that improve mental well-being across diverse groups.

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### Conflict of Interest Statement

The authors declare that they have no conflict of interest.

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