

Associations Between Academic Stress and Depressive Symptoms Mediated by Anxiety Symptoms and Hopelessness Among Chinese College Students

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Purpose: Explore the potential mediating effects of anxiety symptoms and hopelessness on the relationship between academic stress and depressive symptoms among Chinese college students.

Patients and Methods: A total of 1309 college students with informed consent were recruited from a local university in China. Academic stress, anxiety symptoms, hopelessness, and depressive symptoms were assessed by self-report scales. Haye's PROCESS macro for SPSS was used to test the hypothesized mediation effect of anxiety symptoms and hopelessness in the relationship between academic stress and depressive symptoms.

Results: Anxiety symptoms, hopelessness, and depressive symptoms were common among college students and were all significantly positively associated with academic stress levels. Academic stress could indirectly affect depressive symptoms by anxiety symptoms, hopelessness, and both anxiety symptoms and hopelessness. The total effect of academic stress on depressive symptoms was 0.063. The total effect of three indirect pathway was 0.039 which account for 62% of the total effect.

Conclusion: The study detailed the specific process of depressive symptoms caused by academic stress in college students. Anxiety symptoms and hopelessness could mediate the relationship between academic stress and depressive symptoms. Paying attention to the anxiety levels and hopelessness levels of college students with high academic pressure is suggested as a means of preventing depression and promoting mental health.

Keywords: academic stress, anxiety, hopelessness, depression, college students

Introduction

In accordance with the World Health Organization, depression is one of the leading causes of disability worldwide and is projected to significantly contribute to the overall global burden of disease by 2030.^{1,2} Research on depression among college students has gained increasing attention in recent years.^{3,4} College years are a critical transition period for students as they become adults, which is often accompanied by a variety of challenges.⁵ Students at this stage are susceptible to a variety of mental disorders. According to an estimate by Eisenberg, approximately 15.6% of undergraduate students in the United States showed signs of depression or anxiety disorder.⁶ Based on a meta-analysis which included 21 studies, the prevalence of depression symptoms among Chinese college students stands at 24.71% and is increasing.⁷ The presence of severe depressive symptoms will not only hinder college students from participating in academic activities, but may also lead to a number of negative consequences, some of which may even be fatal.⁸

In college students, academic stress may play a crucial role in the development of depression.⁹ Academic stress is a term used to describe the stress that individuals can experience in regards to exams or assignments, educational environments, being evaluated, and a variety of academic-related issues.^{10,11} According to the traditional Confucian philosophy, education in China tends to focus mainly on various examinations or tests, resulting in a high level of pressure environment for Chinese students.¹² Research has demonstrated that academic stress is associated with a variety of mental health problems in adolescents, especially depression, indicating that further research is warranted on this topic.¹³

Multiple factors may be involved in the effect of academic stress on depressive symptoms. Researchers have demonstrated that anxiety symptoms are positively correlated with academic stress, and that academic stress is a risk factor for anxiety symptoms among students.¹⁴ Anxiety symptoms are closely related to school performance, exams, assignments, ranking, test scores, teacher-student relationships, and other related topics.^{15,16} Moreover, a large body of research has demonstrated that anxiety symptoms and depressive symptoms are closely related among college students.^{17–19} Based on the stress response theory, students exposed to a high academic stress environment may experience anxiety, and this anxiety may further contribute to the occurrence of depression.¹⁸

The other factor which may mediate the effect of academic stress on depressive symptoms is hopelessness. The term “hopelessness” refers to a pessimistic attitude towards future outcomes and the belief that the adverse outcome cannot be modified.²⁰ Previous evidence suggests that uncontrollable chronic stressors are associated with hopelessness in adolescents.^{21,22} Furthermore, several theories such as the helplessness-hopelessness model of depression and anxiety suggest that hopelessness may also be associated with anxiety and may contribute to the development of depression.^{23,24} It is possible that exposure to multiple academic-related stressors may lead to persistent and uncontrollable stress, which in turn damages the goals and hopes of students, causing them to develop hopeless thoughts further contributing to the development of depression.²⁵

Although it has been suggested that anxiety symptoms and hopelessness are linked to academic stress and depression, it is unclear how anxiety symptoms and hopelessness influence these relationships. Thus, in this study we examined the mediating effects of anxiety symptoms and hopelessness on the relationship between academic stress and depressive symptoms among Chinese college students. This research will enable us to better understand the relationship between academic stress and depression. We hypothesize that 1) anxiety symptoms may mediate the effect of academic stress on depressive symptoms; 2) hopelessness may mediate the effect of academic stress on depressive symptoms; and 3) both anxiety symptoms and hopelessness may mediate the effect of academic stress on depressive symptoms.

Materials and Methods

Settings and Participants

The study was conducted in Hunan province, China, using a cross-sectional design.

The study complied with the Declaration of Helsinki. Ethics approval was obtained from the Clinical Research Ethics Committee at the Second Xiangya Hospital of Central South University. Samples were collected conveniently from the local university. The inclusion criteria were: 1) Able to read and understand Chinese, and 2) Obtain the informed consent of the participants, and for participants under the age of 18, informed consent was obtained from their guardians. In all, 1309 college students completed the survey. After filling out the paper questionnaires, the raw data were entered into the computer. Following the removal of missing values and typed errors, 1157 cases were included in the final analysis.

Materials

Basic Socio-Demographic Characteristics

The basic socio-demographic characteristics data included age, gender, major, ethnic group, family history of mental illness, parental education status, and family economic level.

Academic Stress Scale

The Academic Stress Scale (ASS) was used to measure the perceived academic stress of college students. This checklist was developed by James Kohn and Gregory Frazer in 1986. It consists of 35 items that identify the common stressors in

college life from various sources.²⁶ Students were asked to respond to the items in a 5-point response format, of which 1 indicates “No stress at all” and 5 indicates “Extremely stress”. The total score ranges from 5 to 175, with a higher total score indicating higher perceived academic stress. The Cronbach’s coefficient for the ASS scale in this sample is 0.89.

Generalized Anxiety Disorder Scale

The Generalized Anxiety Disorder Scale (GAD-7) was developed by Spitzer in 2006, and it may be used for screening for generalized anxiety disorders and for the assessment of symptom severity.²⁷ GAD-7 scores range from 0 to 27. Scores of 5, 10, and 15 are considered to be indicators of mild, moderate, and severe anxiety, respectively. GAD-7 has high reliability and validity in the Chinese version, which has been widely utilized in China.²⁸ In this study, Cronbach’s coefficient alpha for GAD-7 was 0.86.

Beck Hopelessness Scale

The Beck Hopelessness Scale (BHS) is a self-reporting instrument used to measure the degree to which students feel hopeless.²⁰ It consists of 20 items, which can be grouped into three dimensions: Feelings About the Future, Loss of Motivation, and Future Expectations. The total score ranges from 0 to 20 points, with the higher the score, the greater the degree of hopelessness. Based on previous research, 0–3 points of BHS are considered normal, 4–8 points are considered mild hopelessness, 9–14 points are considered moderate hopelessness, and greater than 14 points are considered severe hopelessness. It has already been demonstrated that the Chinese version of the BHS scale has high reliability and validity.²⁹ In this study, the Cronbach’s coefficient alpha of the BHS was 0.70.

The Quick Inventory of Depressive Symptomatology-Self-Report

The Quick Inventory of Depressive Symptomatology-Self-Report scale (QIDS-SR) is a widely used self-report scale with 16 items describing 9 critical symptom domains of depressive symptoms, which has been shown to have excellent psychometric properties.³⁰ The total score can be determined by adding the scores of the nine criterion symptom domains, which range from 0 to 27, with higher scores indicating more severe depression symptoms. The summated scores indicate the following: 0–5 no depression, 6–10 mild, 11–15 moderate, 16–20 severe, and 21–27 very severe depression.³¹ The previous study demonstrated that the Cronbach’s coefficient alpha of the QIDS-SR Chinese version was 0.76,³² which is the same as our samples for this current study.

Data Analysis

Due to missing data or typing errors, 152 cases were eliminated from the final data analysis. The basic socio-demographic characteristics data were analyzed by the descriptive statistic method. Spearman correlation was used to explore the association between the main variables.

According to Edwards, one of the best approaches to test mediation is the bias-corrected percentile bootstrap method.³³ Therefore, in order to test the hypothesized multiple mediation model, the PROCESS macro for SPSS (Model 6) which was developed by Hayes was utilized.³⁴ Bias-corrected percentile bootstrap method with 5000 samples was adopted. In addition to this, in order to control the effect of gender and age on the results, these two variables were used as control variables in the subsequent mediation analysis. Therefore, the hypothesized mediating role of anxiety symptoms and hopelessness in the relationship between academic stress and depressive symptoms after control the effect of age and gender were assessed by three equations through multiple linear regressions. All the data were analyzed with SPSS (version 26.0) with a significance level of $P < 0.05$ (two-tailed).

Results

Sample Characteristics

Table 1 presents the socio-demographic characteristics of the sample. Among the participants, the average age was 20.23 and the range of ages was from 17 to 25 years old; the majority of students were Han ethnic, and 60.2% of them were female. 63.3% of students majored in natural science and 36.7% majored in the humanities. 67.5% of the participants have siblings, 69.3% reported having difficulties in interpersonal relationships, and 92.4% reported do not have a family history of mental illness. There were only 3.8% of students who reported a low household income, 47.5% who reported a medium household

Table 1 Socio-Demographic and Clinical Characteristics of the Sample

Variables	Number	Percent (%)
Gender (n = 1157)		
Male	460	39.8
Female	697	60.2
Major (n = 1151)		
Humanities	422	36.7
Natural science	729	63.3
Ethnic (n = 1151)		
Han	1058	91.9
Others	93	8.1
Being the only child (n = 1155)		
Yes	375	32.5
No	780	67.5
Interpersonal difficulties (n = 1153)		
Yes	799	69.3
No	354	30.7
Family history of mental illness (n = 1155)		
Yes	88	7.6
No	1067	92.4
Mother's education (n = 1131)		
Primary school	285	25.2
Middle school	466	41.2
High school	198	17.5
College	182	16.1
Father's education (n = 1133)		
Primary school	178	15.7
Middle school	462	40.8
High school	263	23.2
College	230	20.3
Household income (n = 1154)		
Low	44	3.8
Medium	548	47.5
High	562	48.7

(Continued)

Table 1 (Continued).

Variables	Number	Percent (%)
Relationship with mother (n = 1149)		
Poor	25	2.2
Medium	198	17.2
Good	926	80.6
Relationship with father (n = 1145)		
Poor	53	4.6
Medium	364	31.8
Good	728	63.6

income, and 48.7% who reported a high household income. Regarding the relationship with parents, 80.6% of students have a good relationship with their mother while 63.6% have a good relationship with their father.

Correlation Between Main Variables

The Spearman correlation analysis was used to test the correlation between the main variable. As shown in Table 2, depressive symptoms were significantly positively associated with academic stress ($r = 0.302$, $p < 0.01$), anxiety symptoms ($r = 0.537$, $p < 0.01$), and hopelessness ($r = 0.410$, $p < 0.01$). Academic stress was significantly positively correlated with anxiety symptoms ($r = 0.260$, $p < 0.01$) and hopelessness ($r = 0.287$, $p < 0.01$). Besides that, anxiety symptoms also had a significant and positively correlation with hopelessness ($r = 0.331$, $p < 0.01$).

The Mediating Effects Analyses

Since gender significantly correlated with academic stress ($r = 0.113$, $p < 0.01$) and anxiety symptoms ($r = 0.080$, $p < 0.01$) while age significantly correlated with academic stress ($r = -0.071$, $p < 0.05$), anxiety symptoms ($r = 0.076$, $p < 0.01$), and depressive symptoms ($r = 0.066$, $p < 0.05$). Therefore, in order to control the effect of gender and age on the results, these two variables were used as control variables in the mediation analysis. Table 3 shows the multiple linear regression results for testing the mediating role of anxiety symptoms and hopelessness in the relationship between academic stress and depressive symptoms after controlling for the effect of age and gender. Academic stress could significantly and positively predict the depressive symptoms in equation 3 ($\beta = 0.024$, $t = 4.985$, $p < 0.01$), anxiety symptoms in equation 1 ($\beta = 0.056$, $t = 9.619$, $p < 0.01$), and hopelessness in equation 2 ($\beta = 0.037$, $t = 7.099$, $p < 0.01$). Moreover, anxiety symptoms could significantly and positively predict both depressive symptoms in equation 3 ($\beta = 0.448$, $t = 18.338$, $p < 0.01$) and hopelessness in equation 2 ($\beta = 0.267$,

Table 2 Means, Standard Deviations, and Correlations Between Academic Stress, Anxiety Symptoms, Hopelessness, and Depressive Symptoms

Variables	Mean	Standard Deviation	1	2	3
1 Academic stress	87.66	15.623	—		
2 Anxiety symptoms	3.10	3.176	0.260**	—	
3 Hopelessness	5.02	2.853	0.287**	0.331**	—
4 Depressive symptoms	4.81	3.132	0.302**	0.537**	0.410**

Note: ** $P < 0.01$.

Table 3 Multiple Linear Regression Results for Testing the Mediating Role of Anxiety Symptoms and Hopelessness in the Relationship Between Academic Stress and Depressive Symptoms After Controlling for the Effect of Age and Gender

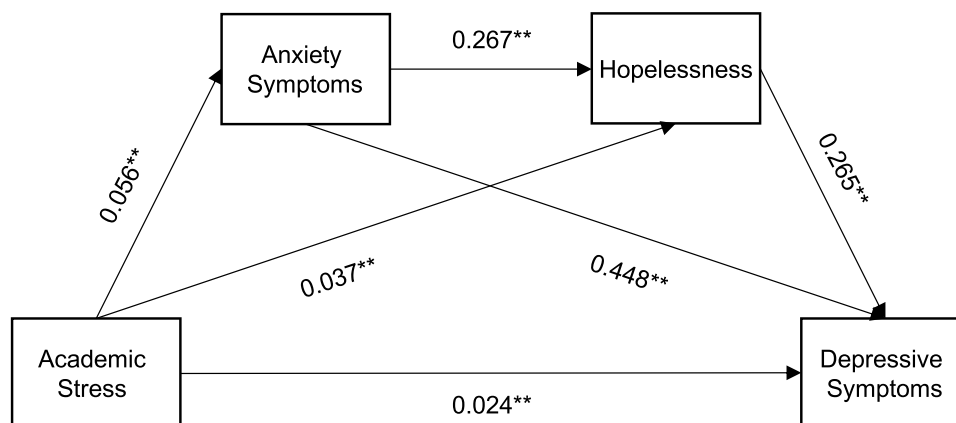
Predictor Variable	Outcome Variable	R	R ²	F	β	t
Equation 1						
Age	Anxiety Symptoms	0.291	0.085	35.569	0.310	3.476**
Gender					0.313	1.685
Academic Stress					0.056	9.619**
Equation 2						
Age	Hopelessness	0.400	0.160	54.930	0.014	0.183
Gender					-0.111	-0.694
Academic Stress					0.037	7.099**
Anxiety Symptoms					0.267	10.538**
Equation 3						
Age	Depressive Symptoms	0.640	0.409	159.523	0.168	2.366*
Gender					0.066	0.449
Academic Stress					0.024	4.985**
Anxiety Symptoms					0.448	18.338**
Hopelessness					0.265	9.746**

Notes: *P<0.05, **P<0.01.

Abbreviations: R, multiple correlation coefficient; R², determinate coefficient; F, F-test; β , standardized coefficient; t, t-test.

t=10.538, p<0.01). In addition, hopelessness also had a direct and significant positive prediction on depressive symptoms in equation 3 ($\beta = 0.265$, t=9.746, p<0.01). The final chain mediating effect model was shown in Figure 1.

The results of bias-corrected percentile bootstrap analysis of the multiple mediation effects were shown in Table 4. Academic stress could partially affect depressive symptoms through the mediating role of anxiety symptoms (indirect effect 1), through the mediating role of hopelessness (indirect effect 2), and through the chain mediating role of both anxiety symptoms and hopelessness (indirect effect 3). Among the three different indirect effect pathways, indirect effect 1 was 0.025, indirect effect 2 was 0.010, and indirect effect 3 was 0.004, which accounted for 40%, 16%, and 6% of the total effect,

**Figure 1** The final chain mediating effect model of academic stress, anxiety symptoms, hopelessness, and depressive symptoms.

Note: **P<0.01.

Table 4 Results of Bias-Corrected Percentile Bootstrap Analysis of the Multiple Mediation Effects

	Effect	Boot SE	Boot LLCI	Boot ULCI	The Ratio of Indirect to Total Effect
Total indirect effect	0.039	0.004	0.031	0.046	62%
Indirect effect 1	0.025	0.003	0.019	0.031	40%
Indirect effect 2	0.010	0.002	0.006	0.013	16%
Indirect effect 3	0.004	0.001	0.003	0.006	6%
Direct effect	0.024	0.005	0.015	0.034	38%
Total effect	0.063	0.006	0.052	0.074	100%

Notes: Indirect effect 1 was academic stress → anxiety symptoms → depressive symptoms, Indirect effect 2 was academic stress → hopelessness → depressive symptoms, Indirect effect 3 was → academic stress → anxiety symptoms → hopelessness → depressive symptoms.

Abbreviations: Boot SE, estimated standard error through bias-corrected percentile bootstrap method; Boot LLCI, 95% confidence interval lower through bias-corrected percentile bootstrap method; Boot ULCI, 95% confidence interval upper through bias-corrected percentile bootstrap method.

respectively. Besides that, the total indirect effect was 0.039, which accounted for 62% of the total effect (0.063) in the relationship between academic stress and depressive symptoms. All the indirect effects were statistically significant.

Discussion

The present study examined the potential mediating role of anxiety symptoms and hopelessness in the relationship between academic stress and depressive symptoms among Chinese college freshmen. It is consistent with our hypothesis that academic stress may contribute to depressive symptoms directly or indirectly through three different indirect pathways: through the mediating role of anxiety symptoms, through the mediating role of hopelessness, and through the chain mediating role of both anxiety symptoms and hopelessness.

In this study, the overall incidence of depressive symptoms was 35.7%, and the incidences of mild, moderate, and severe depressive symptoms were 29.7%, 5.6%, and 0.3%, respectively. It was higher than the prevalence estimate of depression in previous studies, which ranged from 11.7% to 25.39%.^{7,35,36} Totally 25.6% of the students in this study have experienced different degrees of anxiety symptoms, which is greater than the discovery of Enrique's funding but lower than Liu and Beiter's funding.^{13,37,38} Disparities may be explained in part by differences in study methods, instruments used, and compositions of the studied populations, as well as differences in the cultural context. In addition, 64.2% of participants indicated an abnormal level of hopelessness, and the average BHS score was higher than that of American college students.³⁹ According to the funding, hopelessness is a common challenge for Chinese college students. The combination of high academic stress, traditional Chinese parenting styles, and Confucian culture may contribute to higher levels of hopelessness among Chinese college students than in the west.^{40–42}

Our study confirms what prior research has indicated: academic stress such as poor academic performance, a desire to succeed, and post-graduation plans can lead to anxiety.⁴³ Moreover, academic stress was positively and significantly associated with hopelessness among college students in this study, which is consistent with previous research.⁴⁴ It is known that anxiety is a normal physical response to stress.¹⁸ Undergraduate students who have been subjected to high levels of academic pressure for a long period of time and adopt ineffective coping methods may experience frustration, despair, and even develop more serious mental disorders, such as depression.^{45,46} Due to both hopelessness and depression being significant risk factors for suicidal behavior,^{47,48} attentions must be paid to the issue of high academic stress affecting college students.

The results of the mediation analysis indicated that academic stress is significantly associated with depression symptoms among college students. This means that the greater the academic stress, the higher the risk of developing depression symptoms. This is consistent with the results of previous studies,^{49,50} verifying the relationship between academic stress and depressive symptoms, indicating that academic stress is an influential factor causing depressive symptoms in college students. In addition to that, anxiety symptoms could also positively and significantly predict depressive symptoms in the current study. Depressed individuals often have comorbidity with anxiety symptoms and the onset time of anxiety is usually earlier than that of depression.^{51,52} In this context, it is critical to help college students control the anxiety level that is caused by academic stress,

in order to prevent and alleviate the symptoms of depression disorders^{53,54} Besides that, a higher level of hopelessness may contribute to more serious depressive symptoms. Previous evidence suggested that there is a high correlation and overlap between hopelessness and depression, which is consistent with our results.^{23,55,56}

In line with our expectations, academic stress could affect depressive symptoms via one direct effect pathway and three indirect effect pathways. First, academic stress could directly affect depressive symptoms, the higher academic stress may cause severe depressive symptoms. Second, academic stress could affect depressive symptoms through the partially mediating effect of anxiety. Third, academic stress affects depressive symptoms through the partially mediating effect of hopelessness. Finally, a significant pathway of academic stress-anxiety symptoms-hopelessness-depressive symptoms was found. The total effect of three indirect pathways accounts for 62% of the total effect which academic stress affects depressive symptoms.

Conclusion

The study detailed the specific process of depressive symptoms caused by academic stress in college students. This contributes to a better understanding of the link between academic stress and depression. It found that problems of anxiety, hopelessness, and depression caused by academic stress are common in college students. In order to promote the mental health of college students, academic stress must be addressed. However, several limitations in the current study must be mentioned. First, the cross-sectional study cannot establish causality relations. Future studies may explore the causal relationship through longitudinal or experimental study designs. Second, the convenience sampling method from a local university in China may decrease the representativeness of the sample. Large, Multicenter randomized studies are needed in the future. Third, the data were collected through self-reported scales. Future studies could use more accurate measurements to reduce potential bias. Fourth, data from college students with severe mental health problems did not exclude from the final analysis, which may potentially enhance the relationship between the main variables. However, since the participants with severe anxiety symptoms, severe hopelessness and severe depression symptoms only accounted for 1.2%, 0.3% and 0.3% of the total sample size, respectively in this study. Therefore, the potential impact on the results might be relatively weak. Future research on college students should be cautious with the same problem.

Funding

This work was supported by the National Natural Science Foundation of China (No. 81974217 and No. 81873806) and the Scientific Research Fund of Hunan Provincial Education Department (18B219).

Disclosure

The authors report no conflicts of interest in this work.

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