



The Impact of Academic Stress on Subjective Well-being among College Students: The Mediating Role of Resilience and Structural Equation Modeling Analysis

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Abstract. Objective: This study examined how resilience mediates the link between academic pressure and life satisfaction in Chinese undergraduates. Data from 450 students ($M_{age} = 20.45$) who completed three validated scales showed that academic stress was negatively associated with both resilience ($r = -0.38$) and subjective well-being ($r = -0.45$), while resilience correlated positively with well-being ($r = 0.52$). Structural equation modeling indicated a partial mediation effect ($\beta_{indirect} = -0.172$, 95% CI $[-0.245, -0.112]$), accounting for 34.96% of the total effect. These findings suggest that interventions bolstering resilience could mitigate the detrimental impact of academic demands on student mental health.

Keywords: Academic stress, Subjective well-being, Resilience, Structural equation modeling, Mediating effect

1 Introduction

Academic stress stems not only from heavy course loads and fierce competition for scholarships but is also closely related to future prospects for further education and employment. In the modern educational landscape, the pressure to excel academically has become a pervasive element of the university experience, often overshadowing the developmental and exploratory aspects of higher education. Long-term and excessive academic stress easily leads individuals to experience negative emotions such as anxiety and depression, which in turn severely impairs their Subjective Well-being (SWB). As an important psychological indicator for measuring an individual's quality of life, subjective well-being reflects the individual's overall cognitive evaluation and emotional experience of their life status^[1].

However, when facing the same degree of academic stress, not all college students experience a significant decline in subjective well-being. This individual difference has prompted researchers to turn their attention to the positive psychological qualities within individuals^[2]. The concept of resilience has been extensively studied across different cultural contexts, highlighting its universal importance in human psychological functioning^[3]. As a crucial psychological protective factor, resilience plays a key role

in buffering stress and promoting mental health^[4]. It acts as an internal shock absorber, allowing students to navigate the turbulent waters of academic demands without succumbing to psychological distress.

Although existing studies have separately explored the pairwise relationships among academic stress, resilience, and subjective well-being, research that places all three within the same theoretical framework—especially studies utilizing Structural Equation Modeling (SEM) to deeply analyze their internal mechanisms—remains relatively scarce. Most previous research has relied on simple regression models that fail to capture the complex, simultaneous interactions between these variables. Based on this, the present study intends to collect relevant data through a questionnaire survey and apply structural equation modeling techniques to systematically examine the mediating role of resilience between academic stress and subjective well-being. This will not only help enrich and expand relevant theories on stress coping and positive psychology but also provide empirical evidence for colleges and universities to carry out targeted mental health interventions.

2 Literature Review and Research Hypotheses

2.1 Relationship between Academic Stress and Subjective Well-being

Academic stress refers to a series of physiological, psychological, and behavioral tension responses triggered by an imbalance between external environmental demands and an individual's own coping abilities during the learning process. According to the Transactional Model of Stress and Coping^[5], stress is not merely an external event but a complex interaction between the individual and their environment. When an individual appraises that external stressors exceed their own coping resources, negative emotional experiences will arise. In the context of higher education, these stressors are multifaceted, encompassing rigorous academic evaluations, peer competition, and the looming pressure of career placement.

A large number of empirical studies have shown that academic stress is an important negative predictor of college students' subjective well-being. Long-term academic stress depletes an individual's psychological resources, leading to psychological burn-out, thereby directly reducing subjective well-being. Furthermore, the chronic nature of academic stress means that students rarely have adequate time to recover, leading to a cumulative negative effect on their overall life satisfaction. The present study proposes the following hypothesis:

H1: Academic stress has a significant negative predictive effect on the subjective well-being of college students.

2.2 The Mediating Role of Resilience

As a dynamic process of psychological development, resilience emphasizes an individual's positive adaptation in adversity. According to the Protective Factor Model, resilience can act as a "buffer" to mitigate the negative impact of external stress on an indi-

vidual's mental health^[8]. This model suggests that protective factors operate by modifying the individual's response to a risk situation, thereby reducing the likelihood of negative outcomes. On the one hand, long-term academic stress may consume an individual's psychological energy, leading to a decline in resilience levels. The continuous demand to perform academically can erode the foundational psychological structures that support resilience, leaving the student vulnerable.

On the other hand, individuals with high resilience are more inclined to adopt positive coping strategies (such as problem-solving and seeking social support). Previous studies have shown that resilience plays an important mediating or moderating role between various stressors (such as life events and economic stress) and mental health.

In the academic context, we hypothesize that academic stress not only directly affects subjective well-being but also indirectly leads to a decrease in subjective well-being by weakening the individual's resilience. The mechanism here is twofold: the stressor directly impacts the emotional state, while simultaneously degrading the very psychological tools (resilience) needed to combat the stressor. Based on this comprehensive understanding of the interplay between stress, resilience, and well-being, the present study proposes the following hypotheses:

H2: Academic stress significantly and negatively predicts resilience.

H3: Resilience significantly and positively predicts subjective well-being.

H4: Resilience plays a mediating role between academic stress and subjective well-being.

3 Research Methods

3.1 Participants

This study adopted a combination of convenience sampling and stratified sampling methods to select college students from three full-time regular universities in a certain province as the survey subjects. This dual sampling approach ensured both the feasibility of data collection and the representativeness of the sample across different academic disciplines and year levels. A total of 500 questionnaires were distributed through an online survey platform (Wenjuanxing). To ensure data quality, strict exclusion criteria were applied. After excluding invalid questionnaires with excessively short response times (less than 120 seconds), patterned responses (such as continuously selecting the same option), and a large number of missing values, 450 valid questionnaires were finally obtained, yielding an effective recovery rate of 90.0%.

Among the valid sample, there were 215 males (47.8%) and 235 females (52.2%), indicating a balanced gender distribution. In terms of academic year, there were 120 freshmen, 135 sophomores, 110 juniors, and 85 seniors, providing a comprehensive cross-section of the undergraduate experience. Regarding academic disciplines, the sample included 198 liberal arts students and 252 science students. The average age of the participants was 20.45 ± 1.32 years. This diverse demographic profile enhances the generalizability of the study's findings to the broader college student population.

3.2 Measurement Tools

College Student Academic Stress Questionnaire.

The questionnaire consists of 15 items and is divided into three dimensions: learning task stress, competition stress, and future development stress. These dimensions comprehensively capture the multifaceted nature of academic pressure in contemporary higher education. A 5-point Likert scale is used, ranging from 1 (completely inconsistent) to 5 (completely consistent), with higher scores indicating greater academic stress.

Connor-Davidson Resilience Scale.

Revised by Yu Xiaonan and Zhang Jianxin^[3], was adopted. The scale consists of 25 items, including three dimensions: tenacity, strength, and optimism. This scale is widely recognized for its robust psychometric properties across various cultural contexts. A 5-point Likert scale is used, ranging from 0 (never) to 4 (almost always), with higher total scores representing higher levels of resilience. In this study, the Cronbach's α coefficient for this scale was 0.89, indicating high reliability.

Subjective Well-being Scale.

The "Satisfaction with Life Scale" (SWLS) developed by Diener et al.^[1] and the "Positive and Negative Affect Schedule" (PANAS) revised by Qiu Lin et al.^[2] were used to measure subjective well-being. This dual approach captures both the cognitive evaluation of life satisfaction and the affective components of well-being. Total subjective well-being score is calculated as the standard score of life satisfaction plus the standard score of positive affect minus the standard score of negative affect. In this study, the Cronbach's α coefficients for the subscales of life satisfaction, positive affect, and negative affect were 0.82, 0.86, and 0.84, respectively, and the Cronbach's α coefficient for the overall subjective well-being measurement was 0.88.

3.3 Data Processing and Statistical Analysis

SPSS 26.0 software was used for descriptive statistics, correlation analysis, and reliability testing. AMOS 24.0 software was used for Confirmatory Factor Analysis (CFA) and the construction and testing of the Structural Equation Model (SEM). SEM was chosen because it allows for the simultaneous estimation of multiple dependence relationships and accounts for measurement error, providing a more accurate representation of the theoretical constructs. The mediation effect was tested using the Bootstrap method (5000 resamples), with the criterion for significance being whether the 95% confidence interval contained 0^[3]. This non-parametric resampling procedure is highly recommended for testing indirect effects as it does not assume a normal distribution of the mediation effect.

4 Research Results

4.1 Common Method Bias Test

Since the data in this study were all derived from participants' self-reports, there might be a Common Method Bias. This bias can artificially inflate the relationships between variables due to the shared method of measurement. Therefore, before data analysis, Harman's single-factor test was used to conduct an unrotated principal component analysis on all variable items. Analysis revealed that there were 8 factors with eigenvalues greater than 1, and the variance explained by the first factor was 28.45%, which is far below the critical standard of 40%.

4.2 Reliability and Validity Analysis of the Measurement Model

To ensure the accuracy of the subsequent structural equation modeling analysis, this study first conducted reliability and validity tests on the measurement model. According to academic standards, the α coefficient and CR value should be greater than 0.70 (this study strictly required them to be greater than 0.75), and the AVE value should be greater than 0.50^[9].

Table 1. Reliability and Convergent Validity Analysis Results of Latent Variables.

Latent Variable	Number of Observed Indicators	Standard-ized Factor Loading Range	Cronbach's α	Composite Reliability (CR)	Average Variance Extracted (AVE)
Academic Stress	3	0.72 ~ 0.85	0.852	0.861	0.624
Resilience	3	0.76 ~ 0.88	0.894	0.902	0.658
Subjective Well-being	3	0.71 ~ 0.84	0.881	0.885	0.605

As shown in Table 1, the Cronbach's α coefficients of the three latent variables—academic stress, resilience, and subjective well-being—were all above 0.85, and the CR values were all greater than 0.86. Meanwhile, the AVE values of all latent variables were greater than 0.60. The standardized factor loadings for all observed indicators were robust, ranging from 0.71 to 0.88, further confirming that the chosen indicators adequately reflect their respective latent constructs.

4.3 Descriptive Statistics and Correlation Analysis

The means, standard deviations, and Pearson correlation coefficients of each variable are shown in Table 2. The descriptive statistics reveal that college students experience a moderate to high level of academic stress ($M = 3.42$), while maintaining moderate levels of resilience ($M = 3.15$) and subjective well-being ($M = 4.21$). The correlation results indicate that academic stress is significantly negatively correlated with both resilience ($r = -0.38, p < 0.01$) and subjective well-being ($r = -0.45, p < 0.01$). Furthermore, resilience is significantly positively correlated with subjective well-being ($r = 0.52, p < 0.01$). The significant correlations among the variables provided a prerequisite foundation for the subsequent structural equation modeling and mediation effect testing.

Table 2. Means, Standard Deviations, and Correlation Matrix of Variables (N=450).

Variable	M	SD	1	2	3
1. Academic Stress	3.42	0.68	1		
2. Resilience	3.15	0.55	-0.38**	1	
3. Subjective Well-being	4.21	0.82	-0.45**	0.52**	1

Note: ** $p < 0.01$. The lower diagonal shows Pearson correlation coefficients.

4.4 Structural Equation Modeling and Mediation Effect Test

Based on the correlation analysis, AMOS 24.0 was used to construct a structural equation model with academic stress as the independent variable, subjective well-being as the dependent variable, and resilience as the mediating variable. The Maximum Likelihood (ML) method was used to estimate the model parameters. The model fit test results showed that all fit indices reached excellent standards: $\chi^2 = 58.42, df = 24, \chi^2/df = 2.43$ (less than 3), RMSEA = 0.056 (less than 0.08), CFI = 0.952 (greater than 0.90), TLI = 0.941 (greater than 0.90), SRMR = 0.042 (less than 0.05). This indicates that the constructed theoretical model has an extremely high degree of fit with the actual observed data.

The path analysis results (as illustrated in Figure 1) showed: academic stress significantly and negatively predicted resilience ($\beta = -0.41, p < 0.001$); resilience significantly and positively predicted subjective well-being ($\beta = 0.42, p < 0.001$); after adding the mediating variable, the direct predictive effect of academic stress on subjective well-being remained significant ($\beta = -0.32, p < 0.001$). This indicates that resilience plays a partial mediating role between academic stress and subjective well-being.

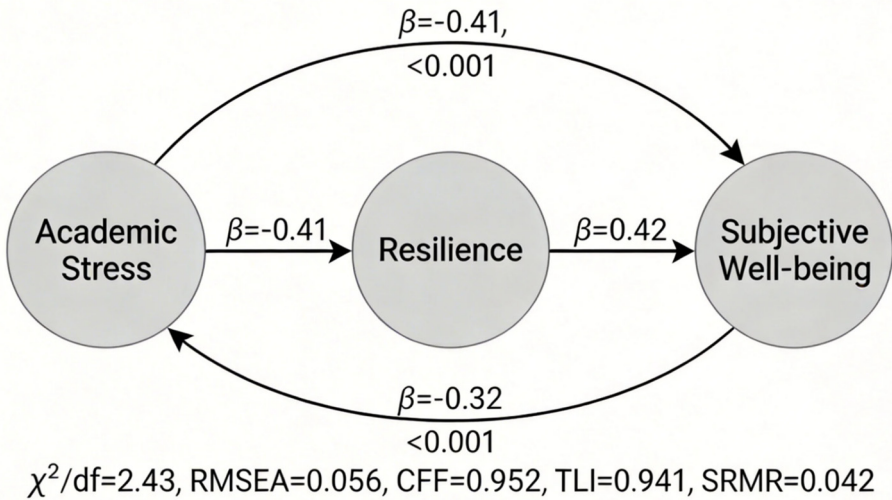


Fig. 1. Structural Equation Model of the Mediating Role of Resilience.

To further verify the significance of the mediation effect, the bias-corrected nonparametric percentile Bootstrap method (5000 resamples) was employed for testing. The mathematical representation of the mediation effect (ME) and total effect (TE) can be expressed as follows:

$$ME = \beta a \times \beta b \quad (1)$$

$$TE = \beta c' + ME \quad (2)$$

Bootstrap analysis confirmed a significant indirect effect ($\beta_{\text{indirect}} = -0.172$, 95% CI $[-0.245, -0.112]$). The total effect value was -0.492 ($-0.32 + (-0.172)$), and the proportion of the mediation effect to the total effect was 34.96% ($0.172 / 0.492$). Hypotheses H1, H2, H3, and H4 were all verified. This robust statistical confirmation underscores the critical pathway through which academic pressure translates into diminished well-being.

5 Discussion

5.1 Direct Effect of Academic Stress on Subjective Well-being

The results of this study indicate that academic stress has a significant negative predictive effect on the subjective well-being of college students, which is consistent with hypothesis H1. This conclusion highly aligns with the results of numerous previous studies^[6]. Under the current educational system and employment environment, college students face multiple academic burdens such as postgraduate entrance exams, certification exams, and GPA rankings. The intensity of these pressures has only magnified in recent years, creating a highly competitive atmosphere that often compromises student mental health.

According to the Conservation of Resources (COR) theory^[5-8], individuals have an instinct to acquire, retain, and protect their own resources. Sustained study pressure, for instance, has been linked to heightened anxiety and lower daily mood ratings among university students — two components closely tied to SWB. This study once again confirmed this direct path through structural equation modeling, suggesting that higher education workers must face up to the direct destructive power of academic stress on students' mental health, rationally arrange curriculum systems, and establish scientific academic evaluation mechanisms.

5.2 Discussion on the Mediating Mechanism of Resilience and Literature Comparison

The core finding of this study is that resilience plays a significant partial mediating role between academic stress and subjective well-being. Specifically, this finding deeply reveals the internal "black box" mechanism by which academic stress affects subjective well-being, moving beyond simple correlational observations to a more nuanced understanding of psychological dynamics.

First, compared with previous literature discussions: this study found that academic stress significantly and negatively predicts resilience, which is consistent with the view of Hu Yue et al. that stressful events deplete resilience^[8]. However, some early literature believed that resilience is a relatively stable personality trait that is not easily changed by the external environment^[3]. The data in this study support the "dynamic development view" or "state view" of resilience, meaning that under continuous high-intensity academic stress, even individuals with originally high resilience may have their psychological defenses against adversity gradually dismantled. This echoes the "resource depletion effect" proposed by Wang Jianping et al. in their study of major stressful events^[8].

Second, regarding the explanation of the mediation effect: the result that resilience positively predicts subjective well-being verifies the Protective Factor Model^[7]. College students with high resilience can conduct cognitive reappraisal more quickly when facing academic setbacks, viewing stress as a challenge rather than a threat, thereby maintaining positive emotional experiences^[3]. In this study, the mediation effect accounted for 34.96% of the total effect, and the Bootstrap 95% confidence interval was [-0.245, -0.112], which did not include 0. This indicates that the mediating effect of resilience was statistically significant, and that, in addition to the direct impact, more than one-third of the negative impact of academic stress on subjective well-being was transmitted through reduced resilience. This proportion is very close to the mediation effect size (about 30%) obtained by Guo Haiying and Zhu Wan'er in a similar population^[7], further enhancing the external validity of the conclusions of this study.

Deepening discussion on theoretical and practical significance: Compared with previous literature that only stayed at the level of correlation analysis^[2], this study utilized structural equation modeling, which not only controlled for measurement errors but also clearly demonstrated the causal logic paths among variables. At the practical level, this conclusion provides a new entry point for psychological interventions in colleges and universities: since it is unrealistic to completely eliminate academic stress, targeted

cultivation and enhancement of college students' resilience (such as enhancing self-efficacy and teaching emotion regulation skills) through group counseling and psychological quality expansion will be an effective way to block the transformation of academic stress into psychological crises.

5.3 Research Limitations and Future Prospects

Although this study has drawn some valuable conclusions, there are still certain limitations. First, this study adopted a cross-sectional research design. Although a causal model was constructed based on a solid theoretical foundation, absolute causal inferences cannot be drawn in a strict sense. Future research could adopt longitudinal tracking designs or experimental intervention designs to further verify the mediating mechanism of resilience over time. Second, the data all came from participants' self-reports. Although statistical tests showed that common method bias was not serious, future studies could combine multi-source data collection methods such as teacher evaluations and peer nominations to enhance objectivity. Third, this study only explored the mediating role of resilience as an internal protective factor. Future research could introduce external environmental variables such as social support and family parenting styles to construct more complex moderated mediation models, in order to comprehensively reveal the impact mechanisms of subjective well-being.

6 Conclusion

Based on the above data analysis and theoretical discussion, this study draws the following main conclusions:

(1) The Academic Stress Questionnaire, Resilience Scale, and Subjective Well-being Scale used in this study all demonstrated excellent reliability ($\alpha > 0.85$, $CR > 0.85$) and validity ($AVE > 0.60$), meeting the measurement standards of high-quality academic research.

(2) Academic stress significantly and negatively predicts subjective well-being and resilience, while resilience significantly and positively predicts subjective well-being.

(3) Academic stress not only directly deprives individuals of their well-being but also indirectly leads to a decline in subjective well-being by eroding the individual's resilience, which is a protective resource. This conclusion provides solid empirical support for intervening in college students' mental health by enhancing resilience.

Acknowledgments

Acknowledgments are placed before the references. This research was supported by the institutional grants aimed at improving student mental health and educational outcomes.

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