

Mechanisms from Academic Stress to Subjective Well-Being of Chinese Adolescents: The Roles of Academic Burnout and Internet Addiction

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Purpose: Academic stress is commonly known to affect adolescents' subjective well-being, but the influencing mechanisms are rarely investigated in the Chinese context. This study aims to investigate the psychological and behavioral factors operating as pathways between academic stress and adolescents' subjective well-being.

Samples and Methods: A multi-stage cluster random sampling is used to select 1043 adolescents from junior and senior high schools in Jinhu County, Jiangsu Province, China (mean age=14.98 years; 51.1% boys). Structural equation modeling is used to test the direct and indirect effects.

Results: Academic stress is significantly correlated with adolescents' subjective well-being after controlling for gender, grade, hukou, and socioeconomic status. In addition to partially mediating the link between academic stress and subjective well-being, academic burnout and Internet addiction can also operate as chain mediators in this mechanism. Adolescents' subjective well-being shows significant gender disparities, with boys having a greater degree of subjective well-being than girls. Father's income is found to have a significant positive association with adolescents' subjective well-being.

Conclusion: The results indicate that academic stress is a significant predictor of academic burnout, which in turn points to a positive association with Internet addiction, thereby explaining low levels of adolescents' subjective well-being. The present study develops current knowledge and expands our understanding of the underlying mechanisms by which academic stress influences adolescents' subjective well-being. This can also illuminate the practical ramifications for policymakers and social workers to mitigate academic-related stress and burnout, prevent Internet addiction, and ultimately promote the well-being of adolescent students.

Keywords: academic stress, subjective well-being, academic burnout, Internet addiction

Introduction

While research on mental health remains grounded in the deficit model and concentrates on mental illness,¹ several recent studies have progressively started to emphasize the benefits of multidimensional well-being on psychological and emotional development. Generally defined as individual's overall cognitive and affective evaluations of their life quality based on personal criteria and principles,² subjective well-being includes three main components, namely, life satisfaction, positive affect, and negative affect.³ As an important indicator for mental health monitoring, greater subjective well-being is credited with numerous positive developmental outcomes,⁴ which is beneficial for health, longevity, academic or work performance, psychosocial functioning, and social support.^{5,6} Individuals with a high level of subjective well-being may better handle negative situations and successfully navigate life.¹ Nevertheless, during the transitional phase from childhood to adulthood, it is common for adolescents to exhibit inadequate psychological wellness and unstable well-being,⁷ a phenomenon that is notably pronounced among Chinese adolescents. Specifically, In the 2015 Programme for International Student Assessment (PISA), the average life satisfaction score of Chinese students was significantly below the global average, ranking at the bottom in comparison to most other nations and economies.⁸ According to the

forementioned facts, the subjective well-being among Chinese adolescents appears to be less promising and potentially concerning, and additional research is imperative to explicate its possible antecedents to provide empirical support for policy and practical implementation.

Resulting from factors like schoolwork, examinations, and academic failures,⁹ academic stress is a prevalent psychological hardship experienced by adolescents throughout the world. Based on PISA survey data, 66% of respondents expressed concerns about receiving poor grades and 55% reported high levels of anxiety when inadequately prepared for exams.⁸ These findings underscore the strong connection between adolescents' stress and their learning experiences. Reflecting an old Chinese proverb, "Everything is worthless except studying".¹⁰ Chinese adolescents seem to encounter such stress even more frequently. Several studies revealed that Chinese students dedicate more time to schoolwork and endure more rigorous academic competitions compared to their counterparts in Western countries.¹¹ Rooted in an exam-centric culture, learning occupies an absolute priority in the lives of Chinese students,¹² and their academic accomplishments are highly prized by teachers, parents, and themselves.¹³ The exam-oriented education system, especially the college entrance examination, has fostered a highly competitive and demanding educational atmosphere for Chinese students.¹⁴ Within such a system and under the weight of elevated educational expectations, Chinese adolescents commonly endure heavy academic stress that is considered to be their most relevant perceived and experienced pressure.¹⁴ As per pertinent investigations, over 50% of Chinese adolescents asserted that their pressures are related to their studies.¹⁵ The aforementioned facts suggest that academic stress among Chinese adolescents constitutes a serious social challenge grounded in profound socio-cultural factors and characterized by its widespread occurrence. Consequently, it is imperative for experts and scholars to maintain ongoing vigilance and conduct comprehensive research into this matter.

With an adverse impact on adolescents' psychological and emotional states,¹⁶ academic stress-related issues have garnered considerable attention from educators, policymakers, and practitioners. The Chinese government has acknowledged the substantial academic burden borne by Chinese students, leading to the issuance of a national policy document that mandates collaborative efforts between educational institutions and external organizations to efficiently alleviate the onerous homework assignments and extracurricular training demands placed on students in compulsory education.¹⁷ This guideline can serve as policy and practice directions for academic stress and burden reduction. Further empirical research is required to expand and deepen current knowledge about adolescents' academic stress-related issues and get this double reduction policy more easily implemented in the school context.

Literature Review

Academic Stress and Subjective Well-Being

Achieving perfect grades or securing a top position within the class is a prevalent aspiration for school-age students. However, the pursuit of academic brilliance frequently results in the buildup of academic stress, endangering students' psychological development and well-being. The diathesis-stress model, which contends that persistently stressful situations can result in psychological problems and emotional disorders when people cannot cope and solve problems effectively, can be used to explain the connection between academic stress and adolescents' subjective well-being.¹⁸ Adolescents are at a stage of immature growth and lack well-developed problem-solving competencies. When confronted with various academic stressors, adolescents tend to exhibit psychological and emotional instability. Empirical studies have shown that students with a high-pressure status in academics display increased negative emotional symptoms such as irritability, anxiety, and depression,^{16,19} as well as school maladjustment and suicidal ideation.²⁰ In addition, their positive emotions are threatened with reduced happiness and psychological well-being.²¹

The negative association between academic stress and subjective well-being has been demonstrated empirically. By analyzing data from the International Survey of Children's Well-being (ISCWeB), Choi et al²² concluded that children with poor academic performance face elevated academic stress, subsequently impacting their perceptions of subjective well-being. An examination of British university students further unveiled that perceived academic stress holds a pivotal role in forecasting subjective well-being; a greater burden of academic stress corresponds with lower perceived subjective well-being in life.²³ Substantial research has shown that subjective well-being is adversely correlated with

academic stress, but literature conducted in the Chinese context yields contradictory results. Due to the enduring impact of the examination-based education system and prevailing “achievement-based” values, Chinese students have cultivated a stronger tolerance to academic stress than their Western counterparts.¹² Despite encountering intense academic stress, Chinese students can demonstrate the ability to withstand unfavorable psychological states, thereby averting a decline in subjective well-being or life satisfaction.²⁴ Given these divergent outcomes, further research is necessary to determine the link between academic stress and adolescents’ subjective well-being, especially within the context of Chinese society.

Academic Burnout as a Mediator

Academic burnout is a psychological syndrome that emerges when academic tasks and demands are beyond one’s capabilities,²⁵ and usually manifests as a variety of symptoms, including emotional exhaustion from academics, cynical or detached attitudes, and feelings of inadequacy.²⁶ Students’ burnout symptoms exert a deleterious effect on both their physical and psychological well-being, with the latter bearing a more pronounced brunt. Several reports have demonstrated that adolescents grappling with academic burnout are susceptible to heightened internalizing difficulties that can detrimentally affect their mental health and subjective well-being.^{27,28} Among 328 Canadian students, Kuo et al²⁹ revealed that school burnout is a substantial detrimental predictor of subjective well-being, with heightened school burnout correlating with diminished subjective well-being. A one-year follow-up survey conducted in the Lithuanian region corroborated a similar finding that high school students displaying minimal indications of school burnout exhibit high levels of subjective well-being in subsequent years.³⁰

Alongside adolescents’ academic stress, subsequent burnout is a prevalent phenomenon within academic contexts. The overwhelming stress and demands inherent to the educational environment can deplete students’ interest and enthusiasm, eventually culminating in the manifestation of academic or school burnout.³¹ Empirical studies conducted across diverse regions and with varied cohorts consistently unveil a positive relationship between academic stress and burnout. Jiang et al discovered that elevated school burnout is linked to increased academic stress from a survey of 552 Chinese middle school students in the Hebei Province.¹² Within the Korean context, Cho illustrated that academic stress stemming from maternal academic achievement expectations positively correlates with middle school students’ academic burnout.³² While prior research substantiated the potential predictive nature of academic stress on academic burnout, several scholars, nevertheless, posited that an individual’s burnout is driven by their perception of stress rather than the specific stressor itself.³³

Internet Addiction as a Mediator

Defined as excessive, obsessive, uncontrolled, and tolerance-causing online usage,³⁴ Internet addiction has evolved into a severe public health concern. According to displacement theory,³⁵ individuals’ compulsive use of electronic devices, including computers and smartphones, might undermine their social interaction and well-being. Empirical investigations also indicated that Internet addiction impairs people’s physical and mental health.³⁶ Preoccupation with the virtual online world may contribute to social isolation, exacerbating feelings of loneliness, anxiety, and sadness, while concurrently diminishing subjective well-being.³⁷ In this case, numerous detrimental psychological disorders are frequently directly linked to excessive Internet use.³⁸ For example, a meta-analysis of 282 articles showed that excessive Internet use is connected adversely with students’ perceptions of subjective well-being, life satisfaction, and positive emotions, but positively related to negative emotions.³⁹ Similarly, a 3-year longitudinal survey revealed that college students’ dependence on smartphones is a risk factor for their mental health.⁴⁰

The relationship between academic stress and Internet addiction can be elucidated by the stress-coping model of addiction,⁴¹ which suggests that people may utilize addictive substances and behaviors to relieve their negative feelings when getting nervous or exhausted from stressful situations. Numerous empirical investigations also demonstrated the significant impact of stress on addictive behaviors.⁴² Academic stress, being among the most notable stressors for adolescents, positively predicts Internet-addictive behaviors in forms such as smartphone addiction or dependency, and problematic or pathological Internet use.⁴³ For example, a cross-sectional survey involving 1399 junior and senior high school students in South Korea revealed that adolescents experiencing elevated academic stress and limited leisure activities are more prone to exhibiting problematic Internet use behaviors.⁴⁴ In Guangxi, Wang et al¹⁵ found that adolescents take smartphones as a “stress reliever” to relax from strain while confronting academic stress; the higher the level of academic stress, the greater the dependence on smartphones.

Chain Mediating Mechanism

The association among academic stress, academic burnout, and Internet addiction can be clarified by general strain theory.⁴⁵ From the perspective of this theory, individuals who are spurred by multiple life stressors are predisposed to encounter negative psychological and emotional symptoms, which may subsequently manifest as deviant or addictive behaviors.⁴³ According to this theory, academic stress stands as a primary catalyst for students developing a burnout attitude toward studies. Academic burnout becomes a regular occurrence when students shoulder substantial academic stress.

In addition, individuals experiencing burnout may adopt substance abuse or addictive behaviors as self-escape mechanisms to numb their negative emotions.⁴⁶ It is empirically proven that burnout attitude serves as a risk factor for behavioral addiction symptoms, encompassing Internet addiction, drug misuse, and alcohol dependence.⁴⁷ Burnout with learning is a potential trigger for various Internet addictive behaviors in adolescents; moreover, as their burnout symptoms escalate, so does their inclination towards online addiction.⁴⁸ A survey of 286 French high school students discovered that exhaustion with schoolwork and feelings of inadequacy at school, which are indicators of academic burnout, can contribute to their problematic Facebook use.⁴⁹ Evidence from Korea also hinted that university students' academic stress and burnout can significantly predict their subsequent smartphone dependence.⁵⁰ The findings of a structural equation modeling (SEM) analysis also revealed the interaction between school burnout and Internet use. In a cohort of students aged 12–14, school burnout status can predict subsequent symptoms of excessive Internet use.²⁸

Furthermore, theory and empirical studies both establish the detrimental effects of Internet addiction on subjective well-being, where addiction to the virtual world disrupts an individual's social life, ultimately diminishing their perception of overall well-being.³⁶

Present Study

Antecedent studies demonstrated the direct relationships among academic stress, academic burnout, Internet addiction, and subjective well-being. Nonetheless, research gaps remain in current investigations. First, the bulk of current research separately explores the correlations among the four variables, but neglects the mediating pathways underlying these relationships, particularly in the Chinese educational context. Given the diversity in respondents' cultural origins and social environment, several debates continue over the associations among the four key variables. Moreover, although an integrated theoretical framework is constructed by synthesizing theories originating from different research fields and groups, empirical investigations are still necessary to provide cross-disciplinary and -group validation.

With the aim to fulfill these research gaps, the present study examines the relationship among academic stress, academic burnout, Internet addiction, and subjective well-being. With the guidance of the diathesis-stress model, displacement theory, stress-coping model of addiction, and general strain theory, an integrated theoretical framework is established to validate the mediators of academic burnout and Internet addiction between academic stress and subjective well-being among Chinese adolescents. Four hypotheses could be proposed based on the above conceptual framework:

H1: A higher degree of academic stress would predict a decline in adolescents' subjective well-being.

H2: A higher degree of academic stress would indicate a greater risk of academic burnout, which would subsequently worsen adolescents' subjective well-being.

H3: A higher degree of academic stress would predict an increase in Internet addiction, which would subsequently impair the subjective well-being of adolescents.

H4: A higher degree of academic stress would predict increased academic burnout, thereby leading to Internet addiction, which would afterwards impair the subjective well-being of adolescents.

Method

Sample and Procedure

Adopting a multi-stage cluster random sampling, this study recruited a sample of 1043 Chinese adolescents in Jinhu County, Jiangsu Province. The sampling procedure is outlined as follows: in the first stage, five junior high schools and two senior high

schools from this county were randomly selected; in the second stage, two classes from each grade (7 to 9) in the middle schools and three classes from each grade (10 to 12) in the high schools were randomly selected; in the third stage, 25 students of each selected classes were randomly chosen to constitute the research sample.

An overview of the research sample's demographic features is presented in Table 1. A total of 1043 valid questionnaires were collected. Among the research sample, 51.1% were male adolescents (N=533), and 48.9% were female adolescents (N=510). The adolescents were between the ages of 11 and 19 (M=14.98, SD=1.548). 508 participants were born in rural areas and 535 participants were born in cities.

Table 1 Demographic Information of Participants (N=1043)

	Frequency	Percent (%)
Gender		
Male	533	51.1
Female	510	48.9
Age	M=14.98	SD=1.548
Grade		
Seventh	234	22.4
Eighth	232	22.2
Ninth	215	20.6
Tenth	141	13.5
Eleventh	109	10.5
Twelfth	112	10.7
Birthplace		
Rural	508	48.7
Urban	535	51.3
Father's education level		
Below primary school	28	2.7
Primary school graduation	82	7.9
Junior high school graduation	366	35.1
Senior high school graduation	294	28.2
Vocational or technical school graduation	126	12.1
Junior college graduation	100	9.6
College or higher	47	4.5
Mother's education level		
Below primary school	71	6.8
Primary school graduation	122	11.7
Junior high school graduation	410	39.3
Senior high school graduation	233	22.3
Vocational or technical school graduation	77	7.4
Junior college graduation	88	8.4
College or higher	42	4.0
Father's occupation		
Leaders/cadres of government agencies	11	1.1
Leaders/cadres of institutions and companies	123	11.8
Private entrepreneur	70	6.7
Professional and technical staff	74	7.1
General staff/clerical staff	97	9.3
Self-employed people	124	11.9
Business and service workers	72	6.9
Blue-collar workers	377	36.1
Farmers/herdsmen/fishermen	73	7.0
Retired/unemployed/unemployed/laid-off	22	2.1

(Continued)

Table 1 (Continued).

	Frequency	Percent (%)
Mother's occupation		
Leaders/cadres of government agencies	10	1.0
Leaders/cadres of institutions and companies	66	6.3
Private entrepreneur	30	2.9
Professional and technical staff	78	7.5
General staff/clerical staff	130	12.5
Self-employed people	118	11.3
Business and service workers	167	16.0
Blue-collar workers	213	20.4
Farmers/herdsmen/fishermen	65	6.2
Retired/unemployed/unemployed/laid-off	166	15.9
Father's income (RMB/month)		
≤999	30	2.9
1000–1999	56	5.4
2000–2999	106	10.2
3000–3999	151	14.5
4000–4999	159	15.2
5000–5999	175	16.8
6000–6999	129	12.4
≥7000	237	22.7
Mother's income (RMB/month)		
≤999	131	12.6
1000–1999	94	9.0
2000–2999	180	17.3
3000–3999	258	24.7
4000–4999	146	14.0
5000–5999	103	9.9
6000–6999	59	5.7
≥7000	72	6.9

Ethical Statement

This study rigorously conforms to the research ethics mandated by the Declaration of Helsinki. Before the survey, the investigator notified the school and the students about the intention and content of the survey. In addition, because the participants of this study are minors, informed consent letters were obtained from students, guardians, and teachers. The questionnaire survey was conducted in full compliance with research ethics, including principles of confidentiality, voluntary participation, anonymity, and no harm to participants. This questionnaire survey has received approval from the ethical committee of the author's affiliated institution (Ethical Committee of Nanjing University's School of Social and Behavioral Sciences).

Measurement

Dependent Variable

The dependent variable in this study is subjective well-being, and for this variable, the Psychological Well-being Subscale of the Kidscreen-52⁵¹ was used to measure it. This subscale measured the well-being of adolescents through six items. Each item is scored on a five-point Likert scale from 1 (not at all) to 5 (extremely). With the mean score of all the items calculated, a higher score suggests a higher level of subjective well-being. The scale exhibited robust reliability and validity in pertinent studies.⁵² The Cronbach's Alpha value for this subscale was 0.922.

Independent Variable

The independent variable in this study is academic stress, which was measured by the Educational Stress Scale for Adolescents.⁵³ This 16-item scale could measure adolescents' academic stress regarding pressure from study, workload, worry about grades, self-expectation, and despondency. Each item is scored on a five-point Likert scale from 1 (never true) to 5 (almost always true). In this scale, the mean value of 16 items is used to calculate the final academic stress level, with higher scores indicating higher levels of academic stress. Studies conducted in various linguistic contexts consistently demonstrate the scale's strong reliability and validity.⁵⁴ In this study, the scale had a Cronbach's alpha = 0.911.

Mediating Variables

The mediating variable of academic burnout was measured by the School Burnout Inventory.²⁶ The scale consisted of nine items and could measure adolescents' academic burnout through three dimensions: exhaustion at schoolwork, cynicism toward the meaning of school, and a sense of inadequacy at school. Each item is scored on a six-point Likert scale from 1 (completely disagree) to 6 (completely agree). The mean score on all the items represents the final academic burnout score, with higher scores indicating higher levels of academic burnout. The scale has undergone thorough validation across a series of related studies, consistently demonstrating strong reliability and validity.¹² The Cronbach's alpha for the scale was 0.844.

The mediating variable of Internet addiction was measured by the Compulsive Internet Use Scale.⁵⁵ The scale contains 14 items and is rated on a five-point Likert scale ranging from 1 (never) to 5 (very often), which is able to measure individuals' Internet addiction in terms of five dimensions: loss of control, conflict, preoccupation, coping, and withdrawal symptoms. In this study, the mean value of the 14 items is calculated to assess the adolescents' Internet addiction. The measure has received extensive validation across a number of relevant investigations and has continuously shown good reliability and validity in diverse linguistic contexts.⁵⁶ The scale showed good internal consistency with a Cronbach's alpha value of 0.912.

Control Variables

This study incorporates the following control variables: gender (male=1 and female=2); grade (from grade 7 to 12); hukou (rural=1 and urban=2), parental education level (from below primary school to college or higher is categorized in order of 1–7), parental occupation (from leaders/cadres of government agencies to retired/unemployed/unemployed/laid-off also categorized in order of 1–10), and parental income (from RMB 999 and below to RMB 7000 and above are categorized in order of 1–8). Specific details about control variables are presented in the Demographic information of participants in Table 1.

Statistical Analyses

The data analysis of this research was divided into two parts: descriptive statistics and structural equation modeling (SEM). In the preliminary analyses, descriptive statistics were applied to examine the mean scores, standard deviations, and correlations among the key variables by using SPSS 26.0. In the structural equation modeling, Amos 26.0 was used to test the measurement and structural model. To check the modeling fitness of the measurement model, confirmatory factor analysis (CFA) was applied first. Then, the structural model was examined to indicate the direct and indirect influence mechanisms among the latent variables. And several fit indices were adopted in this study, namely, χ^2 , CFI, GFI, and RMSEA.

Results

Descriptive Statistics and Preliminary Analyses

The correlation matrix in Table 2 summarizes bivariate correlations among the key variables. As can be seen, all the variables were significantly associated with each other in the expected direction. Academic stress was positively correlated with adolescents' academic burnout and Internet addiction but inversely connected with subjective well-being. Academic burnout was positively associated with Internet addiction, while negatively related to subjective well-being. In addition, Internet addiction was demonstrated to be negatively linked to subjective well-being.

Table 2 Descriptive Statistics and Bivariate Correlations for Key Variables

	Mean	SD	1	2	3	4
1	3.251	0.803	1			
2	2.922	1.085	0.565**	1		
3	2.779	0.922	0.439**	0.455**	1	
4	3.807	0.918	-0.349**	-0.461**	-0.311**	1

Notes: 1, Academic stress; 2, Academic burnout; 3, Internet addiction; 4, Subjective well-being.

** $p < 0.01$.

Measurement Model

The results corroborated that the measurement model was well-fitting ($\chi^2 = 911.825$, $df = 141$, $p < 0.001$, $CFI = 0.937$, $GFI = 0.909$, $RMSEA = 0.072$). The standardized factor loadings of all the observation variables consisting of the latent variables ranged from 0.537 to 0.890 (Table 3), demonstrating a significant factor loading. These values exceeded the allowable factor loading value. As a result, all of the observation variables selected in this study accurately mirrored the intrinsic structure of the latent variable, indicating a well-fitted model.

Structural Model

The results of the validation of the structural model also revealed a satisfactory model fit for the following indicators, $\chi^2 = 1162.121$, $df = 275$, $p < 0.001$ (due to the sensitivity of the chi-square test to the large sample size, a model mismatch discrepancy could arise); $CFI = 0.923$, $GFI = 0.936$, $RMSEA = 0.056$. All the indicators reported above imply that the structural model matches the data well. Additionally, the results of the model validation revealed that the whole model could account for 30.1% of adolescents' subjective well-being.

The standardized effects of academic stress, academic burnout, and Internet addiction on adolescents' subjective well-being in the structural model are illustrated in Figure 1. For simplicity, the control variables are omitted in Figure 1, and only the relationships among the independent and dependent variables are depicted in the graphic. All of the hypotheses proposed in this study are confirmed by the analysis results. Regarding the effect of academic stress on adolescents' subjective well-being, after controlling for the sociodemographic variables, a statistically significant negative relationship is evident ($\beta = -0.138$, $p < 0.05$), indicating that academic stress negatively affects adolescents' subjective well-being. In addition, after controlling for sociodemographic factors, academic stress exerts an indirect effect on adolescents' subjective well-being through the chain mediating influence mechanism involving academic burnout and Internet

Table 3 Standardized Factor Loadings of Observed Variables on Latent Construct

Latent Construct	Observed Variable	Factor Loading
Academic stress	Pressure from study	0.751
	Workload	0.649
	Worry about grades	0.537
	Self-expectation	0.695
	Despondency	0.859
Academic burnout	Exhaustion at schoolwork	0.715
	Cynicism toward the meaning of school	0.836
	Sense of inadequacy at school	0.831
Internet addiction	Loss of control	0.853
	Preoccupation	0.890
	Withdrawal symptoms	0.679
	Coping	0.642
	Conflict	0.645

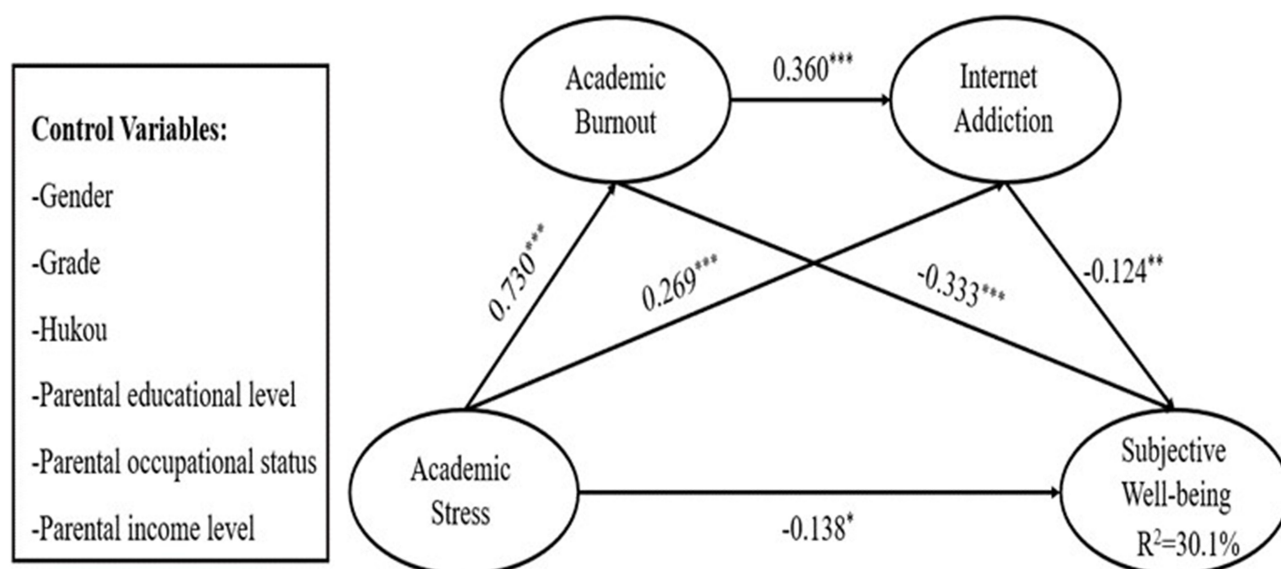


Figure 1 The structural model.

Notes: $***p<0.001$, $**p<0.01$, $*p<0.05$.

addiction. Specifically, academic stress exhibits a positive correlation with academic burnout ($\beta=0.730$, $p<0.001$) while academic burnout demonstrates a negative correlation with subjective well-being ($\beta=-0.333$, $p<0.001$), indicating that academic stress might exacerbate adolescents' study-related burnout, subsequently diminishing their subjective well-being. Simultaneously, academic stress displays a positive linkage with Internet addiction ($\beta=0.269$, $p<0.001$), whereas symptoms of Internet addiction in adolescents negatively correlate with subjective well-being ($\beta=-0.124$, $p<0.01$), suggesting that academic stress might contribute to the emergence of Internet addictive behaviors in adolescents, subsequently diminishing their subjective well-being. Furthermore, adolescents' academic burnout is significantly and positively associated with Internet addiction ($\beta=0.360$, $p<0.001$), implying that youngsters who are burned out in learn are more prone to exhibit Internet-addictive behaviors. In conclusion, academic stress could affect adolescents' subjective well-being both directly and indirectly. And the indirect influence mechanisms can be summarized in three pathways, including academic burnout as a mediator, Internet addiction as a mediator, and the chain mediating effect of academic burnout and Internet addiction.

In this study, control variables include gender, grade, hukou, parental education level, parental occupation, and parental income. In the overall model, only two of these control variables: gender ($\beta=-0.082$, $p<0.01$) and father's income ($\beta=0.063$, $p<0.05$) had statistically significant impact on adolescents' subjective well-being. For the control variable of gender, the subjective well-being of female adolescents is comparatively lower than that of male adolescents. The control variable of the father's income is positively associated with adolescents' subjective well-being, and a higher father's income is linked to higher degrees of adolescents' subjective well-being. Apart from gender and father's income, grade, household registration, parental education level, parental occupation, and mother's income do not exert significant effects on adolescents' subjective well-being.

Discussion

Overall, based on the data collected from Jinhu County, Jiangsu Province, this study delves into the chain mediating effect of academic burnout and Internet addiction in the association between academic stress and subjective well-being among adolescent students in China's circumstance. Thus, a new conceptual framework is established to cover current knowledge gaps. Academic stress and adolescents' subjective well-being are found to be highly correlated. Academic burnout and Internet addiction not only exert separate and partial mediating effects between academic stress and adolescents' subjective well-being but also contribute to a chain mediating mechanism within the relationship. The following interprets and discusses the pertinent findings and implications for theory, social policy, and social work interventions.

The findings confirm Hypothesis 1 and illustrate that adolescents' subjective well-being may be negatively affected by academic stress, consistent with the diathesis-stress model. This theory states that chronic stressful settings can cause psychological problems and emotional illnesses among individuals who are unable to cope with and handle difficulties appropriately.¹⁸ As one of the most prevalent stressors of immature adolescents, academic stress has a considerable impact on students' perceptions of subjective well-being. One possible explanation is that intensive educational stress may dampen students' passion for study, and evoke undesirable consequences such as academic procrastination and school burnout,^{57,58} subsequently resulting in students' discontentment with their academic life. In addition, while the present results align with most previous empirical findings,²⁹ demonstrating that academic stress is a major factor influencing students' life satisfaction and positive affect,²² still a few studies continue to declare that academic stress does not do this inevitably leads to negative psychological states in students.²⁴ The possible causes are the disparities in the cultural backgrounds and measurement methods between our study and earlier research.

The empirical results confirm Hypothesis 2, which proposes that academic burnout mediates the relationship between adolescents' academic stress and subjective well-being. Despite previous explorations focused on the relationship between academic stress and academic burnout, as well as between academic burnout and subjective well-being respectively, there has been no comprehensive theoretical and empirical study have investigated the mediating role of academic burnout. The findings of the SEM corroborate prior research in that academic stress is positively connected with adolescent students' burnout symptoms, including tension, emotional exhaustion, and cynical attitude toward school, ultimately impairing their psychological health and well-being.¹² The potential explanation is that, with continuous energy and resource consumption, academic stress may drive students to doubt the value and worthiness of school life, thereby causing burnout and frustration with academics.³¹ These symptoms further exacerbate students' depression, which is a severe detriment to their well-being.²⁸ Therefore, the present results are consistent with those of previous studies, demonstrating that academic burnout may act as a partial mediator between academic stress and adolescents' subjective well-being.

Another findings validate Hypothesis 3, illuminating that Internet addiction can serve as a partial mediator in the relationship between academic stress and subjective well-being. Given the substantial body of previous research has separately explored the interrelationships among academic stress, Internet addiction, and subjective well-being, the mediator of Internet addiction is identified. The findings substantiate both the stress-coping model of addiction⁴¹ and displacement theory,³⁵ indicating that Internet addiction is not merely a possible behavioral consequence of heavy academic pressure,⁴³ but also an antecedent factor in reducing adolescents' life satisfaction and subjective well-being.³⁹ When overburdened with academic obligations and tasks, individuals might be inclined to overuse the Internet as a deliberative strategy for handling academic hassles and eliminating emotional tension.⁵⁹ Correspondingly, maladaptive Internet use is a potential threat to adolescents' well-being since it could incite issues with school maladjustment,⁶⁰ including interpersonal problems, social anxiety, and social isolation. Overall, this study suggests that Internet addiction can operate as a partial mediator in the association between academic stress and adolescents' subjective well-being.

The findings further corroborate Hypothesis 4 by indicating that academic burnout and Internet addiction not only mediate the relationship between academic stress and adolescents' subjective well-being separately but also collectively contribute to this relationship through a serial mediating mechanism. Previous literature separately explored the interrelationships among the variables but has not simultaneously verified the associations among the four variables. According to the present results, academic stressors can intensify adolescent students' burnout of learning tasks and goals, leading to study avoidance behavior such as Internet addiction, and ultimately diminishing their perceptions of subjective well-being. This conclusion is compatible with the general strain theory, which postulates that multiple strains may elicit negative psychological or emotional symptoms and subsequently promote deviant or addictive behaviors.⁴⁵ The aforementioned discourse already explains the pathways of academic stress-academic burnout and Internet addiction-subjective well-being, but not the mechanism between academic burnout and Internet addiction. The results of the data analysis indicate that adolescents' academic burnout can positively predict their Internet addictive behavior; the more severe burnout toward learning, the more likely they are to develop Internet addiction. This finding is in line with several studies in different countries and regions.^{49,50} Additionally, when appropriate resources are lacking, individuals may exhibit burnout reactions⁶¹ and then maladaptive addictive behaviors may be induced to escape from the emotional

difficulties.⁶² Taken together, the aforementioned results and discussions suggest that academic burnout and Internet addiction may serve as chain mediators between academic stress and subjective well-being.

In this study, gender as a control variable has a significant effect on adolescents' subjective well-being, with the findings indicating that female adolescents have lower levels of subjective well-being than male adolescents. Previous studies found gender disparities in people's perceptions of event severity and emotional expression.⁶³ Females are more prone than men to judge events as being more severe and place greater emphasis on emotional reactions and social support, whereas males prefer to discount emotional stress.⁶⁴ Considering their greater emotional sensitivity, females are prone to be more responsive to life stressors and express diminished subjective well-being. The present results support previous studies, demonstrating that female adolescents have lower levels of subjective well-being than males.

The results also imply that adolescents' subjective well-being could be positively predicted by paternal income; high levels of father's income are associated with increased subjective well-being. Previous research showed that adolescents with low family socioeconomic status report less academic stress and test anxiety.⁸ Similarly, according to the family investment model, affluent families can offer a high standard of life quality and educational resources to better satisfy children's academic demands, thus minimizing the risk of developing academic or exam anxiety.⁶⁵ By contrast, adolescents in lower-income families have limited access to material goods and may feel more deprived compared with their peers.⁶⁶ From previous research and theories, it can be predicted that adolescents from well-off families tend to exhibit positive mental health and high levels of subjective well-being. Furthermore, Chinese cultural traditions notably emphasize a gendered distinction between domestic and productive activities, with the prevailing notion that "men are chiefly responsible for activity in society while women are responsible for the home".⁶⁷ Influenced by this perspective, Chinese fathers typically assume the role of primary breadwinners, and Chinese mothers primarily undertake the duties of caring for the elderly and children.⁶⁸ In this case, paternal earnings constitute a substantial portion of family income and exert a favorable predictive effect on adolescents' subjective well-being.

Implications

In summary, this study constructed an original theoretical framework to explain the associations among academic stress, academic burnout, Internet addiction, and subjective well-being. The framework shows that academic stress exacerbates the academic burnout of adolescents and prompts their online addiction behavior, consequently decreasing their level of subjective well-being.

Both theoretical and practical relevance can be supplied by this investigation. Theoretically, the results of this study corroborate the diathesis-stress model, stress-coping model of addiction, displacement theory, and general strain theory. Thus, academic stress affects subjective well-being both directly and indirectly, with academic burnout and Internet addiction serving as mediating roles. This study also provides cross-cultural demonstration to reinforce these theories within Chinese society and the formulated framework can also be used as a theoretical cornerstone for further empirical investigations.

Moreover, the present findings can provide empirical guidance to inform social policy strategies. Chinese society places a high value on academic performance and test grades, so parents and teachers expect adolescents to succeed in their studies. Consequently, Chinese adolescents are especially susceptible to academic stress, yet its pernicious psychological and behavioral consequences are largely ignored by policymakers and practitioners. Therefore, In light of this, it is imperative to champion political and practical backing for young students to address and alleviate academic stress and burnout, thereby fostering positive youth development.

Meanwhile, this study proposes a potential psychological and behavioral developmental pathway for adolescents experiencing academic stress, which can provide an empirical basis and reference for professional social work interventions. Specifically, a tripartite intervention team including social workers, psychological counsellors, and teachers can be established to respond promptly to adolescents' psychological and behavioral problems caused by academic stress. Furthermore, social workers can tailor intervention methods and therapeutic strategies in accordance with the severity of academic stress. Drawing on the expertise of on-campus counsellors and teachers, practitioners can periodically evaluate students' academic stress levels alongside their corresponding psychological conditions. Based on the exhibited symptoms of academic stress and the prevailing psychological status, the social work intervention teams can administer

tailored and differentiated services for students, spanning group counselling, skills enhancement, and crisis intervention, with the ultimate aim of promptly reshaping the psychological and behavioral trajectories of adolescents and steering them back toward a positive course.

Limitations

The limitations of this study could be summarized in several aspects. First, while this study confirms that academic burnout and Internet addiction may act as chain mediators between academic stress and adolescents' subjective well-being, it has not yet investigated potential variations in effects among the sub-dimensions of these variables. Secondly, in terms of research methodology, the cross-sectional survey design results in a minor deficiency in exploring and confirming the causal relationships among these variables. Thus, further longitudinal surveys are required to rectify the methodology limitation. In addition, the collection of a nationally representative sample for this study was impeded by a range of constraints encompassing human, material, and financial resources. Consequently, the data for this study originates exclusively from junior and senior high schools in Jinhu County, Jiangsu Province. Finally, diverse pathways and mechanisms intersect the relationship between academic stress and adolescents' subjective well-being. In this study, only academic burnout and Internet addiction are selected as mediating variables in terms of adolescents' attitudes and behaviors which does not encompass all potential influencing mechanisms. Consequently, there is a requirement for future research to broaden and delve into a more extensive and intricate pathway connecting academic stress and adolescents' subjective well-being.

Conclusion

This study demonstrates a chain mediating mechanism that translates academic stress into subjective well-being within a sample of Chinese adolescents. This marks the inaugural study to explore the links among academic stress, academic burnout, Internet addiction, and subjective well-being within an integrated framework. Although further efforts are required to elucidate the causal relationships among the key variables, the present study considerably advances both theoretical interpretation and practical implications. The overall conclusions are as follows. Academic stress has a significant negative effect on adolescents' subjective well-being. Academic burnout and Internet addiction not only independently mediate the relationship between academic stress and adolescents' subjective well-being, but also jointly influence the relationship through a chain mediating mechanism.

Disclosure

The authors report no conflicts of interest in this work.

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