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Academic procrastination and negative emotions in the post-epidemic ERA: Life autonomy as a mediator and psychological resilience as a moderator

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Abstract: This study examines the mechanisms through which academic procrastination affects negative emotions among college students in the post-pandemic era, focusing on the mediating role of life autonomy and the moderating role of psychological resilience. A cross-sectional survey was conducted with 776 students from three Chinese universities, who completed measures of academic procrastination, negative emotions, life autonomy, and psychological resilience. Data were analyzed using mediated and moderated mediation models. The results showed that: (1) academic procrastination was positively associated with negative emotions; (2) life autonomy partially mediated this relationship—higher procrastination predicted lower life autonomy, which in turn predicted more negative emotions; and (3) psychological resilience moderated both the link between procrastination and life autonomy and the link between life autonomy and negative emotions. Specifically, higher resilience weakened the negative effect of procrastination on autonomy, while strengthening the protective effect of autonomy against negative emotions. These findings clarify how procrastination influences emotional well-being and highlight the importance of fostering life autonomy and psychological resilience in students. Practically, interventions aimed at reducing procrastination and improving emotional adjustment should incorporate strategies to enhance students' sense of autonomy and resilience.

Keywords: *Academic procrastination, College students, Life autonomy, Mediated moderating model, Negative emotions, Psychological resilience.*

1. Introduction

College students face a variety of challenges in terms of age and maturity, mental health, and personal safety, which make them considered vulnerable [1]. Public emergencies, at the same time, exacerbate their vulnerability [2]. In the post-epidemic era and under the context of COVID-19, this vulnerability is reflected in aspects such as mental health, academics, and employment. In terms of mental health, the global lockdown and school closures caused by the epidemic placed a heavy mental burden on college students, who appeared anxious, depressed, fatigued, and distressed as a result [3]. In terms of academics, many classes in colleges and universities have been suspended or converted to online learning because of the epidemic, which disrupted the traditional college experience for many students [4]. Besides that, the separation from their friends and classmates during the online teaching period has also exacerbated some students' feelings of isolation and depression [5]. In terms of employment, with massive business closures and economic turmoil caused by the spread of the epidemic, many companies had to lay off employees, resulting in fewer job opportunities for college graduates [6]. Therefore, many students suffered from increased stress and anxiety due to unemployment and

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economic uncertainty [7]. Thus, it can be seen that the impact of COVID-19 on college students is multifaceted and far-reaching.

In the face of the impact of the epidemic, college students generally experience negative emotions such as anxiety, anger, helplessness, and panic [8]. Among them, depression and anxiety seem to be more serious [9], which significantly affect college students' academic life and physical health [10]. For example, research found that only 12.94% of college students suffered from anxiety during the non-epidemic period in China [11]. However, 46.6% of college students experienced negative emotions, such as anxiety, sadness, nervousness, fear, or panic during the COVID-19 pandemic [12]. Nevertheless, depression symptoms (30.03%), anxiety symptoms (31.05%), and negative emotions (14.50%) of college students in medical schools were lower than those of non-medical college students (44.49%, 46.22%, and 24.81%, respectively) [13]. Therefore, it is of crucial necessity to study negative emotions among college students. At the same time, previous research has found that the generation of negative emotions is again correlated with academic procrastination [14].

Most studies have focused on the effects of negative emotions on academic procrastination; however, relatively few studies have examined the effects of academic procrastination on negative emotions, especially within the context of emergent management. Some studies have shown that COVID-19 has led to significant changes in the way college students study and learn [15], and these changes have had an impact on college students' academic procrastination [16]. Meanwhile, the significant positive correlation between students' procrastination behaviors and negative emotions has been confirmed [17, 18]. First, it has been proven that the process of academic procrastination is accompanied by negative emotions, and the long-term accumulation of procrastination is bound to cause harm to the physical and mental health of procrastinators [19]. Secondly, academic procrastination is closely related to high levels of negative emotions such as depression and anxiety [20], and students often claim that their heavy academic tasks and academic stress caused their academic procrastination behaviors, which further led to strong negative emotions [21]. last but not least, some studies also found that students were less motivated to study due to feelings of self-blame or guilt for the emergence of academic procrastination and showed stronger negative emotions [22]. It is evident that the negative consequences of students' academic procrastination can induce negative emotions.

Academic procrastination is also closely associated with individuals' sense of life meaning; for example, academic procrastination affects life autonomy [23, 24]. Studies have found that individuals with high levels of academic procrastination have weak self-control and low levels of personal life autonomy [25, 26]. At the same time, life autonomy is also closely related to negative emotions. High life autonomy can help individuals positively deal with their life development and relieve such negative emotions as depression, anxiety, or suppression [27]. Conversely, when individuals cannot have good control over their own life development, they tend to exhibit more negative mood fluctuations, such as anxiety and depression [28]. Therefore, it can be concluded that the lower the degree of individuals' academic procrastination, the higher the degree of their life autonomy and the lower the level of their negative emotions [29, 30]. Unfortunately, few studies have examined the mediating role of life autonomy on academic procrastination and negative emotions.

In the meantime, some studies have shown that the relationship between academic procrastination and negative emotions may also be influenced by individuals' external psychological environment, such as psychological resilience [31, 32]. On the one hand, it has been found that students with lower levels of psychological resilience may not be able to regulate themselves and study less efficiently due to their inability to normally face the stress of study and exams, leading to academic procrastination [33, 34]. On the other hand, psychological resilience plays a role in negative emotions such as anxiety and depression [35]. For example, psychological resilience can motivate individuals to choose effective ways to cope with, resist, or buffer negative effects and improve negative psychological states [36]. In contrast, individuals with lower psychological resilience are more vulnerable to negative emotions and

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may experience negative emotional responses and behavioral reactions [37]. Therefore, in the post-epidemic era, the positive role of psychological resilience needs to be emphasized to reduce academic procrastination among college students as well as to improve their negative emotions.

Unfortunately, few relevant studies have investigated how psychological resilience is associated with academic procrastination, life autonomy, and negative emotions. Moreover, even fewer studies have explored the effect of psychological resilience as a contextual condition for academic procrastination and negative emotions, or the effect of life autonomy as a mediator for academic procrastination on negative emotions. This should invoke our reflection and further motivate us to explore how academic procrastination affects college students' negative emotions in the post-epidemic era, and whether life autonomy and psychological resilience play a relevant role in it, to provide targeted opinions to alleviate college students' negative emotions.

In order to enhance our understanding of the impact of academic procrastination on negative emotions among college students in the post-epidemic period, the relevant work in the literature is reviewed first, followed by the introduction of the mediated moderating model. Subsequently, hypotheses regarding the mediating effect of life autonomy and the moderating effect of psychological resilience are presented. Finally, the results of this study are reported, and further research directions are proposed in the conclusion section.

2. Literature Review

2.1. The Relationship Between Academic Procrastination and Negative Emotions

The word procrastination is of Latin origin and originally meant "to postpone or delay until tomorrow." The word procrastination was not originally intended to be positive or negative, but changes over time have given it a variety of meanings and emotions. It has a negative implication in various fields and situations [38], especially in the academic field, because of its high frequency among students [39], it has attracted the attention of researchers and is referred to as academic procrastination. Academic procrastination, as a technical term, first appeared in 1984. Researchers identified academic procrastination as a learner's personal tendency to actively delay starting and completing academic tasks. Once this tendency occurs, learners have difficulty completing academic tasks within the time limit [40]. After decades of extensive research, scholars have gradually developed a deeper understanding of academic procrastination, and they have defined it from different perspectives. From the perspective of subjective will [41], it is classified into active and passive procrastination. From the perspective of individual differences, Artin and Milgram [42] classified it into situational and trait procrastination.

Although a wealth of research findings has contributed to a broader and deeper understanding of academic procrastination, there is no unified definition of academic procrastination. The commonly shared view is that academic procrastination is a negative, maladaptive behavior that is accompanied by emotional experiences such as anxiety and depression [43], which can affect students' academic performance in minor cases as well as their physical and mental health in major cases. Studies have shown that, on the one hand, academic procrastination not only causes a decline in students' academic performance but also triggers adverse emotional experiences [14]. On the other hand, chronic academic procrastination can result in negative self-judgments and affect overall physical and mental health [44]. Thus, it is evident that academic procrastination can trigger adverse emotions in students.

Previous researchers have focused on college students' negative emotions related to academic procrastination, but few studies have examined the impact of academic procrastination on negative emotions among college students. Negative emotions refer to emotional changes in response to psychological stress, primarily manifesting as reduced emotional control, irritability, or crying. Under the influence of COVID-19, people's perception of the epidemic has triggered negative emotions such as panic, worry, and fear of infection, which are regarded as negative emotions Tracy and Robins [45].

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Lovibond and Lovibond [46] considered stress, depression, and anxiety as the most frequent negative emotions of individuals, forming a three-dimensional model. All these three can be assessed both in relation to one another and independently as negative emotions, and research has shown that academic procrastination has an impact on the negative emotions of stress, anxiety, and depression. For example, chronic academic procrastination can increase college students' academic stress and lead to emotional distress [47]. Furthermore, academic procrastination positively predicts personality anxiety, test anxiety, and study anxiety [48] as well as cognitive and emotional anxiety [49]. In addition, academic procrastination is closely associated with high levels of negative emotions such as depression and anxiety, and lower levels of self-esteem [20, 50]. This shows that there is a correlation between academic procrastination and negative emotions among college students, especially for the three dimensions of stress, depression, and anxiety. That is, individuals with low levels of academic procrastination would produce relatively low levels of negative emotions. Therefore, hypothesis 1 can be proposed.

H_1: Academic procrastination is positively related to negative emotions.

Although many studies have verified the relationship between academic procrastination and negative emotions, there are not enough studies showing a significant direct effect of low academic procrastination on low negative emotions. It is evident that there is no consistent and systematic conclusion about the internal mechanism between academic procrastination and negative emotions. Therefore, it might be more helpful to reveal the relationship between them by adding the exploration of mediating and moderating factors.

2.2. The Mediating Role of Life Autonomy

Life autonomy refers to students' ability to take charge of the direction of their lives, to make their own choices, and to take responsibility for their own actions [51]. College students' life autonomy has an important impact on their life satisfaction, personal evaluation, life adjustment, and psychological and physical health. The higher the life autonomy of college students, the higher their psychological health, personal evaluation, life adjustment, and life satisfaction [52]. Studies have shown that there is a correlation between life autonomy and various factors and variables. For example, negative life autonomy can lead to a series of psychological problems, which can seriously affect students' physical and mental development [53]. Conversely, positive life autonomy can diminish or counteract negative emotions such as worry and anxiety [52] and thus improve individuals' emotions and sense of life aspirations [54].

Related studies have also confirmed a link between life autonomy and academic procrastination. Tian et al. [55] verified significant differences in the level of life autonomy among students with superior, intermediate, and low academic achievements. Their results showed that students with higher academic grades had higher self-efficacy, self-confidence, sense of value, and life autonomy. Moreover, individuals with higher life autonomy have their own direction in life and therefore have better self-control and can control their behaviors better [56], while college students' self-control negatively predicts their academic procrastination, college students have more discretionary time and are easily addicted to cell phones and the online world. They may even become bored with school due to confusion and helplessness, resulting in lower grades [57]. While college students with higher life autonomy have higher personal evaluations [58]. Some studies have shown that having a persevering personality positively predicts academic engagement, which is a significant negative predictor of academic burnout and academic procrastination [59].

Although few studies have used academic procrastination as an influential variable to examine the mechanisms of life autonomy in the post-epidemic era among college students, the studies above have verified that college students with lower levels of academic procrastination exhibit greater self-control and higher life autonomy. Thus, these hypotheses can be proposed.

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H_{2a} Academic procrastination is negatively related to life autonomy

Some psychologists believe that people must learn to handle and regulate their emotions flexibly [60]. In terms of the impact of life autonomy on life activities, life autonomy can be divided into positive and negative aspects. Negative life autonomy is manifested as pessimism, indifference, low self-esteem, low moral sense, etc., and facing life with a negative attitude can produce a series of psychological problems that seriously affect students' physical and mental development [53]. Conversely, positive life autonomy can diminish or counteract negative emotions such as worry and anxiety [61], thus increasing individuals' emotions and sense of desire for life [54]. Though external factors that lead to negative emotions cannot be completely eliminated, a strong will can be developed to mitigate or eliminate those annoying negative emotions. The increase in life autonomy can further promote changes in self-experience, interpersonal experience, and life values. It can also alleviate negative emotions by fostering more emotional and psychological identification with the environment [62]. Therefore, life autonomy can promote college students' self-management skills, enhance their self-efficacy, and build a strong will. Based on the above research, it is clear that negative emotions can be mitigated or eliminated through enhancing college students' life autonomy. That is to say, the higher the degree of individuals' life autonomy, the lower their negative emotions. As a result, this hypothesis is proposed:

H_{2b} Life autonomy is negatively related to negative emotions

Numerous studies have shown that individuals with low levels of academic procrastination exhibit higher self-efficacy, greater perseverance in personality, and stronger self-control, all of which are indications of high levels of life autonomy [63-65]. Meanwhile, individuals with a high degree of life autonomy have higher well-being and positive emotions [66]. Otherwise, negative emotions or even suicidal ideation may be generated [67]. In summary, the lower an individual's level of academic procrastination, the higher their level of life autonomy, which in turn can mitigate negative emotions. In summary, hypothesis 2 can be proposed:

H_{2} Life autonomy mediates the relationship between academic procrastination and negative emotions

2.3. The Moderating Role of Psychological Resilience

Psychological resilience was originally proposed by Anthony, a psychologist, in the 1970s. Werner [68] defined psychological resilience as an individual's recovery ability after they have experienced trauma. In addition, John Dryden and Bruce considered psychological resilience as a dynamic developmental process in which individuals are able to adapt to stress and setbacks, remain healthy, and recover quickly from negative events when they are in adverse situations [69].

In terms of the impact of psychological resilience on academic procrastination, it can be divided into positive and negative aspects. From a positive perspective, students are more likely to get stuck and experience academic procrastination when coping with academic setbacks, while during this period, psychological resilience can provide sufficient coping resources to help students better adjust to negative emotions and perceptions. In the meantime, it helps to alleviate their fear of failure, thus making them less likely to choose to avoid problems through academic procrastination [33, 70]. On the negative side, when students' academic pressure is high, some students with low psychological capital, especially those with low psychological resilience, tend to be unable to withstand it, which could lead to academic burnout, life rebellion, or even behavioral extremes, such as self-inflicted harm, hurting others, or destroying property [34, 71]. Based on the effect of psychological resilience on individuals' coping styles, a large number of studies have also explored the relationship between psychological resilience and academic performance [72, 73]. Studies have shown that psychological resilience is significantly and negatively related to negative emotions and academic procrastination [74]. In summary, students with lower levels of psychological resilience may not be able to regulate themselves properly due to their inability to face the stress of studying and exams, and their learning efficiency is reduced, leading to academic procrastination. Therefore, the following hypothesis is proposed.

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H_{3a} Psychological resilience is negatively related to academic procrastination

It has been proven that individuals with high life autonomy have a higher degree of self-control and a lower degree of academic procrastination. Related studies have shown that individuals with high psychological resilience are able to adjust their psychological state to adapt to changes in their environment when facing stress and adversity, and they tend to have a more positive and optimistic perception of their life [66]. In contrast, individuals with low psychological resilience cannot reasonably regulate their psychological state when facing stress and frustration, and they tend to exhibit less positive life autonomy [35]. It can be observed that there is a significant correlation between psychological resilience and life autonomy. Therefore, the following hypotheses can be proposed.

H_{3b} Psychological resilience is positively correlated with life autonomy

H_{3c} Psychological resilience may have an interactive effect with academic procrastination, thus affecting the individual's life autonomy.

Through the above-mentioned research, it can be concluded that psychological resilience may have an effect on the mediating role of life autonomy, and at the same time, psychological resilience may play a moderating role in studies related to academic procrastination and life autonomy, which may further affect individuals' life autonomy. In summary, the third hypothesis can be proposed.

H_3 Psychological resilience may play a moderating role in this study, that is, psychological resilience interacts with academic procrastination and thus affects individuals' life autonomy.

The above-mentioned studies have shown that college students' life autonomy is closely related to psychological resilience [75]. People with a high degree of life autonomy have a stronger sense of meaning in life, which can further influence their psychological resilience [76]. On the one hand, people with a strong sense of meaning in life have higher levels of psychological resilience, and those with a clear purpose in life have higher levels of psychological resilience than those who avoid life [77]. On the other hand, life autonomy can help people achieve self-concordance by increasing their psychological resilience levels [78].

In the meantime, it was found that psychological resilience was correlated with negative emotions. For example, some studies proposed that college students are in a period of rapid physical and mental development, so only with strong psychological resilience can they effectively cope with negative emotions such as difficulties, frustration, and stress in their daily lives [79]. Furthermore, some researchers also found that psychological resilience could provide sufficient coping resources to help students better adjust to negative emotions and perceptions and reduce their fear of failure [33]. Besides that, it has also been found that psychological resilience is significantly positively related to positive emotions and significantly negatively related to negative emotions [9, 80]. Therefore, the following hypotheses are proposed.

H_{4a} Psychological resilience is positively related to life autonomy

H_{4b} Psychological resilience is negatively related to negative emotions

H_{4c} Psychological resilience may have an interactive effect with life autonomy and thus influence individuals' negative emotions.

It can be deduced from the above analysis that psychological resilience may have an effect on the mediating role of life autonomy and may influence the generation of negative emotions in individuals. In summary, the fourth hypothesis is proposed.

H_4 Psychological resilience may play a moderating role in this study, that is, psychological resilience interacts with life autonomy and thus affects individuals' negative emotions.

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3. Methods

3.1. Participants and Procedures

A web-based questionnaire was conducted on students to collect data from September 7 to September 15, 2022. The participants were college students from three higher education institutions in Guangxi Zhuang Autonomous Region, China.

A random sampling method was used in this study to investigate the mental health status of students in higher education institutions in Guangxi Zhuang Autonomous Region, and a sample of 800 students was taken from three colleges. After that, the respondents were asked to fill in the questionnaires, and then the data were collected and analyzed. Finally, 776 valid questionnaires were obtained, including 219 (28.2%) male students and 557 (71.8%) female students, aged between 19 and 25 years old. Before finalizing the study design, the researchers interviewed a sample of students at these three colleges to understand their emotional and psychological state.

3.2. Data Collection

This study used an online questionnaire to collect data. A moderated mediating analysis was conducted with academic procrastination as the independent variable, negative emotions as the dependent variable, life autonomy as the mediating variable, and psychological resilience as the moderating variable. In this survey, students used their recess time to scan QR codes to complete the questionnaire. QR codes are black-and-white graphic symbols on a two-dimensional plane [81] which were widely used and accepted in China during the COVID-19 pandemic for activities such as online payments, daily travel, and data entry. The questionnaire used in this study consisted of five parts and included 75 items: (a) demographic information, (b) academic procrastination scale, (c) negative emotions scale, (d) life autonomy scale, and (e) psychological resilience scale. Of these, the academic procrastination scale and the negative affect scale were initially designed in English and then translated into Chinese, with the original and back-translated versions compared to eliminate discrepancies. The translations were corrected and optimized before finalizing the questionnaires, ensuring the scales' equivalence.

3.3. Materials

3.3.1. Academic Procrastination Scale

The Academic Procrastination Scale was developed by Tuckman [82] and consists of 16 questions that measure a person's level of academic procrastination. A 5-point scale was used, with "1" indicating "strongly agree," "2" indicating "somewhat agree," "3" indicating "unsure," "4" indicating "somewhat disagree," and "5" indicating "strongly disagree." The scores were transformed to provide a range of possible scores from 16 to 96. In the present study, the Cronbach's alpha coefficient for this scale is 0.920.

3.3.2. Negative Emotions Scale

The three-factor model of depression, anxiety, and stress proposed by Clark and Watson [83] was used. Lovibond and Lovibond [46] developed the Depression-Anxiety-Stress Scale (DASS-42) for the three-factor model to assess depression, anxiety, and stress in adults. This scale has been translated into several languages and used worldwide because of its simplicity, uniqueness, and speed of operation. A 5-point scale is used to assess the degree to which the subject is experiencing various negative affective states. The criteria are "1" for "not conforming at all," "2" for "relative inconformity," "3" for "being unsure," "4" for "relative conformity," and "5" for "totally conforming." The higher the score, the higher the index of depression, anxiety, and stress. In the present study, the Cronbach's alpha coefficient is 0.965.

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3.3.3. Life Autonomy Scale

The Life Autonomy Scale was developed by Jing-Ying Pan and Man-Ying Hsieh, which aims to examine college students' life autonomy. The scale is based on the theoretical basis of the concept of life autonomy as well as Schart, Franck, Rolome, and Rogers' perceptions of life autonomy attitudes, and six dimensions of life autonomy were analyzed: ideal, autonomy, love and care, sense of being, attitude toward death, and life experience. A 5-point scale was used, in which the criteria are "1" for "not conforming at all", "2" for "relative inconformity", "3" for "being unsure", "4" for "relative conformity", and "5" for "totally conforming". In this study, the Cronbach's alpha coefficient for the Life Autonomy Scale is 0.825.

3.3.4. Psychological Resilience Scale

The psychological resilience scale was adopted from the scale proposed by Hu and Gan [84], who summarized the concept of psychological resilience from domestic and foreign scholars. The scale consists of 25 questions [85] and is divided into five dimensions, including goal focus, emotional control, positive cognition, family support, and interpersonal assistance. The questionnaire was scored on a 5-point scale, using feelings, reactions, and agreement as indicators. The criteria are "1" for not conforming at all, "2" for relative inconformity, "3" for being unsure, "4" for relative conformity, and "5" for totally conforming. In this study, the Cronbach's alpha coefficient for the psychological resilience scale is 0.958.

3.4. Statistical Analyses

In this study, IBM SPSS 26.0 was used to process the data for analysis. First, a Harman one-way test was conducted to check the possibility of common methodological bias [86]. The results of the non-rotated principal component analysis showed that nine factors had eigenvalues greater than 1 and contributed 66.512% to the total variance. The first factor accounted for 34.245%, which is below the critical criterion of 40% [87], indicating the absence of significant common method bias. Therefore, the differences between the independent and dependent variables are mainly due to differences in the variables rather than differences in data collection and measurement methods. Descriptive statistical analysis was then performed to calculate the mean and standard deviation of each variable to observe the numerical trends and their dispersion. Then, Pearson product-moment correlation coefficients were calculated to evaluate the correlation between variables (see Table 1, Table 2).

After the CMV evaluation, descriptive analysis, correlation analysis, and model testing of the data were performed based on the research hypotheses. First, this study examined the concentration and dispersion trends of the data through descriptive analysis; then, correlation analysis among the variables was conducted to test the relationships among the independent, dependent, mediating, and moderating variables through calculating Pearson correlation coefficients. Based on the correlations, the research hypotheses were further examined, and the PROCESS (version 4.1) plug-in in SPSS was used to test the model's moderating and mediating effects. The PROCESS plug-in was developed by Hayes [88] specifically for path analysis-based mediating and moderating analysis and their combinations.

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Table 1.
The descriptive statistics among variables.

Variable	N	Mean	SD	Variable	N	Mean	SD	Variable	N	Mean	SD	Variable	N	Mean	SD
Academic procrastination	776	2.59	0.64	Negative emotions	776	2.12	0.75	Life autonomy	776	3.54	0.60	Psychological resilience	776	3.20	0.70
Male	219	2.67	0.71	Male	219	2.24	0.92	Male	219	3.47	0.64	Male	219	3.25	0.83
Female	557	2.57	0.60	Female	557	2.07	0.67	Female	557	3.57	0.58	Female	557	3.18	0.65
Grade level				Grade level				Grade level				Grade level			
1	84	2.54	0.72	1	84	2.12	0.95	1	84	3.61	–	1	84	3.40	0.74
2	141	2.50	0.60	2	141	2.04	0.72	2	141	3.56	0.61	2	141	3.26	0.70
3	253	2.53	0.61	3	253	2.06	0.70	3	253	3.60	0.60	3	253	3.21	0.68
4	233	2.68	0.62	4	233	2.20	0.76	4	233	3.50	0.57	4	233	3.17	0.70
5	65	2.81	0.69	5	65	2.25	0.72	5	65	3.35	0.57	5	65	2.93	0.72
Age				Age				Age				Age			
19	289	2.59	0.64	19	289	2.13	0.73	19	289	3.53	0.60	19	289	3.16	0.69
20	201	2.63	0.64	20	201	2.18	0.70	20	201	3.50	0.60	20	201	3.16	0.64
21	245	2.55	0.62	21	245	2.05	0.76	21	245	3.58	0.60	21	245	3.28	0.74
22	28	2.75	0.61	22	28	2.25	1.02	22	28	3.60	0.63	22	28	3.12	0.78
23	5	2.43	1.03	23	5	1.53	0.51	23	5	4.07	0.93	23	5	3.62	0.93
24	2	2.78	0.40	24	2	2.33	0.47	24	2	3.96	0.65	24	2	3.40	0.74
25	6	2.70	0.84	25	6	2.62	1.55	25	6	3.13	0.35	25	6	3.67	1.05

Note: N=sample size. M=Means. SD=standard deviation. Grade level is dummy coded.
(1=top 10% of grade, 2=top 10%-20% of grade, 3=top 20%-40% of grade, 4=top 40%-70% of grade, 5=not in top 70%).

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4. Results

4.1. Descriptive Statistics and Correlation Analysis

Descriptive analyses as well as correlation analyses of academic procrastination, negative emotions, life autonomy, and psychological resilience among college students are presented in Tables 1 and 2.

Table 2.
Correlations among variables.

Variables	(1)	(2)	(3)	(4)
(1) Academic Procrastination	1			
(2) Negative Emotions	0.613***	1		
(3) Life Autonomy	-0.572***	-0.477***	1	
(4) Psychological Resilience	-0.493***	-0.475***	0.469***	1

Note: *p < 0.05, **p < 0.01, ***p < 0.001.

The results in Tables 2 showed that college students' academic procrastination was significantly positively correlated with negative emotions (r=0.613, p<0.001), academic procrastination and life autonomy (r=-0.572, p<0.001) were significantly negatively correlated, and academic procrastination was significantly negatively correlated with psychological resilience (r=-0.493, p<0.001) and negative emotions (r=-0.477, p<0.001). Psychological resilience was significantly and negatively correlated with negative emotions (r=-0.475, p<0.001), and was significantly and positively correlated with life autonomy (r=0.469, p<0.001). The correlations of the study are therefore in line with the expected assumptions.

4.2. Mediating Effect of Life Autonomy

This study employed Model 4 of the SPSS PROCESS macro for multiple regression analysis, with academic procrastination as the independent variable, negative emotions as the dependent variable, and life autonomy as the mediating variable. Gender, age, and grades were included as control variables because they may influence the other variables. These control variables were transformed into dummy variables prior to entering the mediating model. When gender, age, and grades were used as control variables, the correlation coefficients between the independent and dependent variables changed very little, indicating that gender, age, and grades had minimal effect on the overall mediated model.

As shown in Table 2, academic procrastination was significantly and positively correlated with negative emotions (β=0.596, SE=0.040, p<0.001), indicating that academic procrastination had a positive predictive effect on negative emotions, i.e., lower levels of academic procrastination among college students were associated with lower negative emotions among individuals. This predictive effect remained significant when life autonomy was added (β=0.124, SE=0.024, 95% CI=[0.076, 0.172]), i.e., higher levels of life autonomy among college students were associated with lower levels of negative emotions. In addition, academic procrastination had a significant negative effect on life autonomy (β = -0.537, SE = 0.028, p < 0.001), while life autonomy also had a significant negative effect on negative emotions (β = -0.232, SE = 0.043, p < 0.001), and the lower the level of academic procrastination, the higher the level of individuals' life autonomy and the lower their degree of negative emotions. That is, life autonomy mediates the relationship between academic procrastination and negative emotions. In addition, the bias-corrected percentile bootstrap method further revealed a moderated mediating effect. Both the direct effect of academic procrastination on negative emotions and the mediating effect of life autonomy between academic procrastination and negative emotions had bootstrap confidence intervals (95%) that did not contain zero values between the upper and lower bounds, as shown in Table 3. This indicates that academic procrastination can have a direct effect on negative emotions and an indirect effect on negative emotions through life autonomy, and the direct and mediated effects account for 82.80% and 17.20% of the total effect, respectively.

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Table 3.
Testing the Mediating Effect of Life Autonomy on Negative Emotions.

Predictors	Life Autonomy					Negative Emotions				
	β	SE	t	95%CI		β	SE	t	95%CI	
				LLCI	ULCI				LLCI	ULCI
Age	-0.005	0.007	-0.637	-0.019	0.010	0.012	0.009	1.441	-0.005	0.029
Gender	0.051	0.040	1.282	-0.027	0.128	-0.087	0.047	-1.868	-0.179	0.004
Grade level	0.060	0.042	1.408	-0.024	0.142	0.049	0.050	0.971	-0.050	0.147
Academic Procrastination	-0.537	0.028	-19.188***	-0.591	-0.482	0.596	0.040	14.835***	0.518	0.675
Life Autonomy						-0.232	0.043	-5.442***	-0.316	-0.148
R-squ	0.331					0.404				
F	95.395***					104.546***				

Note: *p < 0.05, **p < 0.01, ***p < 0.001. Analyses conducted by PROCESS Model 4, N = 776. Gender is dummy coded (1, female, 2, male).

Table 4.
Total Effect, Direct Effect, and Indirect Effect Among the Variables.

	Effect size	Boot SE	95%CI		Relative effect size
			LLCI	ULCI	
Total effect	0.721	0.033	0.658	0.787	
Direct effect	0.597	0.040	0.518	0.675	82.80%
Indirect effect	0.124	0.024	0.076	0.172	17.20%

Note: Analyses conducted by PROCESS Model 4, N = 776.

4.3. Moderated Mediating Effects

In order to verify the moderating effect of psychological resilience on the paths of "academic procrastination → life autonomy" and "life autonomy → negative emotions," the moderating variable psychological resilience was added to the mediating model. The results of Table 4 showed that the interaction term between psychological resilience and academic procrastination reached a significant level (β=-0.065, p<0.001) with a 95% CI of [-0.122-0.008]. The interaction term for psychological resilience and life autonomy reached a significant level (β=0.195, p<0.001) with a 95% CI of [0.116--0.275].

To better test the mediated model with moderation, psychological resilience was divided into high, medium, and low groups according to plus or minus one standard deviation (Table 5), and a simple slope test was also conducted (Figures 2 and 3). Thus, the following findings were observed:

(1) When the level of psychological resilience was low, college students' life autonomy showed a significant decreasing trend as the level of academic procrastination increased (Effect = -0.373, t = -10.170, p < 0.001).

(2) When the level of psychological resilience is high, college students' life autonomy shows a buffered decreasing trend with the increase of their academic procrastination (Effect=-0.465, t=-12.417, p<0.001).

(3) When the level of psychological resilience is low, college students' negative emotions showed a significant decreasing trend with the increase of their life autonomy (Effect = -0.353, t = -6.048, p < 0.001).

(4) When the level of psychological resilience was high, there was no significant correlation between life autonomy and negative emotions (Effect = -0.078, p > 0.05).

Figure 1 shows the moderated mediating model in which psychological resilience moderates the mediating model of life autonomy by buffering the effect of academic procrastination on life autonomy and buffering the effect of life autonomy on negative emotions. Moreover, psychological resilience moderates the first and second stages of the mediating process to establish the moderated mediating model.

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Table 5.
Testing the Moderated Mediating Effect of Life Autonomy on Negative Emotions.

Predictors	Life Autonomy					Negative emotions				
	β	SE	t	95%CI		β	SE	t	95%CI	
				LLCI	ULCI				LLCI	ULCI
Age	-0.002	0.007	-0.23	-0.153	0.012	0.009	0.008	1.095	-0.007	0.025
Gender	0.084	0.038	2.207*	0.009	0.16	-0.103	0.045	-2.274*	-0.192	-0.014
Grade level	0.062	0.041	1.533	-0.018	0.142	0.044	0.048	0.903	-0.051	0.138
Academic procrastination	-0.419	0.031	-13.517***	-0.48	-0.358	0.508	0.041	12.446***	0.428	0.588
Life Autonomy						-0.216	0.044	-4.893***	-0.302	-0.129
Psychological resilience	0.209	0.028	7.438***	0.154	0.265	-0.207	0.034	-6.020***	-0.275	-0.14
Academic procrastination * Psychological resilience	-0.065	0.029	-2.251**	-0.122	-0.008					
Life Autonomy * Psychological resilience						0.195	0.041	4.810***	0.116	0.275
R-squ	0.383					0.449				
F	79.482***					89.358***				

Note: *p < 0.05, **p < 0.01, ***p < 0.001. Analyses conducted using the PROCESS model, 58 N = 776. Gender is dummy coded (1, female, 2, male).

Table 6.
The mediating response value of independent variables: academic procrastination and life autonomy at different levels of the moderating variable, psychological resilience.

Predictor	PR	Effect	Boot SE	95%CI	
				LLCI	ULCI
Academic Procrastination	-0.704	-0.373	0.367	-0.446	-0.301
	0.000	-0.419	0.310	-0.480	-0.358
	0.704	-0.465	0.374	-0.539	-0.392
Life Autonomy	-0.704	-0.353	0.058	-0.467	-0.238
	0.000	-0.216	0.044	-0.302	-0.129
	0.704	-0.078	0.046	-0.168	0.012

Note: Bootstrap sample size = 5,000. Low, 1 SD below the mean. High, 1 SD above the mean. PR, Psychological resilience

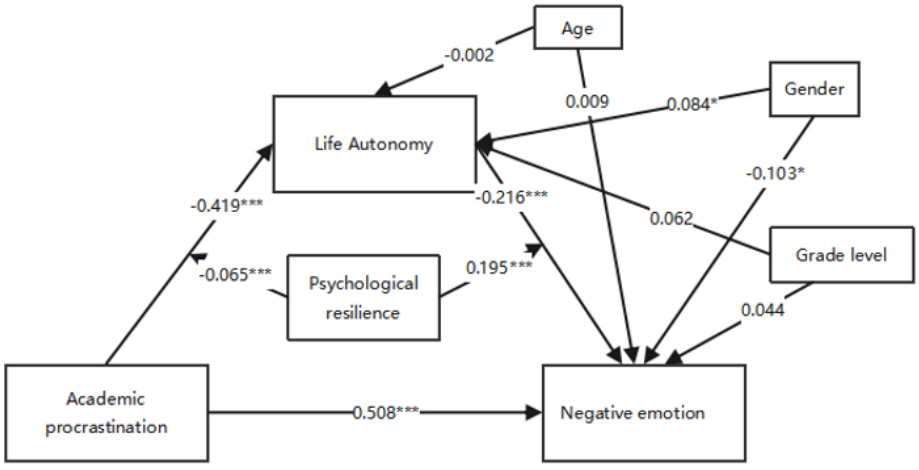

Figure 1.
The moderated mediation model.

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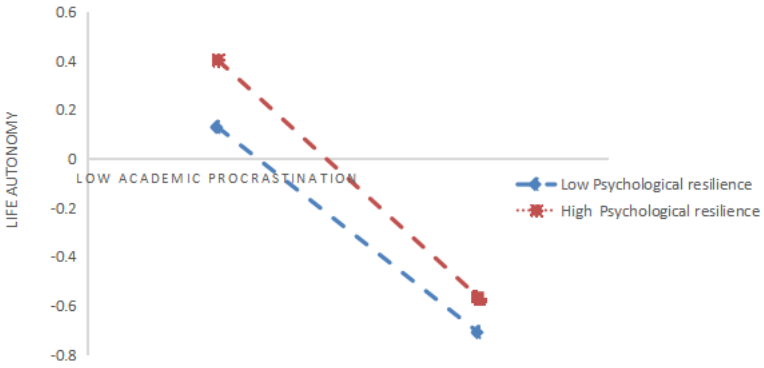

Figure 2.
The relationship between academic procrastination and life autonomy for high and low levels of psychological resilience.

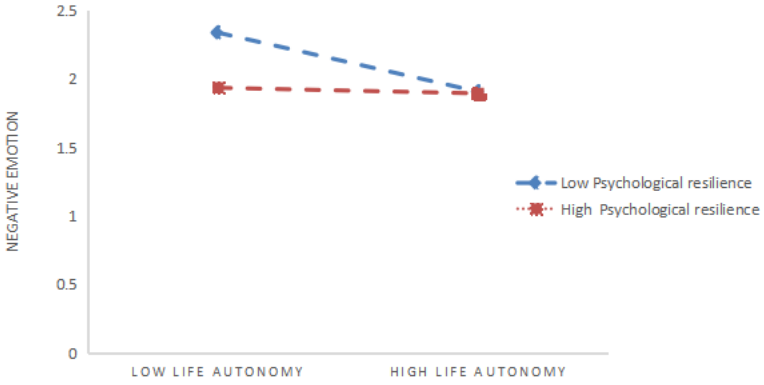

Figure 3.
The relationship between life autonomy and negative emotions for high and low levels of psychological resilience.

5. Discussion

5.1. Discussion of the Results

This study focused on the relationship and mechanisms between academic procrastination and negative emotions among college students in the post-epidemic era, with life autonomy as the mediating variable and psychological resilience as the moderating variable. The results showed that (1) academic procrastination and negative emotions were positively correlated, academic procrastination and life autonomy were negatively correlated, and life autonomy and negative emotions were negatively correlated. (2) Life autonomy mediates the relationship between academic procrastination and negative emotions. (3) Psychological resilience inhibits the negative correlation between academic procrastination and life autonomy, while strengthening the negative correlation between life autonomy and negative emotions.

First, the findings are basically consistent with H1, i.e., academic procrastination is positively associated with negative emotions. However, there are studies that have come up with the opposite findings, i.e., individuals' academic procrastination is negatively associated with negative emotions.

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From the perspective of neural basis, it was found that procrastination and trait anxiety share a common physiological basis, the right hippocampus, meaning that academic procrastination arises to repair the negative emotions that individuals feel when they are studying. Thus, academic procrastination is negatively associated with negative emotions [89]. In the context of the post-epidemic era, college students' classes have been changed to online instruction, which would reduce their learning efficiency. However, the academic examination requirements have not been changed, and most students study hard to pass the exams, so they have fewer academic delays, but the academic courses taught by online classes have brought them more negative emotions, such as stress and anxiety. In other words, the external learning conditions of college students have become worse, but the academic requirements have not decreased, and the greater the individuals' effort, the greater their pressure, which finally led to more negative emotions. The results of this study, however, showed a positive relationship between academic procrastination and negative emotions, which is consistent with the results of previous studies. On the one hand, the results of the study on college students in medical schools found that college students' procrastination was negatively related to positive emotions and significantly positively related to negative emotions. It is suggested that individuals with procrastination behaviors experience more negative emotions [16]. On the other hand, some studies have found that academic procrastination behaviors of poor college students are associated with high levels of negative emotions such as anxiety [14]. The main reasons for this result are the relatively good academic performance, positive study attitude, and high motivation of medical school students. Meanwhile, poor college students do not have many other temptations but have a strong motivation to study. They hope to change their fate through study. Therefore, they are more motivated to study and have low academic procrastination, so they have fewer negative emotions. This shows that, in comparison with previous studies, it is possible to change the correlation between academic procrastination and negative emotions in particular groups or in particular situations. The results of this study can lead us to think deeply about future research on the relationship between academic procrastination and negative emotions. The relationship between the two variables may be strongly influenced by individual characteristics as well as particular contexts.

Secondly, the results of this study also validated the establishment of H2, confirming that life autonomy plays a mediating role between academic procrastination and negative emotions among college students. This implies that part of the effect of academic procrastination on negative emotions in college students is generated through life autonomy and that individuals with higher life autonomy have a clearer life direction. First, from the perspective of brain science, individuals with low levels of life autonomy tend to have weaker belonging or feel disconnected from the collective, and their brains process information in the same way as people who suffer threats of physical harm. That is, when a threat is detected, the hypothalamus releases cortisol, which negatively affects the prefrontal lobe, and this negative effect is mainly associated with negative emotions [90]. Secondly, students with higher self-control can better regulate their behaviors, which in turn reduces individuals' academic procrastination [56, 65]. Besides that, the increase in college students' life autonomy can further promote changes in their self-experience, interpersonal experience, and life values, thus improving their life satisfaction and alleviating the generation of negative emotions [91]. Individuals with low levels of academic procrastination exhibit greater self-efficacy, perseverance, and self-control, all three of which are indicators of high levels of life autonomy. At the same time, individuals with a high degree of life autonomy have a higher sense of well-being and more positive emotions, while, on the contrary, they will have negative emotions or even suicidal thoughts. Thus, life autonomy mediates the relationship between academic procrastination and negative emotions among college students.

Third, this study is consistent with the results of H3 and previous studies, which confirmed that psychological resilience was negatively related to academic procrastination and positively related to life autonomy. Meanwhile, psychological resilience had a negative effect on the relationship between academic procrastination and life autonomy. That is to say, the moderating effect of psychological

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resilience on college students, on the contrary, slowed down the possibility of low academic procrastination but promoted a high degree of life autonomy. On the one hand, the results of this study are consistent with the findings of Yun-Cheng Lai et al, who found that psychological resilience is significantly negatively related to academic procrastination [71]. People with high levels of psychological resilience are able to control their lives and studies well, and when they encounter difficulties and challenges, they rise to the occasion and are able to complete their academic tasks on time. Therefore, the higher the level of psychological resilience, the lower the level of academic procrastination [92]. Researchers also found that the higher individual's self-control, the lower the level of their academic procrastination [25]. Thus, it is clear that in the post-epidemic era, although COVID-19 has had a profound impact on college students, it has not changed the fact that psychological resilience is negatively related to academic procrastination. The relationship between the two may also be minimally or insignificantly influenced by particular contexts.

On the other hand, the present study is also consistent with the findings of Xue-Fen Lai et al, who proposed that both psychological resilience and life autonomy are positively related. First, people with clear life goals have higher levels of psychological resilience than those who avoid life [93]. Second, it has been shown that psychological resilience plays an important role in the quality of life of medical students [94]. Again, psychological resilience can positively predict the degree of life autonomy and positive ways of coping with life [18]. Thus, it can be seen that in the context of the post-epidemic era, although the context has changed, it has not altered the fact that psychological resilience is positively related to life autonomy. The relationship between the two may also be minimally or insignificantly affected by particular contexts.

Moreover, psychological resilience has a negative moderating effect on the relationship between academic procrastination and life autonomy. That is to say, the moderating effect of psychological resilience among college students slowed down the likelihood of low academic procrastination but promoted a high degree of life autonomy. Previous studies have demonstrated that higher levels of psychological resilience among college students are associated with greater self-control and higher life autonomy. At the same time, many studies on students have shown that academic procrastination has a significant negative effect on self-control [95]. Additionally, college students with high levels of academic procrastination tend to have weak self-control and low levels of life autonomy, and thus academic procrastination negatively predicts college students' life autonomy [48]. However, on the contrary, the results presented in this study differed from previous ones in that low academic procrastination among college students did not increase but rather decreased the degree of life autonomy under the moderating effect of psychological resilience. The main reason for this result is that, in the process of fighting the ferocious and uncertain COVID-19 pandemic and under the context of a closed campus learning environment, the psychological resilience of college students is gradually decreasing. At the same time, as the number of students infected with COVID-19 increased, their mentality "collapsed" and they began to develop a confused and helpless attitude toward life, and they became fearful and resistant to the epidemic [96]. Therefore, compared with previous studies, psychological resilience showed a negative moderating effect under the particular context in the present study, but this negative condition did not change the significant negative relationship between academic procrastination and life autonomy. The results of this study may lead to further consideration of the effect of psychological resilience on the interaction between academic procrastination and life autonomy, the relationship of which may be significantly affected by specific contexts.

Fourth, the results of this study were consistent with the results of H4 and previous studies, which confirmed that psychological resilience was positively related to life autonomy and negatively related to negative emotions. Meanwhile, psychological resilience had a positive effect on the relationship between life autonomy and negative emotions. This indicates that college students with higher levels of psychological resilience can effectively improve negative emotions through positive changes in life

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autonomy. That is to say, the relationship between life autonomy and negative emotions is influenced by psychological resilience, and psychological resilience can promote positive changes in life autonomy, which enables individuals to reduce the production of negative emotions. From a neuroscience perspective, it has been verified that psychological resilience is closely related to neural circuit connectivity [97]. For example, people with high psychological resilience have stronger and more flexible neural circuit connections and are able to cope with challenges and changes better, and these changes allow individuals to develop neural circuit mechanisms that regulate emotions such as reward, fear, and emotional responses [98].

However, on the contrary, some studies have obtained opposite findings, that is, psychological resilience deepens the positive changes in life autonomy, so it increases the production of negative emotions in individuals. Under the influence of psychological resilience, slight negative emotions such as anxiety and stress are generated through positive changes in life autonomy [99]. While this mild anxiety is positive anxiety, which can stimulate learners' enthusiasm for learning and increase learning efficiency [100]. The main reason for this result lies in the specific context of generating mild negative emotions. The results of the present study indicated that psychological resilience had a positive effect on the relationship between life autonomy and negative emotions, which is consistent with the findings of Zhang Qun et al. On the one hand, it was found that college students with low levels of life autonomy had no clear life pursuits and ideals, and they showed anxiety, worry, and swings in their mood due to spiritual emptiness [101]. On the contrary, those with a high degree of life autonomy have a higher sense of life meaning, which has a significant negative correlation with negative emotions such as depression and anxiety [102]. Thus, life autonomy is significantly and negatively correlated with negative emotions. On the other hand, psychological resilience positively predicts the degree of life autonomy [103]. People with high levels of psychological resilience usually have more confidence and determination to face challenges in life and can maintain a good psychological state through self-regulation and adaptation in the face of difficulties [91]. Therefore, a high level of psychological resilience is very important for enhancing life autonomy. Also, it has been found that psychological resilience is significantly positively correlated with positive emotions and significantly negatively correlated with negative emotions [9, 80]. People with high levels of psychological resilience can better adapt to life's challenges and maintain good moods in the face of stress, thus reducing the generation of negative emotions. It can be seen that, in comparison with previous studies, psychological resilience still shows a positive moderating effect despite being in a special situation like the COVID-19 pandemic, which aligns with previous research. The results of this study may lead to further consideration of the effect of psychological resilience on the interaction between life autonomy and negative emotions, which may not be significantly affected by specific contexts.

5.2. Discussion of Implications

From a theoretical perspective, our study links academic procrastination and negative emotions, which deepens the understanding of the relationship between academic procrastination and negative emotions. In addition, the mediating and moderating effects are analyzed. The study found that college students' life autonomy had a negative effect on their negative emotions. Besides that, psychological resilience moderated the first and second halves of the path from academic procrastination to life autonomy and then to negative emotions.

From a practical perspective, the relationships among these four variables presented in this study may help people to better understand how to improve academic procrastination while coping with public health events among college students or even the general public. This will better help college students to be psychologically prepared for public health events and to promote their academic and self-control abilities. Thus, the negative effects of major public health events such as COVID-19 in the post-epidemic era can be mitigated through positive psychological interventions on college students. This

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theory and practice are highly instructive in reality. After experiencing academic procrastination, college students can take effective measures to reduce the generation of their academic delays, improve their self-control ability, and adjust the impact of psychological resilience, thereby reducing the generation of negative emotions.

5.3. Limitations and Future Direction

There are two limitations in this study:

First, the data obtained from those college students can only reflect their psychological conditions and characteristics in a short period of time. It is difficult to reflect the relationship between life autonomy and psychological resilience in a dynamic and comprehensive way. Therefore, a combination of longitudinal design methods can be employed in future studies to better explore the continuous and long-term interactions between variables.

Second, the participants in this study were only involved students from three colleges, and did not investigate the specific majors of the participants in detail. Therefore, the data results of this study did not take into account the differences among college students from different schools and majors. Consequently, follow-up research can attempt to increase the sample size of colleges and universities and also examine the differences in majors among college students.

6. Conclusion

This study examined the relationship between academic procrastination and negative emotions among college students in the post-epidemic era using a moderated mediating model. Life autonomy played a mediating role between academic procrastination and negative emotions, and psychological resilience moderated the first and second half paths of academic procrastination, life autonomy, and negative emotions. The results showed that academic procrastination had a significant positive effect on negative emotions, and that life autonomy mediated the relationship between academic procrastination and negative emotions. In addition, psychological resilience moderated the relationship between academic procrastination and life autonomy, and the association was weakened when the prevalence of psychological resilience was higher. At the same time, psychological resilience also moderated the relationship between life autonomy and negative emotions, and this association was stronger when the prevalence of psychological resilience was higher. These results contribute to a more comprehensive understanding of academic procrastination and negative emotions.

Institutional Review Board Statement:

The studies involving human participants were reviewed and approved by Liuzhou Vocational & Technical College. The participants gave their consent to participate in this study.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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