



The Impact of Academic Pressure on College Students' Use of AI: The Moderating Effect of Mindfulness

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Abstract. This study investigates the relationships between academic pressure and different types of artificial intelligence (AI) use among college students, as well as the moderating role of mindfulness. Drawing on previous research, AI uses are classified into four dimensions—instrumental use, social use, entertainment use, and escape use. A two-wave longitudinal survey was conducted among Chinese college students, with academic pressure and mindfulness measured at Time 1 and different types of AI use measured at Time 2. Results indicated that academic pressure was negatively associated with social and instrumental AI use but did not show statistically significant associations with entertainment and escape AI use. Moreover, Mindfulness moderated the relationships between academic pressure and both entertainment and instrumental use, while no moderating effects were found for social or escape use. The discussion focuses on the implications of these findings for understanding how academic pressure and mindfulness shape different patterns of AI use among college students.

Keywords: Academic pressure; Artificial intelligence use; Mindfulness; Conservation of Resources theory; college students; Technology use

1 Introduction

Regarding the use of artificial intelligence (AI) tools by college students, recent research has increasingly shifted from focusing solely on their instrumental benefits to examining the psychological and contextual factors that shape patterns of AI use. Emerging evidence suggests that students' engagement with AI technologies is influenced not only by perceived usefulness, but also by academic demands and psychological states that may constrain or facilitate technology use [1]. With the gradual deepening of the application of generative AI, such as ChatGPT in the field of education, researchers have begun to pay attention to issues such as individual psychological burden and technical anxiety associated with its use [1]. Academic pressure, as a key factor affecting college students' mental health and learning behavior, may play an important role in shaping AI use patterns; however, the nature of its relationship with different forms of AI use remains insufficiently understood.

According to the I-PACE model [2], situational stressors such as academic pressure may influence individuals' technology-related behaviors by taxing cognitive resources

and undermining executive control, thereby altering behavioral outcomes. Rather than exerting a universal effect, the impact of academic pressure on AI use is likely to vary depending on individuals' available psychological resources. Mindfulness, as a psychological resource associated with enhanced self-regulation and adaptive stress appraisal, has been shown to shape how individuals respond to stress and regulate behavior [3]. It may therefore mitigate the extent to which academic pressure impacts students' AI use. Accordingly, the present study aims to empirically examine the relationship between academic pressure and college students' AI use, and to investigate whether mindfulness moderates this relationship.

1.1 The Role of Academic Pressure on College Students' Use of AI

Academic pressure is defined as the psychological stress response and emotional depletion that students experience in the process of pursuing academic goals due to continuous burdens, competition, and expectations [4]. Recent studies further indicate that artificial intelligence technologies, particularly generative AI systems, can also evoke technostress reactions, such as anxiety, cognitive overload, and avoidance tendencies among users [5]. Pressure can erode an individual's cognitive resources, causing them to develop technical anxiety and trigger defensive avoidance behaviors, ultimately suppressing AI use among college students. When the perceived pressure exceeds an individual's cognitive processing ability, students may no longer view AI as an aid but as an additional cognitive burden. [6]

The Conservation of Resources (COR) theory provides a theoretical basis for understanding the relationship between academic pressure and AI use. This theory holds that when college students perceive that their time, energy, and emotional resources are at risk of being lost due to heavy academic pressure, they instinctively adopt resource conservation strategies and reduce the exploration of new technologies that require additional resource costs [7]. Under conditions of heightened stress, individuals may show more constrained cognitive processing, which can reduce behavioral flexibility and increase reliance on familiar responses, rather than engaging in innovative technologies that involve uncertainty. More recent meta-analytic evidence further confirms that acute and chronic stress reliably impair core executive functions, including cognitive flexibility and inhibitory control, which are essential for adaptive technology engagement [8]. Therefore, it can be inferred that: Under high academic pressure, students might find it difficult to afford the exploratory costs required to master cognitively demanding skill such as AI Prompt Engineering, thus showing a negative preference for the use of AI technology.

1.2 The Moderating Role of Mindfulness

Mindfulness is defined as a trait of awareness that focuses on the present moment in a non-judgmental way [9]. The Mindfulness-to-Meaning Theory (MMT) points out that mindfulness can help individuals disengage from negative stress assessment through "decentralization" and promote their positive re-evaluation of stress events [3]. Against

the backdrop of college students facing academic pressure, mindfulness may become a key regulatory factor determining their AI use patterns.

Specifically, when an individual's level of mindfulness is low, it is difficult for them to effectively prevent the depletion of cognitive resources caused by academic pressure. Students with low mindfulness often lack emotional regulation and are more likely to fall into passive rumination about their academic burden. Continuous mental exhaustion may increase individuals' susceptibility to threat rigidity when encountering new AI technologies. From a Conservation of Resources perspective, academic pressure may deplete psychological resources, reducing individuals' capacity to accommodate the cognitive adaptation of new technology use [7]. Consequently, individuals with lower mindfulness may be less able to regulate stress responses when engaging with AI tools [3]. On the contrary, students with a higher level of mindfulness have greater cognitive flexibility and can view academic pressure as a manageable challenge rather than a threat [3]. By maintaining awareness, these students can objectively evaluate the usefulness and ease of use of AI technology even in a stressful environment, thereby reducing the inhibitory effect of pressure on technology adoption [10, 11]. From this point, it can be foreseen that mindfulness, as an effective psychological buffering mechanism, might weaken the negative effect of academic pressure on AI use behavior.

1.3 The Current Study

Given the irreversible trend of AI technology in higher education, understanding the psychological barriers that students encounter during the use process and their regulatory mechanisms holds significant theoretical and practical value. Although existing literature has explored the causes of AI dependence, there is a lack of research on how academic pressure can affect AI use and how mindfulness as an internal resource can alter this path. Therefore, this study aims to explore the relationship between academic pressure and the use of AI among Chinese college students, and further investigate the moderating effect of mindfulness. Based on the above literature review, we propose the following hypotheses:

H1: Academic pressure negatively predicts AI use.

H2: Mindfulness moderates the relationship between academic pressure and AI use. When the level of mindfulness is lower, the negative predictive effect of academic pressure on AI use is more pronounced; When the level of mindfulness is higher, the negative predictive effect of academic pressure on the use of AI is significantly weakened.

When testing the above hypotheses, this study controls for participants' gender and age to more precisely examine the relationships [12, 13].

2 Method

2.1 Participants

This study adopted the convenient sampling method and recruited college students from multiple Chinese universities as subjects through the Credamo platform. A two-stage longitudinal design was adopted for data collection. The collection was carried out at

two time points (with an interval of one week). On the first day, 535 students were distributed, and 493 students were retained through attention detection. A total of 461 students participated for the second time, and 415 students eventually passed the attention test. The final valid data consisted of 415 subjects. The age ranged from 18 to 28 years old ($M_{\text{age}} = 20.86$, $SD_{\text{age}} = 2.00$), among which 162 were male (39.0%) and 253 were female (61%). There were 42 freshmen, 111 sophomores, 132 juniors, 68 seniors, 19 first-year graduate students, 31 second-year graduate students, 4 third-year graduate students, 3 first-year doctoral students, 2 third-year doctoral student, and 3 fourth-year doctoral students.

2.2 Measures

2.2.1 Academic Pressure.

In the first measurement point (T1), this study used the academic pressure scale from the Mental Health Screening Scale for Chinese College Students developed by Fang et al. (2018) to examine academic pressure. This scale contains four items (such as: "Feeling difficulty in learning", Cronbach's $\alpha = 0.86$). The four-point Likert scoring system was adopted (1 = "very unsimilar to me"; 4 = "very similar to me"). The higher the cumulative score, the greater the academic pressure. This scale has been widely used.

2.2.2 Use of AI.

In the second measurement point (T2), the AI use of the subjects was measured by the AI use scale adapted from Huang et al. (2024)[14]. This scale consists of 12 questions and covers 4 dimensions: instrumental use (3 questions, such as "I use AI to obtain the necessary information"; Cronbach's $\alpha = 0.89$), social use (3 questions, such as "I use AI to alleviate my sense of loneliness"; Cronbach's $\alpha = 0.78$), entertainment use (3 questions, such as "I use AI to entertain and relax myself"; Cronbach's $\alpha = 0.94$), and escape use (3 questions, such as "I use AI to escape stress and responsibility"; Cronbach's $\alpha = 0.80$). A 4-point likert scoring system was adopted ("none at all" to "uses a lot"). The higher the average score of each dimension, the higher the frequency or intensity of AI use in that aspect.

2.2.3 Mindfulness.

At the first measurement point (T1) we used the Mindfulness Attention Awareness Scale (MAAS) developed by Brown and Ryan (2003) to measure mindfulness. This scale consists of 15 items (such as "Experiencing a certain emotion but becoming aware of it after some time"). The Likert method was adopted with a six-point scoring system (1= "almost never", 6= "almost always"), and the average score of 15 items was used as the indicator. The Cronbach's α of this scale in this study was 0.86.

2.3 Procedure

This research adopted a two-stage longitudinal design, with an interval of 7 days between the two measurements. At T1, participants completed the filling of demographic

information (age, gender), academic pressure scale, and mindfulness scale online. One week later, the subjects were required to report their AI use online. To ensure data quality during the measurement process, the questionnaire included attention detection questions. Participants could receive a reward of 2.5 yuan each time they completed the questionnaire. All data were collected anonymously to protect the privacy of the participants.

3 Data Analysis

In this study, the data were analyzed using IBM SPSS 27.0 statistical software. Firstly, descriptive statistics and Pearson correlation analyses were conducted to report the means, standard deviations of the major variables, and the correlations among them. Secondly, hierarchical regression analyses were adopted to test the predictive effect of academic pressure on each dimension of AI use. In the regression equations, gender and age were included as control variables in the first step, and academic pressure was included as a predictor in the second step. Finally, Model 1 in the SPSS macro program PROCESS compiled by Hayes (2018) [15] was used to test the moderating effect of mindfulness on the relationship between academic pressure and the use of AI.

4 Results

4.1 Descriptive Statistics and Correlations

The results (Table 1) showed that there were varying degrees of correlations between academic pressure and different dimensions of AI use. Academic pressure was significantly negatively correlated with instrumental use, social use, and entertainment use ($r = -0.31$). However, the correlation with escape use was not significant. Mindfulness was significantly negatively correlated with all dimensions of AI use. In addition, academic pressure was negatively associated with mindfulness. Finally, all four types of AI use were positively interrelated, with social use and entertainment use showing the strongest association.

Table 1. Descriptive statistics and correlation coefficients of each variable (N=415)

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1 Academic Pressure	9.186	3.219	—					
2 Mindfulness	2.705	0.940	0.640**	—				
3 Instrumental Use	7.672	3.195	-0.097*	-0.160**	—			
4 Social Use	4.540	2.245	-0.221**	-0.141**	0.468**	—		
5 Entertainment Use	5.354	2.948	-0.314**	-0.306**	0.555**	0.798**	—	
6 Use Escape	3.969	1.683	-0.083	0.010	0.315**	0.673**	0.541**	—

* $p < .05$, ** $p < .01$.

4.2 Hypothesis One Test

Taking academic pressure as the predicting variable, each dimension of AI use (instrumental use, social use, entertainment use, and escape use) as the outcome variable, and gender and age as covariates, a series of regression analyses were conducted (Table 2).

Table 2. The predictive Effect of Academic Pressure on AI Use

	Instrumental use			Social use			Entertainment use			Escape use		
	β	t	95% CI	β	t	95% CI	β	t	95% CI	β	t	95% CI
Gender	-0.08	-1.57	[0.28, 0.03]	0.04	0.79	[-0.06, 0.15]	0.01	0.15	[-0.12, 0.14]	-0.02	-0.43	[-0.10, 0.06]
Age	0.20	3.95	[0.65, 1.94]	0.25	5.17	[0.71, 1.59]	0.32	6.96	[1.43, 2.55]	0.17	3.32	[0.24, 0.92]
Academic Pressure	0.05	0.73	[-0.15, 0.05]	-0.15	-3.02	[-0.17, -0.04]	-0.23	-5.05	[-0.31, -0.13]	-0.04	-0.79	[-0.07, 0.03]

The results showed that, for instrumental use, the regression coefficient of academic pressure was not significant ($\beta = -0.05, t = -1.06, 95\% \text{ CI } [-0.15, 0.05]$). For social use, the regression coefficient of academic pressure was significantly negative ($\beta = -0.15, t = -3.02, 95\% \text{ CI } [-0.17, -0.04], \Delta R^2 = 0.020$). For entertainment use, the regression coefficient of academic pressure was significantly negative ($\beta = -0.23, t = -5.05, 95\% \text{ CI } [-0.31, -0.13], \Delta R^2 = 0.050$). For escape use, the regression coefficient was not significant ($\beta = -0.04, t = -0.79, 95\% \text{ CI } [-0.07, 0.03]$). In each model, age had a significant positive predictive effect on AI use, while the predictive effect of gender was not significant.

4.3 Hypothesis Two Test

The results regarding the moderating effect of mindfulness are as follows. For the instrumental use, the main effect of academic pressure was not significant ($\beta = 0.05, t = 0.73, p = 0.465$), while the main effect of mindfulness was significant and negative ($\beta = -0.59, t = -2.82, p = 0.005$). Moreover, the interaction between academic pressure and mindfulness was significant ($\beta = 0.15, t = 2.96, p = 0.003$). Conditional effect analysis showed that when mindfulness was at a low level, the negative predictive effect of academic pressure on instrumental AI use was not significant ($\beta = -0.11, t = -1.35, p = 0.177$); When mindfulness was at the average level, the effect of academic pressure was not significant ($\beta = 0.05, t = 0.73, p = 0.465$); When mindfulness was at a high level, the positive predictive effect of academic pressure on instrumental AI use was significant ($\beta = 0.20, t = 2.48, p = 0.014$). It suggested that the higher the level of mindfulness, the more positively academic pressure was associated with instrumental AI use.

For the social use, the main effect of academic pressure was significantly significant ($\beta = -0.10, t = -2.41, p = 0.017$), while the main effect of mindfulness was not significant ($\beta = -0.01, t = -0.04, p = 0.970$). The interaction between the two was also not significant ($\beta = 0.04, t = 1.12, p = 0.265$), that is, mindfulness did not moderate the association between academic pressure and the social use of AI.

For the entertainment use, the main effect of academic pressure was significant ($\beta = -0.12, t = -2.20, p = 0.028$), and the main effect of mindfulness was significant and negative ($\beta = -0.59, t = -3.21, p = 0.001$). The interaction between the two was significant ($\beta = 0.15, t = 2.96, p = 0.003$). Conditional effect analysis indicated that when mindfulness was at a low level, the negative predictive effect of academic pressure on entertainment use was significant ($\beta = -0.26, t = -3.58, p = 0.0004$). When mindfulness was at the average level, this negative effect was significant ($\beta = -0.12, t = -2.20, p = 0.028$); When mindfulness is at a high level, the effect of academic pressure was no longer significant ($\beta = 0.02, t = 0.23, p = 0.815$), indicating that a high level of mindfulness can buffer the negative impact of academic pressure on the entertainment use of AI.

For the escape use of AI, the main effect of academic pressure was not significant ($\beta = -0.06, t = -1.73, p = 0.085$), and the main effect of mindfulness was not significant ($\beta = 0.20, t = 1.74, p = 0.082$). Moreover, the interaction effect between academic pressure and mindfulness did not reach a significant level ($\beta = 0.01, t = 0.24, p = 0.810$), indicating that mindfulness did not moderate the relationship between academic pressure and the escape use of AI.

5 Discussion

This study explored the relationship between academic pressure and different types of AI use among college students, as well as the moderating effect of mindfulness in this relationship. Overall, academic pressure was negatively associated with entertainment and social AI use, while no significant effects were observed for instrumental or escape AI use. In addition, mindfulness played a significant moderating role in the relationships between academic pressure and entertainment and instrumental AI use, but not in relation to social or escape AI use. These findings highlight the importance of examining AI use from a more refined, psychologically informed perspective, responding to recent calls for deeper empirical research in the field of AI in education [16]

5.1 The Effect of Academic Pressure on Use of AI

The results of Hypothesis One test showed that academic pressure had inconsistent impacts on different types of AI use. Specifically, academic pressure showed a significant negative effect on both social and entertainment AI use. That is, the higher the academic pressure, the lower the degree of AI use by college students for social interaction and entertainment. However, academic pressure did not show a significant effect on the instrumental and escape use of AI. Overall, Hypothesis One received partial support. According to the Conservation of Resources (COR) theory, when an individual is under

high academic pressure, their key psychological resources such as time and energy are threatened. The individual tends to prioritize the protection of limited resources and reduce investment in non-core activities [7]. In this study, the social and entertainment use of AI were relatively non-essential activities for those college students with high academic pressure. Therefore, it was easier to be reduced when academic pressure increased. On the contrary, the instrumental use of AI directly served the completion of academic tasks, while the escape use of AI was more likely to reflect stable coping or use tendencies. In other words, these two types of use patterns did not entirely rely on the academic pressure level, thus resulting in the non-significant effect of academic pressure on them.

5.2 The Moderating Effect of Mindfulness

The results of Hypothesis Two test indicated that, mindfulness significantly moderated the relationship between academic pressure and the entertainment and instrumental use of AI, while no significant moderating effect was found for social and escape AI use. Therefore, Hypothesis Two also received partial support. One possible explanation is that academic pressure reflects both subjective stress and objective academic demands, which directly constrain the time and energy available for social engagement, leaving limited room for mindfulness to alter this relationship. On the other hand, escape-oriented AI use may be more closely linked to individuals' relatively stable coping tendencies in digital contexts, making its association with academic pressure less susceptible to moderation by mindfulness [2].

In terms of the instrumental use of AI, for those students with higher mindfulness, academic pressure and the instrumental use of AI showed a more positive association. In terms of the entertainment use of AI, the negative impact of academic pressure mainly occurred among those students with a lower level of mindfulness. As the level of mindfulness improved, this negative relationship gradually weakened and was even no longer significant. From the perspective of COR theory, mindfulness may influence an individual's way of resource management in stressful situations. For the instrumental use of AI, those students with higher mindfulness tended to view AI as a tool that helps to enhance resource and its use efficiency. When confronting with academic pressure, they might proactively increase the instrumental use of AI to support academic tasks and prevent further loss of resources. Therefore, a positive effect of academic pressure on instrumental use of AI was found among those students with high (but not average or low) mindfulness. For the entertainment use of AI, individuals with higher mindfulness are better able to regulate their resource consumption in academic pressure situations, thereby retaining sufficient cognitive and psychological energy to engage with new AI technologies, thereby reducing the inhibitory effect of academic pressure on the entertainment use of AI.

5.3 Limitations and Contributions

This study has certain limitations. Firstly, although a two-stage longitudinal design was adopted, the causal relationship among the variables needs to be further verified

through experimental study. Secondly, this study mainly relied on self-report questionnaires and thus may be affected by common method bias. Future research can verify the findings by including objective AI use records. Still, this study has theoretical contributions. Firstly, the findings support the multi-dimensional nature of AI use, indicating that different types of AI use are driven by different psychological mechanisms [1]. Secondly, this study emphasizes that mindfulness shapes different patterns of AI use behaviors by influencing the way individuals allocate their psychological resources in stressful situations [17]. At the practical level, it suggests that enhancing students' emotional regulation ability and cognitive flexibility through mindfulness training may be helpful in guiding them to use AI technology for instrumental and social support rather than for escape or excessive entertainment [3].

6 Conclusions

Overall, this study indicates that the impact of academic pressure on AI use as well as the moderating effect of mindfulness differs across use dimensions. Regarding Hypothesis One, academic pressure was negatively associated with social and entertainment AI use but showed no significant effects on instrumental or escape AI use. For Hypothesis Two, mindfulness exhibited a dimension-specific moderating effect, moderating the relationship between academic pressure and instrumental and entertainment AI use, but not that relationship involving social or escape AI use.

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