

# Effects of psychological stressors on depression and anxiety among postgraduates: the mediating effect of mental health literacy

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## Research Article

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# Abstract

Postgraduates are exposed to tremendous psychological stressors, which are significant antecedents of and are closely related to depression and anxiety. Mental health literacy is essential to mental health. However, few studies have explored the mediating role of mental health literacy between psychological stressors and depression and anxiety. A total of 1,237 postgraduates were included in the analysis. The participants completed the Postgraduate Psychological Stress Questionnaire, the National Mental Health Literacy Questionnaire, the Patient Health Questionnaire 9, and the Generalized Anxiety Disorder 7 Scale. Correlation and difference tests analyses were used to examine the intervariable correlations, and mediation analyses were used to examine the underlying mechanism between psychological stressors and depression and anxiety. Results showed that (1) Approximately 31.51% and 20.36% of the postgraduates reported having depression and anxiety, respectively. The mean score for mental health literacy was 40.15. The responses of female, doctoral, and first-year students were associated with the degree of depression. Compared with other students, the responses of female graduate students were more strongly associated with the degree of anxiety, and very harmonious student-supervisor relationships were positively related to depression and anxiety levels. (2) Mental health literacy significantly negatively were correlated with depression and anxiety symptoms, whereas psychological stressors were significantly positively correlated with depression and anxiety. (3) Mental health literacy partially mediated the relationship between psychological stressors and depression/anxiety symptoms. Psychological stressors directly predicted depression/anxiety symptoms among postgraduates, and also indirectly predicted depression/anxiety symptoms through the mediating role of mental health literacy. Comprehensive, and specific psychological education and training programs are needed to improve mental health literacy among postgraduates, especially those experiencing overwhelming psychological stress.

## Introduction

### Psychological stressors among postgraduates

Postgraduate study is a critical period of early adulthood, and it is essential for postgraduate students to obtain a degree for career prospects, which helps students establish intimate relationships and prepares them to adapt to multiple social roles. When graduates begin to engage in learning, they are confronted with enormous stressors that can cause widespread and deep-seated emotional strain(Gallea et al., 2021). First, academic stressors are paramount and put overwhelmingly high pressure on graduates that they must confront. Long hours of work or study disrupt graduate students' work–life balance to the extent that, they do not have enough resilience to recover. According to the report on the Development of China's National Mental Health, graduate students must devote considerable energy to completing a course of study, with 70% of them working more than 8 hours a day and 36.5% working more than 10 hours a day(Fu et al., 2023). Moreover, Nature conducted a survey of 6320 graduate students, revealing that 76% work 41 or more hours per week(Woolston, 2019). Additionally, postgraduate students must cope with academic stress arising from tasks such as performing experiments as well as writing and publishing papers that are essential to postgraduate education during the training period. Importantly, postgraduate students risk prolonging or failing to graduate if their academic research does not proceed smoothly(Shi et al., 2023). Second,

interpersonal stressors such as having a tense graduate–advisor relationship or an inharmonious roommate relationship and intimate relationships are pervasive during daily study life (Jones-White et al., 2022; Wu et al., 2024). On the basis of the stages of Erickson’s developmental theory, graduate students need to mature as adults by maintaining intimacy and avoiding isolation. The ability to make a full commitment with a teacher, friend or lover is critical to obtain a sense of psychological well-being. Finally, economic and career prospects act as stressors (Gallea et al., 2021). A tuition fee is required to enter the graduate level, and a proportion of students are troubled by difficulties with financial pressure (Thomas et al.), or face challenges in supporting families. In addition, uncertainty about job prospects may seem overwhelming: as universities expand, the number of postgraduates increases, and competition becomes increasingly fierce.

## Effects of psychological stressors on depression and anxiety

These negative stressors can induce emotional distress for graduate students, and depression and anxiety are two typical negative emotional symptoms that can undermine mental health and learning performance. Evans conducted a survey of 2,279 postgraduates from 26 countries, and reported sixfold increases in depression (39% vs. 6%) and anxiety (41% vs. 6%) among graduate students (Evans et al., 2018). Depression refers to a variety of mood-related concepts and a spectrum of difficulties and is associated with personal, societal, and economic burdens (Anita Thapar et al., 2022). The stress diathesis model posits that stressors can contribute to the development and progression of depression (Nielsen et al., 2020). Researchers have reported that the distributions of postgraduates’ perceived economic stressors, academic stressors, employment stressors, love and sexual stressors, and social and other stressors are 75.9%, 91.70%, 91.70%, 85.3%, 75.6%, and 85.3%, respectively. Moreover, the path coefficient results revealed that stressors were positively associated with a positive coping style ( $\beta = 0.30$ ) (Shi et al., 2023). Guo et al. conducted a systematic review of a global cohort of 27,717 postgraduate students from 1980–2020, and the results revealed that the prevalence of depression in the postgraduate population ranged from 6.2%–84.7%, with a pooled overall prevalence of 34% (95% CI: 28–40,  $I^2 = 98.6\%$ ). Specifically, the prevalence of mild, moderate and severe depression symptoms was 27%, 13% and 8%, respectively (Guo et al., 2021). Anxiety is characterized by symptoms such as worry, social anxiety and performance fears (Szuhany & Simon, 2022). Tremendous stressors are considered risk factors for anxiety, increasing the risk of deterioration owing to anxiety-related symptoms. A recent study indicated that individuals who engaged in the composition of a graduation thesis have elevated levels of cortisol and tension–anxiety, which are associated with hypothalamus–pituitary–adrenal axis activity (Izawa et al., 2007). Furthermore, a considerable body of previous research has highlighted that a plethora of stressors, encompassing difficulties in maintaining a work-life balance, uncertainty surrounding future employment prospects (Hill et al., 2022), and financial constraints (Woolston, 2019), surpass the coping capacities of postgraduates as a result of being positively associated with heightened anxiety symptoms or even anxiety disorders (Dabbagh et al., 2023; Jones-White et al., 2022). A systematic review of 39,668 postgraduate students revealed that 34.8% (95% CI: 29.5%–40.5%) of individuals experienced anxiety and that the incidence of anxiety has increased significantly since 2005. Further analysis revealed that 19.1% of the survey participants experienced mild anxiety, 15.1% experienced moderate anxiety, and 10.3% experienced severe anxiety (Chi et al., 2023). In conclusion, graduate students who suffer from chronic stress while studying may experience disruptive consequences

owing to mental health symptoms, especially depression and anxiety, which, in the long term, undermines the academic performance, psychological well-being and development. Therefore, psychological interventions must be provided to graduate students.

## **Psychological stressors, mental health literacy, depression and anxiety**

The predominant mental health concern among the general population is characterized by a higher prevalence rate accompanied by a lower outpatient rate. Over the past three decades, the prevalence of various psychological disorders has tended to increase, with the weighted lifetime prevalence of all mental disorders (excluding dementia) reaching 16.6%. However, only 8% of individuals have sought the support of professional mental health services(Phillips et al., 2009). A substantial body of previous research has identified a paucity of knowledge and skills related to mental health as key factors contributing to individuals' reluctance to seek professional help in psychology. Mental health literacy (MHL) was proposed by Jorm, and refers to knowledge and beliefs about mental disorders that aid in their recognition, management or prevention(Jorm et al., 1997). On the basis of cultural diversity, Kutcher et al. expanded the concept into a broader construct defined as understanding how to obtain and maintain positive mental health, understanding mental disorders and their treatments, decreasing stigma related to mental disorders, and enhancing help-seeking efficacy(Kutcher et al., 2016). Similarly, researchers in China have expanded mental health into the MHL construct and added the dimension of "self–other", with MHL referring to the knowledge, attitudes and behaviours that individuals have developed to promote their own and others' mental health and to cope with their own and others' mental illnesses(Jiang et al., 2021). Because MHL is closely linked to mental illness coping and mental health promotion(Kutcher et al., 2016), enhancing MHL can lead to substantial improvements in mental health and subjective well-being, while serving as a mitigating factor against adverse emotions, specifically depression and anxiety(Hu et al., 2022; Huang et al., 2021). On the one hand, the onset of depression could be attributed to the interplay of psychological diathesis following exposure to stressors. Evidence has indicated that MHL has a protective effect against depression among numerous different cohorts, including college students, left-behind children, and elderly individuals. On the other hand, patients diagnosed with anxiety disorders who have elevated MHL reserves may be capable of preventing the progression of their condition. Furthermore, high MHL levels have been shown to be negatively correlated with reduced anxiety levels.

## **The present study**

An overwhelming majority of the extant studies have reported correlations between the variables of stress, mental health literacy, depression, and anxiety. Nevertheless, no study has yet comprehensively explored the interactions and mutual mechanisms among these four variables. In addition, the studies have focused mainly on ordinary citizens, undergraduates, elderly people, patients with psychological disorders and have not focused on graduate students in special fields. In comparison with the aforementioned groups, postgraduate students possess distinctive characteristics in terms of academic performance, interpersonal development, and economic status. The findings derived from the research conducted on this group may not be universally applicable to the postgraduate population, a topic that merits further exploration and

analysis. On the basis of the above analyses, this study hypothesizes that postgraduate students' psychological stressors, MHL, depression and anxiety significantly vary across demographic and academic-related variables and that mental health literacy mediates the relationship between stress and depression and anxiety among postgraduate students.

## Methods

### Participants

The participants were 1400 postgraduate students who were recruited from five universities in Chongqing, and cluster sampling was performed using recruitment posters. The study was approved by the ethics committee of Army Medical University (NO.2025-24-01). The participants provided written informed consent before completing the questionnaires, which were both voluntary and anonymous. A total of 1,400 questionnaires were distributed, and 1,389 were recovered. Following the exclusion of questionnaires with an empty answer rate of more than 5% and those with regular answers, 1,237 valid questionnaires were analyzed, yielding a validity rate of 88.35%.

The participants had a mean age of  $26.01 \pm 1.55$  years; 482 (39.0%) were male, and 755 (61.0%) were female; 1187 (96%) were enrolled in a master's program, and 50 (4.0%) were enrolled in a doctoral program; 375 (30.3%) were in their first year, 560 (45.3%) were in their second year, 302 (24.5%) were in or past their third year; and 663 (53.6%) had a very harmonious tutor–student relationship, 554 (44.8%) had a generally harmonious tutor–student relationship, and 20 (1.7%) had a disharmonious relationship (estranged, tense, or extremely tense).

## Measures

### Psychological stressors

Psychological stressors were assessed with the Postgraduate Psychological Stress Questionnaire, which consists of 32 items rated from 1 ("very inconsistent") to 7 ("very consistent") that evaluate 8 stress dimensions—dissertation requirements, professional development, study tasks, worrying about the future, interpersonal loneliness, economy and looks, physical health, environment and poor state of mind— with higher scores indicating greater levels of psychological stress. The Cronbach's  $\alpha$  coefficient in the current sample was 0.94, indicating that the reliability and validity were good.

### Mental health literacy

Mental health literacy was assessed with the National Mental Health Literacy Questionnaire, reflecting six dimensions consisted of 60 items: knowledge and concepts related to mental health, knowledge and concepts related to mental illness, attitudes and habits to maintain and promote one's own mental health, attitudes and habits to cope with one's own mental illness, attitudes and habits to maintain and promote the mental health of others, and attitudes and habits to address the mental illness of others. The knowledge and concepts dimensions scored using judgement questions for results of 0 or 1, whereas the attitude and

habit dimensions rated from 1 (“very inconsistent”) to 5 (“very consistent”), with higher total scores indicating higher levels of mental health literacy. In this study, the Cronbach’s  $\alpha$  coefficient for the questionnaire was 0.80.

## Depression

Depression was assessed with the Patient Health Questionnaire, encompassing a range of 9 symptoms experienced over the past two weeks, including anhedonia, depressed mood, sleep disturbance, fatigue, appetite changes, low self-esteem, concentration problems, psychomotor disturbances and suicidal ideation. The participants were assigned scores ranging from 0 (“not at all”) to 3 (“nearly every day”) for each of the nine symptoms, with higher scores indicating more severe depression. In accordance with the norm, a total score ranging from 1–4 reflects no or minimal depression, a total score ranging from 5–9 reflects mild depression, a total score ranging from 10–14 reflects moderate depression, a total score ranging from 15–19 reflects moderately severe depression, and scores  $\geq 20$  reflect severe depression (Kurt, K. et al., 2001). The Cronbach’s  $\alpha$  coefficient for the questionnaire in question was 0.84.

## Anxiety

Anxiety was assessed with the 7-item Generalized Anxiety Disorder Scale (GAD-7). The GAD-7 consisted of 7 items rated from 0 (“not at all”) to 3 (“nearly every day”), and the total scores ranged from 0–21. The scale assessed how much time an individual had spent worrying about seven problems in the past two weeks, including “feeling nervous, anxious or on edge” and “not being able to stop or control worrying”. Higher scores indicated higher anxiety levels. In accordance with the norm, a total score ranging from 0–4 reflects minimal anxiety, total score ranging from 5–9 reflects mild anxiety, total score ranging from 10–14 reflects moderate anxiety, total score ranging from 15–21 reflects severe anxiety (Spitzer et al., 2006). The Cronbach’s  $\alpha$  coefficient for this questionnaire was 0.86.

## Statistical analysis

Descriptive statistics, independent t-tests and one-way ANOVA were performed using SPSS26.0 to analyze the current situation and the differences in postgraduate students’ current psychological stress levels, mental health literacy, and depression and anxiety. Pearson’s correlations were used to describe the correlations between these variables, and the mediation model was tested with structural equation modelling by AMOS 24.0 by using the bootstrap method, with 5000 samples and a 95% confidence interval. The effect is viewed as significant if zero is not included in the 95% confidence interval.

## Results

### Common method bias test

Harman’s one-way method was used to test for common method bias. The results of the unrotated exploratory factor analysis revealed that 27 factors had eigenvalues greater than 1 and that the first factor explained 15.52% of the variation, which was less than the critical criterion of 40%. This result suggests that there was no serious common method bias in this study.

# Preliminary and correlation analyses

The mean mental health literacy score of 1237 postgraduate students was  $40.15 \pm 6.85$ , which was compared with the norm(Jiang et al., 2021) of Chinese nationals (35.81) in a one-sample t-test,  $t(1,237) = -22.24$ ,  $p < 0.01$ . Moreover, 259 of the participants had moderate depression symptoms (20.93%), 106 of the participants had moderately severe depressive symptoms (8.56%), and 25 of the participants had severe depression symptoms (2.02%). In addition, 205(16.57%) and 47(3.79%) postgraduate students had moderate and severe anxiety symptoms, respectively.

Table 1 shows significant differences among the graduate student in terms of the depression and anxiety scores by sex, graduate student category, grade and relationship with the advisor. Specifically, compared with male students, female students scored significantly higher than male students did in terms of total depression and anxiety scores, doctoral students scored significantly higher than master's students did in terms of total depression scores, 1st-year graduate students scored the highest in terms of total depression scores, and graduate students who had very harmonious relationships with their supervisors had the lowest total depression and anxiety scores.

Pearson correlation analysis revealed that the postgraduate student psychological stressors were significantly negatively correlated with mental health literacy ( $r = -0.286$ ,  $P < 0.001$ ) and significantly positively correlated with depression and anxiety ( $r = 0.580, 0.574$ ,  $P < 0.001$ ). Mental health literacy was significantly negatively correlated with depression and anxiety ( $r = -0.336, -0.339$ ;  $P < 0.001$ ). Depression was significantly positively correlated with anxiety ( $r = 0.820$ ,  $P < 0.001$ ) (Table 2).

Table 1  
Analysis of the differences in stress, depression and anxiety among graduate students

| Factor                         | Category                          | Depression  | T/F    | Anxiety     | T/F    |
|--------------------------------|-----------------------------------|-------------|--------|-------------|--------|
| Sex                            | Male                              | 6.83 ± 4.90 | -2.24* | 5.32 ± 4.17 | -2.16* |
|                                | Female                            | 7.50 ± 5.26 |        | 5.87 ± 4.41 |        |
| Postgraduate category          | Master                            | 7.17 ± 5.12 | -2.5*  | 5.61 ± 4.32 | -1.77  |
|                                | Doctor                            | 9.02 ± 5.24 |        | 6.72 ± 4.37 |        |
| Grade                          | First year                        | 7.53 ± 5.23 | 2.97*  | 5.79 ± 4.24 | 0.78   |
|                                | Second year                       | 7.38 ± 5.11 | 1=2>3  | 5.71 ± 4.33 |        |
|                                | Third year and beyond             | 6.63 ± 5.03 |        | 5.39 ± 4.41 |        |
| Mentoring relationship         | Very harmonious relationship      | 6.71 ± 5.27 | 7.65** | 5.16 ± 4.43 | 9.32** |
|                                | Generally harmonious relationship | 7.84 ± 4.90 | 1<2    | 6.23 ± 4.14 | 1<2    |
|                                | Disharmonious relationship        | 8.10 ± 5.36 |        | 6.00 ± 3.77 |        |
| Note. **p < 0.01, ***p < 0.001 |                                   |             |        |             |        |

Table 2  
Correlations analysis between variables

| Variables                                | M      | SD     | 1         | 2         | 3        | 4 |
|------------------------------------------|--------|--------|-----------|-----------|----------|---|
| 1.Psychological stressors                | 92.420 | 20.960 | 1         |           |          |   |
| 2.Mental health literacy                 | 40.150 | 6.858  | -0.286*** | 1         |          |   |
| 3.Depression                             | 7.270  | 5.140  | 0.580***  | -0.336*** | 1        |   |
| 4.Anxiety                                | 5.650  | 4.327  | 0.574***  | -0.339*** | 0.820*** | 1 |
| Note. N = 1237, **p < 0.01, ***p < 0.001 |        |        |           |           |          |   |

## Mediation analyses

The mediating effect of mental health literacy was tested by structural equation modelling using AMOS 24.0 software. The results showed that the direct path coefficients of the effects of the psychological stressors on depression and anxiety were significant ( $\beta = 0.61, 0.60, P < 0.01$ ), and the direct model fit was good ( $\chi^2/df$

= 7.91, RMSEA = 0.07, CFI = 0.97, TLI = 0.96, and NFI = 0.96) (Fig. 1). Moreover, a mediating effect of the graduate students' mental health literacy between the psychological stressors and depression and anxiety was identified ( $\chi^2/df = 6.69$ , RMSEA = 0.07, CFI = 0.94, TLI = 0.93, NFI = 0.93). The bootstrap method was adopted to test the significance of the mediating effect, and none of the 95% confidence intervals of the mediating effect between stress and depression or anxiety contained 0, indicating that the mediating effect was significant (Table 3). The path coefficients between stress and depression and anxiety were significant ( $\beta = 0.48, 0.49$ ;  $P < 0.05$ ); therefore, mental health literacy partially mediated the relationships between psychological stressors and depression and anxiety. The total effect scores of stress on depression and anxiety were 0.607 and 0.604, respectively, and the indirect effect scores were 0.125 and 0.114, respectively, accounting for 20.59% and 18.87% of the total effect, respectively (Fig. 2).

Table 3  
Chain mediation model

| Model pathways                                                                                                                                                         | β     | SE    | 95% CI |       | Effect ratio |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|--------|-------|--------------|
|                                                                                                                                                                        |       |       | LLCI   | ULCI  |              |
| Total effect                                                                                                                                                           |       |       |        |       |              |
| Psychological stressors→depression                                                                                                                                     | 0.607 | 0.019 | 0.569  | 0.642 |              |
| Psychological stressors→anxiety                                                                                                                                        | 0.604 | 0.019 | 0.564  | 0.639 |              |
| Direct effect                                                                                                                                                          |       |       |        |       |              |
| Psychological stressors→depression                                                                                                                                     | 0.482 | 0.027 | 0.428  | 0.533 | 79.41%       |
| Psychological stressors→anxiety                                                                                                                                        | 0.490 | 0.028 | 0.431  | 0.538 | 81.13%       |
| Indirect effect                                                                                                                                                        |       |       |        |       |              |
| Psychological stressors→Mental health literacy→depression                                                                                                              | 0.125 | 0.017 | 0.093  | 0.161 | 20.59%       |
| Psychological stressors→Mental health literacy→anxiety                                                                                                                 | 0.114 | 0.017 | 0.082  | 0.150 | 18.87%       |
| Note. β = standardized regression coefficient; SE = standard error; LCI = lower bound of the 95% confidence interval; UCI = upper bound of the 95% confidence interval |       |       |        |       |              |

Discussion

Characteristics of and correlations among mental health literacy, depression and anxiety

The mean mental health literacy score for graduate students was 40.15, which was significantly higher than the mean score of 35.81 for the general population in China. This finding is consistent with the conclusions of previous research, which revealed that individuals with higher educational levels have greater access to information and resources, enabling them to acquire knowledge and skills related to mental health, to be

less likely to stigmatize mental illness and to be more likely to seek professional help (Trompeter et al., 2022; Yang et al., 2024). Our sample revealed that the prevalence of clinical depression was 31.51% and that the prevalence of clinical anxiety was 20.36% among the graduate students, which were slightly higher rates of depression and anxiety than those reported in previous systematic reviews (Chi et al., 2023; Guo et al., 2021). The differences in the positive rates might be related to differing methodologies and the consequences of the postpandemic period. The repercussions of the COVID-19 pandemic, have influenced individuals' *modus vivendi* and economic substructures to a considerable degree, occasioning diverse pressures on the employment, economy and social life of graduate students and consequently increasing depression and anxiety levels (Carr et al., 2022).

Moreover, the incidence of depression and anxiety was considerably greater in females than it was males, which aligns with the findings of previous studies (Chi et al., 2023; Guo et al., 2021). Similarly, a World Health Organization report (WHO, 2017) showed that the prevalence of depression and other mental health problems is considerably greater among females than it is among males, which may be connected to the variations in and susceptibility to social roles, emotional states, and biological structures between sexes (Guo et al., 2020). Additionally, the doctoral candidates showed much higher levels of depression than the master's candidate did, a finding that has been corroborated in other studies (Guo et al., 2020; Guo et al., 2021); however, doctoral students encounter tremendous academic challenges, potentially requiring more effort to fulfil their academic requirements. Consequently, when confronted with obstacles in their studies, they are more susceptible to psychological distress, particularly if they are unable to promptly adapt and cope; thus, they are prone to depression (Woolston, 2019). However, our study revealed no differences in anxiety levels among the graduate student groups. This finding is in accordance with the findings of Chi's systematic review of 23 extant studies, which revealed that both master's and doctoral students exhibited comparable levels of anxiety (Chi et al., 2023). Further research has indicated that the depression score of students in the first year is significantly higher than is that of students in other years. These findings are in accordance with the results of Ying (Ying, 2011) et al., who surveyed 65 master's students and reported that first-year students exhibited significantly lower levels of depression than students in other years did. Moreover, according to Levecque et al., (Levecque et al., 2017) mental health issues were more common at the start of the PhD program than they were during its execution. Conversely, an investigation by Barry (Barry et al., 2018) et al. revealed no disparities in depression grades among 81 doctoral students. However, Liu (Liu et al., 2019) et al. reported that depression, anxiety and other mental health problems were more prevalent among doctoral students in higher grades. The discrepancies in these research results may be ascribed to the divergent perspectives on graduation requirements and training models across disparate cultural contexts. The discrepancies in these research results may be ascribed to the divergent perspectives on graduation requirements and training models across disparate cultural contexts. First-year post-graduate students have recently embarked upon their postgraduate studies and are adapting to an alien environment and all aspects of postgraduate life. Coping with the intense academic workload requires students to mobilize psychological resources. If postgraduate students' coping mechanisms are inadequate to handle the trials of the novel setting, they will encounter a heightened degree of depression. Nevertheless, students in their third year of postgraduate study are on the cusp of graduation and have acquired experience over the preceding two years. Thus, they have reached a stable stage in terms of their dissertations and other aspects. Consequently, their levels of depression are at their nadir. Finally, students reporting a highly

harmonious relationship with their supervisor demonstrated the lowest prevalence of depression and anxiety. The prevailing sentiment is that, during the period of graduate study, the primary objective of the student is the attainment of a degree. The quality of the relationship between postgraduate students and their supervisors is conducive to successful completion of students' academic obligations(Wu et al., 2024). The literature clearly shows that when student–supervisor are harmonious, the incidence of mental health issues among graduate students significantly decreases(Jones-White et al., 2022; Liu et al., 2019). The rationale for this phenomenon pertains to the notion that, within a positive social interaction context, supervisors are better positioned to offer practical assistance, emotional support and a sense of belonging (Huang et al., 2024; Jones-White et al., 2022).

Our study indicated that mental health literacy was negatively correlated with depression and anxiety which aligns with previous findings. For example, Yao et al. investigated 5578 colleges and reported that mental health literacy was significantly negatively correlated with depressive symptoms and anxiety symptoms(Yao et al., 2023). Huang et al. verified that inadequate mental health literacy was significantly associated with depressive symptoms and anxiety symptoms among undergraduates as well(Huang et al., 2021). A previous study revealed significant links between mental health literacy and depression as well as anxiety among groups of left-behind children, teenagers, and patients(Chen et al., 2017; Melas et al., 2013; Sun et al., 2021). In addition, we found that psychological stressors were significantly negatively associated with mental health literacy. Lu and Qian revealed that perceived stress was negatively correlated with mental health literacy among patients with coronary heart disease and among preschool teachers(Lu et al., 2025; Qian et al., 2023).

## **Direct effects of psychological stressors on depression and anxiety**

The results of this study suggest that psychological stressors predict depression and anxiety since the direct effect of psychological stressors on depression and anxiety is significant; that is, when postgraduates experience greater degrees of psychological stress, they are at greater risk of developing depression and anxiety. On the one hand, postgraduates undergo a plethora of stressors(Erica et al., 2023; Erin et al., 2014); for example, Bastos(Aline et al., 2025) used machine learning and reported that academic-related stressors effectively predict depressive symptoms among graduate students ( $R^2 = 0.26$ ), and among the academic stressors, those that made the greatest contribution to the predictive model were “fear and worry about academic performance”, “financial difficulties”, “fear and worry about academic progress and plans”, and “fear and worry about academic deadlines”. Li(Li et al., 2025) also reported that stress is significantly related to depression among postgraduate students ( $\beta = 0.22$ ,  $p < 0.05$ ). On the basis of the stress diathesis model and stress sensitization theory(Hammen et al., 2000), stressors are predisposing and triggering factors for the occurrence of depression; importantly when genetic predispositions are controlled, robust evidence indicates that specific and cumulative lifetime stressors are involved in the aetiology of depression(Su et al., 2022). When postgraduates are exposed to overwhelming psychological stressors, if they lose the ability to achieve dynamic equilibrium between stress and coping, cognitive distortion(Haaga et al., 1991) results in forms such as awfulizing beliefs and overgeneralizing towards degrees, as well as in epigenetic changes in glucocorticoid signalling, serotonergic signalling, and neurotrophin genes(Caroline et

al., 2019). Cognitive theory and chronic mild stress are two common depressive models used to delineate the pathogenesis of depression in terms of both psychological and physiological mechanisms. On the other hand, Ling(Ling & Yu, 2023) et al. investigated 321 graduate nursing students and verified that clinical work stress positively and significantly predicted anxiety ( $\beta = 0.26, p < 0.05$ ), and that stressors in university life were positively associated with anxiety symptoms among international students ( $\beta = 0.23, p < 0.05$ )(Shi et al., 2023; Wang et al., 2023). These findings are consistent with the results of this study. From the perspective of gene–environment interactions on anxiety symptoms(Jennifer et al., 2007), genetic effects and negative life events are both etiological factors that have been associated with the progressive deterioration of anxiety symptoms. Neurobiological links between stress and anxiety illuminated that circuits of the basolateral amygdala (BLA), norepinephrine inputs from the locus coeruleus to the BLA, nucleus accumbens and circuit dynamic synchronicity underlie processing(Daviu et al., 2019). Moreover, negative life events such as academic, interpersonal, economic and career prospects stressors that overload stress might cause graduate students to become preoccupied with future concerns, evoking increased heart rate and perceived physiological arousal and leading to worsening anxiety symptoms (Cook et al., 2025).

## **The mediating effect of mental health literacy**

Our results align with the hypothesis that mental health literacy partially mediates the relationship between psychological stressors and depressive and anxiety, which is consistent with the findings of a previous study in which with high levels of MHL were significantly associated with worsening depressive and anxiety symptoms in elderly individuals (Ding et al., 2022), college students(Huang et al., 2021; Yao et al., 2023)and patients with mental disorders(Charlotte et al., 2019). These findings suggest that a high level of mental health literacy may act as a buffer against the impairing effects of psychological stressors and consequently alleviate depressive and anxiety symptoms, specifically for graduate students. This is the first study to examine the buffering effect of mental health literacy on the link between psychological stressors and depression as well as anxiety symptoms among a group of postgraduates. The protective effect of mental health literacy is most likely explained by the following factors: First, postgraduates with elevated mental health literacy are endowed with the capacity to summon pertinent psychological resources, thus enabling them to procure professional assistance from external sources(Altweck et al., 2015). This situation means that they have the relevant knowledge, attitudes and behavioural habits regarding mental health issues or disorders, which is an essential skill for individuals to manage emotional issues during the period of study experienced by graduate students when they encounter stressful events and reduces the likelihood of experiencing depression and anxiety in high-stress situations(Paulus et al., 2015). Moreover, studies have shown that the occurrence of psychological problems or disorders is related to an individual's stigma of mental illness. For example, considering psychological distress to be a dangerous and unpredictable neurological or psychiatric disorder can lead to discriminatory and exclusionary misconceptions. This stigmatization exacerbates the sense of shame associated with illness, hindering individuals from seeking positive psychological support(Li, 2012). Hence, early intervention for mental health problems can be facilitated by well-developed mental health literacy, whereas graduate students can be prevented from seeking professional help because of poor mental health literacy(Xu et al., 2018). Specifically, graduate students with high levels of mental health literacy tend to have a more scientific understanding of mental

health and disorders, and are less likely to stigmatize them. This situation means that such graduate students are better able to obtain professional help (Nazari et al., 2023). Thus, graduate students who possess elevated levels of mental health literacy are endowed with the awareness and fortitude to proactively seek assistance from others, thereby amplifying the likelihood that their depression and anxiety issues will be discerned by their family members, friends, and classmates. The provision of multisource social support in terms of information, materials or emotions can help reduce depression and anxiety (Puga et al., 2023; Yang et al., 2024). In conclusion, the well-developed mental health literacy of graduate students can act as a bulwark against the deleterious effects of psychological stressors on depression and anxiety by increasing individuals' psychological coping mechanisms and resources and by mitigating the stigmatization of mental illness, thereby enhancing the motivation and actions for seeking assistance, and strengthening social support. The internal logical relationship is that individuals with higher levels of psychological literacy level have fewer perceptions of stigmatization and less of shame, so such individuals can implement psychological intervention earlier through self-psychological adjustment and the seeking of professional psychological help from outside and obtain the greater social assistance from the wider community. The interplay among motivation, action, and the individual and group levels engenders a virtuous cycle of psychological support.

## **Conclusion and limitations**

The current study investigated the mental health literacy circumstances and the prevalence and factors associated with depression and anxiety among postgraduates in China. Our investigation revealed that the mean score for mental health literacy was 40.15, signifying an elevated level that surpasses the mean for the general population in China. Additionally, 31.51% and 20.36% of the postgraduates in this study were subjected to depression and anxiety, respectively. Compared with students in other categories, female postgraduates, doctoral students, and first-year students in this study reported significantly higher scores on depression scales, which are considered factors for depression. Female graduate students scored much higher on anxiety tests than male graduate students did, which is a sign that the former might be more likely to experience anxiety. The lowest levels of depression and anxiety, which are protective factors against depression and anxiety, were experienced by postgraduates who had very harmonious relationships with their supervisors. Our findings also revealed a the mediating effect of mental health literacy on the association between psychological stressors and depression as well as anxiety. Furthermore, the study yielded significant findings that may pertain to mental health literacy in the context of coping with psychological stressors among postgraduate students, thereby underscoring the interplay of mediating processes in this demographic and the protective factors of mental health literacy. The present study has implications for future research. The establishment of a dynamic and intelligent psychological assessment mechanism, especially monitoring and focusing on graduate students with higher levels of depression and anxiety, coupled with the improvement of a multichannel mental health literacy cultivation system and the creation of an atmosphere that promotes positive mental health literacy, may serve as effective strategies for alleviating depression and anxiety among graduate students.

The current study has several limitations. First, the data were collected from a nonclinical sample, and a cross-sectional method was used. Further studies should consider these limitations and focus on

replicating these in a prospective longitudinal design with clinical samples. In addition, we only analyzed only the mediating role of mental health literacy between psychological stressors and depression as well as anxiety. Other general predispositions (optimism, meaning in life, and hope) may also be mediators. Third, this study investigated the relationship between psychological stress, mental health literacy and depression/anxiety in a sample of graduate students. The initiative did not encompass initiatives related to the enhancement of graduate students' mental health literacy. Thus, programmes based on psychological education and training related to mental health literacy should be implemented for intervention and should focus mainly on how to identify postgraduates with high levels of stress with depression or anxiety.

## **Declarations**

### **Ethical approval**

All procedures performed in studies with human participants were in accordance with ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Approval was obtained from the ethics committee of Army Medical University (NO.2025-24-01)

### **Ethical guidelines**

The study was conducted in accordance with national legislation and the Declaration of Helsinki.

### **Consent to participate**

Written informed consent was obtained from all the postgraduates. Participation was voluntary and anonymous, and participants were informed that they could withdraw from the study at any time.

### **Consent to publish**

Not Applicable.

### **Data availability**

The data of the current study are available from the corresponding author on request.

### **Competing Interests**

The authors declare no conflict of interest.

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### **Authors' contributions**

J. J. and J. W. and developed the study concept and the study design J. J. wrote the main manuscript text. Testing and data collection were performed by J. H. D., K. X., L. C., H.Z. and X. T.C . performed the data analysis and interpretation. J.W. rovided critical revisions. All authors reviewed the manuscript.

### **Clinical trial number**

Not applicable.

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## Figures

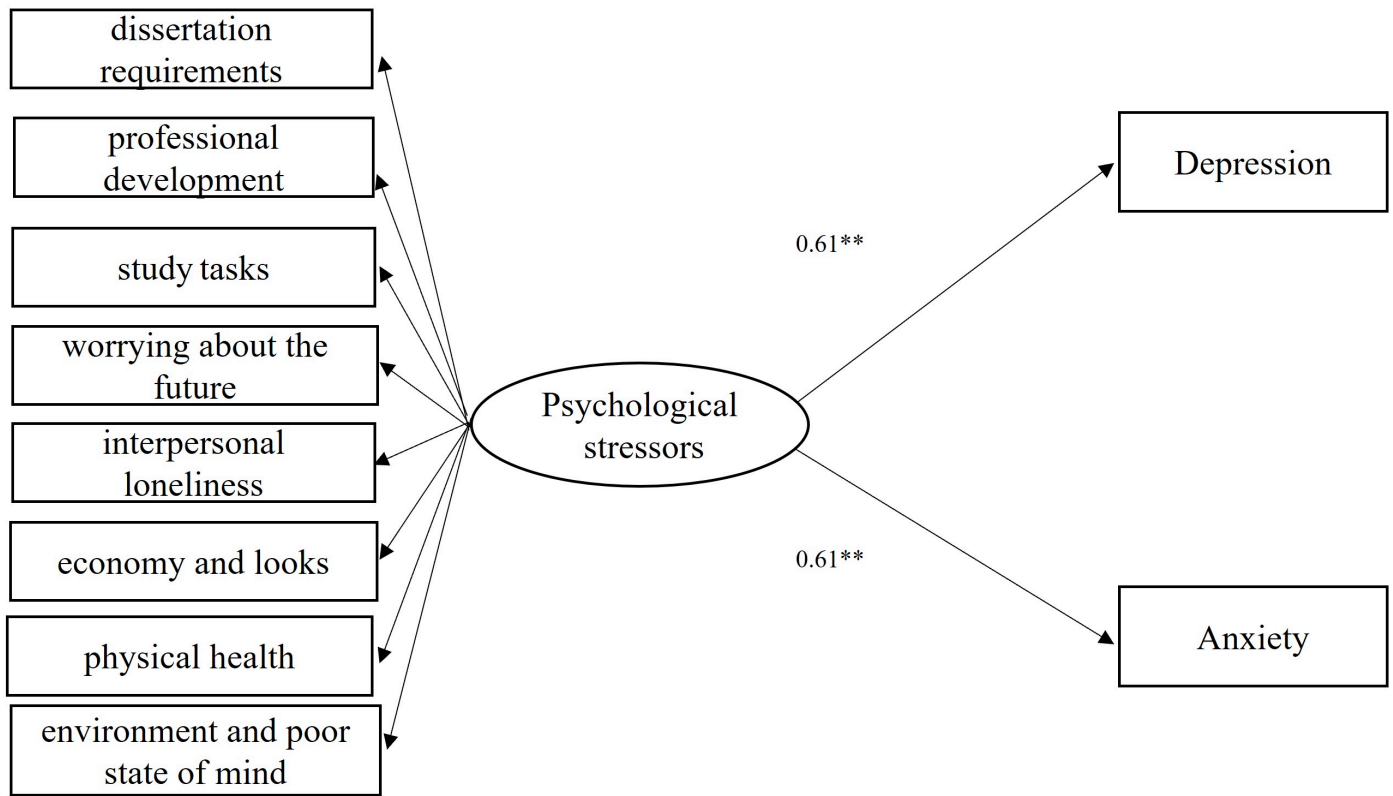


Figure 1 Direct effect of Psychological stressors on depression and anxiety.

# Figure 1

See image above for figure legend.

Note. \*\* $p < 0.01$

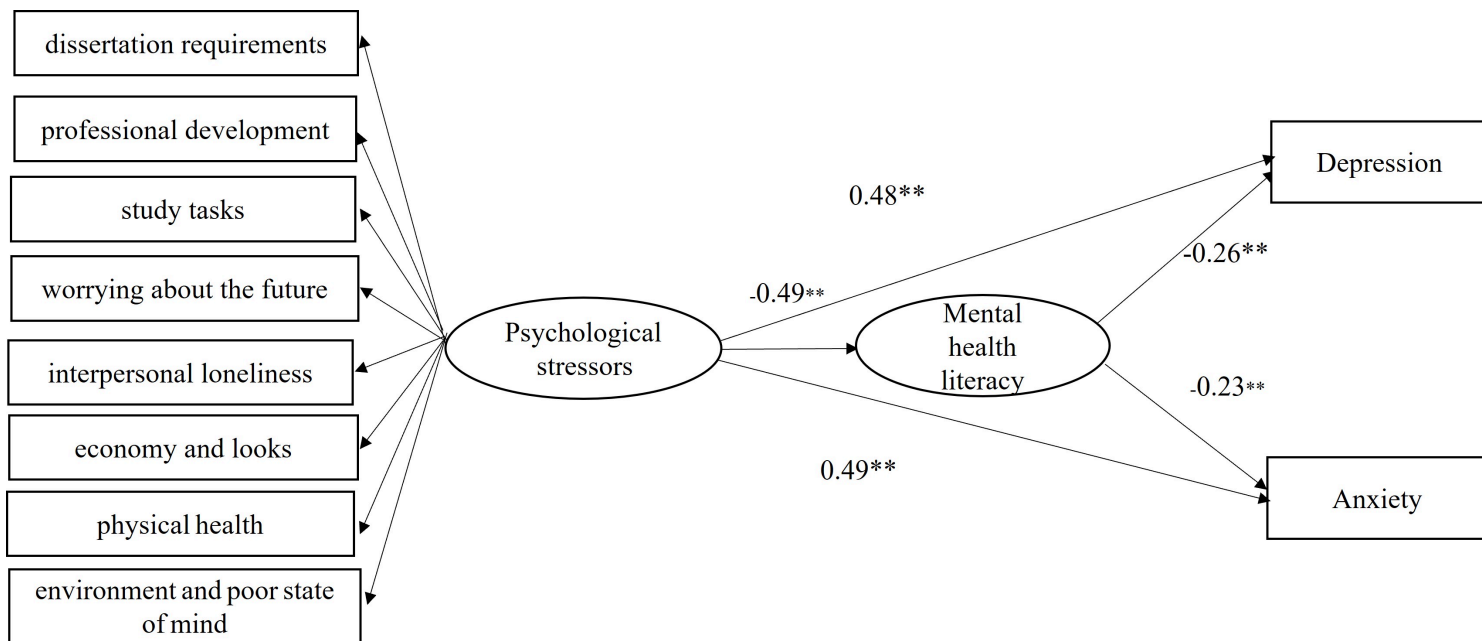


Figure 2 The mediating effect of mental health literacy

## Figure 2

See image above for figure legend.

Note. \*\* $p < 0.01$