**Academic Journal of Management and Social Sciences**
ISSN: 2958-4396 | Vol. 9, No. 3, 2024

# The Impact of the Mentoring Relationship on the Research Self-efficacy of Graduate Students: The Moderating Role of Stress and its Regulatory Impact on Stress Mindset

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**Abstract:** Graduate education is pivotal in fostering innovative talent and facilitating national modernization efforts. It serves as a crucial component in executing the strategy of scientific advancement through education and research. Grounded in self-efficacy theory and social cognitive career theory, this study developed a moderated mediation model to investigate the connection between mentoring relationships and research self-efficacy. Data were gathered from 2,278 graduate students across various provinces and cities nationwide, analyzed using SPSS software for model testing and theoretical validation. The findings indicated a positive association between mentoring relationships and research self-efficacy; stress functioned as a mediating factor between these relationships and research self-efficacy; Stress Mindset negatively moderated the relationship between mentoring relationships and research self-efficacy, as well as the relationship between mentoring relationships and stress, while also mediating the impact of stress. This study elucidated the mechanisms through which mentoring relationships influence research self-efficacy and offered recommendations for enhancing graduate students' research self-efficacy.

**Keywords:** Research Self-efficacy; Mentoring Relationship; Stress; Stress Mindset; Graduate Students.

## 1. Introduction

Graduate education as an important stage in higher-level human capital training has significant significance for cultivating innovative talents and improving the level of national innovation-driven development. Not only does graduate cultivation and development receive external influences such as nurturing methods, academic atmosphere [1], etc., but also their intrinsic motivation is particularly important. In social cognition theory, individual confidence in achieving goals through action plays a key role in behavior motivation. Therefore, Bandura proposed "self-efficacy", emphasizing that self-efficacy is an important factor affecting personal decisions and actions [2]. Self-efficacy has been widely applied in work performance [3], entrepreneurship [4], academic achievement [4], among others, while scientific research self-efficacy refers to its specific application in the field of scientific research, specifically targeting characteristics and behaviors of researchers [6]. Scientific research self-efficacy reflects graduates' confidence in successfully completing tasks related to scientific research and their recognition of their ability to effectively execute each step of the scientific research process [7][8]. Among all studies on scientific research self-efficacy, graduate students are the most common subjects [9]. Scientific research self-efficacy plays an important role in graduate cultivation, enhancing scientific research self-efficacy can help graduate students increase investment in scientific research voluntarily, improve scientific research creativity, and contribute to the construction and development of an innovative country.

According to social cognitive career theory, research self-efficacy perception includes personal factors such as anxiety and interest in research [10], and environmental factors including mentoring relationships, scientific training environment [11][12] etc., which can be used as antecedent variables for predicting variables such as research efficiency, expected research results, and research interests. Among them, the mentoring relationship is a process of interaction and communication between "tutor" and "student", through academic guidance and various interactions between graduate students and their supervisors, establishing educational relations with those being educated, social ethical connections, and psychological relationships based on emotional, cognitive, and personality interactions at multiple levels [13]. The impact of the mentoring relationship on research self-efficacy perceptions is multifaceted. First, it provides opportunities for learners to interact and collaborate with others; graduate students can obtain more scientific knowledge and skills by communicating and collaborating with their supervisors, and gain inspiration and guidance from other people's experiences, thereby enhancing their ability and confidence in scientific research [14]. Second, the mentoring relationship stimulates learning motivation and interest among learners. In the mentoring relationship, support and encouragement from tutors and peers can motivate graduate students' initiative and proactiveness, making them more enthusiastic about scientific activities, thus improving research self-efficacy perceptions [15]. Additionally, the mentoring relationship also provides channels for connecting and utilizing learning resources. Through communication and guidance with their supervisors, graduate students can access more learning resources and information, thereby improving the quality and effectiveness of scientific research [16]. Therefore, building and developing good mentoring relationships are crucial for promoting the enhancement of graduate student research self-efficacy perceptions and the development of scientific research [17]. In recent years, there have been many cases of psychological problems such as depression and anxiety

symptoms [18] among graduate students due to academic pressure in China. The overall level of depression and anxiety is six times that of the general population [19]. Multiple studies show that mentor-student relationships significantly affect the levels of mental stress among graduate students [20] [21]. In a positive mentoring relationship, the mentor serves as a role model for students, offering guidance and support. The mentor provides professional and effective research supervision to address graduate students' questions and concerns, enhancing their engagement and sense of achievement in research. Additionally, the mentor offers essential emotional support, fostering closer connections between faculty and students, and improving the harmony of the mentoring relationship. These factors contribute to alleviating research-related stress for graduate students and enhancing their mental well-being. However, bad mentoring relationships cannot relieve graduate student's pressure but sometimes become one source of stress [22], which hinders graduate students' confidence in scientific research and innovative output.

In addition, how will graduate students respond when they are in a poor mentoring relationship? This paper introduces Stress Mindset as an independent variable to study how graduate students alleviate the negative impact of mentor-student relationships on research self-efficacy by regulating their perception of pressure and evaluation of themselves. Stress Mindset refers to individuals' general views or attitudes towards emotional states such as stress, which can be divided into two types: beneficial Stress Mindset and harmful Stress Mindset. Beneficial Stress Mindset can reduce individual's stress response and perceived stress while enhancing positive emotions and cognitive abilities, thereby more effectively responding to stressful events [23]. The regulation of Stress Mindset helps graduate students regulate their emotions so that they can face pressures and setbacks with good state and positive attitude, thus improving their research self-efficacy.

In previous studies, research self-efficacy was often used as an intermediary and moderating variable in its effect variables. However, it is rarely discussed who influences or how to form research self-efficacy. The relationship between mentoring relationships and research self-efficacy has been studied relatively richly, but most of these studies only focus on their direct relationship without empirical research on their mechanism. In addition, there are also few studies about the regulatory mechanisms of Stress Mindset for research self-efficacy. This paper constructs a moderated mediation model that explores the mediating role of pressure in the relationship between mentoring relationships and graduate students' research self-efficacy, analyzes the regulating role of Stress Mindset in this relationship, and provides suggestions for improving graduate students' research self-efficacy and scientific ability.

# 2. Theoretical Basis and Research Hypotheses

## 2.1. Mentoring Relationship and Research Self-efficacy

The mentor-student relationship, as an important interpersonal and social relationship among graduate students, has a critical impact on their personal development and quality of cultivation. The mentor-student relationship refers to a special mentoring relationship established between graduate students and mentors in universities or research institutions. In this relationship, the mentor no longer directly teaches like during university years but mainly guides and directs to help graduate students with learning and research work [24]. Rose proposed that the mentor-student relationship is a guiding relationship; ideally, professors will take graduate students under their protection, helping them set goals and develop skills, and assisting them in successfully entering academic and professional fields [25]. Mentors play an important role in guiding and supporting graduate students' research process. Through imparting knowledge, methods, and skills related to research, mentors help establish the foundation for graduate students' research and provide necessary resources and support. This guidance and support help graduate students have clearer awareness and planning about their own professional development, thereby improving their self-efficacy in research.

Some scholars believe that the mentoring relationship is a psychological level of relationship, which gradually forms interpersonal emotional bonds and connections [26] between teachers and students in interactive activities such as teaching and education. The tutor guides and cultivates graduate students' research interests to stimulate their enthusiasm and motivation for scientific research work, and through timely feedback and evaluation helps them understand their own performance in scientific research work, providing professional guidance and suggestions. When graduate students feel trusted and recognized by tutors, they will be more motivated to overcome difficulties and improve their scientific research ability, thereby enhancing their sense of self-efficacy in scientific research. In addition, the emotional support, encouragement and recognition provided by the tutor can enhance the confidence of graduate students, reduce anxiety and frustration during the process of scientific research, and promote the improvement of self-efficacy in scientific research.

The mentoring relationship emphasizes a complex and diverse interactive relationship, rather than a single Mentoring Relationship [27]. The close cooperation and interaction between tutors and graduate students provide an opportunity for graduate students to learn and grow. Through communication with their supervisors and other graduate students, graduate students can draw on others' experiences and perspectives, broaden their thinking and horizons. Supervisors as important role models for graduate students set up correct research values and attitudes through their professional competence, scientific ability and moral integrity [27].

A good mentoring relationship promotes graduate students' recognition and respect of their supervisor, thereby strengthening learning and imitation from them, enhancing one's own sense of self-efficacy in research. Paglis et al. found that the student's self-efficacy was predicted by the mentoring relationship [28]. Love et al. also confirmed that positive tutoring experiences have a significant predictive effect on research self-efficacy [29], Students with closer mentor-protégé relationships tend to have higher research self-efficacy [30], and the significant positive correlation between student's research self-efficacy and mentoring relationship [31]. A positive mentoring relationship helps graduate students to cultivate their research self-efficacy, stimulate their research motivation and potential; while a negative mentoring relationship may lead to lower research self-efficacy of graduate students, which will have adverse effects on their physical and mental health. Based on this, we propose

a hypothesis that.

H1**:** The mentoring relationship positively influences graduate students' research self-efficacy.

## 2.2. The Mediating Role of Pressure

Stress refers to a series of physiological and psychological tension responses that individuals experience after cognitive assessment of internal and external environmental stimuli. Previous studies have shown significant correlations between mentoring relationships and graduate students' stress levels [32]. First, if mentors do not provide timely or detailed guidance for their graduate students, or there is poor information exchange, graduate students may feel confused and stressed, unsure how to effectively conduct research work. According to social support theory, social support from non-simultaneous sources can help reduce individual's perception of stress, thereby producing an alleviating effect [33]. The mentor's support not only benefits in improving graduate student's scientific research ability and output [34]., but also helps alleviate the pressure on graduate students [35]. Second, as guides for graduate students, mentors hold relatively high-power positions; if they emphasize authority excessively or impose unreasonable pressures and requirements on graduate students, graduate students may feel overwhelmed with stress, leading to anxiety and uneasiness [36]. Finally, if conflicts, lack of cooperation, or mutual distrust exist between mentors and graduate students, graduate students may feel tense and stressed. Good interpersonal relationships are the foundation of positive mentoring relationships, while strained interpersonal relationships may exacerbate graduate students' sense of stress [37]. Based on this, we propose hypotheses:

H2: The mentoring relationship negatively affects stress.

According to self-efficacy theory, individual psychological state is an important factor affecting self-efficacy. Previous studies have shown that stress has a significant negative correlation with research self-efficacy [13] [38]. First of all, when graduate students face research tasks and challenges, they may feel pressure and anxiety, worrying about whether they can cope or meet expectations. This kind of pressure will weaken their confidence, produce negative self-evaluation, and reduce their research self-efficacy. Secondly, excessive stress may lead them to avoid or evade research tasks, depriving them of opportunities to practice and develop research skills, thereby reducing their evaluation and confidence in their ability in research, which further reduces their research self-efficacy. Finally, when graduate students feel too much pressure, they tend to focus excessively on completing tasks and coping with stress, pursuing short-term results and rewards instead of setting goals for research and striving for long-term development, thus damaging their research self-efficacy. Based on this, we propose hypotheses:

H3: Pressure negatively affects research self-efficacy.

Under a positive mentoring relationship, mentors can effectively meet graduate students' research and social needs by guiding, supporting, and caring for them [39], reducing their perception of stress. Mentors provide professional guidance on scientific research to help graduate students overcome difficulties in scientific research, improve their ability to solve problems, reduce pressure from scientific research work, and make graduate students feel more secure and confident when facing challenges in scientific research, thereby enhancing self-efficacy [40]. In addition, the mentor's social network and resource sharing capabilities can provide graduate students with more opportunities for scientific research and learning resources, which helps expand their vision of scientific research, enhance their scientific research abilities, relieve academic, employment, psychological pressures, and strengthen their sense of efficacy in scientific research. Based on this, we propose hypotheses as follows:

H4: Pressure mediates the relationship between learning and teaching relationships and research self-efficacy.

## 2.3. The Regulatory Role of Stress-Oriented

Crum et al. proposed the concept of "Stress Mindset" in 2013 to describe an individual's general view or attitude towards stress. If a person believes that stress can enhance their cognitive abilities, physical health and well-being, it indicates they have a positive Stress Mindset. Conversely, if they believe that stress is harmful, they hold a negative Stress Mindset [23] Stress psychology research shows that psychological state can influence stress response. Specifically, orientations refer to one's attitudes and emotional tendencies; individuals with healthy, positive orientations are more likely to exhibit strong psychological resilience and adaptability, making appropriate and effective responses to stressful events. On the contrary, those with negative, pessimistic orientations may be prone to inappropriate and unreasonable stress reactions. Therefore, orientations do affect stress responses [41]. When the mentoring relationship is tense or communication is not smooth, graduate students with high Stress Mindset are more likely to re-evaluate from a positive perspective.

Conflict, taking active coping strategies such as open communication with supervisors and seeking social support, can reduce stress perception. Conversely, graduate students with low Stress Mindset are more likely to perceive conflicts or sources of pressure in their supervisory relationships as insurmountable obstacles, leading to increased stress perception. Additionally, high-stress-oriented graduate students have greater capacity for positive stress management, employing effective emotion regulation and coping strategies that transform stress into motivation and mitigate the negative effects of stress. High-stress-oriented graduate students typically have stronger self-affirmation and higher psychological resilience [42], even in cases of poor mentorship, they can rely on their intrinsic sense of worth to quickly recover from adversity and draw lessons from it, maintaining confidence in their research abilities. When facing difficulties in mentoring relationships, they are able to manage their emotions more effectively, reduce interference from negative emotions, actively face challenges, and even turn these obstacles into opportunities for personal growth and improvement in scientific ability, thereby protecting or enhancing high levels of research self-efficacy. In addition, during interactions with mentors, criticism or feedback from mentors may be interpreted by high-stress-oriented graduate students as an opportunity to improve themselves rather than a negation of their capabilities, which helps maintain or enhance research self-efficacy through a positive mindset. Under an unharmonious mentoring relationship, graduate students can change their perception and evaluation of stress by regulating their stress-related cognitions. This will help them better cope with stress [43]. Positive stress-related cognitions can help students maintain good mental health and physical health, participate more actively in research and study, thereby enhancing scientific confidence and self-efficacy [44]. At the same time, positive stress-related cognitions can motivate students to be more proactive in

communicating and interacting with teachers, obtaining more learning resources and support, thus strengthening scientific self-efficacy.

Based on this, we propose a hypothesis that:

H5a: The negative regulatory effect of Stress Mindset on mentoring relationship and pressure is that as the level of Stress Mindset increases, the negative impact of tutoring on pressure decreases. Conversely, the greater the negative influence will be.

H5b: The negative regulatory effect of Stress Mindset on mentoring relationship and research self-efficacy, that is, as the level of Stress Mindset increases, the negative impact of tutoring on research self-efficacy decreases. Conversely, the negative influence will increase.

Due to Stress Mindset regulating the relationship between mentoring relationships and research self-efficacy, as well as that of pressure on research self-efficacy, it is proposed that the moderating effect of Stress Mindset is a moderated mediation. Low levels of Stress Mindset make graduate students difficult to correctly recognize and handle pressures, which further strengthens the negative impact of an unharmonious mentor-student relationship on these students, reducing their confidence and sense of efficacy. That is, low levels of Stress Mindset will enhance the mediating role of pressure.

Based on this, we propose the following hypotheses:

H6: Stress coping orientation mediates the relationship between stress and mental health. When graduate students' stress mindset is lower, the mediating effect of stress is enhanced; when their stress mindset is higher, the mediating effect of stress is weakened. Therefore, the model constructed in this paper is shown as Figure 1.

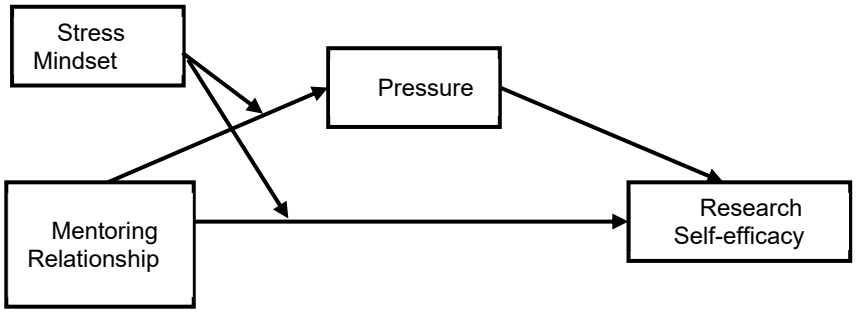


**Figure 1.** Research Model

# 3. Research Methods

## 3.1. Research Object

This study used a questionnaire survey method to distribute questionnaires to master and doctoral students in all provinces, municipalities and autonomous regions across the country. A total of 2300 questionnaires were distributed, with 2278 valid responses received. Among them, there were 1114 males (48.9%), 1164 females (51.1%); first-year graduate students accounted for 372 people (16.3%), second-year graduate students accounted for 491 people (21.6%), third-year graduate students accounted for 472 people (20.7%), and first-year doctoral students accounted for 265 people (11.6%).There were 216 people in second year (9.5%), 255 people in third year (11.2%), 120 people in fourth year (5.3%), and 87 people at or above fifth year (3.8%).

## 3.2. Research Tools

### 3.2.1. Research Self-efficacy Scale

Based on previous research, this study designed a questionnaire to measure graduate students' self-efficacy in scientific research with 10 items such as "I understand the main principles of major research methods". The Likert scale was used for scoring, and scores ranged from 1 (very inconsistent) to 5 (very consistent). Higher scores indicated stronger self-efficacy in scientific research among graduate students. The Cronbach's alpha coefficient of the questionnaire was 0.914.

### 3.2.2. The Scale of Mentoring Relationship

The main scale used to measure the mentoring relationship was developed by Scandura and Ragins, including three dimensions of role model (RM), psychological social support (PS) and career development guidance (CD). There were 9 items in total. The Likert five-point scoring system was adopted with a score of "very inconsistent" for 1 point and "very consistent" for 5 points. A higher score indicated better harmony between mentors and mentees. The Cronbach's α coefficient of this scale is 0.894.

### 3.2.3. Pressure Gauge

The main self-rating scale used was the Lovibond and Lovibond [46], with a total of 7 items such as "I find it hard to calm down when I am upset." The Likert five-point scoring system is adopted, where 1 represents "very inconsistent" and 5 represents "very consistent". A higher score indicates a higher stress index. The Cronbach's alpha coefficient for this scale was 0.902.

### 3.2.4. Stress Heart Vector Scale

The main scale used was the Stress Mindset questionnaire developed by Crum et al. [23], which consisted of eight items, such as "Experiencing pressure can improve my performance and efficiency". The Likert five-point scoring system was adopted, with a score of 1 representing "very inconsistent" and a score of 5 representing "very consistent". A higher score indicated a higher level of Stress Mindset. The Cronbach's alpha coefficient for this scale was 0.810.

## 3.3. Statistical Methods

The data were analyzed by SPSS 26.0 for validity and reliability analysis, descriptive statistics and correlation analysis. The moderated mediation effect was tested using model 8 of PROCESS in Hayes' SPSS plug-in to estimate confidence intervals.

# 4. Research Results

## 4.1. Common Method Bias Analysis

The common method bias was statistically tested using the single factor analysis of Harman [47]. The results showed that the variance explained by the first factor is 27.16%, which is lower than the critical standard of 40%. Therefore, this study

does not have serious common method bias.

## 4.2. Descriptive Statistics and Correlation Analysis

The analysis results showed that mentoring relationship and learning was negatively correlated with stress, positively correlated with research self-efficacy; Research self-efficacy is also negatively correlated with stress. The correlation results provide preliminary verification for this article's hypothesis. All variables in the model have a correlation coefficient less than 0.7, indicating no serious multicollinearity exists.

**Table 1.** Descriptive Statistical Analysis Results (N=2278)

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| 1.Gender | 1.511 | 0.500 | 1 | | | | | |
| 2.Grade | 3.501 | 1.980 | -0.016 | 1 | | | | |
| 3.mentoring relationship | 3.908 | 0.825 | -0.018 | -0.145** | 1 | | | |
| 4.Stress | 2.190 | 0.857 | 0.021 | 0.131** | -0.413** | 1 | | |
| 5.Research Self-Efficacy | 3.883 | 0.889 | -0.020 | -0.161** | 0.442** | -0.430** | 1 | |
| 6.Stress Mindset | 3.685 | 0.802 | -0.041* | -0.117** | 0.388** | -0.380** | 0.420** | 1 |

**Note: ***p<0.001, **p<0.01, *p<0.05, the same below. Gender: Male=1, Female=2. Grade: Master's First Year=1, Master's Second Year=2, Master's Third Year and above=3, Doctoral First Year=4, Doctoral Second Year=5, Doctoral Third Year=6, Doctoral Fourth Year=7, Doctoral Fifth Year and above=8.

## 4.3. Hypothesis Testing

### 4.3.1. The Mediating Role of Pressure in the Relationship between Tutor-student Learning and Research Self-efficacy was tested

Using Model 4 of the PROCESS program in SPSS, with peer learning relationship as an independent variable, research self-efficacy as a dependent variable, pressure as a mediating variable and gender and grade as control variables to test the mediation model. The data analysis results are shown in Table 2. There is significant influence on research self-efficacy by peer learning relationships ($\beta = 0.461$, $t = 22.621$, $p < 0.001$), which shows positive correlation between them, thus hypothesis H1 was established. Further, by constructing a mediation effect model with pressure as an intermediary variable, it was found that the relationship between mentorship and research self-efficacy remained significant ($B = 0.334$, $t = 15.745$, $p < 0.001$), while there is also a significant correlation between them (-0.418, -20.882, $p < 0.001$). The hypothesis H2 holds; Pressure significantly affects research self-efficacy ($\beta = -0.303$, $t = -14.836$, $p < 0.001$) and they are negatively correlated, which means that Hypothesis H3 holds true.

**Table 2.** Examination of the Mediating Effects of Stress

| Regression equation | | Fit indices | | | Coefficient Significance | | |
|---|---|---|---|---|---|---|---|
| Dependent Variables | Predictor Variables | R | $R^2$ | F | β | SE | t |
| Research Self-Efficacy | | 0.453 | 0.205 | 195.841*** | | | |
| | Gender | | | | -0.024 | 0.033 | -0.730 |
| | Grade Level | | | | -0.045 | 0.009 | -5.265*** |
| | mentoring relationship | | | | 0.461 | 0.020 | 22.621*** |
| Stress | | 0.419 | 0.176 | 161.716*** | | | |
| | Gender | | | | 0.026 | 0.033 | 0.787 |
| | Grade Level | | | | 0.032 | 0.008 | 3.811*** |
| | mentoring relationship | | | | -0.418 | 0.020 | -20.882*** |
| Research Self-Efficacy | | 0.525 | 0.276 | 216.064*** | | | |
| | Gender | | | | -0.017 | 0.032 | -0.519 |
| | Grade Level | | | | -0.035 | 0.008 | -4.313*** |
| | mentoring relationship | | | | 0.334 | 0.021 | 15.745*** |
| | Stress | | | | -0.303 | 0.020 | -14.836*** |

After controlling for gender and grade, we tested the mediating effect of stress on the relationship between mentoring relationships and research self-efficacy as shown in Table 3. The direct effects of mentoring relationships on research self-efficacy and the indirect effects mediated by stress were both significant with a bootstrapping 95% confidence interval that did not include zero. This indicated that mentoring relationships could directly predict research self-efficacy and indirectly through stress, suggesting that the mediation effect was significant and hypothesis H4 was supported. The direct effect of mentoring relationships accounted for 72.61% of total effects while the indirect effect mediated by stress accounted for 27.39%.

**Table 3.** Decomposition of Total Effects, Direct Effects, and Mediating Effects

| | Effect size | Boot CI lower limit | Boot CI upper limit | Proportion of effect |
|---|---|---|---|---|
| Mediating effect | 0.126 | 0.100 | 0.153 | 27.39% |
| Direct effect | 0.334 | 0.293 | 0.376 | 72.61% |
| Total effect | 0.460 | 0.421 | 0.501 | |

#### 4.3.2. The Regulatory Role of Stress Mindset in Mediation Model was tested

To test the moderating effect of Stress Mindset in the relationship between mentoring and research self-efficacy under pressure, we used PROCESS model 8 for data analysis, as shown in Table 4. The interaction between guided learning relationships and Stress Mindset significantly predicts both stress (β=0.131, t=6.249, p<0.001) and research self-efficacy (β=-0.105, t=-5.049, p<0.001). The results showed that Stress Mindset as a moderator variable had an effect on the mediating role of learning relationship in research self-efficacy.

**Table 4.** Examination of the Moderated Mediation Model

| Regression equation | | Fit indices | | | Coefficient Significance | | |
|---|---|---|---|---|---|---|---|
| Dependent Variables | Predictor Variables | R | $R^2$ | F | β | SE | t |
| Stress | | 0.494 | 0.244 | 146.508*** | | | |
| | Gender | | | | 0.017 | 0.031 | 0.552 |
| | Grade Level | | | | 0.024 | 0.008 | 2.998** |
| | Mentoring Relationship | | | | -0.269 | 0.022 | -12.184*** |
| | Stress Mindset | | | | -0.240 | 0.022 | -10.976*** |
| | mentoring relationship * Stress Mindset | | | | 0.131 | 0.021 | 6.249*** |
| Research self-efficacy | | 0.569 | 0.324 | 181.401*** | | | |
| | Gender | | | | -0.010 | 0.031 | -0.310 |
| | Grade level | | | | -0.030 | 0.008 | -3.850*** |
| | Mentoring Relationship | | | | 0.233 | 0.022 | 10.421*** |
| | Pressure | | | | -0.227 | 0.021 | -11.047*** |
| | Stress Mindset | | | | 0.230 | 0.022 | 10.456*** |
| | Mentoring Relationship* Stress Mindset | | | | -0.105 | 0.021 | -5.049*** |

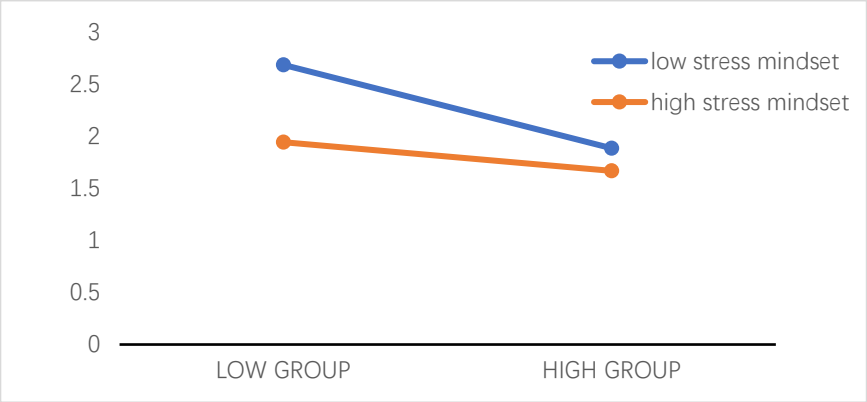


**Figure 2.** The Moderating Role of Stress Mindset in the Relationship between mentoring relationship and Stress

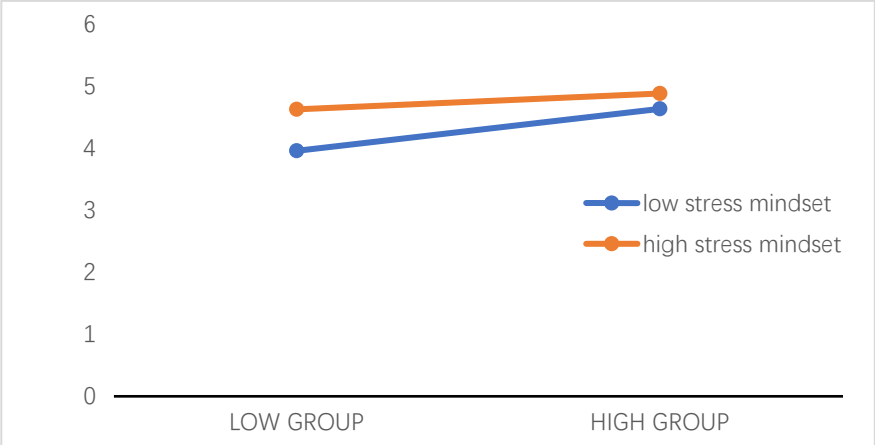


**Figure 3.** The Moderating Role of Stress Mindset in the Relationship between mentoring relationship and Research Self-Efficacy

Further simple slope analysis (see Figures 2 and 3) shows that, at a lower level of mentoring relationship (M-1SD), low stress students have significantly higher downward pressure than high stress students; while at a higher level of mentoring relationship (M+1SD), the gap between high and low stress students in downward pressure is reduced. That is, when graduate student's stress levels increase, the predictive effect of mentoring relationships on pressure decreases, which supports hypothesis H5a;from Figure 3 it can be seen that, at a lower level of mentoring relationship (M-1SD), high stress students have significantly higher research self-efficacy compared to low stress students; while at a higher level of mentoring relationship (M+1SD), the difference in research self-efficacy between high and low stress students becomes smaller. That is, as graduate students' stress levels rise, the predictive effect of mentoring relationships on research self-efficacy decreases, supporting hypothesis H5b.

At three different levels of Stress Mindset, the mediating effect of stress on the relationship between mentorship and research self-efficacy shows a decreasing trend (see Table 5). Specifically, as graduate students' levels of Stress Mindset increase, the mentoring relationship becomes less susceptible to the influence of stress on their research self-efficacy, supporting the validity of hypothesis H6.

**Table 5.** Mediation Effects at Different Levels of Stress Mindset

| | Stress Mindset | Effect Size | Boot SE | Boot CI Lower Bound | Boot CI Upper Bound |
|---|---|---|---|---|---|
| Stress Mediation | M-1SD | 0.085 | 0.012 | 0.063 | 0.109 |
| | M | 0.061 | 0.009 | 0.044 | 0.080 |
| | M+1SD | 0.037 | 0.010 | 0.018 | 0.057 |

# 5. Research Conclusion and Discussion

## 5.1. Research Conclusion

All hypotheses in this article were verified. The research results showed that first, the student-teacher relationship has a significant positive impact on graduate students' scientific self-efficacy. This result is consistent with previous findings. In healthy and close relationships between teachers and students, mentors provide necessary guidance to students in both academic and value creation aspects, creating an excellent environment for their research work. Students are focused on their research studies, trusting each other with their mentor, and maintaining harmonious relations. A positive Mentoring Relationship enables graduate students to feel supported by their mentors at all times, which helps them improve their motivation and confidence in research, enhancing personal scientific efficacy. Second, stress acts as a mediator between the Mentoring Relationship and scientific self-efficacy. During the graduate stage, mentors have comprehensive influence over students in terms of academics and research. Being in negative Mentoring Relationships means that when faced with difficulties, graduate students do not receive timely help or sufficient emotional support. Their perception of pressure is greater, further affecting their expectations about their own behavior and research output, reducing individual confidence and scientific self-efficacy. Third, stress coping mediates the relationship between the Mentoring Relationship and scientific self-efficacy, the relationship between the Mentoring Relationship and stress, and the mediating effect of stress on the relationship between the Mentoring Relationship and scientific self-efficacy. That is, high-level stress coping ability allows graduate students who hold such views to change their perceptions of disharmonious Mentoring Relationships and the resulting pressures, regulate themselves, maintain good attitudes, view challenges as opportunities for growth, continuously enriching their confidence and sense of self-efficacy in research. It was indicated that when Stress Mindset level is high, the negative impact of mentoring relationship on research self-efficacy and pressure are weak. The mediating effect between them is also weak; conversely, it's strong.

## 5.2. Theoretical Contribution

The theoretical contribution of this article is as follows: First, it further verifies the relationship between mentoring relationships and research self-efficacy. It provides new theoretical ideas for exploring antecedents of research self-efficacy. In previous studies, research self-efficacy was often presented as an independent variable or a moderating variable, with little attention paid to its antecedent variables and their relationships. This study focuses on the relationship between mentoring relationships and research self-efficacy, explores its mechanism, and expands and supplements research on research self-efficacy.

Second, this study examines the relationship among mentoring relationships, stress, and research self-efficacy by using stress as a mediating variable. It reveals how mentoring relationships affect graduate students' research self-efficacy through stress, thus providing a new pathway for the influence of mentoring relationships on research self-efficacy. Additionally, we introduce Stress Mindset as a moderator to analyze changes in the relationships among variables under different levels of Stress Mindsets, emphasizing the importance of positive orientations.

## 5.3. Management Inspiration

Based on the analysis and conclusions of this article, we propose the following management implications: First, advocate for good communication between teachers and students, encourage building closer mentoring relationships. The tutors should set an example by their own actions to serve as role models for graduate students, maintain close communication with them, understand their learning progress and research developments, provide timely guidance and feedback, and encourage graduate students to raise questions and concerns, then offer positive support and answers. Tutors can help graduate students find research directions and interesting topics, inspire their enthusiasm for study and research, encourage them to put forward their ideas and research plans, stimulate innovative spirit and exploration. In addition, tutors should provide necessary support and resources for graduate students, guide their scientific research and academic exchanges, expand their academic horizons and

interpersonal networks. Second, strengthen self-management and tutor support to effectively alleviate graduate student stress. Graduate students should learn how to manage time and tasks efficiently, make clear learning plans, set short-term and long-term goals, improve work efficiency and reduce pressure. Tutors should provide scientific research guidance and emotional support for graduate students, pay attention to their psychological health status. At the same time, graduate students should actively communicate with tutors, raise problems and solve them in a harmonious tutor-graduate relationship, continuously enhance themselves through continuous improvement. Third, encourage graduate students to cultivate optimistic and resilient coping orientations, increase resilience against pressure. Scientific research will encounter various challenges and difficulties, but maintaining a positive mindset can better cope with pressures and crises, enhancing confidence and scientific research efficacy. Universities can conduct Stress Mindset management and mental health education to help graduate students correctly regulate negative emotions, establish supportive peer communities, promote emotional exchange, and enhance social support among graduate students.

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