

Challenge-Hindrancel Stressors and Academic Engagement Among Medical Postgraduates in China: A Moderated Mediation Model

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Background: Improving academic engagement of medical postgraduates is crucial for enhancing the quality of learning and the development of medical education. Due to medical postgraduates face high levels of stress and rigorous demands, yet the mechanisms linking challenge-hindrancel stressors to academic engagement in this context remain largely unexplored. This study aims to explore the comprehensive relationship between challenge-hindrancel stressors and academic engagement among medical postgraduates in China.

Methods: Data were collected from 437 medical postgraduates in China, to investigate their challenge-hindrancel stressors, emotional exhaustion, learning, relaxation and academic engagement. Among these postgraduates, 40.3% were male and 59.7% were female, with the mean age of the participants being 25.71 years. Statistical procedures were conducted using Mplus 8.3, ensuring a robust analysis of the data collected.

Results: Our study showed that both challenge and hindrance stressors are significantly positively correlated with emotional exhaustion among Chinese medical postgraduates, and emotional exhaustion is negatively associated with academic engagement. Emotional exhaustion mediates the relationship between challenge-hindrancel stressors and academic engagement. Learning plays a protective role, moderating the challenge stressors and emotional exhaustion relationship and its indirect effect on academic engagement. However, relaxation was not identified as a significant moderating factor in this context.

Conclusion: Our findings not only revealed emotional exhaustion as a potential mechanism underlying the relationship between challenge-hindrancel stressors and academic engagement but also validated the moderating role of learning in mitigating the adverse effects of challenge stressors on emotional exhaustion and academic engagement among Chinese medical postgraduates. This comprehensive insight into the complex dynamics between different stressors and academic engagement provides both theoretical and empirical evidence for medical universities. It underscores the importance of interventions to enhance academic engagement in stressful environments and serves as a valuable reference for the development of reasonable assessment systems. These contributions are crucial for fostering a supportive educational atmosphere and promoting the well-being of medical postgraduates.

Keywords: challenge-hindrancel stressors, academic engagement, emotional exhaustion, recovery experiences, mastery (learning) & relaxation, medical postgraduates

Introduction

With the robust advancement of technological innovation and the escalating demands for healthcare services, China's requisites for the quality of medical education have been on a progressive rise.^{1,2} Medical postgraduates, trained as the nation's high-level medical talents, is a pivotal force leading the production of medical knowledge and technological innovation. The quality of their learning not only impacts the standard of advanced medical education but also holds significant implications for the future progression of China's healthcare system. As one of the crucial indicators for assessing educational quality, academic engagement reflects their behavioral, emotional, and cognitive dedication and output in the process of learning.^{3,4} It not only influences the goals, achievements, and academic level attainable by

medical postgraduates but also stimulates their positive psychological qualities such as optimism, resilience, and sense of significance.⁵⁻⁷ Therefore, promoting academic engagement should be a priority in the training of medical postgraduates.

Due to the demanding nature of the medical profession and the complexity of medical research, medical postgraduates confronted with a triplex of pressures: rigorous academic requirements, intensive research commitments, and a competitive environment.⁸ They are entrusted with substantial responsibilities, required to absorb extensive medical knowledge, participate in scientific research undertakings, and exert considerable exertion within the confines of limited time and energy resources.^{9,10} Consequently, the perpetual elevated demands have the potential to trigger stress during the postgraduate academic journey.^{11,12} Previous research proved that external environmental factors served as one of the important antecedents influence the academic engagement of the students.¹³ Stressors, as the origins of stress, constitute pivotal environmental factors influencing the quality of academic engagement among medical postgraduates. However, some studies in medical education only focused on the correlation between the general stress and its academic outcomes,^{9,12} there is a research gap in investigating the specific role of stressors (challenge and hindrance) and how they affect the mechanisms of academic engagement among medical postgraduates. To fill the theoretical and empirical gaps, this study aims to investigate the mechanisms through which different stressors affect academic engagement among medical postgraduates in China, and identify the moderating factors influenced these relationships.

Challenge & Hindrance Stressors and Academic Engagement

Academic engagement refers to a positive, fulfilling study-related state of mind or passion for learning, which is characterized by three core features: vigor, dedication, and absorption.³ This concept is universally recognized as indicative of the amount of time, effort, and energy that students dedicate to educationally meaningful activities. Highly engaged medical students can better able to cope with academic pressure, invest more time and effort in learning, and demonstrate a high degree of focus and enjoyment in medical field.^{7,14,15} Furthermore, a comprehensive meta-analysis revealed that academic engagement is significantly influenced by internal and external factors (eg, self-efficacy, motivation, teaching styles, academic obstacles, etc.).¹³ These elements play critical roles in shaping students' passion for learning. Despite some of the internal factors have been explored in medical education field,^{7,16,17} the effect of external variables, especially stressors on academic engagement remains insufficiently investigated, highlighting a need for further research in this area to enhance educational outcomes.

Meanwhile, medical education is characterized by a high prevalence of stress,^{18,19} and Chinese medical postgraduates are mainly subjected to the pressure of high demands in their professional studies and research work.^{8,15} According to the Challenge-Hindrance Stressor Framework Theory²⁰ and the Conservation of Resources Theory,²¹ the pressures experienced by medical students or postgraduates can be classified into challenge stressors and hindrance stressors. Challenge stressors include academic workload, time pressure, research pace, project complexity, and sense of research responsibility, which can be controlled by individuals and provide opportunities for personal growth and better academic engagement once overcome.^{10,22,23} In contrast, hindrance stressors such as interpersonal conflicts, insufficient resources, and a sense of insecurity in research work are beyond individuals' control and limit opportunities for personal growth. These stressors lead individuals to conserve their energy and reduce their investment in learning or research work, resulting in lower academic engagement.^{10,22,23}

Given that existing literature does not specifically differentiate between challenge-hindrance stressors and academic engagement, some empirical studies only proved that academic stress negatively affects academic engagement.²⁴⁻²⁸ A study by Chyu & Chen challenges the prevailing notion that stress is universally detrimental to academic engagement, suggesting that academic stress could positively correlate with school engagement under certain conditions.²⁹ They posited that while elevated levels of stress can be harmful to one's well-being and overall function, manageable amounts of stress can actually serve as a motivational catalyst, encouraging individuals to excel or put forth greater effort in challenging scenarios.²⁹ The inconsistent findings in the educational context highlight a further investigation in understanding the specific relationship between different stressors and academic engagement. Additionally, previous studies have predominantly focused on general populations, overlooking specialized stressful groups such as medical postgraduates. These leave significant gaps in our understanding and underscore the urgent need for targeted research.

Emotional Exhaustion as a Mediator

Although the direct impact of challenge stressors and hindrance stressors on academic engagement may exhibit significant heterogeneity among medical postgraduates, previous research confirmed that two types of stressors can lead to emotional exhaustion in individuals.^{30,31} Emotional exhaustion is a stress response to a highly stressful situation, reflecting the negative experience of being emotionally overloaded and “drained” by the continuous overload of stress. From the theoretical perspective of stressor-strain,^{32–34} stressors can elicit a stress response in individuals, which in turn can result in various negative consequences referred to as strain. That is to say, challenge and hindrance stressors are stimuli that induce the stress process, and are positively correlated with stress.^{35,36} The undesirable consequences of stress can lead to negative emotions, and forms of strain, such as anxiety and exhaustion, are the proximal outcomes of this process.³⁷ In addition, drawing upon from the Conservation of Resources Theory,²¹ external stressors are the “catalysts” of individual resource depletion whether they are appraised as being positive or negative. With the increased levels of arousal occur, it is easy to cause excessive depletion of individual resources, followed by emotional depression such as frustration, disappointment and anger, which can lead to individual’s refusal of emotional arousal and induces emotional exhaustion.^{38–43}

In contrast to the substantial body of research linking stressors to exhaustion, there has been comparatively less exploration of the relationship between emotional exhaustion and academic engagement. While related studies have predominantly focused on the role of positive emotions in fostering academic engagement,^{44,45} research has not been adequately addressed how negative emotional states might influence students’ engagement. According to the Conservation of Resources Theory,²¹ emotional exhaustion represents feelings of being overextended and depleted of one’s emotional and physical resources. This depletion not only reduces the level of energy but also diminishes the investment of effort in the learning process. Thus, we speculate emotional exhaustion served as the mediator to explain the underlying mechanism between challenge-hindrance stressors and academic engagement among medical postgraduates.

H1: Challenge and hindrance stressors are positively related to emotional exhaustion.

H2: Emotional exhaustion is negatively related to academic engagement.

H3: Emotional exhaustion mediates the relationship between challenge and hindrance stressors and academic engagement.

Learning and Relaxation as a Moderator

Given the linkage of stressors with negative emotions, what can individuals do to buffer both stressors to emotional exhaustion relationship? The Recovery Experience Theory and Conservation of Resources Theory posits that mastery experiences (ie, learning) as a resource-building activity and relaxation as a demand-shielding activity provide individuals with resource recovery pathways.^{46,47} Some empirical evidences also suggested that learning and relaxation at work are associated with more vitality and less fatigue.^{48,49} Learning activities provide the opportunity to experience competence and proficiency.⁵⁰ They may promote medical postgraduates’ academic competence and research literacy, such as attending conferences, workshops, and seminars related to their area of specialization, taking online courses on new medical advancements and techniques, or observing and imitating the academic skills of outstanding postgraduates. These activities help to build up new internal resources and improve positive mood, with the gradual improvement of learning level, they will obtain sufficient useful instrumental resources (eg, information, knowledge, abilities, and skills) and psychological resources (eg, competence, self-efficacy, mental resilience) to counteract the threat of stressors,^{51,52} reduce the experience of negative emotions and weaken the “exhaustion” of excessive loss of emotional resources, thereby they will be more likely to engage in their medical study and research.

Relaxation is characterized by a state of low activation and increased positive affect, typically experienced during leisure activities that do not impose further demands on oneself.⁵⁰ These activities may prompt medical postgraduates to temporarily stay away and escape from stressors, helping to divert their attention from work pressure.⁵³ Engaging in

relaxation activities such as mindfulness meditation, deep breathing exercises, progressive muscle relaxation, or yoga, as well as leisure activities that are not related to work, such as spending time with family and friends, taking a walk outside, listening to some music, or pursuing a hobby, can help medical postgraduates temporarily shield stressful sources of negative emotions.^{50,54} Studies have shown that engaging in relaxation benefits emotional stability and life satisfaction and mitigates the negative effects of stressors on emotional exhaustion.^{50,54} By incorporating relaxation into their daily routine, medical postgraduates can improve their emotional stability, life satisfaction, and academic engagement.

However, it is worth noting that the effects of learning and relaxation in alleviating emotional exhaustion caused by these two categories of stressors have yielded inconsistent findings. Some studies have demonstrated that learning can mitigate negative emotions brought about by hindrance stressors, thereby reducing deviant behavior at work, while the buffering effect of relaxation is not significant.⁵⁵ Conversely, other studies have confirmed that relaxation can alleviate work-related fatigue and benefit emotional stability.^{50,56} The incongruity of research findings provides an opportunity to validate the efficacy of the regulatory roles of learning and relaxation in the medical educational domain. Based on the aforesaid, we hypothesize:

H4: Learning moderates the relationship between challenge and hindrance stressors and emotional exhaustion.

H5: relaxation moderates the relationship between challenge and hindrance stressors and emotional exhaustion.

H6: The indirect effect of challenge and hindrance stressors on academic engagement through emotional exhaustion is moderated by learning.

H7: The indirect effect of challenge and hindrance stressors on academic engagement through emotional exhaustion is moderated by relaxation.

Overall, this study explores the relationship between challenge and hindrance stressors and academic engagement among Chinese medical postgraduates. Grounded in the Conservation of Resources Theory, it investigates how stressors impact academic engagement through emotional exhaustion, validating its role as a mediating mechanism. Furthermore, by examining learning and relaxation as moderating variables, our research not only tests but also extends our understanding of the Conservation of Resources theory, highlighting its theoretical importance in resource conservation for medical postgraduates.

Method

Participants and Procedure

Data collection for this study was conducted methodically in 2023, involving students from three medical universities in China: China Medical University, Hubei University of Medicine, and Air Force Military Medical University. Utilizing the Chinese online survey platform Wenjuanxing (www.sojump.com), participants were systematically recruited. The survey explained the study's objectives and guaranteed confidentiality and anonymity, emphasizing that responses would be exclusively for research purposes. At the beginning of the survey questionnaire, all participants were requested to consent to participate in the research. Demographic information such as age, gender, grades, work experiences and their current institution was collected. Upon completing the survey, participants were rewarded with a 10 RMB digital red envelope as compensation for their time and effort. A total of 440 medical postgraduates (full-time research master's degree) participated in this study, with 437 responses deemed valid for final analysis, resulting in a response rate of 99.3%. Three responses were excluded due to repetitive answers, ensuring the integrity and reliability of the data collected. Among these postgraduates, 40.3% were male and 59.7% were female, with their ages ranging from 21 to 40 years. About 42.8% postgraduates were in their first grade, 34.3% were in the second grade, and the rest of 22.9% were in the third grade. The proportion of the postgraduates with more than six months of work experience was accounted for 32.3%.

Measures

The questionnaires included participants' demographic data (gender, age, grade, work experience), Challenge-Hindrance Stressors Measure, Maslach Burnout Inventory-Student Survey, Utrecht Work Engagement Scale-Student, Recovery Experience Questionnaire. All the measures were used in Chinese version for survey.

Challenge and Hindrance Stressors

This study assessed challenge and hindrance stressors with the original scale proposed by Cavanaugh et al.²⁰ It consists of six challenge-related items and three hindrance-related items. An example of a challenge-related item was "The number of projects and assignments I have" and an example of a hindrance-related item was "The amount of red tape I need to go through to get my job done". Responses were collected using a 5-point Likert scale in which 1 was "never" and 5 was "very often". In this study, the Cronbach's alpha coefficient for Challenge Stressors & Hindrance Stressors was 0.85 and 0.80, respectively.

Emotional Exhaustion

The 16-item MBI-SS is a validated tool used to measure burnout in student populations,³ and it consists of three subscales: emotional exhaustion, cynicism, and academic efficacy. Responses are provided on a 7-point Likert scale with higher values referencing more frequent occurrences. We only used emotional exhaustion dimension in our study. An example of an exhaustion-related item was "I feel emotionally drained by my studies". Participants could answer on a 7-point scale ranging from 1 "never" to 7 "always". In this study, the Cronbach's alpha coefficient for Emotional Exhaustion was 0.93.

Academic Engagement

Academic engagement was assessed with the 17-item UWES-S that includes three subscales for using in student samples: Vigor (VI; 6 items), Dedication (DE; 5 items), and Absorption (AB; 6 items).³ All items are scored on a 7-point frequency rating scale ranging from 1 (never) to 7 (always). For instance, the item "When I'm doing my work as a student, I feel bursting with energy". from vigor dimension; the item "I find my studies full of meaning and purpose". from dedication dimension; the item "Time flies when I am studying". from absorption dimension. In this study, the Cronbach's alpha coefficient for Academic Engagement was 0.96.

Learning and Relaxation

To measure the extent to which participants took time for learning and relaxation. We used the mastery experience scale and the relaxation scale, respectively, from the recovery experience questionnaire developed by Sonnentag & Fritz.⁵⁰ Participants indicated the extent to which they engaged in the listed behaviors at study (1 = Strongly disagree, 5 = Strongly agree). Sample items for learning include "I learn new things" and "I do something to broaden my horizons". Sample items for relaxation include: "I use the time to relax" and "I do relaxing things". In this study, the Cronbach's alpha coefficient for Learning & Relaxation was 0.88 and 0.88, respectively.

Data Analysis

Descriptive statistical and correlation analysis were performed using SPSS 23.0. Subsequently, the prediction capability of the structural model and the link between constructs were examined using Mplus 8.3 software. The analytical strategy involved testing mediation model, examining and assessing the moderated mediation model. In this study, path analyses were executed to scrutinize specific relational interactions. We adopted the Bootstrap method to test the significance of mediating path (a bootstrap sample of 5000 was specified) for the parameters and used to construct 95% confidence intervals (CIs). The significance of the indirect effects in the bootstrapped data is determined by the inclusion or exclusion of zero within the 95% confidence intervals.⁵⁷ Specifically, confidence intervals that include zero indicate that the indirect effects are not significant.

Results

Preliminary Analysis

Tables 1 and 2 present the descriptive statistics for the constructs and correlation matrix among them. In this study, the average age of the postgraduate sample was 25.71 years, and ages ranged from 21 to 40 years. Regarding gender distribution, 59.7% of the participants were female, while 40.3% were male. As for academic standing, 42.8% of the postgraduates were in their first year, 34.3% in their second year, and the remaining 22.9% were in their third year. Additionally, 32.3% of the postgraduates had more than six months of work experience. The results in Table 2 indicated that challenge and hindrance stressors were both significantly and positively associated with emotional exhaustion ($r = 0.44, p < 0.001$; $r = 0.61, p < 0.001$). However, only hindrance stressors were found to be negatively associated with academic engagement ($r = -0.33, p < 0.001$). Challenge stressors were significantly and positively associated with learning ($r = 0.10, p = 0.047$), while hindrance stressors were negatively associated with learning ($r = -0.18, p < 0.001$). Furthermore, emotional exhaustion was negatively related to academic engagement ($r = -0.34, p < 0.001$), learning ($r = -0.20, p < 0.001$), and relaxation ($r = -0.10, p = 0.030$). Finally, academic engagement was positively associated with learning and relaxation ($r = 0.48, p < 0.001$; $r = 0.19, p < 0.001$).

Path Analysis

Testing the Mediating Role of Emotional Exhaustion

The results reported in Table 3 revealed that the mediation model showed a good fit, $\chi^2(4) = 1.95, p = 0.74$ ($\chi^2/df = 0.49$), CFI = 1.00, TLI = 1.02, RMSEA = 0.00 (90% CI = 0.00–0.09), SRMR = 0.01. After controlling for the gender, age,

Table 1 Minimum, Maximum, Means, Standard Deviations, Skewness, Kurtosis, Reliability

Variables	Minimum	Maximum	M	SD	Skewness	Kurtosis	Reliability
1. Age	21	40	25.71	2.78	1.47	2.77	
2. Grade	1.00	3.00	1.80	0.79	0.37	-1.30	
3. CS	1.00	5.00	3.22	0.79	-0.16	0.07	0.85
4. HS	1.00	5.00	3.17	0.94	-0.17	-0.47	0.80
5. EX	1.00	7.00	3.80	1.17	0.13	0.89	0.93
6. AE	1.00	7.00	3.89	0.92	-0.11	2.60	0.96
7. Learning	1.00	5.00	3.60	0.71	-0.75	1.58	0.88
8. Relaxation	1.00	5.00	3.90	0.71	-0.74	1.78	0.88

Note: N = 437.

Abbreviations: CS, challenge stressor; HS, hindrance stressor; EX, emotional exhaustion; AE, academic engagement.

Table 2 The Correlation Matrix Among Variables

Variables	1	2	3	4	5	6	7	8	9	10
1. Gender	1									
2. Age	-0.18**	1								
3. Grade	-0.03	0.42**	1							
4. Work experience	0.13**	-0.61**	-0.20**	1						
5. CS	-0.05	0.12*	0.12*	-0.14**	1					
6. HS	0.11*	0.02	0.04	-0.02	0.31**	1				
7. EX	0.07	0.04	0.09	-0.06	0.44**	0.61**	1			
8. AE	0.02	0.04	-0.02	-0.03	0.05	-0.33**	-0.34**	1		
9. Learning	-0.04	0.02	-0.04	-0.09	0.10*	-0.18**	-0.20**	0.48**	1	
10. Relaxation	0.06	-0.08	-0.04	0.00	-0.01	-0.03	-0.10*	0.19**	0.49**	1

Notes: N = 437. * $p < 0.05$, ** $p < 0.01$, two-tailed.

Abbreviations: CS, challenge stressor; HS, hindrance stressor; EX, emotional exhaustion; AE, academic engagement.

Table 3 Standardized Indirect Effects and 95% Confidence Intervals for the Mediation Model

Model Pathways	Estimated	95% CI	
		Lower	Upper
Challenge stressors → Emotional exhaustion → academic engagement	-0.09 ^a	-0.16	-0.04
Hindrance stressors → Emotional exhaustion → academic engagement	-0.17 ^a	-0.26	-0.08

Note: ^aBootstrap confidence intervals that exclude 0.

grade and work experience, a positive and significant relationship was found between challenge stressors and academic engagement in the absence of the mediator ($\beta = 0.26, p < 0.001$), a negative and significant relationship was found between hindrance stressors and academic engagement without the mediator ($\beta = -0.22, p < 0.001$). A positive and medium association was found between challenge and hindrance stressors and emotional exhaustion ($\beta = 0.28, p < 0.001$; $\beta = 0.53, p < 0.001$). The relationship between emotional exhaustion and academic engagement was also statistically significant ($\beta = -0.32, p < 0.001$). To evaluate the significance of indirect effects, as shown in Table 3, both indirect effect of challenge stressors and hindrance stressors on academic engagement through emotional exhaustion were significant (effect = -0.09 , 95% C.I. [$-0.16, -0.04$]; effect = -0.17 , 95% C.I. [$-0.26, -0.08$]).

Moderated Mediation Test Taking Learning as the Moderator

The main results of moderated mediation analysis are presented in Figure 1 and Table 4. As can be seen from the mediator variable model for predicting emotional exhaustion, after controlling for gender, age, grade and work experience, challenge and hindrance stressors were positively correlated with emotional exhaustion, while the interaction term of challenge stressors and learning was negatively correlated with emotional exhaustion ($\beta = -0.11, p = 0.013$). Namely, learning moderated the association between challenge stressors and emotional exhaustion. To better understand the moderating effect of learning, the plot of the relation between challenge stressors and emotional exhaustion at two levels of learning (1 SD below the mean and 1 SD above the mean) was described in Figure 2. With reference to Figure 2, for individuals with low levels of learning (1 SD below the mean), challenge stressors were strongly associated with emotional exhaustion, while this association was weaker for individuals with high levels of learning (1 SD above the mean). The effects for high and low levels of learning were statistically different ($\beta = -0.22, p = 0.013$). To further verify the moderated mediation relationships, we examined the indirect effect of challenge stressors on academic engagement via emotional exhaustion to be different across high and low levels of learning. As can be seen from the dependent variable model for predicting academic engagement, after controlling for gender, age, grade and work experience,

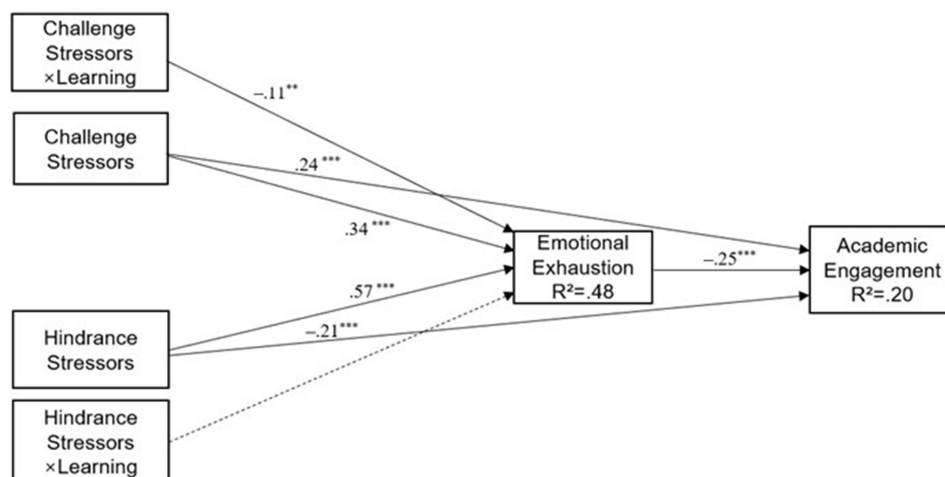


Figure 1 Results of direct and moderating effects of learning.

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

Table 4 Effect Analysis at Values of the Moderator

Conditional Direct Effect Analysis at Values of the Moderator	β	Boot SE	Boot LLCI	Boot ULCI
Learning (M-1SD)	0.45***	0.07	0.31	0.59
Learning (M+1SD)	0.23**	0.07	0.09	0.37
Conditional Indirect Effect Analysis at Values of the Moderator	β	Boot SE	Boot LLCI	Boot ULCI
Learning (M-1SD)	-0.11**	0.03	-0.19	-0.06
Learning (M+1SD)	-0.06*	0.03	-0.12	-0.02

Notes: N=437. Bootstrap sample size = 5000. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Abbreviations: LL, low limit; CI, confidence interval; UL, upper limit.

challenge stressors were positively correlated with academic engagement ($\beta = 0.24, p < 0.001$), learning was found to moderate the mediation of emotional exhaustion on the relationship between challenge stressors and academic engagement. High levels of learning were associated with lower emotional exhaustion and higher academic engagement, whereas low levels of learning corresponded to higher emotional exhaustion and reduced academic engagement. The result showed that the indirect effect of challenge stressors on academic engagement through emotional exhaustion was also moderated by learning. Overall, this model explained 48.0% of variance in emotional exhaustion, 20.0% of variance in academic engagement. By contrast, learning was not found to moderate the association between hindrance stressors and emotional exhaustion, and the indirect effect was not significant, either.

Moderated Mediation Test Taking Relaxation as the Moderator

As can be seen from Figure 3, the mediator variable model for predicting emotional exhaustion, after controlling for gender, age, grade and work experience, challenge and hindrance stressors were positively correlated with emotional exhaustion, while the interaction term of challenge stressors and relaxation, hindrance stressors and relaxation were not significant. Namely, relaxation was not found to moderate the association between challenge-hindrance stressors and emotional exhaustion, and the indirect effect was not significant, either.

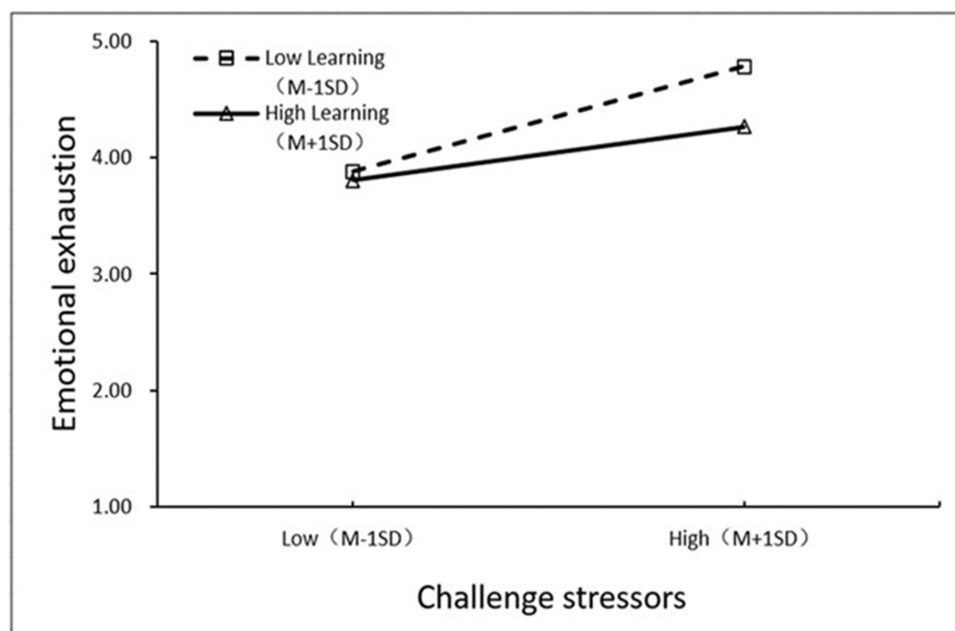


Figure 2 Moderation Plot with Learning as Moderator.

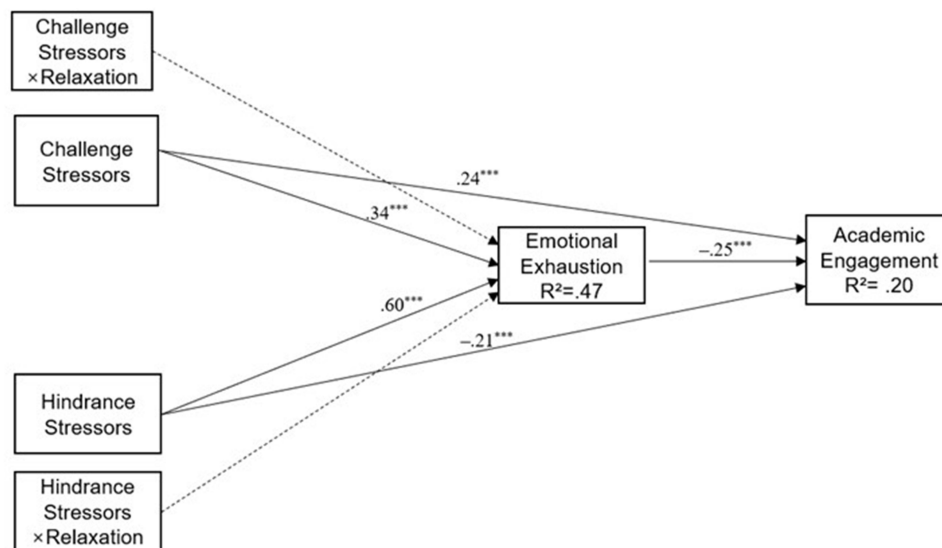


Figure 3 Results of direct and moderating effects of relaxation.
Note: *** $p < 0.001$.

Discussion

The main objective of this study was to investigate the relationship between challenge-hindrance stressors and academic engagement among medical postgraduates in China. We also examined the mediating effect of emotional exhaustion and the moderating role of learning and relaxation in the relationship between the two stressors and academic engagement. Overall, our hypotheses were partially supported. To our knowledge, this is the first study using the two-dimensional stressor framework to explore potential associations with academic engagement among Chinese medical postgraduates. Our findings may contribute to the understanding of how challenge-hindrance stressors relate to academic engagement in medical higher education and provide empirical evidence for interventions aimed at enhancing the academic engagement of medical postgraduates.

Mediating Effect of Emotional Exhaustion

The findings of this study support our hypotheses 1. Challenge and hindrance stressors exhibit a significant positive correlation with emotional exhaustion among Chinese medical postgraduates. The results are consistent with previous research conducted in occupational contexts,^{30,35,36,58–61} highlighting the generalizability of our findings. Although challenge stressors have two opposing effects, on one hand, they can act as motivators and have positive effects on work outcomes; on the other hand, they can also increase strain, which in turn may negatively affect those same work outcomes. We proved that emotional exhaustion is the first potential explanation and a proximal outcome for the relationship between the two forms of stressors and academic engagement. The explanation for this relationship is that the elevated arousal and cognitive workload required to comprehend and address the ongoing demands of a stressful situation can lead to emotional exhaustion.⁶² Meanwhile, our findings are also in line with a meta-analysis conducted by Bakker et al, and emotional exhaustion was negatively related to job engagement, which encompasses an individual's motivation, dedication, and absorption in work-related activities.⁶³ Specifically, in the educational setting, medical postgraduates who experience high levels of emotional exhaustion may exhibit decreased academic motivation, reduced interest in learning, and lower academic engagement. Hence, our hypotheses 2 was supported. In essence, our study shed light on emotional exhaustion as a potential mechanism that underlies the relationship between challenge-hindrance stressors and academic engagement among medical postgraduates. From the theoretical perspective of stressor-strain theory,^{32–34} stressors trigger a stress response that can cause negative outcomes like strain. Challenge and hindrance stressors initiate this stress process and are linked to increased stress levels. The undesirable consequences of stress lead to negative emotions, such as emotional exhaustion. We also draw upon the Conservation of Resources Theory,^{21,64}

emotional exhaustion represents feelings of being overextended and depleted of one's emotional and physical resources, it may reduce the level of energy and investment of effort in the process of learning for medical postgraduates.

Moderating Effect of Learning

The results of our study confirmed that the direct path from challenge stressors to emotional exhaustion and the indirect effect of challenge stressors on academic engagement through emotional exhaustion were moderated by learning. By contrast, learning was not found to moderate the association between hindrance stressors and emotional exhaustion, and the indirect effect was not significant, either. Our hypotheses 4 and 6 were partially supported. Although some empirical studies provided the evidence for the buffering role of learning between the hindrance stressors and emotional exhaustion or work outcomes,⁵⁵ this study suggests that learning might be more helpful for having less emotional exhaustion in response to challenge stressors. There are some potential reasons for these results, and one reason could be that challenge stressors, such as high workload or time pressure, require a higher level of cognitive effort and problem-solving skills.^{35,36,65} Therefore, when medical postgraduates are equipped with effective learning strategies and skills, they may be better able to cope with the demands of these stressors and increase their personal resources to counteract emotional exhaustion. In contrast, hindrance stressors, such as interpersonal conflicts, insufficient resources may be more related to external factors beyond the control of medical postgraduates. Thus, even with effective learning strategies or resources, medical postgraduates may still feel helpless and frustrated in dealing with these stressors, leading to higher levels of emotional exhaustion. Another potential reason could be that challenge stressors may provide a sense of meaning and purpose for medical postgraduates, as they are directly related to their academic and professional development.^{3,66} Thus, when medical postgraduates perceive these stressors as challenging but manageable, they may feel more energized and engaged in their learning, leading to lower levels of emotional exhaustion. On the other hand, hindrance stressors may be perceived as obstacles or barriers to their goals, resulting in feelings of demotivation and disengagement.^{20,67} Overall, these potential reasons suggest that learning may be a valuable resource for medical postgraduates in coping with challenge stressors and reducing emotional exhaustion, but the effectiveness of learning may depend on the nature of stressors.

Moderating Effect of Relaxation

While we did find some significant buffering roles of learning activities on the relationship between challenge stressors and academic engagement, our results showed that relaxation did not moderate the direct relationship between challenge-hindrance stressors and emotional exhaustion and indirect relationship between challenge-hindrance stressors and academic engagement mediated by emotional exhaustion. Thus, the hypotheses 5 and 7 were not supported by our findings. These results are consistent with the previous studies conducted in working environment, indicating relaxation fail to act as a useful buffering condition.⁵⁵ One potential reason is that taking time for relaxation, such as walking, listening to music, or doing exercise, may not provide medical postgraduates with coping strategies and academic resources to deal with stressful situations. Although relaxation activities as a demand-shielding activity may help individuals feel more relaxed in the short term, it is difficult for them to restore and replenish personal resources in a timely manner.⁶⁸ In fact, when the medical postgraduates realize their failure to change the stressful situation despite the time consumed, it may generate the feelings of anxiety and frustration, which can diminish the restorative benefits of relaxation. An alternative interpretation is that the exclusive reliance on transient relaxation fails to augment their motivational drive (eg, self-efficacy) necessary to contend with stressors. If medical postgraduates perceive themselves as incapable of completing academic tasks successfully, it is likely to impede their ability to mobilize their emotions, resulting in a depletion of emotional resources that cannot be compensated adequately. As a result, relaxation may not be a helpful buffering strategy in these circumstances.

Limitations and Future Direction

Limitations of this study should be considered when interpreting the results. Firstly, our data were collected at a single time point, precluding any causal inferences regarding the relationships among the variables. Future studies should utilize dynamic longitudinal designs (such as the experience sampling method) to establish the temporal sequence of stressors,

emotional exhaustion, and academic engagement among medical postgraduates. Moreover, relying solely on self-reported measures in our study may be subject to response biases and common-method variance. Future studies should incorporate multiple data sources and methods to increase the validity of the findings. Secondly, our sample consisted solely of medical postgraduates from a few universities in China. Therefore, caution should be exercised in generalizing our findings to other populations or contexts. Future studies should investigate whether the relationships among stressors, emotional exhaustion, and academic engagement vary across different disciplines, cultures, or countries. Thirdly, while the present study asked participants to rate the challenge and hindrance stressors encountered during their studies, they were not prompted to appraise them as either challenge or hindrance stressors. This also raises a methodological concern regarding the validity of the data collected. Thus, future research should aim not only to capture individual assessments of challenge and hindrance stressors but also to include appraisals of these stressors as challenge or hindrance. Finally, our study concentrated solely on particular recovery activities (learning and relaxation). However, to gain a more comprehensive understanding of the buffering roles of activities, future research may explore additional forms of resource-building and demand-shielding activities.

Practical Implications

The present study yields several practical implications for medical universities in China. From the perspective of the underlying mechanism of challenge-hindrance stressors on academic engagement, our study highlights that the emotional exhaustion is a potential mediator between stressors and academic engagement. Although challenge stressors are regarded as “good stressors” with a positive impact on medical postgraduates’ learning and research work, and hindrance stressors are commonly considered “bad stressors”, it is noteworthy that even “good stress” can potentially have negative effects. Therefore, it is essential to apply moderate research pressure to enable individuals to achieve optimal marginal benefits while maintaining a healthy psychological state. Second, this finding also underscores the need for university administrators and postgraduate supervisors to adopt a dialectical view of the impact of challenge-hindrance stressors on the psychological well-being of postgraduates. They should pay close attention to the emotional state of medical postgraduates and utilize emotion regulation strategies to alleviate and dissipate their negative emotions. Furthermore, interventions that target reducing stress and emotional exhaustion, such as mindfulness training, could be implemented to improve academic engagement among medical postgraduates. Third, the study suggests that learning activities could be valuable resources for medical postgraduates in coping with challenge stressors and reducing emotional exhaustion. Therefore, postgraduate programs that provide medical postgraduates with effective learning resources and platform could help them cope better with academic demands and reduce emotional exhaustion. Supervisors may introduce opportunities for postgraduates to learn new things in their research work or facilitate their own effort for learning during the study. Meanwhile, medical postgraduates can also expand more learning channels and resources to develop their own competence and profession. Based on above, medical universities should design and formulate reasonable research tasks and construct moderate and challenging research goals, research tasks and research evaluation mechanisms for postgraduates.

Conclusion

This study probed the relationship between challenge-hindrance stressors and academic engagement among medical postgraduates. Furthermore, we examined the mediating effect of emotional exhaustion and the moderating effect of learning and relaxation in this relation. The results showed that challenge and hindrance stressors were positively correlated with emotional exhaustion, which in turn, was positively associated with academic engagement. Learning moderated the direct relationship between challenge stressors and emotional exhaustion and indirect relationship between challenge stressors and academic engagement mediated by emotional exhaustion. Relaxation was not found to moderate the association between challenge and hindrance stressors and emotional exhaustion, and the indirect effect was not significant, either. Future research should explore the impact of stressors on outcome variables under different mediating effects to uncover more detailed mechanisms of how dual stressors influence academic engagement. Meanwhile, an additional wide range of recovery activities that serve to buffer the effects of stressor should be explored. Additionally, longitudinal studies would be beneficial to examine the long-term effects of challenge and hindrance stressors on

academic engagement and career outcomes. This approach could offer deeper insights into the temporal dynamics of stress and engagement, and the lasting benefits of targeted interventions.

Declaration of AI-Assisted Technologies in the Writing Process

During the preparation of this work, the author(s) used Chat AI in order to proofread the language. Subsequent to its use, the authors thoroughly reviewed and manually edited the text to ensure accuracy and integrity. The responsibility for the content and its originality remains solely with the authors.

Data Sharing Statement

The raw data supporting the conclusions of this article will be available from the corresponding author on reasonable requests.

Ethics Approval and Consent to Participate

The studies involving human participants were reviewed and approved by the Hubei University of Medicine Ethics Committee (Reference No: 2022RE043). All methods were carried out in accordance with the Declaration of Helsinki and approved by the aforementioned ethics committee. All participants provided their written informed consent to participate in this study.

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Disclosure

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

1. Qiao J, Wang Y, Kong F, Fu Y. Medical education reforms in China. *Lancet*. 2023;401(10371):103–104. doi:10.1016/S0140-6736(22)02629-0
2. Liu X, Feng J, Liu C, et al. Medical education systems in China: development, status, and evaluation. *Acad Med*. 2023;98(1):43–49. doi:10.1097/ACM.0000000000004919
3. Schaufeli WB, Salanova M, González-Romá V, Bakker AB. The measurement of engagement and burnout: a two sample confirmatory factor analytic approach. *J Happiness Stud*. 2002;3(1):71–92. doi:10.1023/A:1015630930326
4. Fredricks JA, Blumenfeld PC, Paris AH. School engagement: potential of the concept, state of the evidence. *Rev Educ Res*. 2004;74(1):59–109. doi:10.3102/00346543074001059
5. Upadaya K, Salmela-Aro K. Development of school engagement in association with academic success and well-being in varying social contexts. *Eur Psychol*. 2013;18:136–147. doi:10.1027/1016-9040/a000143
6. Casuso-Holgado MJ, Cuesta-Vargas AI, Moreno-Morales N, Labajos-Manzanares MT, Barón-López FJ, Vega-Cuesta M. The association between academic engagement and achievement in health sciences students. *BMC Med Educ*. 2013;13(1):1–7. doi:10.1186/1472-6920-13-33
7. Wu H, Li S, Zheng J, Guo J. Medical students' motivation and academic performance: the mediating roles of self-efficacy and learning engagement. *Med Educ Online*. 2020;25(1):1742964. doi:10.1080/10872981.2020.1742964
8. Hou L, Ji C, Zhang Z. Analysis of stress status of medical postgraduates in China. *Basic Clin Med*. 2019;10:1503–1505. In Chinese.
9. Shadid A, Shadid AM, Shadid A, et al. Stress, burnout, and associated risk factors in medical students. *Cureus*. 2020;12(1):e6633. doi:10.7759/cureus.6633
10. Shete AN, Garkal KD. A study of stress, anxiety, and depression among postgraduate medical students. *CHRISMED J Health Res*. 2015;2(2):119–123.
11. Liu H, Yansane AI, Zhang Y, Fu H, Hong N, Kalenderian E. Burnout and study engagement among medical students at Sun Yat-sen University, China: a cross-sectional study. *Medicine*. 2018;97(15):e0326. doi:10.1097/MD.00000000000010326
12. Jordan RK, Shah SS, Desai H, Tripi J, Mitchell A, Worth RG. Variation of stress levels, burnout, and resilience throughout the academic year in first-year medical students. *PLoS One*. 2020;15(10):e0240667. doi:10.1371/journal.pone.0240667

13. Myint KM, Khaing NN. Factors influencing academic engagement of university students: a meta-analysis study. *J Myanmar Acad Arts Sci.* 2020;18:185–199.
14. Virtanen V, Pyhältö K. What engages doctoral candidates in biological and environmental science to doctoral studies? *Psychol.* 2012;12A:1231–1237. doi:10.4236/psych.2012.312A182
15. Zhang G, Wu H, Xie AN, Cheng H. The association between medical student research engagement with learning outcomes. *Med Educ Online.* 2022;27(1):2100039. doi:10.1080/10872981.2022.2100039
16. Kassab SE, El-Sayed W, Hamdy H. Student engagement in undergraduate medical education: a scoping review. *Med Educ.* 2022;56(7):703–715. doi:10.1111/medu.14799
17. Babenko O, Oswald A. The roles of basic psychological needs, self-compassion, and self-efficacy in the development of mastery goals among medical students. *Med Teach.* 2019;41(4):478–481. doi:10.1080/0142159X.2018.1442564
18. Jeong Y, Kim JY, Ryu JS, Lee KE, Ha EH, Park H. The associations between social support, health-related behaviors, socioeconomic status and depression in medical students. *Epidemiol Health.* 2010;32:e2010009. doi:10.4178/epih/e2010009
19. Oró P, Esquerda M, Mas B, Viñas J, Yuguero O, Pifarré J. Effectiveness of a mindfulness-based programme on perceived stress, psychopathological symptomatology and burnout in medical students. *Mindfulness.* 2021;12:1138–1147. doi:10.1007/s12671-020-01582-5
20. Cavanaugh MA, Boswell WR, Roehling MV, Boudreau JW. An empirical examination of self-reported work stress among US managers. *J Appl Psychol.* 2000;85(1):65–74. doi:10.1037/0021-9010.85.1.65
21. Hobfoll SE. Conservation of resources: a new attempt at conceptualizing stress. *Am Psychol.* 1989;44(3):513–524. doi:10.1037/0003-066X.44.3.513
22. Salam A, Yousuf R, Bakar SMA, Haque M. Stress among medical students in Malaysia: a systematic review of literatures. *Int Med J.* 2013;20(6):649–655.
23. McCauley KD, Hinojosa AS. Applying the challenge-hindrance stressor framework to doctoral education. *J Manag Educ.* 2020;44(4):490–507. doi:10.1177/1052562920924072
24. Van Ryzin MJ, Roseth CJ. The cascading effects of reducing student stress: cooperative learning as a means to reduce emotional problems and promote academic engagement. *J Early Adolesc.* 2021;41(5):700–724. doi:10.1177/0272431620950474
25. Raufelder D, Kittler F, Braun SR, Lätsch A, Wilkinson RP, Hoferichter F. The interplay of perceived stress, self-determination and school engagement in adolescence. *Sch Psychol Int.* 2014;35(4):405–420. doi:10.1177/0143034313498953
26. Af Ursin P, Järvinen T, Pihlaja P. The role of academic buoyancy and social support in mediating associations between academic stress and school engagement in Finnish primary school children. *Scand J Educ Res.* 2021;65(4):661–675. doi:10.1080/00313831.2020.1739135
27. An M, Kang AY, Kim YA, et al. Comparison of academic engagement, academic burnout, stress, and social support by grade among undergraduate nursing students. *J Korean Soc Sch Health.* 2017;30(2):113–123. doi:10.15434/kssh.2017.30.2.113
28. Saleem MS, Isha ASN, Awan MI, Yusop YB, Naji GMA. Fostering academic engagement in post-graduate students: assessing the role of positive emotions, positive psychology, and stress. *Front Psychol.* 2022;13:920395. doi:10.3389/fpsyg.2022.920395
29. Chyu EPY, Chen JK. Associations between academic stress, mental distress, academic self-disclosure to parents and school engagement in Hong Kong. *Front Psychiatry.* 2022;13:911530. doi:10.3389/fpsyg.2022.911530
30. Podsakoff NP, LePine JA, LePine MA. Differential challenge stressor-hindrance stressor relationships with job attitudes, turnover intentions, turnover, and withdrawal behavior: a meta-analysis. *J Appl Psychol.* 2007;92(2):438–454. doi:10.1037/0021-9010.92.2.438
31. Hargrove MB, Nelson DL, Cooper CL. Generating eustress by challenging employees: helping people savor their work. *Organ Dyn.* 2012;42:61–69. doi:10.1016/j.orgdyn.2012.12.008
32. Koeske GF, Koeske RD. A preliminary test of a stress-strain-outcome model for reconceptualizing the burnout phenomenon. *J Soc Serv Res.* 1993;17(3–4):107–135. doi:10.1300/J079v17n03_06
33. Frese M, Zapf D. Methodological issues in the study of work stress: objective vs. subjective measurement of work stress and the question of longitudinal studies. In: Cooper CL, Payne R, editors. *Causes, Coping and Consequences of Stress at Work.* Chichester: Wiley; 1988:375–411.
34. Spector PE, Jex SM. Development of four self-report measures of job stressors and strain: interpersonal conflict at work scale, organizational constraints scale, quantitative workload inventory, and physical symptoms inventory. *J Occup Health Psychol.* 1998;3(4):356–367. doi:10.1037/1076-8998.3.4.356
35. LePine JA, LePine MA, Jackson CL. Challenge and hindrance stress: relationships with exhaustion, motivation to learn, and learning performance. *J Appl Psychol.* 2004;89(5):883–891. doi:10.1037/0021-9010.89.5.883
36. LePine JA, Podsakoff NP, LePine MA. A meta-analytic test of the challenge stressor-hindrance stressor framework: an explanation for inconsistent relationships among stressors and performance. *Acad Manag J.* 2005;48(5):764–775. doi:10.5465/amj.2005.18803921
37. Jex SM. *Stress and Job Performance: Theory, Research, and Implications for Managerial Practice.* Thousand Oaks, CA: Sage Publications Ltd; 1998.
38. Cordes CL, Dougherty TW. A review and an integration of research on job burnout. *Acad Manage Rev.* 1993;18(4):621–656. doi:10.5465/amr.1993.9402210153
39. Leiter MP, Maslach C. The impact of interpersonal environment on burnout and organizational commitment. *J Organ Behav.* 1988;9(4):297–308. doi:10.1002/job.4030090402
40. Hobfoll SE. Social and psychological resources and adaptation. *Rev Gen Psychol.* 2002;6(4):307–324. doi:10.1037/1089-2680.6.4.307
41. Hobfoll SE, Johnson RJ, Ennis N, Jackson AP. Resource loss, resource gain, and emotional outcomes among inner city women. *J Pers Soc Psychol.* 2003;84(3):632–643. doi:10.1037/0022-3514.84.3.632
42. Liu Y, Wang M, Chang CH, Shi J, Zhou L, Shao R. Work-family conflict, emotional exhaustion, and displaced aggression toward others: the moderating roles of workplace interpersonal conflict and perceived managerial family support. *J Appl Psychol.* 2015;100(3):793–808. doi:10.1037/a0038387
43. Park HI, Jacob AC, Wagner SH, Baiden M. Job control and burnout: a meta-analytic test of the Conservation of Resources model. *Appl Psychol.* 2014;63(4):607–642. doi:10.1111/apps.12008
44. Denovan A, Dagnall N, Macaskill A, Papageorgiou K. Future time perspective, positive emotions and student engagement: a longitudinal study. *Stud High Educ.* 2020;45(7):1533–1546. doi:10.1080/03075079.2019.1616168

45. Rodríguez-Muñoz A, Antino M, Ruiz-Zorrilla P, Ortega E. Positive emotions, engagement, and objective academic performance: a weekly diary study. *Learn Individ Differ*. 2021;92:102087. doi:10.1016/j.lindif.2021.102087
46. Sonnentag S, Mojza EJ, Demerouti E, Bakker AB. Reciprocal relations between recovery and work engagement: the moderating role of job stressors. *J Appl Psychol*. 2012;97(4):842–853. doi:10.1037/a0028292
47. Hobfoll SE. The influence of culture, community, and the nested-self in the stress process: advancing conservation of resources theory. *Appl Psychol*. 2001;50(3):337–421. doi:10.1111/1464-0597.00062
48. Fritz C, Lam CF, Spreitzer GM. It's the little things that matter: an examination of knowledge workers energy management. *Acad Manage Perspect*. 2011;25(3):28–39. doi:10.1108/dlo.2012.08126aaa.010
49. Trougakos JP, Hideg I, Cheng BH, Beal DJ. Lunch breaks unpacked: the role of autonomy as a moderator of recovery during lunch. *Acad Manage J*. 2014;57(2):405–421. doi:10.5465/amj.2011.1072
50. Sonnentag S, Fritz C. The Recovery Experience Questionnaire: development and validation of a measure for assessing recuperation and unwinding from work. *J Occup Health Psychol*. 2007;12(3):204–221. doi:10.1037/1076-8998.12.3.204
51. Sun Y, Hu X, Ding Y. Learning or relaxing: how do challenge stressors stimulate employee creativity? *Sustainability*. 2019;11(6):1779. doi:10.3390/su11061779
52. Yao H, Ma L. The influence of challenge-obstacle scientific research stress on postgraduate psychological anxiety: the mediating role of achievement motivation and self-efficacy. *China High Educ Res*. 2021;05:79–85. In Chinese.
53. Stone AA, Kennedy-Moore E, Neale JM. Association between daily coping and end-of-day mood. *Health Psychol*. 1995;14(4):341–349. doi:10.1037/0278-6133.14.4.341
54. Fredrickson BL, Mancuso RA, Branigan C, Tugade MM. The undoing effect of positive emotions. *Motiv Emot*. 2000;24:237–258. doi:10.1023/A:1010796329158
55. Zhang C, Mayer DM, Hwang E. More is less: learning but not relaxing buffers deviance under job stressors. *J Appl Psychol*. 2018;103(2):123–136. doi:10.1037/apl0000264
56. Kühnel J, Sonnentag S. How long do you benefit from vacation? A closer look at the fade-out of vacation effects. *J Organ Behav*. 2011;32(1):125–143. doi:10.1002/job.699
57. Davidson R, MacKinnon JG. Bootstrap inference in a linear equation estimated by instrumental variables. *Econometrics J*. 2008;11(3):443–477. doi:10.1111/j.1368-423X.2008.00247.x
58. Crawford ER, Le Pine JA, Rich BL. Linking job demands and resources to employee engagement and burnout: a theoretical extension and meta-analytic test. *J Appl Psychol*. 2010;95(5):834–848. doi:10.1037/a0019364
59. Yao AY, Jamal M, Demerouti E. Relationship of challenge and hindrance stressors with burnout and its three dimensions. *J Pers Psychol*. 2015;14:203–212. doi:10.1027/1866-5888/a000141
60. Wu H, Qiu S, Dooley LM, Ma C. The relationship between challenge and hindrance stressors and emotional exhaustion: the moderating role of perceived servant leadership. *Int J Environ Res Public Health*. 2020;17(1):282. doi:10.3390/ijerph17010282
61. Zhou B, Li Y, Hai M, Wang W, Niu B. Challenge-hindrance stressors and cyberloafing: a perspective of resource conservation versus resource acquisition. *Curr Psychol*. 2021;1–10. doi:10.1007/s12144-021-01505-0
62. Cooper CL, Dewe PJ, O'Driscoll MP. *Organizational Stress: A Review and Critique of Theory, Research, and Applications*. Thousand Oaks, CA: Sage; 2001.
63. Bakker AB, Demerouti E, Sanz-Vergel AI. Burnout and work engagement: the JD–R approach. *Annu Rev Organ Psychol Organ Behav*. 2014;1(1):389–411. doi:10.1146/annurev-orgpsych-031413-091235
64. Hobfoll SE, Freedy J. Conservation of resources: a general stress theory applied to burnout. In: *Professional Burnout*. New York: Routledge; 2017:115–129.
65. Prem R, Ohly S, Kubicek B, Korunka C. Thriving on challenge stressors? Exploring time pressure and learning demands as antecedents of thriving at work. *J Organ Behav*. 2017;38(1):108–123. doi:10.1002/job.2115
66. Flinchbaugh C, Luth MT, Li P. A challenge or a hindrance? Understanding the effects of stressors and thriving on life satisfaction. *Int J Stress Manag*. 2015;22(4):323–345. doi:10.1037/a0039136
67. Sawhney G, Michel JS. Challenge and hindrance stressors and work outcomes: the moderating role of day-level affect. *J Bus Psychol*. 2022;37(2):389–405. doi:10.1007/s10869-021-09752-5
68. Sonnentag S, Venz L, Casper A. Advances in recovery research: what have we learned? What should be done next? *J Occup Health Psychol*. 2017;22(3):365–380. doi:10.1037/ocp0000079

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