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Mediating Role of Mindfulness and Self-Regulation in the Relationship between Perceived Stress and Subjective Well-Being among University Students

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Abstract

Objective: This study aimed to explore the mediating roles of mindfulness and self-regulation in the correlation between perceived stress and subjective well-being among university students

Method: The research involved 353 undergraduates and utilized the Chinese version of the Perceived Stress Scale (CPSS), the Subjective Happiness Scale (SHS), the Mindfulness Attention Awareness Scale (MAAS), and the Self-Regulation Survey (SRS). Partial least square structural equation modelling (PLS-SEM) through SmartPLS software was used to test the proposed relationships.

Results: The findings indicated significant relationships among perceived stress, subjective well-being, self-regulation, and mindfulness. Specifically, perceived stress positively predicted mindfulness ($\beta = 0.400$, $t = 6.233$, $P < 0.001$) and self-regulation ($\beta = 0.441$, $t = 5.547$, $P < 0.001$). Mindfulness significantly mediated the relationship between perceived stress and subjective well-being ($\beta = 0.241$, $t = 3.559$, $P < 0.001$), while self-regulation did not exhibit a mediating effect. This suggests that, although self-regulation assists students in managing behaviors and emotions, it may not influence the stress-well-being pathway as effectively as mindfulness does.

Conclusion: The results underscore the importance of integrating mindfulness strategies into educational programs to enhance students' mental and emotional well-being. This study provides empirical support for the development of mindfulness-related curricula in universities, suggesting that fostering mindfulness could serve as a pivotal intervention for improving subjective well-being among students facing high levels of perceived stress.

Key words: *Mental Health; Mindfulness; Psychological; Psychologic Stress; Self-Regulation; Well Being*

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In recent years, the prevalence of stress among university students has risen to concerning levels, sparking significant academic and social interest. Perceived stress is defined as the subjective assessment of stressors in one's life, encompassing feelings of being overwhelmed and unable to cope. For university students, who navigate complex demands such as rigorous academic expectations, social transitions, and financial pressures, the experience of heightened stress can have detrimental effects on both their academic performance and overall well-being (1-3). Research indicates that a substantial number of students report experiencing high levels of stress, which can lead to anxiety, depression, and reduced academic engagement (4-6).

The impact of perceived stress on student populations underscores the necessity for effective coping strategies. Two psychological constructs that have garnered attention as potential buffers against perceived stress are mindfulness and self-regulation. Mindfulness, rooted in Eastern traditions of meditation, involves maintaining an open, non-judgmental awareness of the present moment. It emphasizes acceptance of thoughts and feelings without judgment, fostering a greater understanding of one's emotional state (7, 8). A growing body of literature suggests that mindfulness is associated with reduced stress levels, greater emotional regulation, and improved overall mental health (9, 10). For instance, studies have demonstrated that students who engage in mindfulness practices report lower levels of perceived stress and enhanced well-being (11).

Self-regulation, on the other hand, refers to the ability to monitor and manage one's thoughts, emotions, and behaviors. It encompasses a range of skills, including goal-setting, self-monitoring, and self-evaluation. Effective self-regulation is crucial for academic success, as it enables students to prioritize tasks, manage time efficiently, and maintain motivation despite obstacles (12, 13). Research has indicated a positive correlation between self-regulation and academic performance, with students possessing strong self-regulatory skills generally achieving better outcomes (14). Furthermore, self-regulation has been linked to well-being, as individuals with effective self-regulation are better equipped to cope with stress and emotional challenges (15, 16).

The interplay between mindfulness, self-regulation, and perceived stress presents a compelling area of inquiry. Mindfulness may function as a protective factor, allowing individuals to respond to stressors with greater ease and clarity. Studies indicate that increased mindfulness is associated with lower levels of perceived stress, suggesting that fostering mindfulness can enhance emotional resilience (17, 18). For instance, a meta-analysis examining the effects of mindfulness-based interventions found significant reductions in perceived stress and improvements in overall well-being among participants (19).

Simultaneously, self-regulation may mediate the relationship between perceived stress and subjective well-being. Students who can effectively regulate their emotions and behaviors may experience less perceived stress and subsequently report higher levels of subjective well-being (20, 21). Various studies have highlighted these dynamics, revealing that self-regulation skills can mitigate the adverse effects of stress on well-being (22). However, the relationships among perceived stress, mindfulness, self-regulation, and subjective well-being are intricate and warrant further exploration (23).

Despite the extensive research on mindfulness and self-regulation, the literature is somewhat limited concerning the specific interactions among these constructs in university students. Although some studies have established correlations between these variables, the mediating roles of mindfulness and self-regulation in the context of perceived stress and subjective well-being remain underexplored (24, 25). Consequently, herein lies the significance of the current study: to elucidate these relationships and clarify how mindfulness and self-regulation may serve as mechanisms through which perceived stress influences subjective well-being among university students.

The proposed research seeks to address the following key questions: 1) How does perceived stress affect the levels of mindfulness and self-regulation among university students? 2) What mediating roles do mindfulness and self-regulation play in the relationship between perceived stress and subjective well-being? By investigating these questions, the study aims to contribute to the existing body of literature and offer insights that are applicable to psychological interventions within academic settings.

Understanding the interplay between perceived stress, mindfulness, and self-regulation is critical for developing effective strategies to enhance students' psychological resilience. By fostering mindfulness practices and self-regulatory skills, educational institutions can better equip students to cope with the inevitable pressures of academic life (26). Such interventions may not only decrease perceived stress but could also promote overall well-being and academic success (27, 28). In summary, the increasing levels of perceived stress among university students necessitate effective coping strategies, with mindfulness and self-regulation emerging as promising constructs. This study aims to bridge the existing research gaps by exploring the relationships among perceived stress, mindfulness, self-regulation, and subjective well-being. The findings may inform the development of targeted interventions, ultimately enhancing the mental health and academic performance of university students.

Materials and Methods

Research Design

This research utilizes a quantitative design combined with structural equation modelling to explore the interrelationships between mindfulness, self-regulation, subjective well-being, and perceived stress among

university students in Jiangxi Province, China. Participants of this research are students from Jiangxi Province, with a total sample of 353 Chinese university students participating in the research, selected using cluster random sampling methods. Questionnaires were used as the primary data collection tool. This analytical approach investigates the interconnectedness and dynamic processes among the four variables—mindfulness, self-regulation, perceived stress and subjective well-being—within the university students' population.

Population and Sample Size

The target population for this study consists of undergraduate students enrolled in universities in Jiangxi Province. Through the cluster random sampling method (Figure 1), participants were randomly selected from three local universities. The information provided by all participants in this study was kept confidential. All participants volunteered to participate in this survey. Utilizing the Sample Size Calculator software, the total sample size was predicted to achieve a statistical power of 0.95, with α set at 0.05. Based on these calculations, the required sample size was determined to be 320 subjects. To account for potential attrition, for example because of incomplete responses or non-cooperative subjects, the study recruited 10% more participants than the required sample size for the survey (29). Therefore, after increasing the sample size by 10%, the final sample size required for this survey was calculated to be 353. A cross-sectional survey was conducted in February-March 2024, randomly selecting students from 11 different majors for this study. The study conducted an open recruitment process, enlisting volunteers from first-year to fourth-year university students.

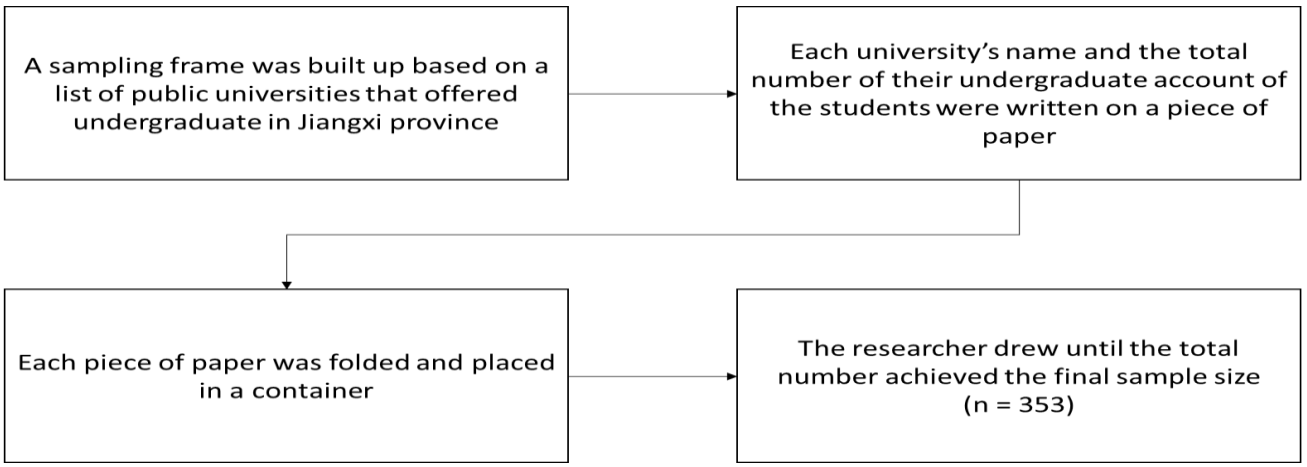

Figure 1. Cluster Random Sampling Process to Assess the Relationship between Perceived Stress and Subjective Well-being in University Students.

Instruments

This study integrated four scales to evaluate the variables, detailed as follows:

Subjective Well-being: The Subjective Happiness Scale (SHS), created by Lyubomirsky and Lepper in 1999, consists of four items in its questionnaire format, employing a 7-point Likert scale ranging from 1 (unhappy) to 7 (happy). It assesses global subjective well-being based on participants' self-assessments or comparisons with others. The SHS demonstrated strong internal consistency, with a correlation coefficient of 0.86, and exhibited good convergent validity (0.62) when compared to related constructs like optimism, self-esteem, and positive emotions. The SHS has been shown to have a significant Cronbach's alpha of 0.86 (30).

Perceived Stress: This study utilised the Chinese version of the Perceived Stress Scale (CPSS), originally developed by Cohen *et al*. (1983) and later revised by Yang Tingzhong and Huang Hanteng (2003) (31). For this purpose, a Likert-type scale is used (1 = never, 5 = a lot). The scale was translated and revised in accordance with the cultural context of China to ensure its relevance to Chinese culture and national conditions. Additionally, necessary modifications were made to its overall structure and specific items. After developing the preliminary questionnaire, its reliability and validity were re-evaluated. The scale demonstrated high internal consistency, with a Cronbach's alpha coefficient of 0.88 (32).

Mindfulness: We used a trait version of the Mindful Attention Awareness Scale (MAAS) to assess subjects' positive thoughts. The one-dimensional scale consists of 15 items, and the internal consistency and reliability estimates for the MAAS are of good quality (alpha range = 0.89-0.93 across time). Participants rated their responses on a six-point Likert scale (1 = almost always, 6 = almost always) (33).

Self-regulation: The Chinese version of the Self-Regulation Scale (SRS) was used in this research. It consists of three dimensions, aimed at measuring the contributions of two sources of self-regulation proposed by the biological functional model. The first dimension is positive self-regulation; the second is dynamic self-regulation; and the third combines various forms of self-

regulation, integrating proactive and dynamic self-regulation. The SRS contains 40 items, scored using a 5-point Likert scale. Three items for each dimension were selected based on surface validity, and the scale has been validated by educational psychologists and mathematics educators. The overall Cronbach's alpha value for the scale is 0.90 (34).

Data Analysis

This study employed SPSS 26.0 and Smart PLS 4.0 for the following statistical analyses of the survey data: structural model analysis and mediation analysis using Partial Least Squares Structural Equation Modeling (PLS-SEM). PLS-SEM was employed due to its strengths in confirmatory analysis, model development, and exploration of emerging research trends (35). A key advantage of Smart-PLS lies in its ability to simultaneously measure both reflective and formative constructs. Its capacity to address constraints within structures, as well as to manage prediction and mediation relationships in PLS, is uniquely positioned compared to established methods (36). This analytical method was chosen considering the ability of PLS-SEM to solve measurement errors in structural models and to estimate causal relationships between all potential components. In this study, the influence of first-order factors on second-order factors within the self-regulation construct was considered, and a structural assessment of the model was conducted. Drawing from the current body of literature, five distinct hypotheses were proposed to address the research question: "How do self-regulation and mindfulness mediate the effects of perceived stress on subjective well-being among Chinese university students?"

In the structural model analysis, seven hypotheses were posited: 1. Perceived stress is significantly and positively related to mindfulness; 2. Perceived stress is significantly and positively related to self-regulation; 3. Self-regulation is significantly and positively related to subjective well-being; 4. Mindfulness is significantly and positively related to subjective well-being; 5. Perceived stress is significantly related to subjective well-being; 6. Self-regulation mediates the relationship between perceived stress and subjective well-being; 7. Mindfulness mediates the relationship between perceived stress and subjective well-being. A t-value exceeding 1.196 indicates the significance of the hypothesis. This study examined how self-regulation mediates the relationship between perceived stress and subjective well-being through employing mediating effect analysis. The study utilized the latest methods, focusing on bootstrapping techniques to test the mediating roles of different constructs.

Ethical Consideration

This study was approved by the UCSI Ethics Committee and the Faculty of Social Sciences and Liberal Arts at UCSI University. All procedures strictly adhered to relevant local laws and institutional guidelines. In line with local regulations, the Ethics Committee/Institutional Review Board waived the requirement for written informed consent from participants or their legal guardians/next of kin.

Results

Table 1 shows descriptive statistics of the participants' sociodemographic profiles. A total of 353 undergraduate students were involved in this study. Of these, 222 were female, and 131 were male. The age of participants ranged from 18 to 24; 317 were in the age range of 18 to 21 years, and 35 were in the age range of 22 to 24 years. According to the descriptive statistics, 132 respondents were majoring in Physical Education, two were majoring in Nursing, 49 in English, 65 in Chinese Language and Literature, 47 in Music, nine in Visual Communication Program, 10 in Communications Engineering, one in Civil Engineering, 35 in Internet and New Media, one in New Energy Materials and Devices, and two in Pre-school Education.

Table 1. Demographic Characteristics of University Students Participating in the Study on the Relationship between Perceived Stress and Subjective Well-Being.

	Frequency	Percentage
Gender		
Male	131	37.1
Female	222	62.9
Age		
18-21	317	89.8
22-24	35	9.9
Specialized Field		
Physical Education	132	37.4
Nursing	2	0.6
English (language)	49	13.9
Chinese Language and Literature	65	18.4

Music	47	13.3
Visual Communication Program	9	2.5
Communications Engineering	10	2.8
Civil Engineering	1	0.3
Internet and New Media	35	9.9
New Energy Materials and Devices	1	0.3
Pre-school Education	2	0.6
Total	353	100

Structural Model Assessment

This section aims at testing the path coefficients (that is, the relationship between the structures) and the statistical significance of the structural paths. H1 evaluates whether perceived stress significantly and positively affects mindfulness. The results revealed that perceived stress has a significant and positive impact on mindfulness ($\beta = 0.400$, $t = 6.233$, $P < 0.001$); hence, hypothesis 1 (H1) was supported. H2 evaluates whether perceived stress significantly and positively affects self-regulation. The results revealed that perceived stress has a significant and positive impact on mindfulness ($\beta = 0.441$, $t = 5.547$, $P < 0.001$). Hence, H2 was supported. H3 evaluates whether perceived stress significantly and positively affects subjective well-being. The results revealed that perceived stress has a significant and positive impact on mindfulness ($\beta = 0.248$, $t = 3.320$, $P < 0.001$). Hence, H3 was supported. H4 evaluates whether mindfulness significantly and positively affects subjective well-being. The results revealed that mindfulness has a significant and positive impact on subjective well-being ($\beta = 0.241$, $t = 0.559$, $P < 0.001$); hence, H4 was supported. H5 evaluates whether self-regulation support significantly and positively affects subjective well-being. The results revealed that self-regulation support has an insignificant impact on subjective well-being ($\beta = 0.032$, $t = 0.459$, $P = 0.646$). Hence, H5 was not supported. Table 2 presents the reliably estimated findings for the three dimensions of self-regulation as a second-order construct. Table 2 and Figure 2 present the results of all the hypotheses.

Table 2. The Reliably Estimated Findings for the Three Dimensions of Self-regulation: Direct Relationships between Different Variables of the Study

Relationship	Beta Coefficient	Standard deviation	T-statistics	P-value	Results
CP → MA	0.400	0.064	6.233	< 0.001	Supported
CP → SR	0.441	0.080	5.547	< 0.001	Supported
CP → SW	0.248	0.075	3.320	0.001	Supported
MA → SW	0.241	0.068	3.559	< 0.001	Supported
SR → SW	0.032	0.069	0.459	0.646	Not Supported

CP = perceived stress, SR = self-regulation, MA = mindfulness Awareness, SW = subjective well-being.

Mediation Analysis

According to H6, self-regulation states the mediating relationship between perceived stress and subjective well-being. In line with the study's results, self-regulation had an insignificant relationship with perceived stress ($\beta = 0.441$, $t = 5.547$) and subjective well-being ($\beta = 0.032$, $t = 0.459$). Therefore, self-regulation did not mediate the relationship between perceived stress and subjective well-being. According to H7, mindfulness states the mediating relationship between perceived stress and subjective well-being. Consistent with the study's outcomes, mindfulness directly affected perceived stress ($\beta = 0.400$, $t = 6.233$) and subjective well-being ($\beta = 0.241$, $t = 6.233$). The indirect effect of perceived stress on mindfulness and subjective well-being was significant. So, mindfulness played a mediating role in the relationship between perceived stress and subjective well-being. Table 3 and Figure 2 show all the mediation results.

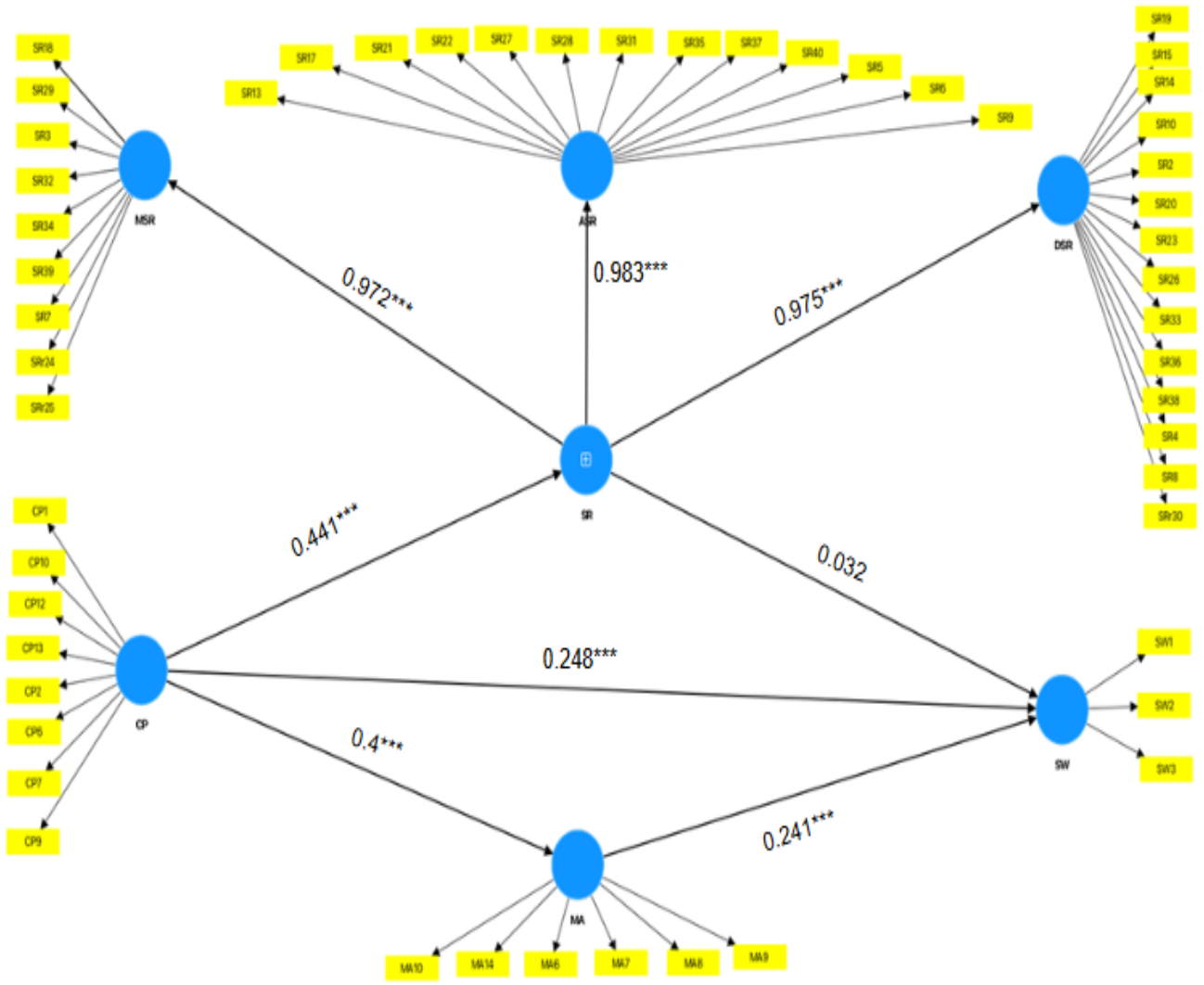

Figure 2. Structural Model Assessment to Assess the Relationship between Perceived Stress and Subjective Well-Being among University Students.

Table 3. Results of Mediation Analyses Assessing the Relationship between Perceived Stress and Subjective Well-Being among University Students.

Path	Indirect effect	Total effect	T-statistics	P-value	Type of mediation
SR → SW		0.032	0.459	0.646	
CP → SR		0.441	5.547	< 0.001	
CP → SR → SW	0.014		0.453	0.651	No mediating effect
MA → SW		0.241	3.559	< 0.001	
CP → MA		0.400	6.233	< 0.001	
CP → MA → SW	0.096		3.327	< 0.001	Partial

CP = perceived stress, SR = self-regulation, MA = mindfulness Awareness, SW = subjective well-being.

Discussion

This study aims to explore the mediating roles of mindfulness and self-regulation in the connection between perceived stress and subjective well-being among university students. These findings offer new insights into how psychological mechanisms can aid students in coping with stress and suggest potential pathways for enhancing their well-being. Firstly, Self-

regulation does not demonstrate a meaningful mediating role between perceived stress and subjective well-being. While self-regulation skills indeed assist individuals in managing stress more effectively, their direct impact on subjective well-being may be more complex. Research suggests that while self-regulation can reduce stress, improvements in well-being may require the involvement of additional factors, such as social support or emotional intelligence (15). These factors may either interact with or modulate the effects of self-regulation. Moreover, other studies indicate that the impact of self-regulation on well-being may depend on higher-order psychological processes, such as cognitive reappraisal or mindfulness (37). In these situations, self-regulation may not act as a significant mediator between subjective well-being and perceived stress.

This research indicates that mindfulness plays a significant moderating role in the relationship between perceived stress and subjective well-being. This suggests that individuals can use mindfulness to better interpret and manage stress, enhancing their subjective well-being. This aligns with research demonstrating that mindfulness practice enhances individual emotional regulation and mental health (38). The findings of this research indicate that the score of stress perception is positively correlated with the score of subjective well-being, and the results show that the higher the score of MAAS, the higher the score of SHS. However, mental health is influenced by various factors, including physiological, psychological, and interpersonal factors. For instance, patients with chronic pain with higher levels of mindfulness report lower levels of distress, anxiety, and depressive symptoms compared to those with lower levels of mindfulness, and they also exhibit better physical and overall health (39, 40). Given the wide range of factors affecting well-being, it is not surprising that the contribution of mindfulness to well-being is relatively modest. Research has indicated that higher levels of mindfulness are linked to improved subjective well-being, and increases in trait mindfulness among long-term practitioners were significantly correlated with enhancements in well-being (41). The outcomes of this research demonstrate a direct correlation between perceived stress and subjective well-being. Individuals with higher levels of resilience experience fewer adverse effects on mental health (42). In stressful situations, resilience has been positively associated with well-being, aligning with the findings of the current research (43). The combination of deep breathing and mindfulness techniques can promote cognitive, emotional, and behavioral self-regulation, contributing to enhanced resilience and well-being.(44)

For university students, common sources of stress may include life adjustment, academic challenges, career planning, and interpersonal relationships, making it unsurprising that they often experience ongoing stress (45, 46). High levels of perceived stress negatively impact the development of both physical and mental health, which in turn affects subjective well-being (47). Participants of this research were university students who typically have high expectations of themselves, resulting in significant self-imposed pressure. However, excessive pressure can be counterproductive to goal achievement. The harmful effects of high perceived stress are particularly evident in disrupted thinking, impaired task performance, and diminished decision-making abilities. Additionally, high levels of perceived stress are generally accompanied by anxiety and worry, which are negative emotions that can adversely impact an individual's life, academic performance, and work. Therefore, perceived stress has a significant negative relationship with subjective well-being.

Furthermore, perceived stress indirectly affects subjective well-being through the mediating role of mindfulness, accounting for 18.48% of the total effect, thus supporting one of our hypothesis. After inducing high perceived stress and negative emotional states in individuals, higher levels of mind-wandering were observed (48). This is because, in high-stress situations, individuals struggle to focus on the present, and their cognition shifts to anticipatory thinking, often manifesting as worry about stressors. Even after the stressors subside, individuals continue to reflect on past stressors, increasing mind-wandering, which is contrary to the principles of mindfulness.

Research indicates that mindfulness, with its focus on the present moment, can enhance positive emotions and overall well-being, particularly for university students who often struggle with perceived stress (49). When individuals fail to maintain their attention to the present, they miss out on positive emotional experiences, leading to increased negative emotions and lower life satisfaction, particularly among those with high stress levels who lack the psychological resources needed for effective coping. Conversely, students with lower stress are more capable of mindfulness, resulting in greater energy and a more positive outlook on life. Additionally, individuals who approach challenges seriously tend to align their actions with their values, managing problems without relying on emotion-based coping strategies. This study suggests that mindfulness moderates the relationship between perceived stress and well-being, supporting previous findings while providing empirical evidence for the interconnectedness of these factors. It lays the groundwork for future research, particularly in developing moderated mediation models, thereby enhancing our understanding of the complex dynamics between perceived stress, mindfulness, and subjective well-being.

Implications of the Study

Through this study, a deeper understanding is gained about the importance of mindfulness awareness, self-regulation, and stress concerning their well-being. Such insight may foster greater interest and engagement in mindfulness practices, encouraging students to actively incorporate mindfulness into their daily lives. This, in

turn, could enhance self-awareness, improve interpersonal relationships, and elevate subjective well-being, facilitating a balanced approach between academic and personal life. By thoroughly investigating the relationships among mindfulness, self-regulation, stress, and well-being in university students and integrating relevant research, this approach can effectively assist students in improving their mindset and enhancing their self-regulation capabilities through increased mindfulness. This, in turn, can lead to greater joy in their future lives. Additionally, providing effective strategies for students to address challenges, alleviate stress, and manage negative emotions holds significant practical implications for the overall development and healthy growth of their personalities. Through a comprehensive understanding of these mechanisms, this study can provide empirical support for schools and mental health professionals to develop and implement more effective mindfulness training programs and interventions, thereby improving students' psychological well-being. In particular, it can provide university students with a more comprehensive mental health strategy by exploring the interactions between mindfulness, self-regulation, and other forms of psychological support.

Limitation

This study acknowledges three main limitations. First, this study did not assess the moderating effects of self-regulation and mindfulness on university students' perceived stress and subjective well-being. Second, the data collection was conducted solely in one province, which may affect the generalizability of the findings to other regions. Ultimately, this study relied solely on quantitative approaches, yet incorporating qualitative methods could strengthen the validation of the quantitative findings. These mentioned constraints may, to some extent, restrict the interpretation and generalization of the results. Future research is recommended to conduct longitudinal studies to observe the dynamic relationships among mindfulness, self-regulation, subjective well-being, and perceived stress. Employing such a research design would enable a more thorough comprehension of the temporal dynamics of these variables. Additionally, it would be beneficial to go beyond mindfulness and self-regulation to explore other factors that may influence subjective well-being and perceived stress such as social support and learning environments. Future studies could consider the impact of these variables to enrich the findings further.

Conclusion

This study explored the relationships among mindfulness, self-regulation, subjective well-being, and perceived stress, with a particular focus on whether mindfulness and self-regulation serve as mediators in these relationships. The results revealed a significant correlation between mindfulness and subjective well-being; however, the mediating role of self-regulation in the relationship between perceived stress and subjective well-being was not found to be significant. This suggests that although self-regulation may play a certain role in moderating stress, other factors or interventions may be necessary to significantly impact subjective well-being. These findings further suggest that incorporating mindfulness training into strategies aimed at enhancing subjective well-being may be an effective approach for improving the mental health of university students. Meanwhile, the limited influence of self-regulation on subjective well-being suggests that future research could further investigate the effects of combining self-regulation with other variables, such as social support and coping strategies, to fully leverage its role in psychological health. In conclusion, mindfulness is crucial for enhancing the subjective well-being of university students, and educators and policymakers should consider integrating mindfulness training into curricula or counselling programs to help students maintain their mental health in the face of stress.

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Conflict of Interest

None.

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