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Academic self-regulation as a bridge between mindfulness and emotional self-efficacy among undergraduate students

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ABSTRACT

The research investigated the function of academic self-regulation as a mediator in the correlation between mindful attention awareness and emotional self-efficacy. A quantitative questionnaire-based study approach was used. A total 647 undergraduate participants (77.1% female), aged 18–24 (74.5%), completed self-report questionnaires, including the mindful attention awareness scale (MAAS), the academic self-regulation scale (ASRS), and the emotional self-efficacy scale (ESES). The proposed model demonstrated acceptable global fit based on the two-index criteria applied in this study, with RMSEA meeting the ≤0.06 threshold and SRMR meeting the ≤0.09 threshold; based on the data, the model appears to be suitable. The findings indicated statistically significant relationships between mindfulness and the subscales of academic self-regulation: self-instruction and self-evaluation. Academic self-regulation showed significant path coefficients with emotional self-efficacy: self-planning, self-monitoring, and self-reaction were statistically significantly associated with using and managing one's own emotions and perceiving emotions through facial expressions. Self-planning and self-monitoring were statistically significantly associated with dealing with emotions in others. Self-planning, self-monitoring, self-instruction, and self-reaction were statistically significant in their association with identifying and understanding one's own emotions. Academic self-regulation elucidates the correlation between mindfulness and emotional self-efficacy. Emotional self-efficacy and well-being can be bolstered by improving mindfulness and self-regulation.

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1. INTRODUCTION

Emotional research has emphasized students' academic performance and explored the variables that can enhance it [1]. Among the variables that influence and predict academic performance, resilience, and adaptability in learning environments is academic self-regulation. Self-regulation refers to the processes by which students effectively manage their learning environment, behaviors, and psychological states to achieve their educational goals [2]. Self-regulation theory posits that an individual's achievement of goals in life or education depends largely on self-regulation processes [3]. In learning contexts, academic self-regulation helps students manage their learning effectively by involving planning, setting goals, and monitoring

progress toward those goals [4]. Previous studies show that students with high academic achievement display elevated levels of academic self-regulation, low stress, and healthy psychological well-being [5]–[8].

Building on this, emotion regulation and attention control play complementary roles [9], [10]. Mindfulness facilitates attention and the development of metacognitive awareness, enabling students to become aware of their emotional and cognitive responses and adjust them to the situation [11], [12]. Therefore, mindfulness is hypothesized to support students' academic achievement by strengthening their ability to appropriately modulate their attention, behaviors, and emotions in response to situational demands [13], [14]. Research has shown that mindfulness practices can enhance students' self-efficacy; students with high levels of mindfulness can maintain focus, manage stress effectively, and respond effectively to academic challenges [15]–[17]. However, future studies are recommended to identify the mediating factors that strengthen the relationship between mindfulness and emotional self-efficacy.

Emotional self-efficacy refers to an individual's conviction in their capacity to manage their emotional states proficiently [18]. Emotional self-efficacy influences students' motivation, engagement, and emotional resilience, making it crucial for academic performance [19]. Prior studies have established an association between mindfulness and emotional self-efficacy, indicating that the awareness and acceptance inherent in mindfulness can enhance confidence in emotional regulation [11], [20], [21]. Self-efficacy beliefs from the perspective of Bandura's social cognitive theory influence an individual's persistence, behavioral choices, and ability to cope with challenges [22]. Students with high emotional self-efficacy demonstrate high motivation, effective stress management, and greater participation in activities [23]. Mindfulness develops emotional self-efficacy through self-awareness and emotional clarity, leading to greater emotional control [24], [25]. Although research indicates a correlation between mindfulness and emotional self-efficacy, investigations into the mediating variables in this relationship, especially the influence of academic self-regulation levels among undergraduate students, remain scarce. This study investigates the mediation function of academic self-regulation in the enhancement of emotional self-efficacy through mindfulness among undergraduate students of various nationalities.

Undergraduate students need skills in managing learning and emotions due to the repetitive academic demands that can increase stress and emotional challenges. How mindful attention awareness translates into emotional self-efficacy in academic settings remain unclear, although some previous studies have shown that mindfulness plays a role in attention control and emotional regulation, and that students' belief in their ability to effectively regulate their emotional states that is, emotional self-efficacy is fundamental to motivation, engagement, and coping. Specifically, there is a paucity of experimental research on culturally varied undergraduate cohorts investigating the mediation function of academic self-regulation in the relationship between mindfulness and emotional self-efficacy. Evidence in the psychology literature indicates that planning, goal setting, progress monitoring, behavior modification, and psychological state—components of academic self-regulation—predict well-being and accomplishment. This study aims to address this gap by investigating the impact of mindfulness on academic self-regulation and the correlation between academic self-regulation and enhanced emotional self-efficacy. The research subject concerns the clarity of the relationship between mindfulness and emotional self-efficacy in undergraduates, as well as the degree to which academic self-regulation mediates this relationship. This study seeks to examine the mediating effect of academic self-regulation on the connection between mindfulness and emotional self-efficacy in a cohort of undergraduate students. This study seeks to determine whether mindful attentive awareness correlates with emotional self-efficacy.

- Is there a correlation between academic self-regulation and emotional self-efficacy?
- Does academic self-regulation mediate the relationship between mindfulness and emotional self-efficacy?

2. LITERATURE REVIEW

Academic self-regulation is seen as a crucial determinant of success and development among undergraduate students. Numerous researches have investigated the correlations between mindfulness, emotional self-efficacy, and academic self-regulation in college students. Research indicates that mindfulness, characterized by non-judgmental awareness of the body [26], mind, and emotions, improves emotional regulation and self-efficacy among students [20]. Similarly, self-efficacy, one's perceived capability to achieve goals and overcome challenges [12], helps students cope with the challenges posed by difficult emotional situations [27]. Studying the interaction between these factors helps understand undergraduate students' academic success and well-being.

2.1. Mindfulness and emotional self-efficacy

Mindfulness entails being cognizant and sustaining awareness of the current moment, devoid of contemplation of the past or future, and refraining from making judgements. This attentive, conscious

attention to the present moment helps an individual become aware of their emotions and respond more appropriately to the demands of situations [27]. Emotional self-efficacy is an individual's feeling of being able to handle their emotions successfully. Investigating the relationship between mindfulness and emotional self-efficacy among undergraduate students is very important because this group may show symptoms of anxiety, stress, and mental health issues with the consequent negative effects [28], [29].

Wahyuni *et al.* [26] investigated the ability of self-compassion and self-efficacy to predict math anxiety at the undergraduate level. The researchers measured math anxiety levels among students in engineering, technology, science, and mathematics (STEM) and non-STEM majors. The findings indicated that students in non-STEM disciplines had greater levels of mathematical anxiety compared to their STEM counterparts. The results indicated no predictive correlation between mindfulness and arithmetic anxiety, despite the observation of a strong link. Menges and Caltabiano [12] examined the relationship between emotional regulation and mindfulness in an undergraduate population. The study's findings showed a statistically significant negative correlation between mindfulness and difficulties in emotional regulation. The findings further indicated no differences in the mean scores (total and subscale) between males and females. The results also showed no differences between the mean scores of males and females on the emotional regulation difficulties scales (total score and subscale scores).

Shawky and Shaheen [30] investigated the effectiveness of mindfulness-based cognitive therapy (MBCT) in enhancing self-efficacy and resilience in women. The results showed that the mean resilience and self-efficacy scores in the post-test were significantly higher than the pre-test in the experimental group. The researchers concluded that mindfulness-based cognitive therapy is effective in enhancing resilience and self-efficacy in women. Ramli *et al.* [27] examined the impact of a mindfulness training program for high school adolescents. The study results showed that mindfulness training enhanced the ability of the participants to regulate their emotions as assessed by pre-and post-test comparison. The researchers stressed the importance that mindfulness training programs can have on helping adolescents regulate their own emotions without changing their perception or evaluation of situations. A study performed by De la Fuente *et al.* [31] examined the relationship between mindfulness and grit against emotional stability and academic burnout among university students. The results showed significant findings that mindfulness was related to improved emotional stability and reduced academic fatigue. Mindfulness and grit were found to be important measures of lessening academic fatigue. This shows how important mindfulness is for supporting the mental health and well-being of university students. Xu *et al.* [32] evaluated the effect of a mindful leadership training program on faculty members' mindfulness and their ability to help students' mental health.

The study results showed that the level of faculty members mindfulness in the experimental group increased by 13.27%, so it is hardly less than 3.13% of the control group. Participants of the experimental group showed enhanced emotional control, mindfulness, self-awareness, and effective communication with students. They also used more practices of mindfulness in their work and dealt with the mental health issues of their students more often. These results suggest that mindful leadership training can be an effective method to improve the mindfulness, emotional regulation, and their role in supporting students' mental health of faculty members. Cai *et al.* [20] conducted a study of healthcare professionals to assess the effect of a Mindfulness-Based Compassion and Resilience Enhancement (MBCARE) program which involved mindfulness and self-compassion. The results concluded that the program resulted in reduced levels of psychological burnout, reduced levels of emotional exhaustion, and increased feelings of personal accomplishment in the healthcare professionals involved in the study. The results also showed that the positive affect improved after the training, whilst the negative affect was not affected. These findings suggest that the training in mindfulness and self-compassion, in spite of the difficulties related to time and availability, is suitable for the needs of healthcare professionals and that its implementation into their professional framework improves their ability to practice the skills acquired positively affecting their emotional stability and compassion that will reach them.

Prior research has given some clues regarding the relationship of mindfulness with emotional self-efficacy in university students. The results of these studies show the positive impact of mindfulness interventions on emotional regulation, student well-being, academic self-regulation, and psychological resilience. These studies draw attention to the importance of implementing mindfulness interventions and training programs in educational settings despite the challenges posed by the academic context and the practical application of such interventions. The results indicate that enhancement of mindfulness and emotional self-efficacy is a good strategy for enhancement of mental health and well-being of undergraduate students. However, further research is needed to understand the sustained effects of these interventions and to clarify the psychological mechanisms underlying the roles of mindfulness and emotional self-efficacy in supporting academic performance and personal development among undergraduate students.

2.2. Mindfulness and academic self-regulation

Mindfulness is an important variable in shaping undergraduate students' academic experiences. Previous studies demonstrate relationship between mindfulness and students' academic performance. The results of these studies indicate that developing mindfulness skills and adopting effective self-regulation strategies can significantly contribute to enhancing academic performance, developing students' skills in coping with academic stress, and mitigating its negative long-term effects [20], [26], [33], [34]. Academic self-regulation is defined as the conscious regulation of personal thoughts, emotions, and behaviors [35]. The importance of the interaction between mindfulness and self-regulation in the academic context is evident, as this interaction contributes to enhancing students' academic achievement, psychological resilience, and supporting their emotional well-being [36]–[38].

Numerous studies have indicated favorable correlations among mindfulness, self-regulation, and academic self-regulation [39]–[43]. Cai *et al.* [20] identified a link between five subscales of mindfulness and self-regulation in their research of university students. The study's results indicated that the subscales of observing, behaving with awareness, and non-judging were positively correlated with delayed gratification skills. The subscales of describing, behaving with awareness, and non-judging exhibited a negative correlation with difficulties in emotion regulation, after accounting for the influence of other mindfulness subscales. These findings confirm the role of some aspects of mindfulness in promoting self-regulation, emotional regulation, and delaying gratification, which enhances students' ability to cope with academic stress. In return, Ramli *et al.* [27] examined the effectiveness of a mindfulness intervention in enhancing self-control and perceived academic control among female students. The study findings indicated that mindfulness training contributed to enhancing students' self-control skills and enhancing conscious academic control. These findings suggest that mindfulness can play a pivotal role in supporting behavioral and cognitive dimensions associated with academic performance and helping to reduce stress and academic pressure. Wahyuni *et al.* [26] investigated the function of mindfulness as a mediating variable between academic stress and self-regulation, as well as the interrelations among academic stress, self-regulation, and mindfulness among Malaysian undergraduate students. The research identified substantial relationships among mindfulness, self-regulation, and academic stress. The study results did not indicate a mediating function for mindfulness in the link between self-regulation and academic stress.

The literature focused on the role of mindfulness in enhancing the academic experience and promoting the well-being of university students. Mindfulness skills are clearly effective in helping students regulate their emotions and manage psychological stress, which positively impacts their academic performance and resilience [20], [26], [33], [34], [36]–[38]. The recommendations in these studies indicate the need to investigate the long-term impact of mindfulness interventions on self-regulation and academic self-regulation, with a focus on understanding the variables that explain the relationship between mindfulness and improving students' well-being. Evaluating the effectiveness of different models of mindfulness programs is also essential for developing supportive and flexible strategies that enhance students' academic performance. In general, the reviewed studies emphasize the importance of integrating mindfulness into educational settings, given its clear impact on developing students' skills, enhancing self-regulation skills, promoting well-being, and academic achievement at the university level.

2.3. Academic self-regulation and emotional self-efficacy

Key factors causing the academic success and psychological well-being of undergraduate students include academic self-regulation and emotional self-efficacy. According to Cai *et al.* [20], self-efficacy and psychological well-being are essential requirements in the academic settings. Menges and Caltabiano [12] therefore also highlight on the fact that emotional self-efficacy plays a role in human growth and counters emotional difficulties when confronted with a negative situation. Studies have offered profound understanding of the interrelatedness of these concepts and the direct and indirect psychological effect of these concepts on various academic and personal aspects of undergraduate students.

The results of the study suggest that academic stress and stress symptoms of the undergraduate students are influenced by self-regulation and external regulation deriving from pedagogical approaches. The researchers theorized that academic stress symptoms are influenced by the level of self-regulation of students (low/medium/high) combined with the level of outside control within the educational setting (low/medium/high). The research was conducted on a group of 527 undergraduates. The level of academic stress experienced by students can be predicted from the self-regulation skills of students and the features of the regulatory framework provided by the educational setting. The results indicate that the extent of academic stress experienced by students in higher education is dependent on the interaction of both individual characteristics of the student and institutional pedagogical approaches.

The researchers used the techniques of ANOVA and MANOVA with different designs (3 * 3, 5 * 1, 5 * 2) to examine the joint effect of academic self-regulation and external regulation on academic stress levels and symptoms. The results suggested that there is an interplay between self-regulation approach of

students and the regulatory framework of the educational environment that informs the intensity of the academic stress encountered by undergraduate students. These findings highlight the importance of understanding the role of individual and contextual factors in the reduction of the adverse effects of academic stress and promotion of students' well-being. The findings result in the conclusion that the determinants and manifestations of the academic stress in undergraduate students are influenced by self-regulation, and external regulatory assistance offered by the educational environment. Nonetheless, previous studies lack studies that directly measure the role of academic self-regulation in emotional self-efficacy. In the study of De la Fuente *et al.* [31], which studied the relationship between the external educational regulation of teachers and the level of self-regulation of students in relation to academic stress. Given this research vacuum, the current study aimed to check the mediation function of academic self-regulation of emotional self-efficacy. An understanding of this position allows for the development of specific treatments that could benefit students with respect to academic achievement and emotional health.

Research has shown a statistically significant correlation between mindfulness and self-efficacy [26], [31], as well as the efficiency of mindfulness-based intervention programs in increasing the levels of self-efficacy [20], [30], [32]. Individuals who are found to possess high levels of mindfulness also exhibit higher levels of self-efficacy and emotional stability. Research continually highlights the relationship between mindfulness and self-regulation academically [20], [26], [36]–[43]. Still, there are deficiencies found in these researches. They have focused primarily on correlational relationships and have not examined definite causal links. Moreover, most of the studies have ignored the possible mediating variables in the relationship between mindfulness, self-efficacy, and emotional self-efficacy. The role of demographic characteristics such as age, level of education, grade point average (GPA), geographical location and subject of study has been poorly explored.

This study attempts to address these deficiencies because it concentrates upon undergraduate students of varied ages, GPAs, places of residence, and academic courses. The research is to examine the mediating role of academic self-regulation on the link between mindfulness and emotional self-efficacy on a proposed model. This work aims to explain the relationships between these variables in an attempt to add to previous research findings and supplement theoretical understanding. This study examines the effect of mindfulness on emotional self-efficacy mediated through intellectual self-regulation. This study assesses the effect of mindfulness on emotional self-efficacy and academic self-regulation, based on the previous research evidence demonstrating the positive impact of mindfulness on self-efficacy. We propose that increased mindfulness enhances academic self-regulation, which then increases emotional self-efficacy.

3. METHOD

3.1. Research approach

As part of a quantitative approach to information gathering, we examined the mediating role of academic self-regulation in a relationship between mindfulness and emotional self-efficacy. The present investigation was conducted to determine whether academic self-regulation, in part, explains the link between mindfulness and emotional self-efficacy.

3.2. Research method

We employed a survey research methodology to collect data from undergraduate students to gain insights consistent with the study's objectives. We collected data on mindfulness, academic self-regulation, and emotional self-efficacy from undergraduate students in Asia, Africa, North America, South America, Australia, and Europe.

3.3. Participants

We employed a convenience sampling technique to choose undergraduate students. We disseminated the study instruments—the mindful attention awareness scale (MAAS), the academic self-regulation scale (ASRS), and the emotional self-efficacy scale (ESES)—through the Moodle platform, university email, WhatsApp messages, and many social media channels. A total of 647 undergraduate students from Australia, Asia, Europe, North and South America, and Africa took part in the research. Participants came from various academic levels, ages, and fields of study from various colleges. The data of the participants are presented in Table 1.

Table 1 shows an excerpt of a sample of 647 with a female preponderance of 77.1%. Most of the participants were aged between 18 to 24 years, which amounted to 74.5%, with students in their third year being the largest participant in the study, at 37.1%. Most people showed mid-range GPAs as well as 56.9%. Majority of the respondents were enrolled in arts and social sciences programs at 56.9% followed by

education 21.6%. The sample came from Asia the most at 87.8%, followed by little from Africa, Europe, North America, South America, and Australia.

Table 1. Demographic characteristics of the participants (N=647)

Variable	Sub-variables	Numbers	Percentage (%)
Gender	Male	148	22.9
	Female	499	77.1
Age (years)	18-24	482	74.5
	25-34	115	17.8
	35 and above	50	7.7
Current year of study	First year	91	14.1
	Second year	110	17.0
	Third year	240	37.1
	Fourth year	163	25.2
	Fifth year or more	43	6.6
Current GPA	High (3.6-4.0)	192	29.7
	Mid (2.5-3.5)	368	56.9
	Low (Below 2.5)	87	13.4
Field of study	Humanities and social sciences	368	56.9
	Natural sciences	21	3.2
	Engineering-technology	53	8.2
	Medical and health sciences	41	6.3
	Business-economics	21	3.2
	Education	140	21.6
	Agricultural sciences	3	0.5
Region of residence	African region	26	4.0
	Asian region	568	87.8
	European region	43	6.6
	North American region	4	0.6
	South American region	4	0.6
	Australian region	2	0.3
Total		647	100

3.4. Measuring instruments

3.4.1. The mindful attention awareness scale

To assess mindfulness for the subjects in this study, we used MAAS to measure the level of mindfulness for the undergraduate students. The MAAS developed by [44] is a self-report measure, using a six-point Likert scale, with responses ranging on a six-point scale from 1 (almost never) to 6 (almost always). The scale consists of 15 items, many of which are written in reverse (e.g., "I may experience an emotion without being aware of it until later"). Reduced scores indicate high levels of awareness.

3.4.2. The academic self-regulation scale

ASRS was developed by Akhtar and Mahmood [45] to assess students' self-regulated learning behaviors. Every 30 items on the scale are linked to the behavior of academic self-regulation. The subscales include self-planning, self-monitoring, self-instruction, self-evaluation, and self-reaction. Participants rate the degree of self-regulated learning behavior in which they engage from a 4-point Likert scale (1=not at all true; 4=completely true). Higher scores indicate the more self-regulated learning strategies applied in educational settings.

3.4.3. The emotional self-efficacy scale

We used ESES to assess the ability of the participants to cope with emotional events [46]. The ESES is a self-report instrument containing 27 items, each of which is an individual's capacity to navigate emotional circumstances (e.g., "I concentrate on positive emotions to figure out solutions to the challenges I meet"). Each of the participants answers on a 5-point Likert scale (from 0=never to 5=always). Increased scores are an indicator of increased emotional self-efficacy. The items of all instruments used in this study had been Arabicized using the forward-backward translation method. We sought a panel of psychology experts, proficient in Arabic and English (including two faculty members from Arab Open University and one language specialist) to evaluate the content and translation of all the items in terms of clarity and cultural appropriateness. During the pilot project, we collected feedback from undergraduates at Al Ain University, Abu Dhabi campus. The students' suggested enhancements were incorporated into the final Arabic versions of the three instruments. Table 2 outlines each instrument together with its subscales, detailing the number of items, Cronbach's alpha coefficients, and modified item-total correlations.

Table 2. Item counts and reliability metrics for each instrument

Scale-subscale	No of items	Cronbach	CITC* Range
MAAS	15	.88	.42-.69
The academic self-efficacy scale	30	.94	.44-.68
Planning academic activities	6	.82	.52-.62
Learning strategies	6	.81	.51-.63
Information retrieval	6	.81	.49-.66
Working in groups	3	.79	.51-.59
Management of relationships with teachers	3	.74	.51-.59
Managing lessons	4	.74	.37-.60
Stress management	2	.54	.37-.37
ESES	27	.95	.55-.70
Using and managing your own emotions	10	.89	.53-.69
Identifying and understanding your own emotions	6	.82	.47-.61
Dealing with emotions in others	8	.87	.61-.65
Perceiving emotion through facial expressions and body language	3	.75	.55-.60
ASRS	30	.84	.21-64
Self-planning	10	.81	.26-.65
Self-monitoring	7	.62	.31-60
Self-instruction	7	.56	.27-.49
Self-evaluation	3	.59	.31-.34
Self-reaction	3	.47	.21-.33

Table 2 indicates that all instruments exhibit adequate internal-consistency reliability. Some of the subscales have low to moderate coefficients. As is known in psychometrics, there is a relationship between the number of items and Cronbach's alpha; as the number of items increases, Cronbach's alpha increases too. Accordingly, to is expected to have low Alpha coefficients when the number of items of the subscale is 3. Additionally, the statistical analysis used in the current study (SEM) takes into account the reliability of the subscales when estimating path coefficients [45]. The results of the current study show CFA results and Cronbach alpha for measurement tools for the full dataset. Table 2 provides evidence of the reasonable psychometric properties of the used data collection tools.

3.5. Data analysis

We used a structural equation model (SEM) to analyze the data. SEM combines two statistical methods: confirmatory factor analysis (CFA) and the simultaneous equation model. Therefore, SEM combines CFA and path or regression analysis into one comprehensive statistical method. These SEM models are the measurement equation (CFA) and SEM [47]. We used SEM to assess the model presented in Figure 1. There are two types of variables: observed variables, which are represented by rectangles, and latent variables, which are represented by circles. In the context of this study, the latent variables represent the scales and the subscales used to collect the data, and the observed variables represent the survey items. This means, as illustrated in Figure 1, that there are 10 CFAs. Each CFA represents a subscale, and the items measure this subscale. These CFAs represent the SEM measurement model, and if the data fits the model, it is considered evidence of the scale's construct validity. The second SEM structural equation model depicted in Figure 1 illustrates the linkages (Paths) among the exogenous variable, mindful attentive awareness, the mediators comprising the five subscales of academic self-regulation, and the four endogenous variables, which are the four subscales of emotional self-efficacy.

The assessment of the SEM models goes in two stages. In the first stage, the global fit indices are investigated. Hu and Bentler's [48] recommendation of using a two-index criterion to evaluate model fit based on root mean square error of approximation (RMSEA) of 0.06 or lower and standardized root mean square residual (SRMR) of 0.09 or lower was used in this study to evaluate the global fit of the model. If the global fit indices reached the acceptable thresholds, the significance of the item loadings on the subscales and the path coefficients between latent variables (subscales) can be investigated in the second stage.

3.6. Ethical consideration

We adhered to ethical standards in scientific research. We avoided elements that violate ethical aspects and cultural privacy during the procedures used in this study. At the commencement of each scale, instructions were provided soliciting each participant's voluntary assent to engage in this study. Participants were assured that all data would remain confidential and would not be divulged under any circumstances. We secured ethical permission from the research ethics committee at Al Ain University (Reference No: COP/AREC/AN/25_15).

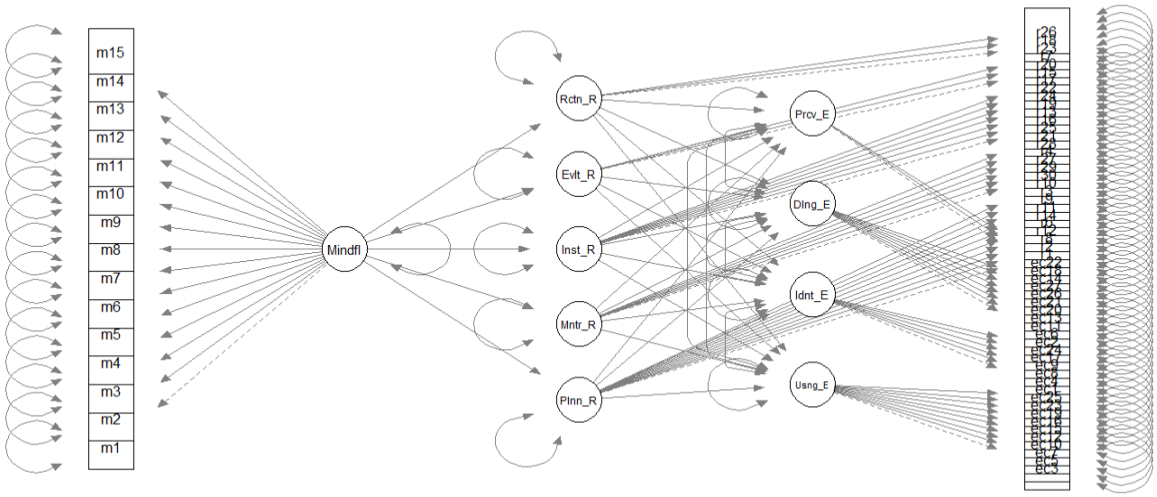

Figure 1. Proposed mediation model linking mindfulness, academic self-regulation, and emotional self-efficacy

4. RESULTS AND DISCUSSION

The present study seeks to examine the structural relationships (Paths) among the exogenous variable mindful attention awareness, the mediators represented by the five subscales of academic self-regulation, and the four endogenous variables, which are the four subscales of emotional self-efficacy, as illustrated in Figure 1. The Lavaan package (Latent variable analysis), a R tool, was employed to evaluate the model utilizing SEM with latent variables to accomplish this purpose. The results show that RMSEA equals .058 and SRMR equals .132. Based on Hu and Bentler [48], cutoff of the two-index criterion to evaluate model fit based on RMSEA of 0.06 or lower and SRMR of 0.09 or lower, the data do not fit the model in Figure 1. Moreover, the results show that three items in the ASRS have non-significant item loading. These items are R10, R17, and R22. These items were deleted because of the insignificant item loadings, and the analysis was conducted again to evaluate the model in Figure 2.

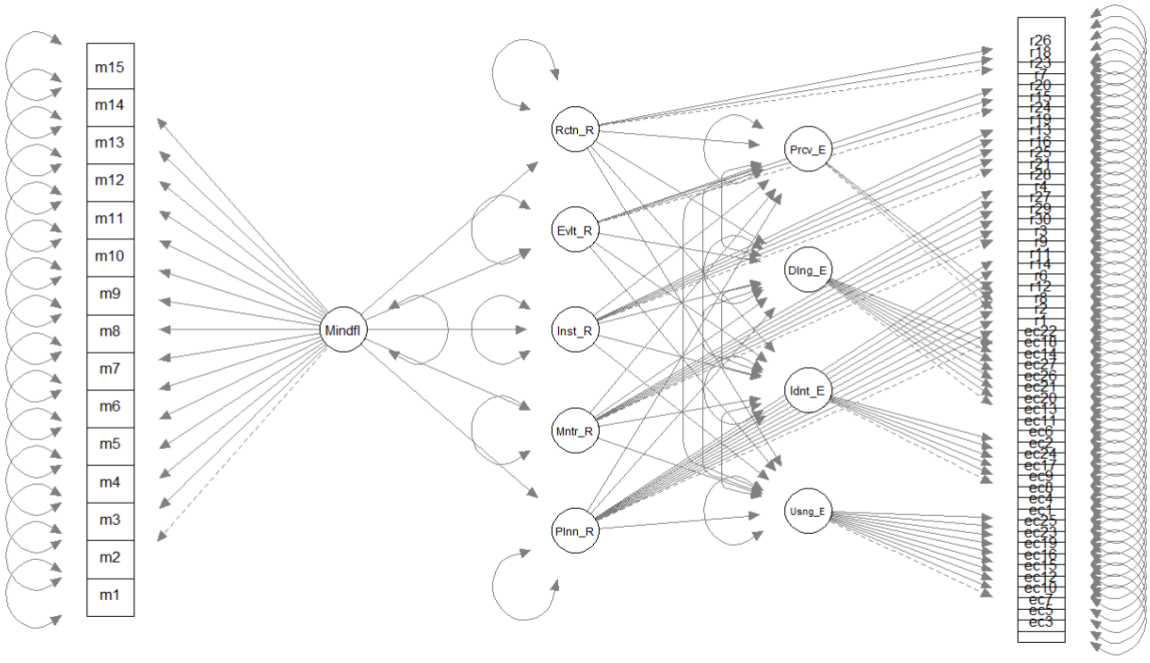

Figure 2. Final SEM results with standardized path coefficients

The second analysis results show that RMSEA equals .054 and SRMR equals .083. Based on Hu and Bentler [48], cutoff of the two-index criterion to evaluate model fit based on RMSEA of 0.06 or lower and SRMR of 0.09 or lower, the data fit the model in Figure 2 (after deleting the three items). As stated earlier, since the global fit indices indicate a good model fit, the item loadings and the structural relationships between the latent variables were reported. Although the results obtained from one analysis are presented in two tables for reporting purposes (Tables 3, and 4). Table 3 summarizes the 10 CFA results, including the range of items loading on its scale and Cronbach's alpha reliability coefficients.

Table 3 represents the SEM measurement of the analysis, and all the items' loadings are statistically significant. Therefore, the results of Table 3 add evidence of the scales' construct validity, besides the Cronbach alphas of the scales, which add evidence of the scales' reliability. Based on the results reported in Table 3, the second SEM structural equation model in Figure 2, which represents the relationships (Paths) between the exogenous variable, mindful attention awareness, the mediators, which are the five subscales of academic self-regulation, and the four endogenous variables, the four subscales of emotional self-efficacy, can be investigated. The results are presented in Table 4.

Table 3. CFA results and Cronbach alpha for measurement tools

Scale-subscale	No of items	Cronbach	Loading range
MAAS	15	.85	1-1.77
ESES	27	.91	Four CFA model
Using and managing your own emotions	10	.91	.84-1.13
Identifying and understanding your own emotions	6	.85	.94-1.07
Dealing with emotions in others	8	.84	.93-1.04
Perceiving emotion through facial expressions and body language	3	.74	1-1.10
ASRS	27	.88	Five CFA model
Self-planning	9	.84	.79-1
Self-monitoring	7	.73	.69-1
Self-instruction	5	.72	.59-1.06
Self-evaluation	3	.69	1-2.37
Self-reaction	3	.72	1-2.76

Table 4. SEM results

Predicted	Predictor	Path Coef.	SE	z	p-value
Using_Emo	Planning_Reg	0.41	0.04	9.67	0.00
	Monitoring_Reg	0.17	0.03	5.22	0.00
	Instruction_Reg	0.01	0.03	0.40	0.69
	Evaluation_Reg	0.09	0.05	1.76	0.08
	Reaction_Reg	0.56	0.19	2.93	0.00
Identifying_Emo	Planning_Reg	0.36	0.04	8.82	0.00
	Monitoring_Reg	0.22	0.03	6.62	0.00
	Instruction_Reg	0.09	0.04	2.52	0.01
	Evaluation_Reg	0.03	0.05	0.64	0.52
	Reaction_Reg	0.38	0.16	2.39	0.02
Dealing_Emo	Planning_Reg	0.36	0.04	8.88	0.00
	Monitoring_Reg	0.26	0.04	7.30	0.00
	Instruction_Reg	-0.02	0.04	-0.66	0.51
	Evaluation_Reg	0.03	0.05	0.53	0.59
	Reaction_Reg	0.12	0.14	0.89	0.37
Perceiving_Emo	Planning_Reg	0.39	0.04	8.70	0.00
	Monitoring_Reg	0.17	0.04	4.49	0.00
	Instruction_Reg	0.05	0.04	1.17	0.24
	Evaluation_Reg	0.03	0.06	0.55	0.58
	Reaction_Reg	0.43	0.19	2.28	0.02
Planning_Reg	Mindful	0.08	0.06	1.37	0.17
Monitoring_Reg	Mindful	0.03	0.07	0.49	0.62
Instruction_Reg	Mindful	0.35	0.07	4.94	0.00
Evaluation_Reg	Mindful	0.15	0.05	3.21	0.00
Reaction_Reg	Mindful	-0.01	0.02	-0.59	0.55

Table 4 presents the coefficients (regression coefficient, standard error, z value, and p-value) for all associations among the exogenous, mediator, and endogenous variables depicted in Figure 2. The initial set of routes in Figure 2 and Table 4 illustrates the path coefficients among the predicted variables, encompassing the four subscales of emotional self-efficacy and the five subscales of academic self-regulation. The second group of pathways in Figure 2 and Table 4 illustrates the path coefficients between

the five subscales of academic self-regulation and the MAAS. The results in Table 4 show that there are three subscales out of five in the ASRS that have significant coefficients (p-value<.05) with the using and managing your own emotions subscale of the ESES. These subscales are self-planning, self-monitoring, and self-reaction.

The results indicate that four out of five subscales in the ASRS exhibit significant coefficients (p-value<.05) in relation to the identifying and understanding your own emotions subscale of the ESES. The subscales include self-planning, self-monitoring, self-instruction, and self-reaction. The results indicate that two out of five subscales in the ASRS exhibit significant coefficients (p-value<.05) in relation to the coping with emotions of others subscale of the ESES. The subscales are self-planning and self-monitoring. Furthermore, the findings indicate that three out of five subscales in the ASRS exhibit significant coefficients (p-value<.05) in relation to the recognizing emotions through facial expressions and body language subscale of the ESES. The subscales include self-planning, self-monitoring, and self-reaction. Furthermore, the data shown in Table 4 indicate that two out of five subscales in the ASRS exhibit significant coefficients (p-value<.05) in relation to the MAAS. The subscales include self-instruction and self-evaluation.

This study sought to investigate academic self-regulation as a mediator variable connecting mindfulness and emotional self-efficacy in undergraduate students. Results indicated path coefficients among the anticipated variables, the five subscales of academic self-regulation, and the four subscales of emotional self-efficacy, as well as path coefficients between the mindful attentive awareness scale and the five academic self-regulation subscales. The results indicated a statistically significant association between the academic self-regulation subscales of self-planning and self-monitoring and all subscales of the ESES. These results align with prior studies that highlighted the significance of self-regulation in cultivating emotional competence [26], [31]. The findings demonstrated that student's continuous evaluation and goal setting related to the learning process were associated with aspects of emotional self-efficacy. This may be explained by the hypotheses that students who work to set clear academic goals, select appropriate strategies to achieve those goals, and organize resources before engaging in a learning task are more adept at identifying and expressing their feelings, regulating their emotional states, recognizing and responding appropriately to the emotions of others. They are also better at adjusting their own emotional responses to achieve a desired mood and maintain emotional balance, indicating that students are adept at responding adaptively to their academic achievements.

A student's identification of academic goals, selection of appropriate strategies, and organization of resources before beginning a learning task is likely to help her/him cope with potential emotional challenges associated with academic tasks, enhancing her/his ability to accurately perceive and understand their emotions. Furthermore, a student actively monitors her/his progress and the effectiveness of her/his strategies during learning activities. Effective self-monitoring allows a student to be constantly aware of her/his emotional states while performing tasks, which improves her/his emotional self-awareness and understanding of emotional states. Internal dialogue guides and regulates cognitive processes during learning. These findings add to the findings of a study [31], which explained the role of self-regulation in managing academic stress, as evidenced by the interaction between self-regulation skills and emotional state. Unlike previous studies that focused primarily on self-regulation and its relationship to academic stress, the results of the current study enhance the understanding of how academic regulation influence emotional skills. This study provides evidence that academic self-regulation influences emotional self-efficacy.

The results also showed a relationship between self-reaction and using and managing of one's own emotions, identifying and understanding one's own emotions, and perceiving emotions through facial expressions and body language. This finding is consistent with theoretical definitions and current research. Self-reaction refers to emotional and behavioral responses following self evaluation, including reinforcement of successes or revision of strategies, also students' ability to critically evaluate their academic outcomes and respond positively. Students who are proficient in self-reaction are expected to be aware of the outcomes of their performance, draw lessons from these experiences, and adjust their strategies accordingly. This skill can enhance the regulation of emotional reactions and the effective use of emotions in various situations. De la Fuente *et al.* [31] suggest that students' emotional and behavioral responses following self evaluation helps enhance emotional intelligence and enhances the ability to manage emotional responses. Cai *et al.* [20] add that the relationship between mindful reaction and emotional regulation is a positive, effective one, indicating that increased evaluative self-regulation is positively associated with emotional stability and effective emotion management. The reflective and evaluative aspects of self-reaction include personal emotional sensitivity not only internal emotional awareness, based on the relationship demonstrated in the current study's results between self-reaction and the perception of emotions through facial expressions and body language. This is consistent with the findings of Deep *et al.* [49], who indicated that mindfulness interventions contributed to improved emotional regulation and interpersonal efficacy. These current findings highlight the importance of integrating mindfulness into academic settings to enhance students' emotional competencies, which are essential for academic success and personal well-being [26], [31].

The results indicated a link between self-instruction, self-reaction, and identifying and understanding one's own emotions, consistent with the idea that internal cognitive dialogue influences emotional awareness [27]. Self-instruction means directing and managing cognitive processes during learning process by the internal dialogue or self-prompting. Self-reaction, characterized as the emotional and behavioral responses that occur after self-evaluation, encompassing the reinforcement of successes or the revision of strategies. Identifying and understanding one's own emotions can be defined as the ability to accurately identify, categorize, and understand the origins and subtleties of one's emotional states. Deep self-instruction and increased emotional awareness may facilitate a clearer understanding of emotional reactions. Furthermore, it can reinforce successful strategies or revise ineffective ones. Student who demonstrates constructive self-reaction is more likely to respond emotionally effectively to her/his academic experiences, enhancing her/his understanding of her/his emotional states. These findings confirm previous findings [31] that self-regulation plays a role in managing emotions and reducing stress among undergraduate students. The results demonstrate the importance of adaptive emotional responses following self-reaction; students are more adept at interpreting emotional cues and adjusting their behaviors when they consciously engage in self-assessment processes. Menges and Caltabiano [12] argue that students can effectively manage emotional challenges when they can interpret emotional cues and adjust their behaviors. For undergraduate students' academic success, mindful self-regulation strategies can be incorporated, particularly in the context of managing academic stress [26], [32]. It is recommended that educational interventions focus on developing mindfulness and self-regulation skills to improve students' emotional and academic resilience.

The findings demonstrated a statistically significant correlation between the MAAS and the academic self-regulation subscales, particularly self-instruction and self-evaluation. Student who has high level of mindfulness, possess present-moment awareness skills may engage in internal dialogue, which enhances cognitive regulation during learning tasks. Student, who can identify her/his thoughts and feelings, promotes internal dialogue that facilitates cognitive processes and improves academic self-regulation skills. This is consistent with Ibrahim [50], who suggested that mindfulness promotes non-judgmental attention to the present moment, which enhances emotional and cognitive responses. The association between mindfulness and self-instruction suggests that mindfulness develops students' skill to accurately evaluate their learning strategies based on academic criteria. Students with high levels of mindfulness have increased levels of self-awareness and awareness of their own responses, which may increase their engagement in reflective practices and help them identify their strengths and weaknesses in academic performance. This corroborates the findings by Cai *et al.* [20], which demonstrated a statistically significant association between mindfulness and self-regulation, encompassing mood management and delayed gratification. The present findings indicating the impact of mindfulness on academic self-regulation align with other research that has demonstrated mindfulness interventions enhance students' cognitive and emotional regulating skills [27]. Mindfulness has also been associated with improved academic performance through the development of self-regulation, which closely aligns with the findings of the current study [20], [26]. Previous research has highlighted correlations between mindfulness and general self-regulation abilities [31], [30]. However, the specificity of academic may include other mediating factors or moderators, such as academic self-efficacy, perceived control or teaching styles [31]. This means that this interpretation underscores the multifaceted nature of self-regulation, and that mindfulness interventions may increase academic self-regulation.

Future research on the effectiveness of mindfulness could incorporate contextual or demographic factors, such as the academic environment, curriculum design, or individual differences, and examine their impact on emotional self-efficacy. The findings of the present study align with other research indicating a connection between self-regulation, emotional self-efficacy, and academic management [26], [31], as well as a positive correlation between mindfulness and emotional regulation [20], [27], [49], [50]. This study incorporates subscale correlations, extending beyond general correlations to illustrate that mindful attention awareness correlates with specific domains of academic self-regulation, including self-instruction and self-evaluation. Additionally, self-planning and self-monitoring are linked to domains of emotional self-efficacy, while self-reaction demonstrates specific connections with emotional management and emotional perception.

The contribution of our study appears in elucidating that academic self-regulation is a bridge between mindful attention awareness and emotional self-efficacy, a mechanism that has not been adequately tested in a culturally diverse sample of undergraduate students, also identifying the influential domains of academic self-regulation. The significance of these new findings demonstrate that mindful attention awareness enhances students' ability to manage their emotions and develops academic skills that can help them cope with the emotional challenges inherent in academic tasks, such as goal setting, consistent monitoring, and strategy selection. The results suggest the necessity of training in planning, monitoring, self-direction, and reflection—skills of academic self-regulation—among undergraduate students, as these skills promote engagement, well-being, and emotional resilience. Future research could explore these relationships

using longitudinal studies and examining contextual factors such as the academic environment, teaching style, and perceived control.

5. CONCLUSION

The present study uncovered structural connections among mindful attentive awareness, academic self-regulation, and emotional self-efficacy. The study's findings indicated a substantial correlation between the academic self-regulation pathway, mindful attentive awareness, and emotional self-efficacy. The most consistent correlations were found between self-planning and self-monitoring across multiple dimensions of emotional self-efficacy. Specifically, both self-planning and self-monitoring strongly predicted the identifying and understanding one's own emotions, dealing with emotions of others, and perceiving emotions through facial expressions and body language. The study also demonstrated the contribution of self-reaction to identifying and understanding one's own emotions and perceiving emotion through facial expressions and body language, while self-instruction was associated with identifying and understanding one's own emotions. Only self-instruction and self-evaluation were significantly associated with mindful attention awareness. This suggests that mindful attention awareness enhances academically related regulatory cognitive processes (such as self-instruction and self-evaluation), which in turn are linked to emotional self-efficacy.

Higher education could benefit from these findings by enhancing students' emotional competencies: students' confidence in understanding and managing emotions in both personal and social contexts could be enhanced by offering interventions that combine mindfulness practices with training in academic self-regulation skills—particularly planning, monitoring, and adaptive self-reflection. Future research may broaden this study to encompass more demographics, such as persons from diverse cultural backgrounds or graduate students, as this could enhance comprehension of how academic self-regulation affects the interplay between mindfulness and emotional self-efficacy. Despite notable relationships between the many subscales of academic self-regulation and emotional self-efficacy, putative influencing factors remain unexamined.

We adopted a cross-sectional approach, which did not examine the causal relationships between mindfulness, academic self-regulation, and emotional self-efficacy. Further studies could clarify the causal relationships between these dimensions using longitudinal or experimental approaches. We used self-report instruments to collect data (MAAS, ASRS, and ESES), we need to consider the potential biases, including participants' motivation to appear their best and the accuracy of their answers. To improve the validity and reliability of the results, behavioral assessments or observational techniques different from those used in the current study could be used. The participants in the current study were undergraduate students, which may limit the generalizability of the results to other educational levels or settings.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
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O : Writing - **O**riginal Draft
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Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

ETHICAL APPROVAL

The authors obtained ethical approval from the Al Ain University (AAU) research ethics committee (Reference No.: COP/AREC/AN/25_15).

DATA AVAILABILITY

The datasets utilized and examined in this investigation are accessible from the corresponding author, [SAAH], upon a reasonable request.

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