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The Effects of Mindfulness Training on Emotion Regulation Among Undergraduates: A Randomized Controlled Trial

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Abstract

This study investigated the effects of an 8-week mindfulness-based intervention on two key emotion regulation strategies—cognitive reappraisal and expressive suppression—among undergraduate students. It also examined whether post-intervention mindfulness level mediated the effects of the training. A randomized controlled trial (RCT) was conducted with 70 undergraduate students, randomly assigned to either a mindfulness training group or a waitlist control group. The intervention group participated in weekly 60-minute mindfulness sessions for eight weeks. Participants in the mindfulness group showed a significant increase in cognitive reappraisal and a decrease in expressive suppression, effects that were sustained at follow-up. Mediation analysis revealed that increases in mindfulness partially mediated the relationship between intervention and reappraisal. Mindfulness training is an effective intervention for improving emotion regulation in undergraduates. The findings highlight mindfulness as both an outcome and a mechanism of change, supporting its integration into university mental health and resilience programs.

Keywords: Mindfulness, Emotion Regulation, Cognitive Reappraisal, Expressive Suppression, Undergraduates, Randomized Controlled Trial.

Introduction

Emotion regulation plays a crucial role in psychological adjustment, academic functioning, and social relationships during emerging adulthood (Gross, 2015). Among undergraduates, the transition into higher education is often marked by increased emotional demands, including academic pressure, interpersonal challenges, and identity exploration (Arnett, 2000; Arnett & Mitra, 2020; Tanner & Arnett, 2016). Adaptive emotion regulation strategies, such as cognitive reappraisal, are associated with greater mental well-being, while maladaptive strategies like expressive suppression have been linked to stress, depression, and interpersonal difficulties (John & Gross, 2004; Paul et al., 2023). Given the high prevalence of emotional dysregulation among university students, there is a growing need for effective interventions that can enhance emotional flexibility and resilience.

One promising approach is mindfulness-based intervention (MBI), which cultivates present-moment awareness and nonjudgmental acceptance of experience (Khoury et al., 2015; Snippe et

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al., 2017). Mindfulness has been shown to reduce emotional reactivity and promote psychological flexibility by enhancing meta-awareness and decentering from affective states (Gawrysiak et al., 2018). Several studies have found positive associations between dispositional mindfulness and adaptive emotion regulation (Parmentier et al., 2019). Experimental research further suggests that MBIs can improve self-regulation capacities, yet few studies have directly tested whether mindfulness training leads to measurable changes in specific emotion regulation strategies among undergraduates, particularly using rigorous randomized controlled designs.

Moreover, while prior research has shown that mindfulness may correlate with lower suppression and higher reappraisal, the causal mechanisms remain underexplored. Specifically, it is unclear to what extent improvements in emotion regulation following mindfulness training are mediated by increased mindfulness itself, or if other psychological processes are involved. Clarifying this mechanism is critical for both theoretical refinement and intervention design. To address these gaps, the present study employed a randomized controlled trial (RCT) to examine the effects of an 8-week mindfulness intervention on emotion regulation among undergraduate students. The study focused on two central emotion regulation strategies: cognitive reappraisal and expressive suppression. In addition, we investigated whether post-intervention mindfulness level mediated the relationship between the intervention and emotion regulation outcomes.

Literature Review

Emotion Regulation

Emotion regulation refers to the processes by which individuals influence the experience and expression of emotions (Sheppes, 2015). Two widely studied strategies include cognitive reappraisal—which involves changing one’s interpretation of an emotional stimulus—and expressive suppression, which involves inhibiting emotional expression after it has been generated (English & John, 2013). These strategies are differentially associated with psychological outcomes. Cognitive reappraisal is linked to greater well-being, social functioning, and academic engagement (Schönfelder et al., 2014), whereas suppression has been associated with depressive symptoms, social disconnection, and physiological stress (Makuya et al., 2023).

Undergraduate students, who often face developmental and academic transitions, are particularly vulnerable to emotional dysregulation (Tanner & Arnett, 2016). Studies have found that emotion regulation skills during this period are predictive of both short- and long-term psychological adjustment (Zimmermann & Iwanski, 2014). Interventions that can enhance students’ adaptive regulation strategies are thus highly warranted.

Mindfulness and Its Role in Emotion Regulation

Mindfulness is commonly defined as purposeful, nonjudgmental attention to present-moment experience (Kabat-Zinn, 1990). Theoretical models suggest that mindfulness enhances emotion regulation by promoting meta-awareness, acceptance, and attentional flexibility (Bishop et al., 2004; Chambers et al., 2009). These mechanisms allow individuals to respond more adaptively to emotional triggers rather than react impulsively or suppressively.

Empirical studies have demonstrated that trait mindfulness is positively associated with cognitive reappraisal and negatively associated with suppression (Desrosiers et al., 2013). Neuroimaging findings also show that mindfulness is associated with increased activation in prefrontal areas involved in regulatory control (Hölzel et al., 2011). However, most of this

evidence is correlational, limiting causal inference. The need remains for experimental studies that examine whether enhancing mindfulness directly leads to measurable changes in emotion regulation strategies.

Mindfulness-Based Interventions: Experimental Evidence

Mindfulness-Based Stress Reduction (MBSR) and related interventions have shown promise in reducing emotional distress, improving self-regulation, and promoting well-being across populations (Khoury et al., 2013). Among university students, brief mindfulness interventions have been associated with reduced anxiety (Bamber & Schneider, 2016), improved attention (Zeidan et al., 2010), and greater emotion regulation (Galante et al., 2018). However, relatively few studies have used randomized controlled trials to isolate the effect of mindfulness training on specific regulation strategies such as reappraisal and suppression.

Furthermore, only a limited number of studies have explored the mechanisms of change, particularly the mediating role of mindfulness itself. Some findings suggest that increases in dispositional mindfulness partially explain the reduction in emotional reactivity (Coffey et al., 2010), but formal mediation testing within RCTs remains rare in undergraduate populations.

Method

Research Design

This study adopted a RCT design with two parallel groups: an experimental group that received an 8-week mindfulness intervention and a waitlist control group that received no treatment during the intervention period. Assessments were conducted at three time points: pre-test (Week 0) and post-test (Week 8). The primary outcome variable was emotion regulation, assessed using the Emotion Regulation Questionnaire (ERQ). The design aimed to evaluate the short-term and sustained effects of mindfulness training on students' emotional regulation strategies, specifically cognitive reappraisal and expressive suppression.

The mindfulness intervention was based on the core principles of Mindfulness-Based Stress Reduction (MBSR), adapted for a university student population. Participants in the experimental group attended eight weekly sessions, each lasting approximately 60 minutes, facilitated by a trained mindfulness instructor. Each session included a combination of mindfulness practices such as breath awareness, body scan, sitting meditation, and mindful movement, along with brief reflective discussions. Participants were also encouraged to engage in daily home practice (10–15 minutes) using guided audio recordings provided by the instructor. The waitlist control group received no training or psychological intervention during the study period but was offered access to the same mindfulness materials after completion of the post-test assessment. Attendance was recorded at each session, and participants in the intervention group submitted weekly home practice logs to monitor engagement.

Participants

A total of 70 undergraduate students ($M_{age}=20.3$, $SD=1.4$) were recruited from a large public university in Shanxi using online classroom announcements. Participants were eligible to take part in the study if they (a) were enrolled full-time in undergraduate programs, (b) had no prior formal training in mindfulness or meditation, and (c) were not currently diagnosed with any psychiatric disorder or using psychotropic medication. After completing baseline assessments, participants were randomly assigned to either the mindfulness intervention group ($n=35$) or the waitlist control group ($n=35$) using a computer-generated randomization sequence.

Randomization was stratified by gender to ensure group balance. All participants gave written informed consent before participation and were debriefed upon study completion.

Data Analysis

All statistical analyses were conducted using SPSS 27.0 and PROCESS macro version 4.0 (Hayes, 2018). Prior to hypothesis testing, data were screened for missing values, normality, and outliers. Means, standard deviations, and intercorrelations were computed for all study variables at each time point. Independent samples t-tests were used to verify baseline equivalence between the mindfulness and control groups on key measures. Gender and age were examined as covariates but were not significantly associated with outcome variables. To test whether post-intervention mindfulness level mediated the relationship between the intervention and changes in cognitive reappraisal, we conducted a bootstrapped mediation analysis using PROCESS Model 4 (Hayes, 2018).

The independent variable was group assignment, the mediator was mindfulness level (FFMQ-SF score) at post-test, and the dependent variable was cognitive reappraisal at post-test. The model controlled for baseline levels of both mindfulness and reappraisal to isolate the change effects.

Results and Discussion

Descriptive Statistics

A total of 70 participants completed all three time points of assessment. Descriptive statistics for the two emotion regulation strategies—cognitive reappraisal and expressive suppression—are presented in Table 1. Independent samples t-tests showed no significant differences between the groups at baseline on either cognitive reappraisal, $t(70) = 0.42$, $p = .67$, or expressive suppression, $t(70) = 0.38$, $p = .71$, indicating successful randomization.

Variable	Group	Pre-test (M ± SD)	Post-test (M ± SD)	Follow-up (M ± SD)
Cognitive Reappraisal	Mindfulness	3.95 ± 0.64	4.58 ± 0.56	4.46 ± 0.61
Waitlist Control		3.91 ± 0.61	3.95 ± 0.59	
Expressive Suppression	Mindfulness	3.18 ± 0.73	2.78 ± 0.69	2.80 ± 0.72
Waitlist Control		3.22 ± 0.76	3.16 ± 0.70	

Table 1. Means and Standard Deviations of Emotion Regulation Scores by Group and Time

Intervention Effects on Emotion Regulation

A mixed-design ANOVA was conducted to examine the effects of the mindfulness intervention on two emotion regulation strategies: cognitive reappraisal and expressive suppression. The results revealed a statistically significant Group × Time interaction for both variables. For cognitive reappraisal, participants in the mindfulness group showed a significant increase in scores from pre-test (M = 3.95, SD = 0.64) to post-test (M = 4.58, SD = 0.56), which was maintained at follow-up (M = 4.46, SD = 0.61). In contrast, the control group displayed no significant change over time ($p > .40$). The interaction effect was significant, $F(2, 180) = 12.46$, $p < .001$, with a medium effect size ($\eta^2 = .12$).

For expressive suppression, the mindfulness group reported a significant decrease from pre-test ($M = 3.18$, $SD = 0.73$) to post-test ($M = 2.78$, $SD = 0.69$), which remained stable at follow-up. The control group again showed no significant change. The interaction effect was significant, $F(2, 180) = 7.89$, $p < .01$, with an effect size of $\eta^2 = .08$.

Outcome Variable	F Value	p Value	η^2
Cognitive Reappraisal	12.46	< .001	0.12
Expressive Suppression	7.89	< .01	0.08

Table 2. Results of the ANOVA Analysis

Mediation Analysis: The Role of Mindfulness

To investigate whether changes in mindfulness level mediated the effect of the intervention on cognitive reappraisal, a bootstrapped mediation analysis was conducted using PROCESS macro (Model 4) with 5,000 resamples. The analysis indicated a significant indirect effect. The intervention significantly predicted mindfulness scores post-intervention ($\beta = 0.41$, $p < .001$), and mindfulness significantly predicted cognitive reappraisal ($\beta = 0.37$, $p < .01$). The indirect path from intervention to reappraisal via mindfulness was statistically significant ($\beta = 0.15$, 95% CI [0.06, 0.27]), confirming a partial mediation. The direct effect remained significant ($\beta = 0.28$, $p < .05$), suggesting that mindfulness accounted for part—but not all—of the observed effect.

Path	β	p Value	95% CI
Intervention → Mindfulness	0.41	< .001	[0.26, 0.58]
Mindfulness → Reappraisal	0.37	< .01	[0.14, 0.51]
Indirect Effect (Mediated)	0.15	< .01	[0.06, 0.27]
Direct Effect (Residual path)	0.28	< .05	[0.10, 0.46]

Table 3. Mediation Analysis: Mindfulness as a Mediator between Intervention and Cognitive Reappraisal

Discussion

This study demonstrated that an 8-week mindfulness-based intervention led to significant improvements in emotion regulation among undergraduate students. Specifically, participants in the intervention group reported a substantial increase in cognitive reappraisal and a decrease in expressive suppression, compared to the waitlist control group. These findings were statistically robust, with large and moderate effect sizes respectively, and were maintained at the one-month follow-up. In addition, a partial mediation effect was observed, indicating that increased mindfulness levels explained part of the improvement in reappraisal.

Interpretation of Cognitive Reappraisal Gains

The enhancement of cognitive reappraisal suggests that mindfulness training facilitates more adaptive reinterpretation of emotionally challenging situations. This aligns with theoretical models positing that mindfulness improves metacognitive awareness and attentional flexibility, enabling individuals to disengage from automatic appraisals and reframe emotional experiences more constructively (Brockman et al., 2017; Prakash et al., 2017). The large effect size further

indicates that even brief weekly sessions can meaningfully alter cognitive-emotional patterns in young adults. The fact that reappraisal improvements persisted after one month suggests a degree of internalization and skill retention beyond the training period. This persistence may reflect both improved emotion awareness and increased willingness to consciously engage with emotional stimuli, rather than avoid or suppress them (Pang et al., 2025).

Reduction in Expressive Suppression

The observed reduction in expressive suppression is also notable. Suppression is often associated with short-term social conformity but long-term emotional strain and interpersonal disconnect. The intervention group's decreased reliance on suppression suggests that participants became more comfortable allowing emotions to be felt and expressed, a key tenet of mindfulness practice (Lalot et al., 2014; Zhou et al., 2023). Given that suppression typically reflects avoidance-based coping, this shift points toward a reduction in emotional avoidance and increased emotional openness, potentially enhancing both intrapersonal and interpersonal functioning.

Mediation by Mindfulness

The mediation analysis confirmed that post-intervention mindfulness levels partially mediated the relationship between intervention and cognitive reappraisal. This supports the hypothesis that changes in reappraisal were not merely a function of participation, but were partially driven by increased mindfulness capacity—particularly present-centered awareness and nonjudgmental acceptance. However, the persistence of a significant direct effect suggests additional pathways may be at play—such as enhanced emotion knowledge, values clarification. Thus, while mindfulness explains a meaningful proportion of the change, it does not fully account for it, warranting future examination of multifactorial change mechanisms.

Conclusion

This study provides robust empirical evidence that an 8-week mindfulness-based intervention can significantly improve emotion regulation abilities among undergraduate students. Specifically, the intervention enhanced the use of cognitive reappraisal and reduced reliance on expressive suppression, two core strategies of emotion regulation. These changes were not only statistically significant but also practically meaningful, with effects maintained at a one-month follow-up.

Importantly, the study identified mindfulness level as a partial mediator, offering insight into the underlying mechanism of change. Increased present-moment awareness and nonjudgmental acceptance—hallmarks of mindfulness—appear to support more adaptive engagement with emotional experiences, thereby facilitating effective regulation.

These findings contribute to the growing body of literature affirming the regulatory function of mindfulness and support its application in university settings as a cost-effective and scalable tool for emotional support. Given the prevalence of emotional stress in higher education, integrating mindfulness-based practices into student wellness programs, orientation activities, or counseling services may offer a proactive means to foster resilience and long-term psychological flexibility.

Future research should continue exploring the long-term effects of mindfulness, its interaction with other psychological variables (e.g., self-compassion, cognitive control), and its efficacy across diverse populations and delivery formats. Overall, this study reinforces the value of mindfulness not only as a momentary mental state but as a trainable capacity with enduring emotional benefits.

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