A Study on the Mechanism of Growth mindset on Anxiety of Chinese Students: The Mediating Role of Emotion Regulation Strategies

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Abstract: Anxiety poses a significant public health challenge in China, particularly impacting college students as evidenced by rising rates of anxiety disorders. This often accompanies depression, resulting in various complications. The current study investigates the impact of positive psychology methods on enhancing individual emotional well-being, particularly focusing on the internal mechanisms through which individual mindsets influence anxiety level. Utilizing a purposive sampling technique, 465 college students from Shaanxi Province, China were selected as participants. The research employed the Dweck Mindsets Scale, Emotion Regulation Scale, and Anxiety Scale to examine the relationship between mindsets and anxiety, constructing a structural equation model to test the research hypothesis. Results reveal a negative direct correlation between growth mindset and anxiety, cognitive reappraisal strategies and anxiety, as well as a positive direct association between expressive suppression strategies and anxiety. Furthermore, the study demonstrates that growth mindset impacts anxiety indirectly through cognitive reappraisal and expressive suppression emotional regulation strategies. These findings contribute to a deeper comprehension of the intrinsic connection between mindsets and emotional well-being, elucidating the mediating function of various emotion regulation strategies in mindset and anxiety. The implications suggest that educators and administrators in universities should actively foster a growth mindset among college students to enhance their emotional well-being and academic success.

Keywords: Growth mindset, Anxiety, Emotion Regulation Strategies, College students

1.Introduction

Anxiety has emerged as a significant public health concern in China, representing the highest prevalence of mental disorders, with a lifetime occurrence rate of 7.57% (Huang et al., 2019). Particularly impactful on college students, anxiety disorders are on the rise among Chinese university students, with a combined detection rate of anxiety symptoms reaching 21.51% (Zhang, Jin, & Zhang, 2021a). Research indicates a close association between anxiety and depression, with individuals experiencing anxiety disorders often also exhibiting symptoms of depression

(Deplancke et al., 2022; Niu et al., 2020; Sung et al., 2020). Notably, anxiety constitutes a significant portion of psychological consultation issues among university students (Zhang, Jin, & Zhang, 2021b). Given that university students are in a critical developmental stage during their academic years, facing pivotal life transitions (Shen et al., 2019), the current generation of Chinese university students, born in the 2000s, encounters a more competitive environment compared to previous generations. They have been exposed to early educational pressures and a lack of carefree childhood experiences, leading to prolonged constraints on their pursuit of happiness and heightened levels of stress (Liu, 2020).

Some studies have shown that certain anxiety experiences can have a beneficial effect on individuals (Endler and Kocovski, 2001). However, prolonged anxiety can result in adverse physical and mental health outcomes, potentially impairing cognitive functions, causing behavioral disturbances, and impacting academic performance. The university phase is a crucial period for personal growth, with many enduring mental health conditions originating during this time (Yu et al., 2022). There is a limited level of anxiety disorder intervention in Chinese universities, families, and society, with Chinese students demonstrating less awareness of anxiety-related issues compared to their Western counterparts (Li et al., 2023).

In recent years, scholars have emphasized the significance of mindset theories in addressing mental health issues such as anxiety and depression (Jia, Zhang, & Qiu, 2022). Cognitivism posits that cognition plays a crucial role in shaping behavior, and mindset theories, as a conceptual framework, can influence an individual's emotional expression and cognitive decision-making processes, thereby guiding them towards different predictions and choices. Dweck (1986) introduced mindset theories in 1986, and over the past three decades, these theories have been extensively utilized in research concerning interventions and the impact on academic performance and mental well-being (Ortiz Alvarado, Rodríguez Ontiveros, and Ayala Gaytán, 2019; Chen et al., 2022; Malespina, Schunn, and Singh, 2022; Verberg et al., 2022). Chinese researchers have recently begun investigating mindsets, focusing primarily on their effects on subjective well-being (Zhou and Ning, 2022), grit (Zhao et al., 2022), and health (Tao Yu et al., 2022).

Numerous scholars have observed that emotion regulation plays a crucial role in anxiety. Emotion regulation involves individuals managing and altering their emotions, typically categorized into two strategies: cognitive reappraisal and expressive suppression (Gross, 2013). These strategies are employed to induce changes in subjective emotional experiences, physiological arousal, and emotional behaviors. Emotion regulation encompasses the regulation of both positive and negative emotions (Aerts et al., 2019). Individuals often unconsciously adjust their emotions based on past experiences when experiencing negative emotions, enabling them to return to a state of equilibrium (Barthel et al., 2022). Emotion regulation is closely linked to health and well-being, particularly mental health overall (Caprara and Steca, 2005). Greenier et al. (2021) emphasized the significance of emotion regulation in the life development of children and adolescents, highlighting its

association with various life outcome variables such as educational expectations, exam anxiety, life satisfaction, happiness, and health. Research indicates that anxious children tend to utilize less adaptive regulatory strategies when dealing with negative life events (Naragon-Gainey, McMahon, and Chacko, 2017). Prolonged emotional suppression without appropriate adjustment in the face of adversity and passive interpersonal relationships among students can lead to emotional disorders, impacting both physical and mental health, and in severe cases, irreversible consequences such as suicide and antisocial behaviors. Students who can effectively and appropriately employ emotion regulation strategies tend to exhibit improved interpersonal relationships, engage in more prosocial behaviors, and demonstrate stronger social skills (Aerts, et al., 2019).

2. Literature Review

2.1 Mindsets and Anxiety

Dweck (1986) introduced the innovative concept of mindset theory, which posits that individuals' perceptions of their own abilities and potential play a fundamental role in shaping their behavior, learning, and accomplishments. Dweck's research delineates two primary mindsets: a fixed mindset, where individuals believe their abilities are inherent and unalterable, leading to avoidance of challenges and quick surrender in the face of setbacks; and a growth mindset, where individuals believe their abilities can be cultivated through effort and persistence, leading to a willingness to tackle challenges and persevere in the presence of obstacles.

Scholars have explored the impact of mindsets on anxiety. For instance, Schleider and colleagues conducted a study involving a diverse group of 13–16-year-olds during the COVID-19 pandemic, revealing that a growth mindset intervention significantly ameliorated anxiety symptoms (Schleider et al., 2020). Yeager et al. (2022) demonstrated that fostering a growth mindset in 9th grade students enables them to adapt flexibly to challenges, enhancing resilience and mitigating the long-term effects of stressors on anxiety. Yeager also conducted a brief and scalable "collaborative mindset" intervention experiment with American high school students, finding that this intervention had a more pronounced positive impact on individuals with a growth mindset. A study at Guttman Community College investigated the effectiveness of a combined mindfulness and growth mindset intervention in reducing math anxiety among students enrolled in a semester-long statistics course (Samuel et al., 2023), with female students experiencing significant reductions in anxiety. Similarly, interventions promoting a growth mindset have been shown to significantly decrease mathematics anxiety and enhance mathematics self-efficacy among first-year students (Samuel & Warner, 2021).

Moreover, researchers have examined high school students over an 8-month period using longitudinal data and 10-day diary reports, revealing that adolescents who hold fixed beliefs about the malleability of individuals, including themselves, experience heightened stress during the transition to high school. This vulnerability is exacerbated when faced with stressors. Additionally, their study identified two potential mechanisms through which cognitive beliefs regarding the plasticity of personality are linked to the development of internalizing symptoms in adolescence—trait attributions and threat appraisals (Seo et al., 2022). Consequently, this study

posited Hypothesis 1: A growth mindset significantly and negatively impacts anxiety among college students.

2.2 Growth Mindset and Emotion Regulation Strategies

Emotion regulation strategies involve individuals managing and altering their emotions, typically categorized into two strategies: cognitive reappraisal and expressive suppression (Gross, 2013). These strategies are employed to induce changes in subjective emotional experiences, physiological arousal, and emotional behaviors. A study by Goodman et al. (2021) found that the belief in emotional plasticity exhibited a negative correlation with suppression and a positive correlation with reappraisal, both of which collectively influenced an individual's social anxiety disorder. King & dela Rosa (2019) measured fixed mindset about emotion individually, the results showed that entity theory of emotion negatively associated with the use of reappraisal strategies. A study on Chinese young people also showed that cognitive malleability belief can significantly and positively predict cognitive reappraisal, that is, the more young people have cognitive malleability belief, the better they are at using cognitive reappraisal for emotional regulation (Zhu et al., 2020). Drawing from the research on growth mindset, cognitive reappraisal, and expressive suppression, hypotheses 2 and 3 were proposed.

Hypothesis 2: Growth mindset significantly and positively influences cognitive reappraisal among college students.

Hypothesis 3: Growth mindset significantly and negatively influences expressive suppression among college students.

2.3 Emotion Regulation Strategies and Anxiety

Martin & Dahlen (2005) employed a questionnaire-based approach to investigate the correlation between emotion regulation tactics and anxiety. Their findings indicated that the use of expressive suppression was associated with increased levels of anxiety, while cognitive reappraisal was linked to decreased individual anxiety levels. Individuals with anxiety tend to rely on expressive suppression rather than cognitive reappraisal following emotional events to manage negative emotions. However, excessive use of expressive suppression can exacerbate anxiety, leading to a detrimental cycle. (Guo & Wang, 2016) further supported these findings by suggesting that cognitive reappraisal strategies are more effective in reducing anxiety compared to expressive suppression strategies. (Shao et al., 2020) conducted a study on anxiety and coping mechanisms, revealing that highly anxious students tend to employ self-blame, fantasy, avoidance, and self-rationalization as coping strategies, while underutilizing positive approaches like problem-solving. Although these strategies may provide temporary relief from negative emotions, they are not conducive to long-term environmental adaptation. Consequently, the study posited two hypotheses:

Hypothesis 4: Cognitive reappraisal has a significant negative impact on anxiety levels among college students.

Hypothesis 5: Expressive suppression has a significant positive impact on anxiety levels among college students.

2.4 The mediating role of Emotion Regulation Strategies

Prior research has indicated that cognitive reappraisal techniques are effective in regulating anxiety, whereas expressive suppression may have limited efficacy and could potentially lead to adverse outcomes such as heightened negative emotional experiences and physiological responses. This is particularly concerning in terms of the long-term impact on mental well-being. The Cognitive Emotional Regulation Questionnaire (CERQ) has been utilized by researchers to explore the association between emotional regulation and negative emotions. Findings have revealed a negative correlation between cognitive reappraisal and anxiety, with the former being able to predict anxiety levels in a negative direction (Martin & Dahlen, 2005b). Variances in individuals' cognitive patterns have been observed to influence their choice of emotional regulation strategies. Studies have shown that individuals with a growth mindset exhibit superior emotional regulation skills and are adept at employing positive strategies to effectively manage negative emotions and prevent emotional disturbances. Conversely, those with a fixed mindset tend to resort to negative emotional regulation methods. A research study explored the interplay of language psychology, negative emotions, emotional regulation, and their associations among adolescent foreign language learners in virtual foreign language classrooms amidst the COVID-19 pandemic. The study revealed a discernible pattern of "growth language-mindset emotion regulation-emotion" emerged in the data, with emotion regulation mediating the impact of participants' growth language mindset on negative emotions, specifically boredom and anger, in online foreign language learning (Dong, 2022). Consequently, this study posits that emotional regulation strategies act as a mediator in the relationship between a growth mindset and anxiety, leading to the formulation of the following hypotheses:

Hypothesis 6: Cognitive reappraisal has a significant mediation effect on the relationship between growth mindset and anxiety among college students.

Hypothesis 7: Expressive suppression has a significant mediation effect on the relationship between growth mindset and anxiety among college students.

Based on the literature, the theoretical framework for this study was proposed in Figure 1.

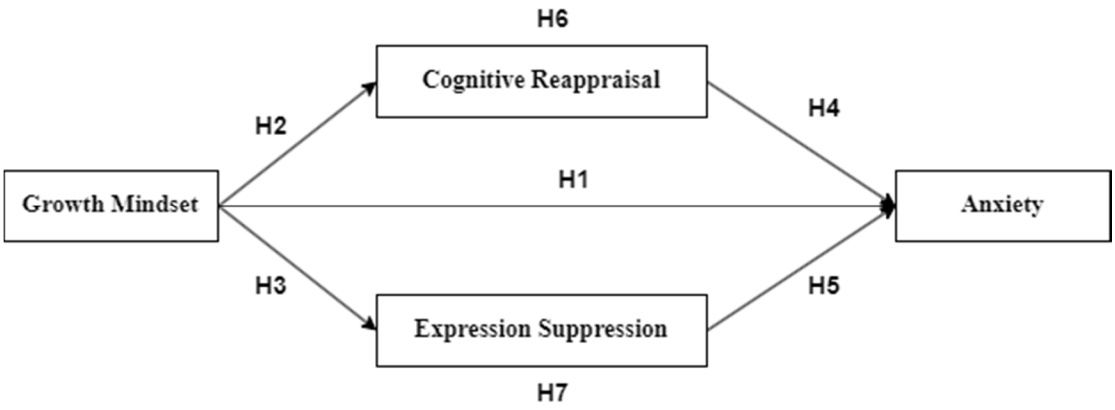

Figure 1 Theoretical framework

3 Materials and methods

3.1 Participants

The research used multistage sampling to collect data, questionnaires are distributed to college students in colleges and universities nationwide through Questionnaire Star, and invalid questionnaires are eliminated according to strict standards. The elimination criteria are: (1) The two designated questions are answered incorrectly; (2) The average answer time for each question is less than 2 seconds; (3) There are obvious answering patterns or tendencies. After initially collecting 660 questionnaires, the reverse-scored items of the questionnaire were recoded and questionnaires with scores outside 3 standard deviations were eliminated. 465 valid questionnaires were obtained (Curran, 2016). Female college students constituted 64.3%, while male college students made up 35.7% of the total. In terms of academic classification, freshmen represented 20.9%, sophomores 38.9%, juniors 26.0%, and seniors 14.2%. Regarding field of study, Natural Sciences comprised 31.4%, Social Sciences 35.3%, Arts and Sports 18.9%, and other disciplines 14.4%. Furthermore, the distribution of participants across different schools was as follows: YU students accounted for 16.6%, SU students 14.8%, NU students 17.8%, SUT students 32.0%, and AU students 18.7%.

Table 1. Demographic Profile of the Respondents (*N*=465)

		Frequency	Percent	Valid Percent	Cumulative Percent
Gender	Male	299	64.3	64.3	64.3
	Female	166	35.7	35.7	100.0
Year of Study	Freshman	97	20.9	20.9	20.9
	Sophomore	181	38.9	38.9	59.8
	Junior	121	26.0	26.0	85.8
	Senior	66	14.2	14.2	100.0
Major	Natural Sciences	146	31.4	31.4	31.4
	Social Sciences	164	35.3	35.3	66.7
	Arts and Sports	88	18.9	18.9	85.6
	Others	67	14.4	14.4	100
School	YU	77	16.6	16.6	16.6
	SU	69	14.8	14.8	31.4
	NU	83	17.8	17.8	49.2
	SUT	149	32.0	32.0	81.3
	AU	87	18.7	18.7	100.0

3.2 Measures

3.2.1 Dweck Mindsets Scale

In this research, the variable under investigation is growth mindset, assessed using the Dweck Mindsets Scale adapted by Chinese researchers (Zhang et al., 2022). This scale comprises 6 items, with 3 items gauging growth mindset and 3 items assessing fixed mindset. A Likert 6-point scale was employed for evaluation, with a rating of “1” indicating “not at all” and “6” indicating “very much so”. Following reverse scoring on the 3 fixed mindset items, higher scores indicate a stronger inclination towards a growth mindset, while lower scores suggest a tendency towards a fixed mindset. An example item from the scale is “Intelligence is difficult to change.”. The scale demonstrated satisfactory reliability, as evidenced by a Cronbach’s alpha coefficient of 0.903.

3.2.2 Stenberg Short-Version Anxiety Scale

The Spielberger State-Trait Anxiety Inventory (STAI) is a commonly utilized tool in research for evaluating anxiety levels. Originally developed by (Spielberger, 1972) in 1972, this inventory is designed to quantify anxiety scores. Recent studies have indicated that the 40-item STAI scale may be overly burdensome in multi-dimensional research settings, leading to participant fatigue. Zsido, Teleki, Csokasi, Rozsa, & Bandi (2020) employed item response theory to create a shortened version of the scale. The Stenberg Short-Version Anxiety Scale consists of 10 items, with 5 items dedicated to measuring state anxiety and 5 items for trait anxiety. Responses are recorded on a Likert 4-point scale, where "1" signifies "not at all" and "4" indicates "very much so." An example item is "I have been feeling restless lately." The scale demonstrates strong reliability, with a Cronbach’s alpha coefficient of 0.911. This study utilizes a dimension packaging approach (Yang et al., 2010) to combine the State Anxiety Inventory Scale (STAIS) and the Trait Anxiety Inventory Scale (STAIT) into two items.

3.2.3 Emotion Regulation Scale

In this research, the investigator utilized the emotion regulation scale revised by Wang Li, specifically designed for Chinese university students, to assess emotion regulation strategies. This scale, developed by (Wang et al., 2007), is grounded in an emotional regulation process model and comprises 14 items categorized into two dimensions: cognitive reappraisal and expressive suppression, each containing 7 items. Within these dimensions, 5 items pertain to regulating five emotions - sadness, anger, aversion, fear, and happiness - while 2 items gauge the frequency of employing a particular strategy. The scale employs a 7-point Likert scoring system, where participants select responses aligning with their perspectives, ranging from "completely disagree" to "completely agree". An example item from the cognitive reappraisal dimension is "When confronted with a situation that could provoke anger, I alter my perspective to mitigate my anger." An illustration from the expressive suppression dimension is "When experiencing happiness, I attempt to conceal it." Both dimensions exhibit strong reliability, as evidenced by Cronbach’s alpha coefficients of 0.902 for cognitive reappraisal and 0.885 for expressive suppression.

3.3 Data analysis

SPSS 26.0 software was used for descriptive statistics and correlation analysis of the research data, and Mplus 8.3 software was used for structural equation model analysis and Bootstrap method mediation effect test.

4 Results

4.1 Common method bias

The study utilized a questionnaire survey method, where participants self-reported their responses to all questionnaire items, potentially leading to common method bias concerns in the measurement. In line with the recommendation by Podsakoff et al. (2003), the researchers performed a Harman univariate test by conducting unrotated principal component analysis on all measurement items simultaneously. If multiple factors are identified and the variance explained by the primary factor is less than 40%, it suggests that common method bias is not significant. The unrotated principal component analysis conducted on the study sample revealed the presence of 5 factors with eigenvalues exceeding 1, and the primary factor accounted for only 35.11% of the variance. This initial finding suggests that the common method bias issue in this study is not substantial.

4.2 Correlation Analysis

The research conducted an analysis to examine the relationship between growth mindset, emotion regulation strategies (expressive suppression and cognitive reappraisal), and anxiety levels in a sample of college students. The findings presented in Table 2 indicate that a negative correlation exists between growth mindset and anxiety ($r = -0.401$, $p<0.01$), suggesting that individuals with a growth mindset tend to experience lower levels of anxiety. Additionally, the study revealed a significant negative correlation between growth mindset and expressive suppression ($r = -0.436$, $p<0.01$), as well as a significant positive correlation between growth mindset and cognitive reappraisal ($r = 0.663$, $p<0.01$). Previous research has also highlighted substantial individual differences in the adoption of emotional regulation strategies, with individuals who employ expressive suppression often not utilizing cognitive reappraisal. Consequently, a notable disparity exists between these two strategies. Furthermore, the analysis demonstrated a significant positive correlation between expressive suppression and anxiety ($r = -0.470$, $p<0.01$), while cognitive reappraisal exhibited an inverse relationship with anxiety, showing a significant negative correlation ($r = -0.403$, $p<0.01$).

Table 2. Descriptive and Correlation Analysis of the Variables

	M ± SD	Growth Mindset	Expressive Suppression	Cognitive Reappraisal	Anxiety
Growth Mindset	25.80 ± 5.649	**0.779**			
Expressive Suppression	26.35 ± 7.968	-0.436**	**0.725**		
Cognitive Reappraisal	33.45 ± 7.282	0.663**	-0.272**	**0.756**	
Anxiety	21.01 ± 6.250	-0.401**	0.470**	-0.403**	**0.801**

**: p<0.01, *: p<0.05.

4.3 Confirmatory factor analysis

The initial phase of this research involved conducting a confirmatory factor analysis (CFA) to assess the measurement model using Mplus 8.3 software with maximum likelihood estimation. The measurement CFA model incorporated items from all variables. The results presented in Table 3 indicated that the four-factor model, which encompassed growth mindset, cognitive reappraisal, expressive suppression, and anxiety, demonstrated a more suitable fit [$\chi2/df = 2.878$, CFI = 0.931, TLI = 0.921, RMSEA = 0.064, SRMR = 0.048] compared to the three-factor model, where items of cognitive reappraisal and expressive suppression were combined into a single factor, as well as other model configurations. Furthermore, the chi-square difference tests revealed a significant decrease in chi-square values between the four-factor model and alternative models (i.e., the three-factor model, two-factor model, and one-factor model). Consequently, the proposed model exhibited a superior fit to the data when compared to the alternative models. In accordance with the four-factor model, the study's $\chi2/df$ was less than 3, RMSEA was below 0.8, SRMR was under 0.8, CFI exceeded 0.9, and TLI surpassed 0.9, indicating a favorable fit of the structural equation model (West et al., 2012).

Table 3 Results of confirmatory factor analyses.

Models	$\chi2$	df	$\Delta\chi2$	Δdf	RMSEA	SRMR	CFI	TLI
Four-factor	584.264	203	-	-	0.064	0.048	0.931	0.921
Three-factor	1588.548	206	1004.284***	3	0.120	0.117	0.749	0.718
Two-factor	1916.827	208	1332.563***	5	0.133	0.115	0.689	0.655
One-factor	2081.644	209	1497.380***	6	0.139	0.117	0.660	0.624

*Note1. The values of $\Delta\chi2$ and Δ df were differences between the four-factor model and other models. Four-factor model = the proposed model (growth mindset, cognitive reappraisal, expressive suppression, and anxiety). Three-factor model = items of cognitive reappraisal and expressive suppression were loaded the same factor. Two-factor model = items of growth mindset, cognitive reappraisal and expressive suppression were loaded on the same factors. One-factor model = items of all variables were loaded on the same factors. RMSEA = root mean square error of approximation; CFI = comparative fit index; TLI = Tucker–Lewis index. ***p < .001.*

Then, we further examined the convergent validity and discriminant validity of the research variables (Anderson & Gerbing, 1988). Convergent validity was tested by three indexes (Fornell & Larcker, 1981): factor load (λ), composite reliability (CR) and average variance extracted (AVE). Table 4 shows that our CR and AVE values fulfilled the recommended levels, with the CR ranging from 0.781 to 0.903 and the AVE ranging from 0.526 to 0.641. These results indicated that the research variables have good convergent validity. With regard to the testing of discriminant validity, the value of AVE sqrt is greater than the correlation coefficient of two potential variables, indicating that there are differences between the variables (see Table 2).

Table 4 Convergent validity index of each variable.

Variables	Items	Estimate	S.E.	Est./S.E.	P-Value	CR	AVE
Expressive Suppression	ERS1	0.721	0.026	28.261	***	0.885	0.526
	ERS2	0.749	0.024	31.729	***		
	ERS3	0.833	0.018	45.527	***		
	ERS4	0.711	0.026	27.373	***		
	ERS5	0.716	0.026	27.682	***		
	ERS6	0.683	0.028	24.370	***		
Cognitive Reappraisal	ERS7	0.649	0.030	21.442	***	0.903	0.572
	ERS8	0.687	0.027	25.408	***		
	ERS9	0.728	0.024	29.898	***		
	ERS10	0.768	0.022	35.375	***		
	ERS11	0.792	0.020	39.802	***		
	ERS12	0.790	0.020	39.119	***		
	ERS13	0.748	0.023	32.530	***		
	ERS14	0.776	0.021	36.839	***		
Growth Mindset	RMAS1	0.759	0.023	33.608	***	0.902	0.607
	RMAS2	0.738	0.024	30.885	***		
	RMAS3	0.773	0.022	35.964	***		
	MAS4	0.781	0.021	37.538	***		
	MAS5	0.827	0.018	46.283	***		
	MAS6	0.793	0.020	38.985	***		
Anxiety	STAIS	0.776	0.036	21.232	***	0.781	0.641
	STAIT	0.825	0.036	22.823	***		

4.4 Hypotheses testing

The data analysis was conducted using Mplus 8.3 through the development of a structural equation

model involving latent variables. This model aimed to examine the relationships among growth mindset, cognitive reappraisal, expressive suppression, and anxiety, while controlling for gender, age, and grade as covariates. The findings presented in Table 5 indicated that the growth mindset had a negative predictive effect on expressive suppression ($\beta = -0.614$, $P < 0.001$) and a significant positive impact on cognitive reappraisal ($\beta = 0.752$, $P < 0.001$). However, the growth mindset did not significantly predict anxiety ($\beta = -0.018$, $P = 0.722 > 0.05$), thereby supporting hypotheses H2 and H3 but not H1. Expressive suppression was found to significantly positively predict anxiety ($\beta = 0.232$, $P < 0.001$), while cognitive reappraisal significantly negatively predicted anxiety ($\beta = -0.170$, $P < 0.01$), supporting hypotheses H4 and H5. Furthermore, the determination coefficient R2 was assessed, following the guidelines of (Chin, 2010), which suggests an R2 value greater than 0.1. Table 5 demonstrates that the R2 values for all endogenous variables met this criterion. The results revealed that 23.7% of the variance in expressive suppression, 54.7% of the variance in cognitive reappraisal, and 42.8% of the variance in anxiety were accounted for by growth mindset, cognitive reappraisal, and expressive suppression.

Table 5. Path analysis of variable relationships.

Result variable	Predictive variable	Estimate	S.E.	Est./S.E.	P-Value	R^2
Expressive Suppression	Growth Mindset	-0.487	0.041	-11.994	***	0.237
Cognitive Reappraisal	Growth Mindset	0.740	0.026	28.226	***	0.547
Anxiety	Expressive Suppression	0.475	0.054	8.860	***	0.428
	Cognitive Reappraisal	-0.281	0.084	-3.369	**	
	Growth Mindset	-0.030	0.084	-0.355	0.722	

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

The results derived from the mediation analysis (see Table 6; Figure 2) showed that expressive suppression and cognitive reappraisal significantly mediated the relationship between growth mindset and anxiety. The total indirect effect value is -0.271 with 95 percent CI [-0.396, -0.136], which accounts for 93.77% of the overall effect of growth mindset on anxiety (total effect value is -0.289 with 95 percent CI [-0.378, -0.181]). The mediating effects especially included two pathways' indirect impacts: indirect effect (1) from Mindset→Cognitive Reappraisal→Anxiety (effect value is -0.128 with 95 percent CI [-0.240, -0.013]); indirect effect (2) from Growth Mindset→Expressive Suppression→Anxiety (effect value is -0.143 with 95 percent CI [-0.189, -0.103]). Indirect effects (1) and (2) accounted for 44.29% and 49.48% of the total effect, respectively. The results imply that expressive suppression and cognitive reappraisal indeed mediated the effect of growth mindset on anxiety. Thus, H6 andH7 was supported.

However, the direct effect between growth mindset and anxiety was found to be -0.018, with a 95% CI of [-0.122, 0.093], indicating its lack of significance. Notably, the results suggested that expressive suppression and cognitive reappraisal acted as complete mediators, as per (Baron & Kenny, 1986). While complete mediation is considered a robust indicator of mediating effects, Preacher & Hayes (2008) have advised against solely focusing on this concept. Therefore, this study shifted its emphasis towards analyzing total effects, direct effects, and indirect effects, along with their statistical significance, to offer a more comprehensive and rigorous interpretation of the research outcomes and methodologies.

Furthermore, additional analyses were conducted to compare the specific indirect effects of growth mindset on anxiety through the mediating pathways of expressive suppression and cognitive reappraisal. The results indicated that relational expressive suppression exhibited a more pronounced negative indirect effect compared to cognitive reappraisal, although the difference between the two specific indirect effects was not statistically significant, as evidenced by a 95% CI of [-0.1219, 0.106].

Table 6 Test of mediated model effect.

Paths	Effect value	S.E.	Bootstrap 95% CI		Proportion of relative effect
			Lower 2.5%	Upper 2.5%	
Total effect	-0.289	0.049	-0.378	-0.181	
Direct effect	-0.018	0.056	-0.122	0.093	6.23%
Total indirect effect	-0.271	0.062	-0.396	-0.136	93.77%
(1) Mindset→Cognitive Reappraisal→Anxiety	-0.128	0.056	-0.240	-0.013	44.29%
(2) Mindset→Expressive Suppression→Anxiety	-0.143	0.022	-0.189	-0.103	49.48%
(1) - (2)	0.015	0.059	-0.121	0.106	4.84%

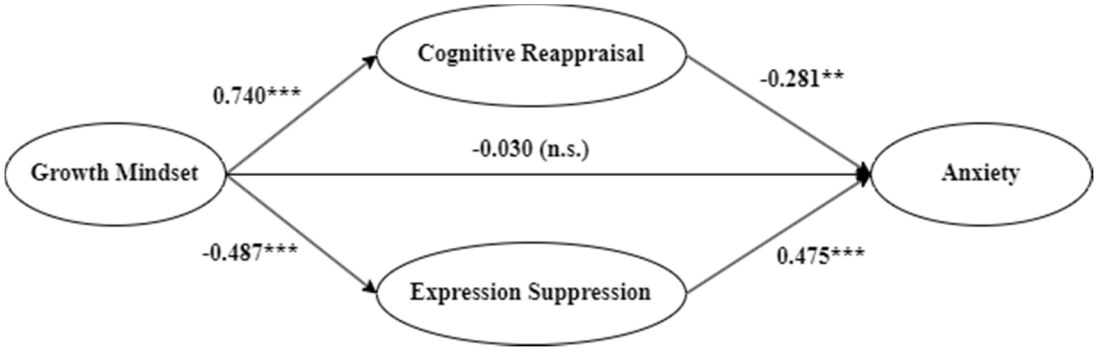

Figure 2 Path coefficients for the mediation model

5 Discussion and conclusions

This study delves into the correlation between growth mindset and anxiety in college students, aiming to elucidate the underlying mechanisms involved. The results indicate that growth mindset may influence anxiety levels through the intermediary processes of expressive suppression and cognitive reappraisal. These findings offer theoretical backing for strategies aimed at reducing anxiety.

The research investigates how growth mindset relates to anxiety and seeks to offer valuable insights and empirical support for individuals seeking to alleviate anxiety symptoms. The study highlights the significant predictive power of growth mindset on anxiety, particularly through the utilization of various emotional regulation techniques. Growth mindset has long been recognized as a protective element that can shield individuals from the negative impacts of stressful life events on their mental and physical well-being (Burnette et al., 2023). It is noted that growth mindset, akin to post-disaster resilience, plays a crucial role in predicting post-disaster and post-traumatic growth, while a lack of growth mindset may exacerbate symptoms of depression, other mental health conditions, or common post-epidemic symptoms (Burnette et al., 2020; Yu et al., 2022). Consequently, the significance of growth mindset in everyday life warrants considerable attention.

This research indicates that having a growth mindset is linked to a higher likelihood of utilizing cognitive reappraisal strategies and a lower likelihood of employing expressive suppression strategies. The theory of mindsets posits that individuals who believe in the potential for personal growth are inclined to focus on transforming negative states through positive actions. Prior studies have demonstrated that cognitive reappraisal is a beneficial strategy that occurs prior to the onset of an emotional response and falls under the category of proactive attention strategies. During this phase, the emotional response has not yet been activated, allowing for the alteration of the entire emotional experience trajectory and serving a regulatory function in emotional experience and expression. In contrast, expressive suppression occurs after the initiation of an emotional response, when the emotional reaction has fully manifested (Li. et al., 2011). By suppressing the emotional response, individuals achieve the goal of emotional regulation. Consequently, individuals with a growth mindset may initially assess negative emotions through cognitive reappraisal strategies, making them less inclined to regulate their emotions through expressive suppression strategies.

Furthermore, cognitive reappraisal is negatively associated with anxiety, while expressive suppression is positively linked to anxiety. Previous research has shown that cognitive reappraisal is an adaptive regulatory strategy correlated with reduced anxiety levels, effectively mitigating negative emotional experiences and physiological responses. Conversely, expressive suppression is considered a maladaptive regulatory strategy associated with heightened anxiety levels. The inhibition of outward emotional expression intensifies internal negative experiences and physiological responses (Liu et al., 2023). In summary, cognitive reappraisal demonstrates a beneficial moderating effect on anxiety, whereas expressive suppression's moderating effect is suboptimal and may even lead to adverse outcomes. A growth mindset, serving as a protective cognitive factor, can assist individuals in promptly alleviating or eliminating negative emotions

through positive cognitive reassessment strategies when faced with such emotions.

In brief, this research suggests that growth mindset, cognitive reappraisal, and expressive suppression can significantly impact an individual's anxiety levels. Growth mindset indirectly influences anxiety through cognitive reappraisal and expressive suppression. These findings not only delve into the mechanism linking growth mindset and anxiety but also offer practical implications. Firstly, acquiring a growth mindset is a valuable skill that can be quickly learned and may aid in reducing negative emotions like anxiety (Dweck & Yeager, 2019). Secondly, interventions targeting growth mindset can be effective due to its malleability. Studies have demonstrated that short-term interventions focusing on growth mindset can decrease anxiety and enhance overall physical and mental well-being (Yeager et al., 2022).

However, this study has several limitations. Firstly, it is a cross-sectional study that lacks longitudinal tracking of changes in participants' growth mindset, emotion regulation strategies, and anxiety, hindering the ability to establish longitudinal relationships among these variables. Therefore, future research could validate these findings through longitudinal tracking methods. Secondly, the emotion regulation strategy scale utilized in this study only encompasses cognitive reappraisal and expressive suppression strategies, overlooking other effective strategies like acceptance strategies (Li et al., 2011). Hence, further exploration of the efficacy of alternative strategies is warranted. Thirdly, while the study indicates that growth mindset indirectly predicts anxiety through cognitive reappraisal and expressive suppression, it does not directly predict anxiety. This could be due to anxiety being a common human emotion triggered in specific situations for everyone. Therefore, investigating the direct relationship between growth mindset and anxiety, potentially influenced by gender or other moderating variables, is essential. Lastly, the relationship between growth mindset and emotional regulation strategies may form a positive cycle, with individuals possessing a growth mindset being more proficient in using cognitive reappraisal strategies, thereby reinforcing the development of a growth mindset. Consequently, future longitudinal studies could further explore the interplay between growth mindset and emotion regulation strategies.

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