The Influence of Growth Mindset on Anxiety of Chinese Students: Examining the Moderating Role of Cognitive Reappraisal

Wang Kang, and Wong Siew ping

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 influence of growth mindset on Chinese students' anxiety, and the moderating effect of cognitive reappraisal on such relationship. Utilizing a purposive sampling technique, 465 college students from Shaanxi Province, China were selected as the sample. The research employed the Dweck Mindsets Scale, Cognitive Reappraisal Scale, and Anxiety Scale, constructing a structural equation model to test the research hypothesis. Results reveal a significant and negative correlation between growth mindset and anxiety, and cognitive reappraisal was found to moderate the relationship between growth mindset and anxiety. These findings contribute to a deeper comprehension of the connection between mindsets and emotional well-being, elucidating the moderating function of cognitive appraisal 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, Cognitive reappraisal, College students**

I. 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, 2021). 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, 2021). 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 college 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).

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II. PROBLEM STATEMENT

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 behavioural 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 behaviour, 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).

III. LITERATURE REVIEW

Growth Mindset and Anxiety

Dweck (1986) introduced the ground-breaking concept known as mindset theory. This theory suggests that individuals' beliefs about their own abilities and potential fundamentally shape their behaviours, learning, and achievement. According to Dweck's research, individuals can possess either a fixed mindset or a growth mindset. In a fixed mindset, people believe that their abilities are innate and unchangeable, leading them to avoid challenges and give up easily in the face of setbacks. Conversely, those with a growth mindset believe that their abilities can be developed through effort and perseverance,

leading them to embrace challenges and persist in the face of obstacles. Scholars have found that mindset influences anxiety. Schleider and colleagues recruited a large and diverse sample of 13–16-year-olds during COVID-19 and found that the growth mindset program significantly improved anxiety symptoms (Schleider et al., 2020). Yeager et al. (2022) treatment of over 1000 9th grade students' growth mindset showed that growth mindset enables teenagers to flexibly respond to challenges, and this stronger resilience helps offset the impact of stressors on long-term anxiety. Yeager also conducted a short-term (approximately 30 minutes) and scalable "collaborative mindset" intervention experiment by recruiting American high school students and found that collaborative mindset intervention has a stronger beneficial effect on people with a growth mindset. A study at Guttman Community College examined how a combined mindfulness and growth mindset intervention for anticipatory and execution anxiety was effective in reducing math anxiety among students in a semester-long statistics course (Samuel et al., 2023). In addition, female students also experienced significant reductions in anxiety. Similarly, growth mindset interventions can also significantly reduce first-year students' mathematics anxiety and improve mathematics self-efficacy (Samuel & Warner, 2021). Other scholars studied high school students through 8-month longitudinal data and 10-day diary reports. The results showed that during the transition to high school, when adolescents believe that people, including themselves, cannot change, they experience stress. We are often more vulnerable in front of the source. Furthermore, their study identified two potential mechanisms by which cognitive beliefs about personality plasticity are linked to the etiologic of internalizing symptoms in adolescence—trait attributions and threat appraisals (Seo et al., 2022). Accordingly, this study proposed hypothesis 1: Growth mindset significantly and negatively influences anxiety among college students.

Cognitive Reappraisal as a Moderator

Cognitive reappraisal is the process of recognizing the causes of emotions, which refers to an individual's revaluation of their own emotions, such as empathy or re understanding and self-rationalization of events that trigger emotional reactions (Gross & John, 2003). Zhang et al. (2022) studied the effects of cognitive reappraisal strategies on social anxiety and depression in Chinese university students, the results showed that cognitive reappraisal played a moderator role between negative evaluation fear on social anxiety. Fan, Zhang, & Jing (2022) conducted a time stress paradigm and Stroop task experiment on 117 students to study the impact of emotion regulation strategies on emotions under different cognitive resources. The results showed that cognitive reappraisal could significantly regulate negative emotions in both the absence of time stress and low cognitive resources. However, cognitive reappraisal strategies were unable to effectively regulate emotions under 8 second time pressure and Stroop task. The cognitive reappraisal strategy relies more on cognitive resources and can only effectively regulate emotions when cognitive resources are sufficient. In addition, some studies have shown that cognitive reappraisal, as a positive self-perception intervention, can significantly moderate the relationship between perceived stress and depression (Xu et al., 2020), and can also significantly moderate the relationship between social exclusion and shame (Lei et al., 2020). Consequently, this study posited hypothesis 2: Cognitive reappraisal moderates the relationship between growth mindset and anxiety among college students.

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

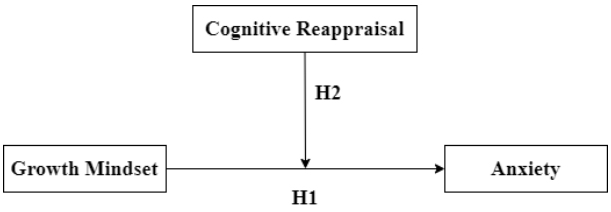

Figure 1. Research Framework

IV. METHOD

Sample

The research used multistage sampling to collect data. This sampling method was used to extract samples from the college student population. Using smaller groups (units) at each stage a commonly used method to collect data from a geographically dispersed large group of people (Bhandari, 2021). According to the purpose of the survey and under the given conditions of human, material and financial resources, the sampling population selected for this survey is undergraduate students in Shaanxi Province, China. Shaanxi Province is one of the major provinces in higher education in my country. According to the data queried by the researcher on the Internet, there are 35 colleges and universities in Shaanxi Province, covering various types of colleges and universities, with a total of undergraduates 711,000 people. Therefore, this study opted for colleges and universities within Shaanxi Province as the study location. this decision not only eased the process of visits and research but also maintained the representativeness of the sample.

Procedures

This quantitative study adopted a cross-sectional survey and was administered by two professional teachers. Informed consent was provided before the administration of the test. Since state anxiety is a short-term feeling, it can generally be stimulated by specific events. Therefore, this study draws on previous research experience and uses the final exam of college students as a triggering event for state anxiety (Hoi Yan, 2006; Suliman & Halabi, 2007). The questionnaire was used for the second time in 2023. It was distributed to students 2 weeks before the final exam of the semester (July 2023) for testing. This period is considered a time when students experience stress and anxiety from dealing with academics demands. At this

time, students need to spend a lot of time reviewing courses and submitting assignments, and they need to successfully pass the exam to successfully enter the course study in the next academic year, otherwise their progress in obtaining a degree will be delayed.

Measures

Dweck Mindsets Scale. In this study, the independent variable is growth mindset, which is measured by the Dweck Mindsets Scale revised by Chinese scholars (Zhang et al., 2022), It includes 6 items, 3 items measuring growth mindset and 3 items measuring fixed mindset. They used the Likert 6-point scale for measurement, "1" represents "not at all" and "6" represents "very much so". After performing reverse scoring on the 3 fixed mindset items, the higher the score, the more individuals have a growth mindset, the lower the score, the more individuals have a fixed mindset. A sample item is "Intelligence is difficult to change.". The scale shows a good reliability with Cronbach's alpha value of 0.903.

Stenberg Short-Version Anxiety Scale. The Spielberger State-Trait Anxiety Inventory (STAI) is widely used in research to assess anxiety. It is used to measure anxiety scores and was developed by (Spielberger, 1972). Research in recent years has shown that the 40-item STAI scale has too many items when conducting multi-dimensional research with other variables, causing participants to experience fatigue reactions. Zsido, Teleki, Csokasi, Rozsa, & Bandi (2020) used project response theory to analyse abbreviation scale. There are 10 items in the Stenberg Short-Version Anxiety Scale to measure state anxiety and trait anxiety respectively. there were 10 items, 5 items measuring state anxiety, and 5 items measuring trait anxiety. They used the Likert 4-point scale for measurement, "1" represents "not at all" and "4" represents "very much so". A sample item is "I have been feeling restless lately.". The scale has a high reliability with Cronbach's alpha value of 0.911. This study adopts a dimension packaging strategy (Yang et al., 2010) to package STAIS and STAIT into two items.

Cognitive Reappraisal Scale. In this research, the investigator utilized the cognitive reappraisal scale specifically designed for Chinese university students, to assess emotion regulation strategies. This scale developed by (Wang et al., 2007), it is a subscale of the Emotion Regulation Scale (ERS) is grounded in an emotional regulation process model and comprises 7 items. 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." And it exhibits strong reliability, with Cronbach's alpha value of .902.

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. First, the relationships among growth mindset, cognitive reappraisal, and anxiety were established using Pearson's correlations. Subsequently, a structural equation model analysis was performed to test if cognitive reappraisal was a moderator in the relationship between growth mindset and anxiety. In the analysis, cognitive reappraisal (± 1 SD), growth mindset, and their interaction term (cognitive reappraisal × growth mindset) were the independent variables, and anxiety was the dependent variable. Moreover, simple slope analyses were used to explore the interaction effect.

V. FINDINGS

Common Method Bias

Due to the questionnaire survey method used in this study, all questionnaire questions were filled out by the participants themselves, so there may be common method bias issues in the measurement. In terms of program control: (1) This study emphasizes anonymity, confidentiality, and the limitation of data to scientific research during the data collection process; (2) Using different scoring methods on different variable measurement items, for example, some measurement questionnaires use Likert 5-point scoring, while others use Likert 4-point scoring; (3) Different responses are used for different questionnaires, such as using agreement level, conformity level, and behavioural frequency. Since program control can only partially correct common method bias, we use statistical methods to further test the effect of 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 three factors with eigenvalues exceeding 1, and the primary factor accounted for only 38.11% of the variance. This initial finding suggests that the common method bias issue in this study is not substantial.

Confirmatory Factor Analysis

The initial phase of this research involved conducting a confirmatory factor analysis (CFA) to assess the measurement model with maximum likelihood estimation. The measurement CFA model incorporated items from all variables. The results presented in Table 1 indicated that the three-factor model, which encompassed growth mindset, cognitive reappraisal, and anxiety, demonstrated a more suitable fit [χ^2/df = 3.647, CFI = 0.943, TLI = 0.932, RMSEA = 0.075, SRMR = 0.037] compared to the

two-factor model, where items of cognitive reappraisal and growth mindset were combined into a single factor, as well as other model configurations. Consequently, the proposed model exhibited a superior fit to the data when compared to the alternative models. In accordance with the three-factor model, the study's χ^2/df was less than 5, RMSEA was below 0.8, SRMR was under 0.8, CFI exceeded 0.9, and TLI surpassed 0.9, indicating a favourable fit of the structural equation model (West et al., 2012).

TABLE 1: RESULTS OF CONFIRMATORY FACTOR ANALYSES

Models	χ^2/df	RMSEA	SRMR	CFI	TLI
3 factor	3.647	0.075	0.037	0.943	0.932
2 factor	8.695	0.129	0.068	0.832	0.801
1 factor	10.626	0.144	0.079	0.787	0.751

Note1. 3 factor model = the proposed model (growth mindset, cognitive reappraisal, and anxiety). 2 factor model = items of cognitive reappraisal and growth mindset were loaded the same factor.1 factor model = items of all variables were loaded on the same factors.

Then, the convergent validity and discriminant validity of the research variables were examined as suggested by Anderson and Gerbing (1988). Convergent validity was tested by three indexes (Fornell & Larcker, 1981): factor load (λ), composite reliability (CR) and average variance extracted (AVE). Table 2 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 0.572 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 2: CONVERGENT VALIDITY INDEX OF EACH VARIABLE

Variables	Items	λ	t	CR	AVE
CR	ERS1	0.687	25.408	0.903	0.572
	ERS2	0.728	29.898		
	ERS3	0.768	35.375		
	ERS4	0.792	39.802		
	ERS5	0.790	39.119		
	ERS6	0.748	32.530		
	ERS7	0.776	36.839		
GM	MAS1	0.759	33.608	0.902	0.607
	MAS2	0.738	30.885		
	MAS3	0.773	35.964		
	MAS4	0.781	37.538		
	MAS5	0.827	46.283		
	MAS6	0.793	38.985		
Anxiety	STAIS	0.776	21.232	0.781	0.641
	STAIT	0.825	22.823		

Note 2: Growth Mindset = GM, Cognitive Reappraisal = CR.

Descriptive Findings

Through descriptive statistics using SPSS 26.0. According to Table 3, among the 465 participants, in terms of gender ratio, female college students accounted for 64.3% and male college students accounted for 35.7%. From a grade perspective, freshmen account for 20.9%, sophomores account for 38.9%, juniors account for 26.0%, and seniors account for 14.2%. In terms of majors, Natural Sciences accounts for 31.4%, Social Sciences accounts for 35.3%, Arts and Sports accounts for 18.9%, and Others accounts for 14.4%. In terms of the proportion of schools selected, students from YU account for 16.6%, students from SU account for 14.8%, students from NU account for 17.8%, students from SUT account for 32.0%, and students from AU account for 18.7%.

TABLE 3: DEMOGRAPHIC PROFILE OF THE RESPONDENTS (N=465)

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

Correlation Analysis

This study conducted a correlation analysis on growth mindset, cognitive reappraisal, and anxiety among college students. The specific data is shown in Table 4. It can be observed that there is a negative correlation between growth mindset and anxiety (r = -0.401, $p<0.01$), indicating that individuals with growth mindset (higher scores in mindsets) tend to have lower levels of anxiety, there is a positive correlation between growth mindset and cognitive reappraisal (r = 0.663, $p<0.01$), there is a negative correlation between cognitive reappraisal and anxiety (r = -0.403, $p<0.01$).

TABLE 4: DESCRIPTIVE AND CORRELATION ANALYSIS BETWEEN VARIABLES

	M ± SD	GM	CR	Anxiety
GM	25.80±5.65	**0.779**		
CR	33.45 ± 7.28	0.663**	**0.756**	

Anxiety	21.01±6.25	-0.401**	-0.403**	**0.801**

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

Hypotheses Testing

This study uses latent moderating structural equations to explore the relationship between growth mindset and anxiety and explores whether cognitive reappraisal regulates this process. The advantage of the latent moderating structural equation is that there is no need to manually construct a product index to define the latent interaction term. When testing the latent moderating effect, the "XWITH" statement can be used to define the latent interaction term in Mplus (Fang & Wen, 2018). We evaluated the model fit. First, we established a model M0 that did not contain latent interaction terms. The results showed that the model M0 fit well (χ^2/df = 3.647, CFI = 0.943, TLI = 0.932, RMSEA = 0.075, SRMR = 0.037). Then, a model M1 containing latent interaction terms is established. Since the latent regulatory structural equation method does not provide traditional fitting indices such as CFI, TLI, RMSEA, etc., the AIC value and log likelihood value are used to test the fitting of the M1 model (Fang & Wen, 2018). The results show that the AIC value of model M1 is reduced by 6.981 compared with model M0, the log-likelihood value of model M1 is increased by 4.491 compared with model M0, and the degree of freedom of model parameters increases by 1, P<0.05, indicating that model M1 is better than M0.

Figure 2 shows the standardized solution of the research model. The results show that growth mindset significantly negatively predicts anxiety (β = -0.124, p = 0.045 < 0.05). Therefore, H1 is obtained support. We tested the moderating effect of growth mindset and cognitive reappraisal, and the results showed that the interaction effect can significantly and negatively predict anxiety (β = -0.302, p = 0.000 < 0.01), and H2 was obtained support. In order to further understand the moderating effect of cognitive reappraisal, a simple slope analysis was subsequently performed. Following the procedure suggested by Aiken et al. (1991), we plotted the interaction between growth mindset and cognitive reappraisal to further interpret the nature of the interaction, as shown in Figure 3.

The results show that at high cognitive reappraisal (M+1SD), growth mindset has a significant negative predictive effect on college students' anxiety (Simple slope = -0.207, t = -3.013, p = 0.003 < 0.001, with 95 percent CI [-0.542, -0.092]); at low cognitive reappraisal (M-1SD), growth mindset has no significant predictive effect on college students' anxiety (Simple slope = -0.041, t = -0.608, p = 0.543, with 95 percent CI [-0.258, 0.139]).

TABLE 5: MODERATING EFFECTS OF COGNITIVE REAPPRAISAL

Result variable	Predictive variable	β	t	p
Anxiety	GM	-0.124	-2.004	0.045
	CR	-0.302	-5.303	***
	GM× CR	-0.083	-2.979	0.003

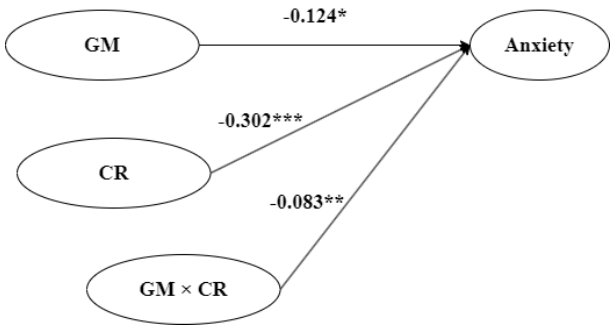

*Figure2. Moderated path analysis results. Unstandardized coefficients are presented here. * p < 0.05. ** p < 0.01.*

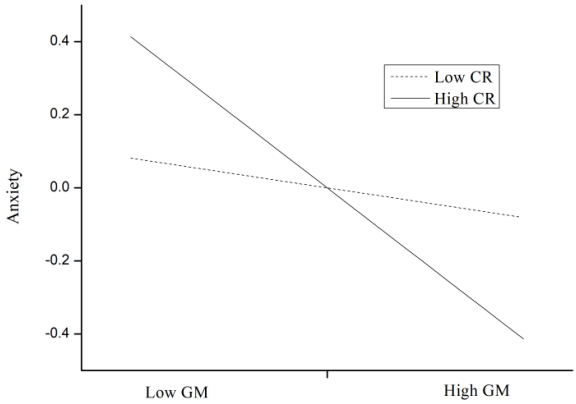

Figure 3. Interaction between growth mindset (GM) and cognitive reappraisal (CR) on anxiety.

VI. DISCUSSION

This research investigated the association between growth mindset and anxiety among college students and examined the underlying mechanism. The findings suggest that growth mindset can affect anxiety through the mediated effects of expression suppression and cognitive reappraisal. This provides theoretical support for reducing anxiety.

This study explored the relationship between growth mindset and anxiety, attempting to provide insights and evidence for individuals to alleviate anxiety. This study indicates that growth mindset can significantly predict anxiety through different emotional regulation strategies. For a long time, growth mindset has been considered a protective factor that can prevent negative life events such as fear and stress from having adverse effects on psychology and physiology (Burnette et al., 2023). Growth mindset or post disaster resilience, exposed to trauma and powerful predictive factors for post disaster and post traumatic growth, lack of growth mindset may exacerbate symptoms of depression, other mental illnesses, or common symptoms after epidemics (Burnette et al., 2020; Yu et al., 2022). Therefore, the role of growth mindset in daily life deserves high attention.

The latent moderation structural equation model of this study shows that cognitive reappraisal moderates the impact of growth mindset on college students' anxiety, and high cognitive reappraisal enhances the effect of growth

mindset on college students' anxiety. That is to say, the higher the cognitive reappraisal, the effect of growth mindset on reducing anxiety is more obvious, which is consistent with existing research. The moderating effect of cognitive reappraisal can be explained by cognitive theory. Individuals with high cognitive reappraisal will actively pay attention to bad emotions in life, prompting the individual to get rid of bad emotions before they appear, while those with low cognitive reappraisal individuals, on the contrary, are not good at getting rid of negative emotions through cognitive changes. This result suggests that we should let teenagers know more about the mechanism of cognitive reappraisal, teach them to develop a growth mindset, and be good at using cognitive reappraisal to intervene in negative emotions.

In summary, this study indicates that growth mindset can effectively affect an individual's anxiety. Cognitive reappraisal can moderate the relationship between growth mindset and anxiety. These research results not only explore the mechanism of the relationship between growth mindset and anxiety, but also provide guidance for practical life. Firstly, growth mindset is an effective tool that can be learned in a short period of time and mastering this "tool" may help alleviate individuals' negative emotions such as anxiety. Secondly, due to the plasticity of growth mindset (Dweck & Yeager, 2019), interventions can be targeted towards growth mindset. Studies have shown that short-term intervention with growth mindset can effectively reduce anxiety and promote individual physical and mental health (Yeager et al., 2022).

VII. LIMITATION

This study also has some limitations. Firstly, this study is a cross-sectional study that did not longitudinally track changes in participants' growth mindset, emotion regulation strategies, and anxiety, making it difficult to determine the longitudinal relationship between these variables. Therefore, in the future, the research results can be verified through longitudinal tracking methods. Secondly, the emotion regulation strategy scale used in this study only includes cognitive reappraisal strategies. However, previous studies have shown that individuals also use other strategies, such as acceptance strategies (Li. et al., 2011), which can effectively regulate negative emotions. Therefore, further exploration of the effectiveness of other strategies should be conducted. In addition, the relationship between growth mindset and emotional regulation strategies may be a positive cycle, with individuals with growth mindset being more adept at using cognitive reappraisal regulation strategies, which in turn strengthens the cultivation of growth mindset. Therefore, to further investigate the interaction between growth mindset and emotion regulation strategies, future longitudinal studies can be conducted on the two.

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