

Emotion Regulation and Depression Symptoms among Chinese Adolescents: The Sequential Mediation Effect of Social Anxiety and Loneliness

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Abstract

The present study aimed to examine the impact of emotion regulation on depression symptoms, with a particular focus on the mediating roles of social anxiety and loneliness among Chinese adolescents. A sample of 316 adolescents ($M_{age} = 16.42$, $SD = 0.61$; 54.11% boys) completed the Emotion Regulation Questionnaire, Social Anxiety Scale, UCLA Loneliness Scale, and Patient Health Questionnaire. The results revealed that expressive suppression not only directly predicted adolescent depression symptoms but also exerted an indirect effect through the sequential mediation of social anxiety and loneliness. In contrast, cognitive reappraisal was found to have a direct negative effect on depression symptoms, with no significant indirect pathways. These findings highlight the critical role of emotion regulation in adolescent mental health and suggest that reducing expressive suppression through interventions such as expressive writing or supportive-expressive therapy may help alleviate depression symptoms.

Keywords

Depression Symptoms, Emotion Regulation, Social Anxiety, Loneliness, Sequential Mediation Effect

1. Introduction

Depression symptoms are among the most common mental health issues in adolescence (Lu et al., 2024), with prevalence rates exceeding those of other age groups (Erskine et al., 2015). Recent trends indicate a concerning increase, with the point prevalence of elevated depression symptoms rising from 24% during

2001-2010 to 37% in 2011-2020 (Shorey et al., 2022). Adolescent depression symptoms can significantly impair developmental outcomes. Extensive research has shown that adolescents with elevated depression symptoms are more likely to experience academic difficulties (Shalayiding et al., 2024), insomnia (Rice et al., 2019), inflammation (Colasanto et al., 2020), and suicidal ideation (Kalin, 2021). In China, empirical studies have also revealed a high prevalence of depression symptoms among secondary school students (Tang et al., 2019), which are positively associated with suicide risk (Li et al., 2025), posing serious threats to their overall health and well-being. Therefore, it is essential to examine the factors that influence adolescent depression symptoms.

According to the Process Model of Emotion Regulation, adaptive emotion regulation strategies can reduce adolescents' negative emotional experiences, while maladaptive strategies may exacerbate them (Allen & Windsor, 2019; Gross, 2015). Adolescence is a period of heightened vulnerability to internalizing disorders, such as depression, that are closely linked to emotion regulation difficulties (Ahmed et al., 2015). From the perspective of the cognitive vulnerability–stress model, depression symptoms may result from the interaction between internal vulnerabilities (e.g., poor emotion regulation) and external stressors (e.g., social anxiety and loneliness) (Alloy et al., 2006). Against this backdrop, the present study investigates how emotion regulation relates to depression symptoms among Chinese adolescents, with particular focus on the mediating roles of social anxiety and loneliness. Clarifying these mechanisms may provide theoretical and practical insights for reducing adolescent depression by improving emotion regulation and alleviating interpersonal stressors.

1.1. Association between Emotion Regulation and Depression Symptoms

Emotion regulation refers to the capacity to modify one's emotional responses to achieve goal-directed outcomes (Gross, 1998) and is generally classified into adaptive and maladaptive strategies (Dryman & Heimberg, 2018). Cognitive reappraisal (CR), an adaptive strategy, involves reinterpreting the meaning of a situation to reduce its emotional impact (Goldin et al., 2008). Greater use of CR has been consistently associated with fewer depression symptoms in adolescents. According to the cognitive content-specificity model, CR helps alleviate depressive symptoms by modifying negative cognitive content, such as unfavorable self-evaluations and pessimistic views of past and future events (Garnefski & Kraaij, 2018; Laurent & Stark, 1993). Empirical studies support this relationship. For example, Sobol et al. (2021) found a significant negative correlation between CR and depression symptoms in a sample of 351 adolescents. Similarly, Kökönyei et al. (2024), using two waves of longitudinal data from 1371 adolescents, found that more frequent use of CR at Time 1 predicted lower depression symptoms at Time 2. These findings underscore the protective role of CR in adolescent mental health.

In contrast, expressive suppression (ES) is a maladaptive strategy that involves

inhibiting outward emotional expressions. Adolescents who rely more heavily on ES tend to experience elevated depression symptoms. Two systematic reviews found that maladaptive strategies such as ES exhibit stronger associations with internalizing problems in adolescents compared to adaptive strategies, with the largest effect sizes observed for depression (Compas et al., 2017; Kraft et al., 2023). Empirical research has similarly shown that greater use of ES is positively associated with depression symptoms (Chen et al., 2019; Ji et al., 2024; Su et al., 2024). For instance, Su et al. (2024) applied the actor-partner interdependence model and demonstrated that both adolescent and maternal ES use predicted higher adolescent depression. Moreover, an experience-sampling study by Cameron & Overall (2018) revealed that frequent use of ES predicted increased depression symptoms three months later. These findings highlight the importance of exploring the differential effects of emotion regulation strategies on adolescent depression.

1.2. Social Anxiety as a Mediator

Social anxiety, characterized by fear of negative evaluation and avoidance of social interactions, is closely linked to emotion regulation (Stein & Stein, 2008). Adolescents who use CR tend to report lower levels of social anxiety (Gómez-Ortiz et al., 2018; Sackl-Pammer et al., 2019). For instance, a study of 407 Chinese adolescents found that lower CR use contributed to heightened social anxiety, as social avoidance may impede effective emotion regulation (Lian et al., 2025). Conversely, frequent use of ES has been linked to higher social anxiety. According to the etiological model of social anxiety, deficits in social-emotional functioning, such as maladaptive regulation strategies, increase vulnerability to social anxiety (Spence & Rapee, 2016). Empirical studies have shown a positive association between ES and social anxiety in adolescents (Sackl-Pammer et al., 2019; Wu et al., 2025). An ecological momentary assessment study with adolescents aged 10 - 13 also found that ES use predicted greater social anxiety one year later (Hauffe et al., 2024).

In addition, social anxiety has been identified as a precursor to depression symptoms in adolescents. The multiple pathways model of anxiety-depression comorbidity suggests that anxiety, particularly social anxiety, may act as a risk factor for subsequent depression (Cummings et al., 2014; Zhang et al., 2023). This relationship has been confirmed by multiple studies (Ernst et al., 2024; Jiang et al., 2025), including longitudinal research. For example, Van Zalk & Tillfors (2017) found that social anxiety predicted depression symptoms over time in a three-wave study of 526 adolescents. Similarly, Zhang et al. (2023) found that social anxiety significantly predicted depression symptoms six months later among 1,947 Chinese adolescents. Thus, social anxiety may mediate the relationship between emotion regulation and depression symptoms.

1.3. Loneliness as a Mediator

Loneliness is defined as the distressing experience resulting from a discrepancy

between desired and actual social relationships (Perlman & Peplau, 1982). Research suggests that lower CR use and greater ES use are both associated with heightened loneliness. The process model of emotion regulation posits that CR generally reduces negative emotional experiences (Gross & John, 2003), while ES is linked to adverse outcomes such as increased negative affect (Tyra et al., 2021). A meta-analysis of 61 studies reported that loneliness is negatively associated with CR and positively with ES (Patrichi et al., 2024). Empirical evidence further supports these links. For instance, Gardner et al. (2017) found that among 443 early adolescents, CR negatively predicted school-related loneliness, whereas ES was positively associated with it. While such findings highlight the connection between emotion regulation and loneliness, additional research is needed to clarify how these strategies influence loneliness in adolescents.

Loneliness has also been consistently identified as a key predictor of depression symptoms in adolescents. According to interpersonal theory, loneliness—reflecting perceived deficits in social connection—is a significant risk factor for depression (Coyne, 1976; Rudolph et al., 2008). A meta-analysis of 44 studies found a strong positive association between loneliness and depression symptoms in adolescent populations (Dunn & Sicouri, 2022). Other studies have confirmed this link (Fang et al., 2023; Kyron et al., 2023; Wang et al., 2020). For example, a psychometric network analysis of 496 adolescents revealed that loneliness was directly associated with three core symptoms of depression: sadness, anhedonia, and worthlessness (Grygiel et al., 2024). In a three-wave longitudinal study, Fang et al. (2023) found that loneliness at Time 1 predicted depression at Time 2, and loneliness at Time 2 predicted depression at Time 3. These findings underscore the potential mediating role of loneliness in the relationship between emotion regulation and depression symptoms.

1.4. The Sequential Mediating Roles of Social Anxiety and Loneliness

Given the established link between emotion regulation and depression symptoms, it is critical to examine whether this relationship is mediated by both social anxiety and loneliness in sequence. According to the cognitive-behavioral model of social anxiety, adolescents with higher levels of social anxiety often engage in avoidance behaviors that limit opportunities for meaningful social interactions, ultimately leading to increased loneliness (Heimberg et al., 2010). Empirical studies support this link between social anxiety and loneliness (Chen et al., 2023; Dong et al., 2024; Sun et al., 2023). For instance, a longitudinal study involving 1010 participants aged 18 - 87 found that earlier social anxiety was the only predictor of future loneliness (Lim et al., 2016). These findings suggest that adolescents with high social anxiety are more likely to experience subsequent loneliness. Thus, it is reasonable to propose that social anxiety and loneliness may jointly mediate the relationship between emotion regulation and depression symptoms in a sequential manner.

1.5. The Present Study

To address these gaps, the present study constructs a sequential mediation model to examine the associations between emotion regulation, social anxiety, loneliness, and depression symptoms among Chinese adolescents. We propose the following hypotheses:

- 1) CR negatively and ES positively predict adolescent depression symptoms;
- 2) social anxiety and loneliness mediate the relationships between emotion regulation strategies and depression symptoms.

The hypothesized model is shown in **Figure 1**.

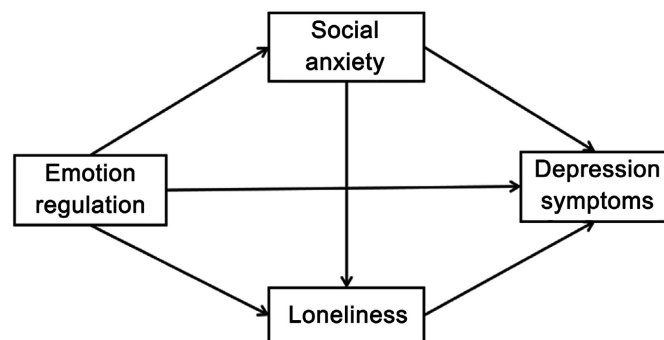


Figure 1. The conceptual mediation model.

2. Method

2.1. Participants

Employing cluster random sampling, 354 adolescents attending 10th and 11th grades in one senior high school in Zhoukou City, China, were recruited to participate in the study in December 2024. All participants completed paper-based questionnaires. A total of 38 invalid responses were excluded: 18 due to patterned or identical responses, and 20 due to incomplete data on key study variables. The final sample was comprised of 316 participants, with boys accounting for 54.11% of the student group ($M_{age} = 16.42$; $SD = 0.61$). The study procedure was carried out following the Declaration of Helsinki. The Ethics Committee of Liaoning Normal University approved the study. Written informed consent was obtained before the survey.

2.2. Measures

Emotion regulation

The Emotion Regulation Questionnaire for Child and Adolescence (ERQ-CA) developed by Gullone & Taffe (2012) was used to measure emotion regulation. This measure includes two specific strategies of emotion regulation: cognitive reappraisal (CR, 6 items) and expressive suppression (ES, 4 items). Items are rated on a 5-point Likert-type response scale ranging from 1 (complete disagreement) to 5 (complete agreement). Higher scores on each scale indicate greater use of the corresponding strategy. The Chinese version of ERQ-CA was revised by Chen et

al. (2016) and showed good validity and reliability. In this study, Cronbach's α was 0.76 and 0.66 for the CR strategy and ES strategy, respectively.

Social anxiety

The Social Anxiety Scale for Adolescents (SAS-A) developed by La Greca & Lopez (1998) was used to measure the levels of social anxiety. This measure contains 18 items which are rated on a five-point Likert scale ranging from 1 (never true) to 5 (very often true). Higher total scores indicate higher levels of social anxiety. The Chinese shortened version of SAS-A-13 adapted by Zhu (2008) shows satisfactory validity and reliability among Chinese adolescents. In this study, Cronbach's α was 0.89.

Loneliness

Loneliness was measured using the 20-item revised version of the UCLA (University of California, Los Angeles) Loneliness Scale (R-UCLA) developed by Russell (1996). Participants rate the items on a four-point scale from 1 = never to 4 = always. Higher total scores indicate higher levels of loneliness. The R-UCLA show satisfactory validity and reliability in Chinese culture (Tu & Zhang, 2015). In this study, Cronbach's α was 0.85.

Depression symptoms

Depression symptoms were measured using the Patient Health Report scale (PHQ-9, Kroenke et al., 2001). This measure includes 9 items which are rated on a 4-point Likert-type response scale ranging from 0 (never) to 3 (almost every day). Higher total scores indicate higher levels of depression symptoms. The PHQ-9 shows satisfactory validity and reliability among Chinese adolescents (Gao & Liu, 2024). In this study, Cronbach's α was 0.85.

2.3. Data Analysis

Data entry, organization, and statistical analysis were performed using SPSS 22.0, and the Hayes (2013) SPSS macro program PROCESS. Specifically, first, we used SPSS 22.0 to examine the correlations between all the investigated variables. Second, the model 6 in PROCESS was used to examine the roles of social anxiety and loneliness in the relationship between each emotion regulation strategy (CR and ES) and depression symptoms. Under the condition of controlling for gender and age, the theoretical hypothesis model was tested by estimating the 95% confidence interval (CI) for mediation effects with 2000 resampled samples. The effects were considered significant if their CIs did not include 0.

3. Results

3.1. Descriptive Statistics and Correlation

Table 1 provided descriptive statistics including means, standard deviations and correlation matrices of the variables. Under the condition of controlling for gender and age, all pairwise correlations among the variables were statistically significant, except for those between cognitive reappraisal (CR) and social anxiety, and between CR and loneliness.

Table 1. Descriptive statistics and correlations among variables.

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7
1. Gender	1.46	0.50	1						
2. Age	16.42	0.61	-0.15**	1					
3. Cognitive reappraisal	17.61	3.33	0.09	-0.07	1				
4. Expressive suppression	11.53	2.27	-0.12*	0.05	0.26***	1			
5. Depression symptoms	20.59	4.20	-0.01	0.08	-0.28***	0.31***	1		
6. Social anxiety	40.36	7.84	0.14*	0.03	-0.09	0.18**	0.47***	1	
7. Loneliness	51.02	6.12	0.09	-0.03	-0.06	0.21***	0.38***	0.32***	1

Note. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

3.2. Mediation Effect Analysis

We used the model 6 in PROCESS to test the mediation effects of social anxiety, loneliness, and the pathway from social anxiety to loneliness on the association between each emotion regulation strategy and depression symptoms. **Figure 2** illustrates the path coefficients of the two models, which indicates that all pairwise path coefficients among the variables were statistically significant except those between variables CR and social anxiety, and between CR and loneliness. Furthermore, bootstrapping results revealed that the mediation effect of social anxiety, loneliness and their chain mediation in the association between expressive suppression (ES) and depression symptoms were also significant. However, none of the mediation effects in the association between CR and depression symptoms were significant. For detailed results, see **Table 2**.

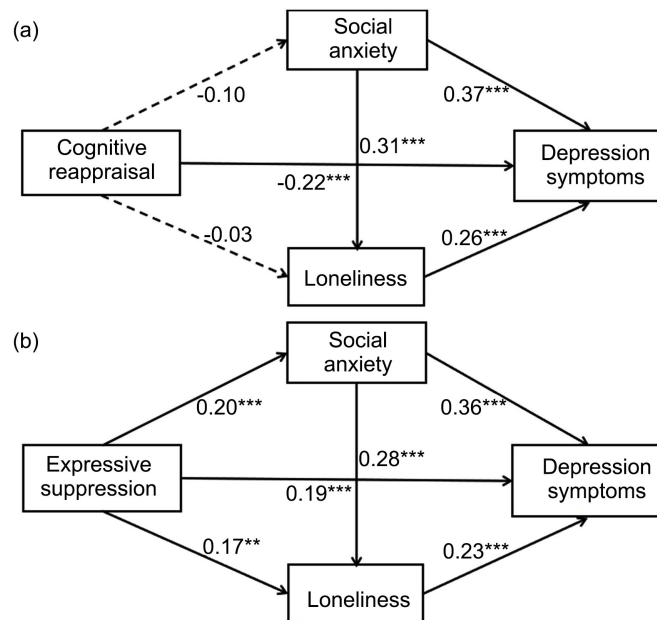


Figure 2. The sequential mediation models. Note. The independent variables in (a) and (b) are cognitive reappraisal and expression suppression, respectively. Path values are the standardized path coefficients. *** $p < 0.001$, ** $p < 0.01$.

Table 2. The pathways of the two sequential mediation models.

Pathways	Effect	S.E.	95% CI	
			Lower	Upper
Direct effect				
Cognitive reappraisal → depression symptoms	-0.279	0.059	-0.395	-0.163
Expressive suppression → depression symptoms	0.350	0.090	0.173	0.528
Indirect effects				
Cognitive reappraisal → Social anxiety → Depression symptoms	-0.048	0.032	-0.115	0.008
Cognitive reappraisal → Loneliness → Depression symptoms	-0.012	0.020	-0.051	0.031
Cognitive reappraisal → Social anxiety → Loneliness → Depression symptoms	-0.011	0.007	-0.027	0.002
Expressive suppression → Social anxiety → Depression symptoms	0.131	0.048	0.048	0.231
Expressive suppression → Loneliness → Depression symptoms	0.072	0.030	0.020	0.140
Expressive suppression → Social anxiety → Loneliness → Depression symptoms	0.024	0.009	0.009	0.044

4. Discussion

The present study recruited 316 adolescents to examine the effects of cognitive reappraisal (CR) and expressive suppression (ES) on depression symptoms, with a focus on the potential mediating roles of social anxiety and loneliness. By constructing a chain mediation model, our findings revealed that CR negatively and ES positively predicted adolescent depression symptoms at a direct level. Furthermore, ES exerted an indirect effect on depression symptoms through the sequential mediators of social anxiety and loneliness. In contrast, CR did not exert an indirect effect via these mediators.

Consistent with Hypothesis 1, both CR and ES were found to directly predict depression symptoms, with CR serving as a protective factor and ES as a risk factor. These findings align with previous research indicating that adaptive emotion regulation strategies such as CR mitigate, whereas maladaptive strategies such as ES exacerbate, depressive symptoms in adolescents (Huang et al., 2025; Ohashi et al., 2024). John & Gross (2004) highlighted that reappraisal is associated with more favorable emotional, social, and psychological outcomes than suppression, supporting the notion that CR reduces depressive symptoms, whereas ES intensifies them. From a neurobiological perspective, habitual use of CR and ES may correspond to distinct structural and functional brain patterns (Cutuli, 2014), potentially influencing adolescent emotional regulation capacities and vulnerability to depression. For instance, habitual CR is associated with enhanced positive emotions and reduced negative emotions (Brockman et al., 2017), whereas adolescents who frequently use ES report fewer positive experiences (Cameron & Overall, 2018; Gross & Cassidy, 2019). The cumulative effect of diminished positive affect and heightened negative affect may heighten adolescents' susceptibility to depressive symptoms (Bean et al., 2022; Santee & Starr, 2022). Additionally, fMRI research has shown that reduced activation in the dorsal midline cortex during CR

tasks is linked to adolescent depression (Stephanou et al., 2017). Collectively, these findings underscore the potential importance of enhancing CR and reducing ES to alleviate depression symptoms among adolescents.

Our findings also partially supported Hypothesis 2, indicating that social anxiety and loneliness sequentially mediated the relationship between ES and depression symptoms. Specifically, adolescents who frequently relied on ES experienced greater social anxiety, which in turn heightened feelings of loneliness, ultimately increasing their risk of depression. This pathway supports the cognitive-behavioral model of social anxiety, which posits that adolescents with high social anxiety often lack confidence and fear negative evaluation, limiting their ability to form close peer relationships and thereby increasing loneliness (Heimberg et al., 2010). Furthermore, the developmental social neuroscience model proposed by Wong et al. (2018) suggests that deficits in social skills contribute to impaired social connectedness and heightened loneliness among adolescents. Empirical evidence supports these models. For example, Danneel et al. (2019) demonstrated that social anxiety in adolescents predicts increasing loneliness over time. Longitudinal findings have similarly shown that frequent use of ES is linked to rising levels of social anxiety (Wang et al., 2024), which subsequently leads to more severe experiences of loneliness (Reinwarth et al., 2024). In turn, persistent or increasing loneliness is a known risk factor for the development of depressive symptoms in adolescents (Kyron et al., 2023; Qualter et al., 2013). These findings collectively support the sequential mediation pathway from ES to depression via social anxiety and loneliness.

Interestingly, CR did not indirectly predict depression symptoms through social anxiety or loneliness. This suggests that CR may exert its effects on depression more directly. Although prior studies have suggested social benefits associated with CR (Dryman & Heimberg, 2018; Gross & John, 2003), recent evidence indicates that CR is more closely linked to general anxiety rather than social anxiety in adolescents (Gökdağ et al., 2024). For example, Wang et al. (2024) found that while ES predicted both general and social anxiety, CR only predicted general anxiety symptoms. Several factors may explain the lack of an indirect effect via social anxiety and loneliness. First, CR is an antecedent-focused strategy, typically employed early in the emotion-generation process (Goldin et al., 2008; Gross & John, 2003). Since it primarily targets internal cognitive and emotional processes, its impact on outward social behaviors may be limited, reducing its potential influence on social anxiety and loneliness. Supporting this, an experimental study by Nasso et al. (2022) found that CR was less effective when participants anticipated receiving social feedback, suggesting that CR may be less adaptive in socially evaluative contexts. Second, as a cognitive change strategy, CR may alleviate depressive symptoms by enhancing psychological flexibility and adaptive thinking (Hussain et al., 2023; Marciniak et al., 2024), rather than by altering social experiences or reducing interpersonal distress. This may explain why CR did not significantly affect depression symptoms via changes in social anxiety or loneliness in our model.

In summary, our findings suggest that CR and ES operate through distinct mechanisms in influencing adolescent depression. ES increases vulnerability to depression via heightened social anxiety and loneliness, whereas CR directly mitigates depressive symptoms, potentially through cognitive or emotional processes not captured by the current mediators. These findings highlight the complexity of emotion regulation and its nuanced pathways to adolescent mental health, emphasizing the need for future longitudinal and experimental research to disentangle these mechanisms further.

5. Limitations and Implications

Several limitations should be acknowledged in the present study. First, the cross-sectional design limits the ability to infer causal relationships among emotion regulation, social anxiety, loneliness, and depression symptoms. Longitudinal or experimental studies are needed to elucidate the temporal and causal pathways between these variables. Second, the data were collected from a single school, which may restrict the generalizability of the findings to the broader population of Chinese adolescents. In addition to the homogeneity of the sample, institutional and environmental characteristics (e.g., mental health resources, academic pressure) may influence the findings. Future research should strive to include more diverse and representative samples from different regions and educational settings to enhance external validity. Third, while the study controlled for variables like age and gender, other potentially influential factors such as socioeconomic status and urban/rural background were not included as controls. These variables could potentially confound the relationships examined in this study, highlighting the need for future research to incorporate them. Fourth, this study focused exclusively on two general and representative dimensions emotion regulation strategies—cognitive reappraisal (CR) and expressive suppression (ES)—while omitting other relevant strategies such as acceptance, refocusing on planning, and rumination. Future studies should consider a broader range of emotion regulation strategies to determine their unique and combined effects on adolescent depression. Finally, the reliance on self-reported data from adolescents may introduce potential biases, such as social desirability or subjective misreporting. Incorporating multiple informants (e.g., parents, teachers) or utilizing alternative assessment methods such as semi-structured interviews or behavioral tasks could enhance the validity of the findings.

Despite these limitations, the study provides both theoretical and practical implications. Theoretically, our findings offer empirical support for the process model of emotion regulation, emphasizing the critical roles that adaptive (CR) and maladaptive (ES) strategies play in shaping adolescents' emotional outcomes. These results enrich our understanding of how specific emotion regulation patterns are associated with depression symptoms during adolescence. Practically, the findings highlight key targets for psychological intervention and prevention. First, the direct and detrimental effect of ES on depressive symptoms underscores the need to

reduce reliance on suppression among adolescents. Interventions such as cognitive-behavioral therapy (CBT) or school-based emotional skills training could help adolescents identify and replace maladaptive regulation strategies with more adaptive ones. For example, supportive-expressive group therapy can reduce emotional suppression (Ho et al., 2016), and expressive writing has been shown to be effective across cultures in decreasing suppression (Lee et al., 2023). Moreover, for adults, interventions that promote positive thoughts, emotions, and behaviors may reduce the suppression of positive emotions, strengthen therapeutic bonds, and alleviate emotional distress (Hoffman et al., 2024). Second, the study identifies social anxiety and loneliness as mediators in the relationship between ES and depression, suggesting that targeting these interpersonal and emotional risk factors could mitigate the negative impact of ES. Enhancing social connectedness, fostering peer support, and building social competence may be effective strategies to buffer adolescents, against the adverse emotional consequences of habitual suppression. In sum, this study underscores the importance of developing emotion regulation interventions tailored to adolescents' social and emotional contexts, with an emphasis on reducing maladaptive regulation and addressing the social-emotional mechanisms underlying depressive symptoms.

6. Conclusion

In conclusion, the present study sheds light on the complex interplay between emotion regulation strategies, social anxiety, loneliness, and depressive symptoms among Chinese adolescents. The findings reveal that expressive suppression not only directly predicts higher levels of depressive symptoms but also indirectly contributes to depression through the sequential mediating effects of social anxiety and loneliness. In contrast, cognitive reappraisal exerts a direct negative effect on depressive symptoms, without significant mediation through social anxiety or loneliness. These results underscore the importance of distinguishing between adaptive and maladaptive emotion regulation strategies and highlight the critical role of interpersonal and emotional factors in adolescent mental health.

Declarations

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Ethical Statement

Written informed consent was obtained from the children, their parents, and the affiliated school. The study design was approved by the Human Research Ethics Committee of Liaoning Normal University.

Authors' Contribution Statements

Jinsheng Hu and Tengxu Yu contributed to the conception of the study. Qiying

Chen was responsible for the data collection. Tengxu Yu analyzed the data and Qiying Chen wrote the draft of the paper. All authors reviewed the manuscript for important content.

Conflicts of Interest

The authors declare no competing interest.

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