

The effect of loneliness on depression in young people: a multiple mediated effects model

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Abstract. – OBJECTIVE: The COVID-19 pandemic led to prolonged isolation and disrupted people's social relationships, contributing to increased loneliness among students. Loneliness is associated with various psychological disorders, including depression, which may result in severe consequences such as self-harm and suicide. This study aims to investigate the factors through which loneliness influences depression.

SUBJECTS AND METHODS: The study involved administering questionnaires to 879 secondary and higher education students in Guangzhou, Guangdong Province, China, during the COVID-19 epidemic. The data that were gathered underwent a comprehensive analysis.

RESULTS: The data analysis revealed a significant positive predictive effect of loneliness on depression. Additionally, the study found that a goal-oriented approach and resilience partially mediated the relationship between feelings of loneliness and symptoms of depression. Furthermore, resilience and goal focus were identified as mediators in a chain, independent of the levels of expression inhibition and cognitive reappraisal. Cognitive reappraisal showed a negative moderating effect on the mediation between loneliness and depression. Moreover, expressive inhibition positively mediated the relationship between loneliness and depression, with resilience playing a role in this association.

CONCLUSIONS: The findings indicate that the inability to alleviate negative emotions through socialization and interpersonal companionship during COVID-19 contributed to increased loneliness and subsequent depression. Reduced resilience due to loneliness may lead individuals to project unfavorable interpersonal experiences onto other aspects of life and believe they are incapable of overcoming challenges, thereby deteriorating depression conditions. Enhancing an individual's resilience may help them better adapt to the pandemic-induced changes, mitigating the risk of depression. Similarly, individuals with high levels of goal focus tend to learn

from their experiences, adjust their pace of life, and exhibit lower levels of depression. Targeted interventions to enhance goal focus may be beneficial in reducing depression levels. Moreover, individuals who inhibit the expression of their unhappiness may experience elevated depression levels, while those with high cognitive reappraisal skills tend to experience less depression by altering their cognitive perspective on distressing situations.

Key Words:

Depression, Loneliness, Resilience, Goal focus.

Introduction

Depression is a prevalent and widespread negative mental state¹, with research indicating a higher prevalence of depression among Chinese university students (23.8%) compared to the global average². The COVID-19 pandemic further exacerbated this issue³, necessitating serious attention to depression and behavioral problems⁴.

Loneliness is a negative psychological experience arising from the perceived absence of interpersonal relationships⁵. Individuals experiencing high levels of loneliness are more likely to suffer from increased depression⁶. The outbreak of COVID-19 has led to reduced social interactions, resulting in heightened feelings of loneliness⁷. Studies^{8,9} have consistently shown a positive relationship between loneliness and depression in adolescents, with higher loneliness levels correlating with more significant negative emotions within school, peer groups, and home settings. Consequently, it is hypothesized that the outbreak of COVID-19 has contributed to an increase in individuals' depressive states through heightened feelings of isolation.

Resilience refers to an individual's capacity to maintain adaptive behavior despite facing adversity¹⁰ and may evolve as an individual matures¹¹. Current research¹² highlights that resilience positively predicts emotional stability in high school students through both direct and indirect pathways. On one hand, resilience is inversely associated with loneliness, with interpersonal support being a significant predictor of loneliness¹³. On the other hand, resilience is predictive of depression¹⁴. Higher resilience levels lead to improved social support, better interpersonal relationships, and reduced loneliness¹⁵. As such, it is proposed that resilience partially mediates the relationship between loneliness and depression.

Goal focus involves setting targets, developing strategies, and problem-solving in challenging situations. Research¹⁶ suggests that fostering achievement motivation is beneficial in developing goal focus, while higher self-efficacy is associated with stronger achievement motivation¹⁷ and lower feelings of loneliness¹⁸. Thus, lower loneliness levels may be linked to greater individual self-efficacy, which fosters motivation and paves the way for goal-focused behavior. Therefore, it is hypothesized that reduced loneliness might facilitate the development of goal-raising focus in students.

Based on the Behavioral Activation model^{19,20}, setting enjoyable, necessary, and routine goals can help individuals re-establish adaptive behavioral patterns, reinforce behavioral efforts, and work towards overcoming depression through behavioral goals. Some researchers²¹ have validated the role of goal-seeking behavior as a mechanism in depression treatment using behavioral activation techniques. Hence, this study posits that goal focus mediates its role between loneliness and depression. Furthermore, the study considers that the level of goal focus is an influential factor in an individual's resilience²², leading to the hypothesis that resilience and goal focus jointly mediate the relationship between loneliness and depression in a chain.

Cognitive reappraisal represents a form of cognitive emotion regulation where individuals actively reevaluate the meaning of events to regulate emotions, as part of the "input" component²³. Those proficient in cognitive reappraisal exhibit more positive emotional experiences and expressive behaviors, along with fewer negative emotional experiences and expressions, leading to positive indicators of well-being, satisfaction, and reduced depression²⁴. Accordingly, this study proposes that individuals can reduce loneliness

through cognitive reappraisal, consequently lowering their depression levels, thus acting as a negative moderator in the relationship between loneliness and depression.

Expression inhibition involves suppressing emotional responses and behaviors as an emotion regulation strategy, often as part of the "output" component²³⁻²⁵. Utilizing expression inhibition for emotion regulation may lead to negative emotional consequences and increased negative emotions²⁶. The study postulates that individuals' increased feelings of loneliness, resulting from expression inhibition, may lead to heightened depression levels, serving as a positive moderator between loneliness and depression.

Interestingly, another research²⁷ has suggested that individuals avoided positive conflict through expression inhibition, a negative coping style, during COVID-19 to alleviate anxiety and ultimately increase life satisfaction. This adaptive behavior maintained resilience and improved adaptive behavior. Therefore, this study proposes that expression inhibition leads to increased feelings of loneliness, while also enhancing resilience, and that expression inhibition plays a positive moderating role in the relationship between loneliness, resilience, and depression.

In summary, the hypotheses of this study are as follows: (1) loneliness is significantly and positively related to resilience, goal focus, and depression; (2) resilience mediates the relationship between loneliness and depression; (3) resilience and goal focus play a chain mediating role in the relationship between loneliness and depression; (4) cognitive reappraisal plays a negative moderating role in the relationship between loneliness and depression; (5) expression inhibition plays a positive moderating role in the relationship between loneliness, resilience, and depression.

Subjects and Methods

Data Collection

The data collection for this study was conducted using the online survey platform WenJuanXing (WJX, <https://www.wjx.cn/>). The survey included several questionnaires to assess various variables related to depression, loneliness, resilience, goal focus, cognitive reappraisal, and expression inhibition. The survey was conducted during the late Spring 2022 semester, which coincided with the peak of the first wave of the COVID-19 epidemic in Guangzhou, Guangdong.

Sample

A total of 879 students participated in the survey, comprising 422 males and 457 females. The mean age of the participants was 20.88 years, with a standard deviation of 0.93 years. The participants were enrolled in a secondary vocational school in Guangzhou, Guangdong.

Demographic Information

The participants' demographic information, including age, gender, and educational level, was collected to provide a better understanding of the sample composition.

Assessment of Depression

The assessment of depression in this study was conducted using the Patient Health Questionnaire-9 (PHQ-9), a widely recognized and validated quantitative evaluation recommended by the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders published by the American Psychiatric Association. The scale, recommended by the Psychiatric Branch of the Chinese Medical Association in Japan, has demonstrated good reliability and validity in both domestic and foreign studies and is commonly employed in various research settings^{28,29}. The PHQ-9 comprises nine questions, such as "I have no energy or interest in doing things" and "I feel depressed, frustrated, or hopeless". Respondents use a 4-point scale to indicate the frequency of each symptom over the past two weeks (0=none, 1=a few days, 2=more than half the time, 3=almost every day). The total score on the PHQ-9 ranges from 0 to 27, with scores falling into different categories: 0-4 for no depression, 5-9 for mild depression, 10-14 for moderate depression, 15-19 for moderate to severe depression, and 20-27 for severe depression³⁰. The total PHQ was taken as the response variable.

Assessment of Loneliness

The University of California Los Angeles Loneliness Scale (ULS) assesses the single-dimensional concept of loneliness and is designed to evaluate the gap between individuals' desire for social interaction and their actual level of social interaction³¹. Notably, the scale avoids explicitly mentioning the word "loneliness" in any of its items, thereby reducing response bias³². The scale consists of 20 self-statement items, but for this study, we utilized the simplified version revised by Russell et al³¹ (1980), which includes four items: two forward items (item 2 and item 4) and two reverse items (item 1 and item 3). Participants

rate their feelings using a 4-point scale (1=never; 2=rarely; 3=sometimes; 4=always) based on the provided statements. The positively worded items are reverse-coded so that higher values indicate higher levels of loneliness. The total loneliness score is obtained by summing up the ratings, resulting in a range of 4 to 16 points, where higher scores indicate greater loneliness levels. Numerous studies³³⁻³⁶ have demonstrated the scale's good reliability and validity across both Eastern and Western cultures.

Assessment of Goal Focus

The Chinese version of the Attention to Positive and Negative Information Scale (CAPNIS) is adapted from the original 40-item English version called the Attention to Positive and Negative Information Scale (APNIS). The APNIS measures chronic individual differences in the tendency to attend to, think about, and focus on positive or negative information related to the self, others, and past and future events. The scale consists of two subscales: the Attention to Negative Information (ANI) subscale, which comprises 18 items, and the Attention to Positive Information (API) subscale, which includes 22 items. These subscales assess negative attentional bias and positive attentional bias, respectively. Participants rate the extent to which each statement in the scale is true of them using a five-point Likert scale, ranging from 1 (very untrue) to 5 (very true). To develop the Chinese version, the translation, back-translation, and revision processes were utilized to ensure linguistic and cultural appropriateness³⁷.

Assessment of Emotion Regulation

The Emotion Regulation Questionnaire (ERQ) was originally developed by Gross and John²³ in 2003 to assess individual inclinations toward different emotional regulation strategies. The scale was later translated by Wang et al⁴⁸ in 2007 for use in the Chinese context. The ERQ consists of two dimensions: cognitive reappraisal and expression suppression. The cognitive reappraisal dimension comprises six items (1, 3, 5, 7, 8, 10), while the expression suppression dimension includes four items (2, 4, 6, 9). Each subscale contains at least one item related to the regulation of both negative and positive emotions³⁸. Participants rate each item using a 7-point scoring method, ranging from 1 (completely disagree) to 7 (completely agree). Higher scores on the scale indicate a greater inclination towards adopting the respective emotion regulation strategy.

Assessment of Resilience

In this study, the researchers utilized a shortened version of the Connor-Davidson Resilience Scale (CD-RISC), referred to as the CDRISC2, which includes two items from the original scale. These two items, namely “Able to adapt to change” and “Tend to bounce back after illness or hardship”, were specifically chosen by the scale’s creators to capture the fundamental concept of resilience, representing the ability to successfully rebound and adapt to changes. Participants responded to each item using a five-point scale, with options ranging from “never” (scored as 1) to “always” (scored as 5). The total score obtained from these two items reflects the level of resilience, with higher scores indicating a higher level of resilience in individuals^{39,40}.

Statistical Analysis

The data analysis was conducted using SPSS 25.0 (IBM Corp., Armonk, NY, USA) and R 4.2.1⁴¹ (Auckland, New Zealand). Harman’s single-factor test was employed to assess the presence of common method biases in the data. The test revealed that a total of 6 characteristic roots were greater than 1, explaining 72.737% of the cumulative variance. However, the maximum factor variance interpretation rate was only 32.157%, which fell below the critical value of 40%. These results indicated that common method biases were not a significant concern in the study, suggesting that the data obtained were reliable for further analysis⁴². We tested the moderated mediation model using the SPSS macro-PROCESS (model 92) (<http://www.afhayes.com>) recommended by Hayes⁴⁵. A $p < 0.001$ was considered significant.

Results

Sample Demographics

A total of 879 students participated in the survey, including 422 males (48%) and 457 females (52%). The participants’ mean age was 20.88 years, with a standard deviation of 0.93 years. The participants were distributed across different age groups as follows: 18-year-olds (1.14%), 19-year-olds (2.39%), 20-year-olds (29.69%), 21-year-olds (45.39%), 22-year-olds (17.63%), 23-year-olds (2.96%), 24-year-olds (0.34%), and 25-year-olds (0.34%). Regarding grade level, the distribution was as follows: 210 students in secondary vocational school grade 1 (23.89%), 210 students in secondary vocational school grade 2

(23.89%), 229 students in secondary vocational school grade 3 (26.05%), and 230 students in higher vocational school grade 1 (26.17%).

To examine the discriminant validity of the variables, a confirmatory factor analysis (CFA) was conducted for the five variables: loneliness, depression, goal focus, resilience, and emotion regulation strategies (cognitive reappraisal and expression suppression). The results, as shown in Table I, indicated that the fit of the five-factor model, which distinguished between the mentioned variables, was superior to the fit of other models, including the one-factor model, which had the poorest fit. This finding supports the presence of good discriminant validity among the variables used in the study, indicating that they represent distinct and separate variables.

Furthermore, both Harman’s single factor test and CFA provided evidence that common method biases were not significant in the data. This suggests that the shared method variance or potential bias due to using the same data collection method did not unduly influence the observed relationships between variables. Consequently, the results can be considered more reliable and valid for the interpretations made in the study.

Reliability and Validity of Each Questionnaire

As shown in Table II, the Cronbach’s α coefficient for the scales used in this study ranged from 0.845 to 0.968, indicating high internal consistency and good reliability. The composite reliability (CR) and average variance extracted (AVE) exceeded the thresholds of 0.7 and 0.5, respectively, for all scales, demonstrating good convergent validity⁴³. Specifically, the minimum CR is 0.839, and the minimum AVE is 0.729. Overall, the measurement tools used in this study are reliable and valid for assessing loneliness, depression, goal focus, resilience, cognitive reappraisal, and expression suppression.

Descriptive Statistics

The Pearson correlations among the variables are presented in Table III. Loneliness showed a significant and positive correlation with depression ($r=0.797$, $p < 0.001$) and expression suppression ($r=0.704$, $p < 0.001$), while it was significantly and negatively associated with goal focus ($r=-0.714$, $p < 0.001$), resilience ($r=-0.787$, $p < 0.001$), and cognitive reappraisal ($r=-0.676$, $p < 0.001$). Depression exhibited significant and negative correlations with goal focus ($r=-0.66$, $p < 0.001$),

Table I. Confirmatory factor analysis.

Models	Factors	χ^2/df	SRMR	TLI	CFI	RMSEA
Five factors (sub-dimensions)	A (3), B (3), C, D, E (2)	6.482	0.052	0.909	0.918	0.079
Five factors	A (3), B, C, D, E	8.789	0.08	0.871	0.883	0.094
Four factors	A, B, C, D+E	11.876	0.086	0.82	0.835	0.111
Three factors	A, B, C+D+E	14.001	0.076	0.784	0.801	0.122
Two factors	A, B+C+D+E	20.182	0.093	0.682	0.705	0.148
One factor	A+B+C+D+E	20.748	0.088	0.673	0.695	0.15

A - loneliness, B - depression, C - goal focus, D - resilience, E - emotion regulation strategies, E (2) - 2 dimensions of emotion regulation: cognitive reappraisal/expression suppression; SRMR-standardized root mean square residual; TLI-Tucker-Lewis index; CFI-comparative fit index; RMSEA-root-mean-square error of approximation.

resilience ($r=-0.708, p<0.001$), and cognitive reappraisal ($r=-0.596, p<0.001$), and it was significantly and positively related to expression suppression ($r=0.634, p<0.001$).

Testing for the Chain Mediation Model

To test the chain mediation model with resilience and goal focus as mediating variables, the structural equation-based mediation analysis proposed by Wen et al⁴³ was employed. The bias-corrected percentile Bootstrap method was used to estimate the confidence interval (CI) of each coefficient. In the first step, the direct effect of loneliness on depression was tested. In the second step, goal focus and resilience were added as mediating variables to the original model. The chain media-

tion model results are shown in Table III, and the analysis was performed using model 6.

The results from Table III indicate that loneliness is a significant negative predictor of resilience [$\beta=-0.787, p<0.001, 95\% \text{ CI } (-1.1866, -1.0693)$], explaining 61.9% of the variance in resilience. Loneliness is also a significant negative predictor of goal focus [$\beta=-0.428, p<0.001, 95\% \text{ CI } (-0.5373, -0.3838)$]. However, resilience is a significant positive predictor of goal focus [$\beta=0.364, p<0.001, 95\% \text{ CI } (0.2195, 0.3266)$], and together, loneliness and resilience account for 56% of the variance in goal focus. Moreover, loneliness is a significant positive predictor of depression [$\beta=0.571, p<0.001, 95\% \text{ CI } (0.5284, 0.6699)$], while resilience [$\beta=-0.16, p<0.001,$

Table II. Reliability and validity of scales.

	M	SD	1	2	3	4	5	6	Cronbach α	CR
1 Loneliness	1.819	0.772	0.794						0.849	0.869
2 Depression	1.700	0.810	0.797***	0.880					0.968	0.969
3 Goal focus	3.329	0.831	-0.714***	-0.660***	0.729				0.845	0.839
4 Resilience	3.427	1.106	-0.787***	-0.708***	0.700***	0.944			0.942	0.942
5 Cognitive reappraisals	4.563	1.232	-0.676***	-0.596***	0.592***	0.634***	0.849		0.938	0.939
6 Expression suppression	3.728	1.275	0.704***	0.634***	-0.559***	-0.614***	-0.623***	0.777	0.855	0.859

* $p<0.05$ ** $p<0.01$ *** $p<0.001$; diagonal are AVE square root values; M-mean, SD-standard deviation, CR-composite reliability.

Table III. Results of chain mediation model.

	Model 1 (Depression)		Model 2 (Resilience)		Model 3 (Goal focus)		Model 4 (Loneliness)	
	β	t	β	t	β	t	β	t
Loneliness	0.837	39.076***	-0.787	37.75***	-0.428	-11.777***	0.571	16.62***
Resilience					0.364	10.011***	-0.16	-4.758***
Goal focus							-0.141	-4.742***
F	1526.955***	1425.027***	557.081***	568.501***				
R ²	0.635	0.619	0.56	0.661				

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

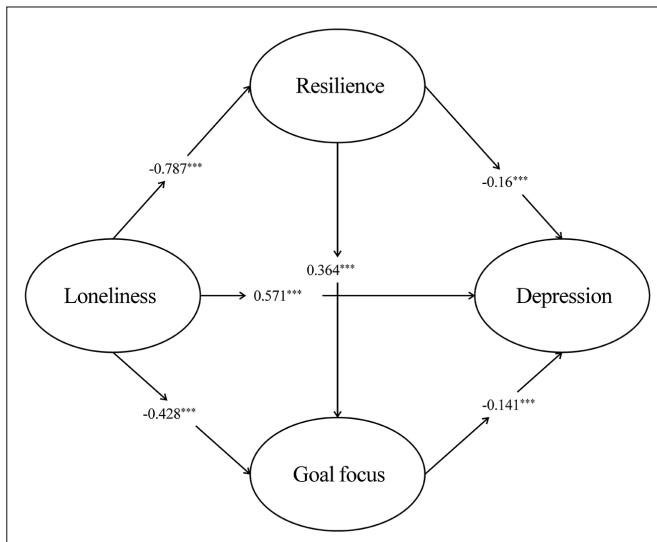


Figure 1. Chain mediation model.

95% CI (-0.1658, -0.069)] and goal focus [$\beta=-0.141$, $p<0.001$, 95% CI (-0.194, -0.0804)] are both significant negative predictors of depression. Overall, the combination of loneliness, resilience, goal focus, and depression explains 66.1% of the variance in depression. These findings shed light on the interplay between loneliness, resilience, goal focus, and depression, emphasizing their importance in understanding psychological well-being, especially in challenging contexts such as the COVID-19 pandemic.

Based on the obtained results, considering the significant direct impact of loneliness on depression and the noteworthy mediating influence of resilience and goal focus in the relationship between loneliness and depression, it was deduced that resilience and goal focus partially mediate the effect of loneliness on depression individually. Furthermore, resilience and goal focus were found to mediate the chain effect between loneliness and depression, as illustrated in Figure 1. These findings emphasize the crucial roles of resilience and goal focus in alleviating the impact of loneliness on depression. Strengthening resilience and fostering goal focus may prove beneficial as

interventions to reduce depression levels, especially during challenging circumstances like the COVID-19 pandemic.

Cognitive Reappraisal as a Moderator

The results from Table IV indicate that in Model 5, where the predictive role of cognitive reappraisal and the moderating role of loneliness \times cognitive reappraisal were introduced to the chain mediation model, the regression equation was found to be overall significant [$F(3, 875)=515.525$, $p<0.001$, $R^2=0.639$]. The variance explained by loneliness, cognitive reappraisal, and loneliness \times cognitive reappraisal on resilience was 63.9%. Loneliness demonstrated a significant negative predictive effect on resilience [$\beta=-0.839$, $p<0.001$, 95% CI (-1.0461, -0.6324)], while the regression coefficient of the interaction term was not significant.

The results from Table V indicate that Model 6, which included the predictive role of cognitive reappraisal and the moderating role of loneliness \times cognitive reappraisal and resilience \times cognitive reappraisal, the regression equation was overall significant [$F(5, 873)=232.357$, $p<0.001$,

Table IV. Reliability and validity of scales.

Path	Effect	Boot SE	Boot LLCI	Boot ULCI	z	p
Loneliness→Resilience→Depression	0.132	0.027	0.072	0.18	4.847	<0.001
Loneliness→Goal focus→Depression	0.063	0.012	0.039	0.084	5.457	<0.001
Loneliness→Resilience→Goal focus→Depression	0.042	0.009	0.024	0.06	4.662	<0.001

SE-standard error, LLCI- lower limits of confidence intervals, ULCI-upper limits of confidence intervals.

$R^2=0.571$]. The combined effects of loneliness, cognitive reappraisal, loneliness \times cognitive reappraisal, and resilience \times cognitive reappraisal on goal focus accounted for 57.1% of the variance. Loneliness had a significant negative predictive effect on goal focus [$\beta=-0.464$, $p<0.001$, 95% CI (-0.7072, -0.2211)], while resilience had a significant positive predictive effect on goal focus [$\beta=0.275$, $p<0.001$, 95% CI (0.110, 0.439)]. However, the predictive effects of loneliness and cognitive reappraisal on goal focus were not significant, and the interaction of loneliness and cognitive reappraisal did not significantly relate to goal focus. Additionally, the interaction of resilience and cognitive reappraisal did not significantly impact goal focus.

Finally, in Model 7, the moderating effects of cognitive reappraisal, loneliness \times cognitive reappraisal, goal focus \times cognitive reappraisal, and resilience \times cognitive reappraisal were added to the chain mediation model, resulting in an overall significant regression equation [$F(7, 871) = 262.615$, $p<0.001$, $R^2=0.679$]. The combination of loneliness, cognitive reappraisal, loneliness \times cognitive reappraisal, goal focus \times cognitive reappraisal, and resilience \times cognitive reappraisal explained 67.9% of the variance in depression. Loneliness was identified as a significant positive predictor of depression [$\beta=1.08$, $p<0.001$, 95% CI (0.8583, 1.3023)]. Additionally, the interaction of loneliness and cognitive reappraisal was found to be significant and negatively related to depression [$\beta=-0.126$, $p<0.01$, 95% CI (-0.1768, -0.0759)].

Bootstrap tests of the regression models were conducted using the SPSS macro-PROCESS. The conditional indirect effect analysis of models 5 to

7 examined the effects of loneliness on depression at different levels of cognitive reappraisal: mean, plus one standard deviation, and minus one standard deviation. The results consistently showed that goal focus and resilience partially mediated the relationship between loneliness and depression, irrespective of the level of cognitive reappraisal. These findings suggest that loneliness can influence depression through the chain mediation of resilience and goal focus.

Furthermore, a simple slope analysis was conducted to further understand how loneliness interacted with cognitive reappraisal to influence depression. After standardizing the data, it was observed that the slope of loneliness on depression under high cognitive reappraisal was lower than the slope of loneliness on depression under low cognitive reappraisal (Figure 2). This result indicates that the effect of loneliness on depression gradually diminishes as cognitive reappraisal increases. In other words, cognitive reappraisal negatively moderates the relationship between loneliness and depression, suggesting that higher levels of cognitive reappraisal can mitigate the impact of loneliness on depression.

Expression Suppression as a Moderator

Model 8 introduced the predictive role of expression suppression and the moderating effect of loneliness \times expression suppression into the chain mediation model. The overall regression equation in Table VI for model 8 was significant [$F(3, 875) = 497.256$, $p<0.001$, $R^2=0.63$], with 63% of the variance in resilience explained by loneliness, expression suppression, and their interaction. Loneliness emerged as a significant negative pre-

Table V. Cognitive reappraisal as moderator - moderated mediation analysis.

	Model 5 (Resilience)		Model 6 (Goal focus)		Model 7 (Depression)	
	β	t	β	t	β	t
Loneliness	-0.839	-7.963***	-0.464	-3.748***	1.080	9.551***
Cognitive reappraisal	0.218	4.238***	0.082	0.744	0.244	2.14*
Loneliness \times cognitive reappraisal	-0.027	-1.093	0.020	0.677	-0.126	-4.914***
Resilience			0.275	3.276**	-0.079	-1.036
Resilience \times cognitive reappraisal			-0.007	-0.358	-0.009	-0.545
Goal focus					-0.100	-0.956
Goal focus \times cognitive reappraisal					-0.004	-0.203
F	515.525***		232.357***		262.615***	
R ²	0.639		0.571		0.679	

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

dicator of resilience [$\beta=-1.311, p<0.001, 95\% \text{ CI} (-1.5211, -1.1009)$], and the interaction of loneliness and expression suppression was also significantly related to resilience [$\beta=0.069, p<0.01, 95\% \text{ CI} (0.0253, 0.114)$].

Model 9 incorporated the predictive role of expression suppression and the moderating effect of loneliness \times expression suppression and resilience \times expression suppression into the chain mediation model. The overall regression equation for model 9 was significant [$F(5, 873) = 224.975, p<0.001, R^2=0.563$], with 56.3% of the variance in goal focus explained by loneliness, expression suppression, and their interaction. Loneliness had a significant negative predictive effect on goal focus [$\beta=-0.511, p<0.001, 95\% \text{ CI} (-0.7824, -0.3197)$]. However, the interaction of loneliness and expression suppression was not significantly related to goal focus, and the interaction of resilience and expression suppression was also not significantly related to goal focus.

Model 10 integrated the moderating effects of expression suppression, loneliness \times expression suppression, goal focus \times expression suppression, and resilience \times expression suppression into the chain mediation model. The overall regression equation for model 10 was significant [$F(7, 871)=266.069, p<0.001, R^2=0.681$], with 68.1% of the variance in depression explained by loneliness, expression suppression, and their interactions. Loneliness emerged as a significant positive predictor of depression [$\beta=0.219, p<0.05, 95\% \text{ CI} (0.0135, 0.4246)$], and the interaction of loneliness and expression suppression was also significantly related to depression [$\beta=0.067, p<0.01, 95\% \text{ CI} (0.0235, 0.1105)$].

Bootstrap tests of the regression models were conducted using the SPSS macro-PROCESS. The conditional indirect effects of models 8-10 analyzed the effects of loneliness on depression at the mean, plus, and minus one standard deviation levels of expression suppression. The results demonstrated that goal focus and resilience partially mediated the effect between loneliness and depression regardless of the level of expression suppression. Hence, loneliness can influence depression through the chain mediation of resilience and goal focus.

To further explore how the interaction between loneliness and expression suppression influenced resilience, a simple slope analysis was conducted. After standardizing the data, it was observed that the slope of loneliness on resilience under high expression suppression was higher than the slope of loneliness on resilience under low expression suppression (Figure 3). This result indicated that the effect of loneliness on resilience gradually increased as expression suppression increased. Expression suppression positively moderated the relationship between loneliness and resilience.

To further investigate how the interaction between loneliness and expression suppression influenced depression, a simple slope analysis was conducted. After standardizing the data, it became evident that the slope of loneliness on depression under high expression suppression was higher than the slope of loneliness on depression under low expression suppression (Figure 1). This result indicates that the effect of loneliness on depression gradually increased as expression suppression increased. Therefore, expression suppression positively moderated the relationship between loneliness and depression.

Table VI. Expression suppression as moderator - moderated mediation analysis.

	Model 8 (Resilience)		Model 9 (Goal focus)		Model 10 (Depression)	
	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>
Loneliness	-1.311	-12.249***	-0.551	-4.674***	0.219	2.091*
Expression suppression	-0.242	-4.719***	-0.140	-1.461	0.058	0.552
Loneliness \times expression suppression	0.070	3.082*	0.030	1.223	0.067	3.024**
Resilience			0.216	2.815**	-0.098	-1.462
Resilience \times expression suppression			0.011	0.640	-0.004	-0.241
Goal focus					-0.006	-0.069
Goal focus \times expression suppression					-0.034	-1.602
F	497.256***		224.975***		266.069***	
R ²	0.63		0.563		0.681	

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

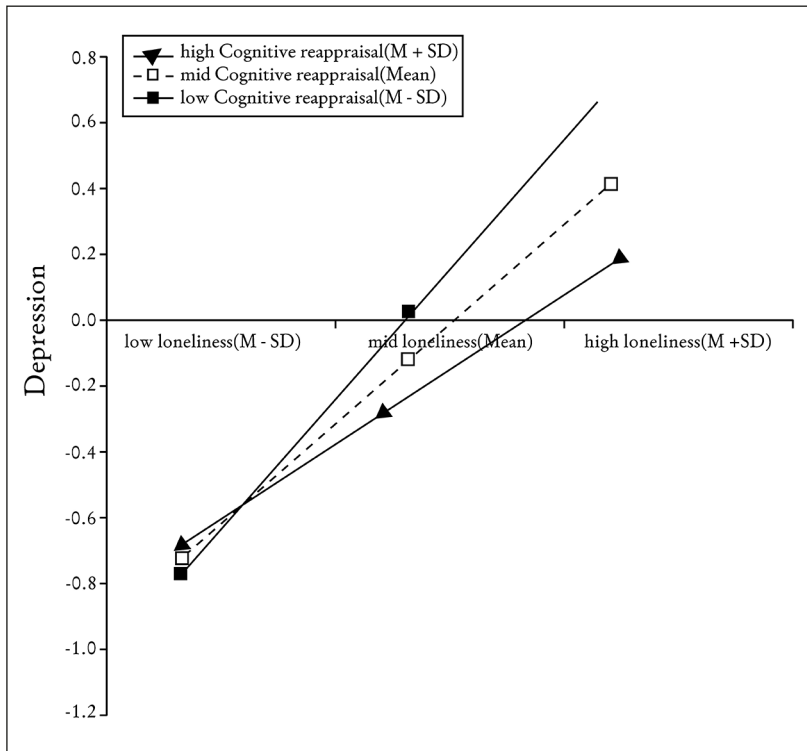


Figure 2. The slope of loneliness on depression under different cognitive reappraisal.

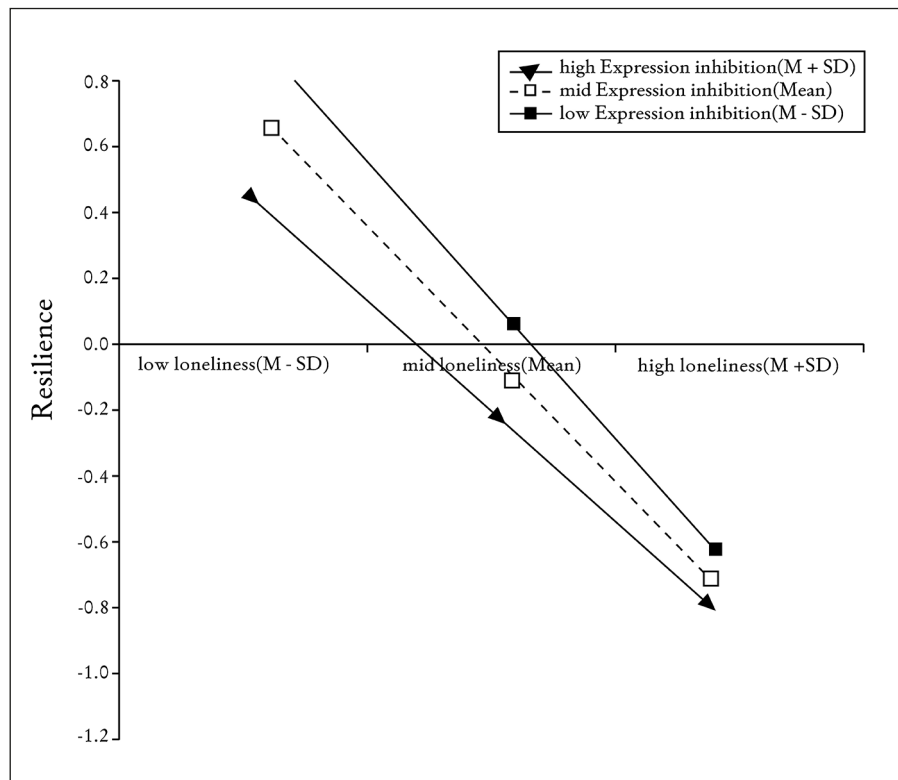


Figure 3. The slope of loneliness on resilience under different expression suppression level.

Discussion

Individuals' loneliness during the COVID-19 pandemic was found to have a significant positive association with their levels of depression, with higher levels of loneliness being linked to increased depression. The period of self-lockdown for COVID-19 contributed to a rise in loneliness, leading to difficulties in alleviating negative emotions and consequently heightening feelings of loneliness and depression. However, individuals who displayed a goal-focused attitude demonstrated the ability to concentrate on problem-solving, maintain clear life goals, and learn from setbacks to achieve their objectives, resulting in a more positive emotional experience and reduced feelings of loneliness. The reason may be that goal-focused individuals prioritize their goals and are less preoccupied with concerns about companionship and social compatibility with others. Moreover, there was a significant negative correlation between loneliness and resilience, as individuals experiencing loneliness tended to perceive a lack of connection with others, a lack of understanding, and challenges in forming friendships, resulting in discomfort and a feeling of incapability to cope with difficult situations. Isolation and lack of companionship during illness and home isolation may also present challenges for individuals in effectively coping with their situation. On the other hand, individuals with high cognitive reappraisal skills demonstrated the capacity to adjust their perspective on the environment, leading to changes in their perceptions. This, in turn, allowed them to re-conceptualize their relationships with others and re-evaluate their social status, leading to reduced feelings of loneliness. In contrast, individuals who suppress their emotions are more susceptible to unhappiness when confronted with negative situations, making it challenging for others to understand and support their innermost thoughts. These findings highlight the importance of addressing loneliness and promoting adaptive coping strategies, such as goal focus and cognitive reappraisal, to mitigate the impact of loneliness on depression and foster better emotional well-being during challenging circumstances like the COVID-19 pandemic⁴⁴.

Depression is found to be negatively associated with goal focus, as individuals who prioritize accomplishing their goals tend to perceive failures as opportunities for growth and learning, leading to reduced feelings of frustration and depression. Moreover, individuals with high levels of resil-

ience possess the belief that they can adapt to changes and cope effectively with setbacks and illnesses, resulting in lower levels of depression and frustration. Additionally, individuals with high cognitive reappraisal skills tend to reframe their thinking about negative emotions, leading to reduced feelings of depression. On the other hand, depression is positively correlated with expression inhibition, as individuals who suppress their emotions during negative experiences may intensify their feelings of depression, as the opportunity for emotional release and relief is hindered. These findings emphasize the importance of goal focus, resilience, and adaptive cognitive strategies in promoting better emotional well-being and mitigating the impact of depression.

During the COVID-19 pandemic, individuals who experience loneliness often feel disconnected from others, lacking meaningful companionship and understanding, which can hinder their ability to form meaningful friendships⁴⁵. This feeling of isolation can hinder their ability to cope effectively with the changes and challenges brought about by home isolation, resulting in a decline in resilience. Moreover, high levels of loneliness can hinder their ability to integrate into social groups and develop fulfilling social connections, leading to frustration in interpersonal relationships and difficulties in maintaining focus on their goals. This frustration and perceived powerlessness can contribute to increased levels of depression. In contrast, individuals with high levels of resilience demonstrate better adaptability to the changes and challenges posed by the pandemic. They can effectively adjust their approach to life, absorb experiences from setbacks, and maintain their focus on their goals despite external distractions⁴⁶. This ability to remain goal-oriented and resilient helps them cope more effectively with negative emotions and experiences, leading to lower levels of depression. Overall, the findings highlight the significant impact of loneliness, resilience, and goal focus on individuals' emotional well-being during challenging times like the COVID-19 pandemic. Reducing loneliness and fostering resilience and goal focus can play a crucial role in promoting mental health and mitigating the adverse effects of depression⁴⁷.

In this study, resilience was examined as a potential mediator in the relationship between loneliness and depression. The results indicated that loneliness directly influences an individual's level of depression, but it also exerts an indirect influence on depression through its impact on

resilience. This finding supports the hypothesis that resilience partially mediates the association between loneliness and depression. These results are consistent with previous research⁴⁹, which has also shown that individual levels of depression are influenced by both loneliness and resilience. The findings suggest that loneliness may have detrimental effects on an individual's resilience, leading to difficulties in interpersonal experiences and a belief that they cannot effectively overcome challenges and illnesses. Consequently, this decreased resilience may contribute to higher levels of depression in individuals. It is apparent that both loneliness and resilience play significant roles in shaping individuals' depression levels. High levels of loneliness, combined with low resilience, may result in increased feelings of isolation and an inability to cope with changes, leading to heightened negative emotions and elevated levels of depression. These findings underscore the importance of addressing loneliness and promoting resilience as potential avenues to mitigate the impact of depression in individuals.

Using goal focus as a mediator, a structural equation model was constructed to examine the relationship between loneliness and depression. The results revealed that loneliness directly impacts depression and also exerts an indirect influ-

ence through its effect on goal focus. This finding aligns with previous research⁵⁰, which has shown that goal focus serves as a mediator between loneliness and depression, indicating that loneliness affects depression through its impact on goal focus, thus supporting the validity of the mediating effect model. This study further confirms the hypothesis that reducing loneliness may facilitate the development of a goal-oriented mindset, which can be beneficial in alleviating depression. It is evident that loneliness plays a crucial role in influencing both goal focus and depression, underscoring the significance of addressing loneliness to improve mental well-being. To effectively reduce depression, it is essential not only to foster strong interpersonal support and decrease feelings of loneliness but also to promote the cultivation of goal-directed behaviors, perseverance, learning from setbacks, and self-belief in overcoming challenges.

A structural equation model was developed to explore the multiple mediating roles of resilience and goal focus in the relationship between loneliness and depression. The results indicated that loneliness had a significant negative impact on both resilience and goal focus, while it positively influenced depression. Resilience emerged as a crucial indicator of mental health, as individuals

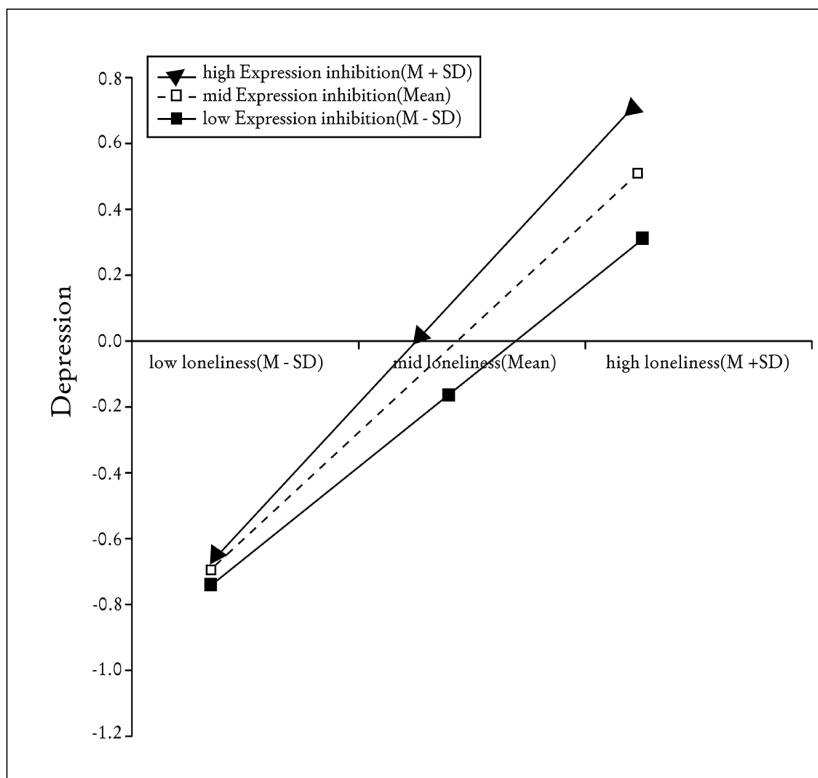


Figure 4. The slope of loneliness on depression under different expression inhibition level.

with higher resilience demonstrated better adaptability to life changes and more effective coping mechanisms. Moreover, resilience was found to be a predictor variable for depression in relation to mental health levels. On the other hand, goal focus emerged as a significant predictor variable for mental health, with individuals displaying higher goal focus showing lower levels of depression. The findings suggest that loneliness negatively affects both resilience and goal focus, which in turn leads to increased levels of depression. This highlights the importance of addressing loneliness to enhance resilience and goal focus as potential pathways for mitigating depression.

This study acknowledges several limitations that should be considered when interpreting the results. Firstly, the sample was limited to a single center and involved non-random sampling, potentially affecting the generalizability of the findings. Secondly, the study did not compare its results with other studies that utilized the loneliness score scale, nor did it assess the efficacy of the scale in comparison to other measures. Thirdly, the evaluation of resilience relied on only two indicators, lacking a comprehensive assessment. Fourthly, there was no gold standard for evaluating subjects' depressive disorder, attention, emotion management, and resilience, potentially limiting the precision of the assessments. For future research, higher-quality questionnaires or indicators are recommended to better understand the subjects' current status. Additionally, larger and higher-quality studies are encouraged to further validate and enhance the reliability of the findings. These considerations will contribute to a more comprehensive and robust understanding of the relationship between loneliness, resilience, goal focus, and depression. We did not report the estimation method and the results of the normality distribution test, so it lacks both technical and theoretical foundation, leading to a mismatch reflected in the poor fit of the models, which would moderate our findings to some extent.

Conclusions

Loneliness exhibited a positive predictive relationship with depression, and the impacts of loneliness and resilience on depression in young individuals were in line with a mediating effect model, with resilience serving as a partial mediator between loneliness and depression. Similarly, the effects of loneliness and goal focus on depres-

sion in young adults also aligned with the mediating effect model, with goal focus partially mediating the link between loneliness and depression. Additionally, when resilience and goal focus were simultaneously tested, loneliness influenced depression in young people through both resilience and goal focus.

Conflict of Interest

The authors have no relevant financial or non-financial interests to disclose.

Ethics Approval

Approval was obtained from the Ethics Committee of the Human Experimentation School of Psychology ShaanXi Normal University (No. 2018-10-002). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Informed Consent

Informed consent was obtained from all guardians of individual participants included in the study.

Availability of Data and Materials

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Authors' Contributions

Mengqi Xiao - conceptualization, methodology, original draft preparation, editing. Xiaoting Liu - conceptualization, methodology, data analysis, editing. Qingxin Huang - conceptualization, methodology, data analysis, editing. Shuqi He - conceptualization, methodology, original draft preparation and editing. All authors read and approved the final version of the manuscript.

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