Psychology Research and Behavior Management

Dovepress

open access to scientific and medical research

Open Access Full Text Article

ORIGINAL RESEARCH

Reappraisal Mitigates, While COVID-19 Burnout Exacerbates the Impact of Depressive Symptoms on Suicidal Ideation Among Chinese College Students

Lijie Ren[1], Ye Chen[2], Xianguo Han[3], Ziyi Chen[2], Zhi Wang[4], Wenxiao Li[2], Hongyuan Chen[2]

[1]Mental Health Center, Shanghai Customs University, Shanghai, People's Republic of China; [2]School of Customs and Public Administration, Shanghai Customs University, Shanghai, People's Republic of China; [3]School of Psychology, Shanghai Normal University, Shanghai, People's Republic of China; [4]School of Customs and Public Economics, Shanghai Customs University, Shanghai, People's Republic of China

Correspondence: Xianguo Han, School of Psychology, Shanghai Normal University, 100 Guilin Street, Xuhui District, Shanghai, 200234, People's Republic of China, Email hanxg.psy@aliyun.com

Background: Suicide is a global public health issue. This study examined the role of COVID-19 burnout and reappraisal in suicidal ideation caused by depressive symptoms among Chinese college students.

Methods: 587 students (261 boys, M_{age} = 19.53, *SD* = 1.42) were assessed using the Short Depression-Happiness Scale (SDHS), Positive and Negative Suicide Ideation (PANSI) inventory, and Emotion Regulation Scale (ERS).

Results: Correlation analysis indicated depressive symptoms were negatively correlated with reappraisal and positively correlated with suicidal ideation and COVID-19 burnout. Reappraisal was negatively correlated with suicidal ideation and COVID-19 burnout. The moderated mediation model showed COVID-19 burnout enhanced the direct effect of depressive symptoms on suicidal ideation and indirectly enhanced this effect by weakening the protective role of reappraisal.

Conclusion: These finding show that reappraisal acts as a protective factor against suicidal ideation in individuals with depressive symptoms, while COVID-19 burnout exacerbates this effect by weakening reappraisal's protective role.

Keywords: depressive symptoms, suicidal ideation, reappraisal, COVID-19 burnout, moderated mediation model

Introduction

Suicide is an ongoing global public health problem.[1] As the most populous country in the world, China accounts for approximately 15% of global suicide deaths.[2] University students, who exhibit suicide rates 2–4 times higher than those of their peers, are of particular concern.[3] In China, the incidence of suicide among college students has been increasing.[4,5] College students are very young, and their life cycle should still be long. College students are the new generation that determines the future of China. Therefore, it is very important to monitor and screen the influencing factors and potential mechanisms of suicidal ideation to protect the safety of college students.

Suicidal ideation is an important psychological precursor and warning signal for considering and attempting suicide.[6] Clinical research has found that approximately 80% of suicide decedents exhibited suicidal ideation in various forms before taking action.[7] Suicidal ideation, which refers to the psychological process where individuals contemplate ending their own lives,[8] plays a significant role in the process of suicide. Suicide ideation can predict attempted suicide in adolescents[9] and it is closely related to completing suicide.[10] The World Health Organization's World Mental Health Survey Initiative studied84850people from the general population in 28 countries to identify any association between suicidal thoughts and plans and suicidal behavior.[11] It found that 29% of people with suicidal ideation went on to make a suicide attempt, usually within a year of onset of the thoughts.[12] Two meta-analyses of suicidal ideation among Chinese

Received: 15 March 2024
Accepted: 20 August 2024
Published: 11 September 2024

university students spanning 10 years respectively showed that the overall incidence of suicidal ideation among Chinese university students was 10.72% and 10.8%, respectively.[13,14] This also shows the necessity and urgency of this research.

Rickelman and Houfek's interactional model of suicidal behaviors[15] emphasizes the influence of the environment, individuals, and epidemiology on suicidal behavior. This model identifies cognitive rigidity, attributional style, stress, hopelessness, and depression as core elements of suicidal behavior. Cognitive rigidity makes it difficult for individuals to effectively use emotion regulation strategies, such as reappraisal and expressive inhibition.[16] Studies have shown that cognitive emotion regulation and depression have a direct impact on suicidal ideation.[17] Stress and despair play a key role in the development of suicidal behavior.[17] Stressful life events regulate depression through negative cognitive emotion and further influence the formation of suicidal ideation. Depression is an important mediating variable of suicidal behavior.[18] This model highlights the interplay between these factors and how together they affect an individual's suicidal behavior.

Research has revealed that depressive symptoms is a critical risk factor for suicidal ideation.[19] Depressive symptoms represent a negative experience in which individuals hold pessimistic views about themselves, the world, and the future.[20] This negative and rigid cognitive pattern can lead to intense psychological distress and even feelings of despair. Due to the desire to alleviate this overwhelmingly negative emotional experience, individuals are highly susceptible to developing suicidal thoughts and behaviors.[21] Numerous studies support the relationship between depressive symptoms and suicidal behavior.[22] A meta-analysis of Chinese college students spanning 20 years found that depressive symptoms are one of the main causes of suicide.[23] A meta-analysis provides a more specific perspective: there is a moderate correlation between depressive symptoms and suicidal ideation in Chinese college students, and depressive symptoms contribute to the development of suicidal ideation.[24]

However, not all individuals experiencing depressive symptoms engage in suicidal behavior,[25] and not all suicide attempts occur during depressive episodes.[26] Some researchers have suggested that among those experiencing depressive symptoms, certain individuals are more likely to develop suicidal ideation, while others display resilience. The determinants of these outcomes may be related to individual emotional regulation strategies and environmental factors.[27]

The absence of adaptive emotional regulation strategies may be a crucial mediating factor in the relationship between depressive symptoms and suicidal ideation. Reappraisal refers to assigning a different meaning to emotional stimuli.[28] According to Gross' model of emotion regulation processes,[29] reappraisal often occurs early in the generation of emotions and is considered a proactive adaptive emotion regulation strategy.[28] Gross found that individuals primarily employing cognitive reappraisal strategies were more likely to share various emotions with others and maintain close relationships with friends.[30] They also applied more self-regulation strategies to keep themselves in a positive emotional state. Research has indicated that individuals with depressive symptoms are less inclined to proactively employ reappraisal as an emotional regulation strategy.[31] On one hand, depressive symptoms reduce adaptive responses to positive stimuli and decreases adaptability.[32] On the other hand, depressive symptoms leads to an attention bias toward negative stimuli,[33] causing individuals to habitually appraise current situations as negative rather than positive.[34] Employing reappraisal strategies can help individuals with depressive symptoms control negative thoughts, thus effectively alleviating their depressive symptoms.[35]

A study has found that employing cognitive reappraisal strategies can effectively reduce suicide risk.[36] Rajappa posited that suicide may serve as an escape from negative emotions, and suicidal ideation and behaviors may emerge when individuals lack effective emotional regulation strategies to cope with emotional distress.[37] A study in China suggested that emotional regulation is a crucial protective factor that prevents suicidal ideation from evolving into suicide attempts.[21] These findings underscore the importance of emotion regulation in suicide prevention. Therefore, reappraisal strategies may play a mediating role in the relationship between depressive symptoms and suicidal ideation.

Public health emergencies can bring pressure to individuals and affect the level of mental health.[38] On January 20, 2020, the National Health Commission of the People's Republic of China issued Announcement No. 1 that the prevention and control measures for Class A infectious disease should be taken for COVID-19. COVID-19 has imposed substantial stress on individual lives and psyches.[39] Thus, burnout is gaining increasing attention. Burnout is considered a long-term response to chronic emotional and interpersonal stress related to work.[40] Burnout is described more as an irritable state than as a specific clinical condition (such as anxiety or depression).[41] COVID-19 burnout refers to a state of exhaustion experienced after prolonged exposure to the stressors associated with the COVID-19 pandemic.[42]

Burnout is a seemingly "normal" response to stress that is easily overlooked and superimposed with depressive symptoms.[43] High levels of burnout make individuals more susceptible to depressive symptoms.[44] Studies have shown a significant increase in depressive symptoms[45] and an increase in suicide cases during the COVID-19 pandemic.[39,46] A meta-analysis showed a significant correlation between burnout and depressive symptoms, and a significant correlation between burnout and suicide.[47] Burnout not only independently predicts suicidal ideation one year later,[48] it also plays a dominant role in the appearance of suicidal ideation within depressed populations.[49] Particularly under adverse circumstances, burnout can significantly diminish the positive effect of reappraisal,[50] leading to increased suicide risk among vulnerable populations.[51] Thus, burnout can directly trigger suicidal ideation, as well as indirectly through depressive symptoms.

It is worth noting that, as of December 2022, the Chinese government has declared an end to COVID-19 pandemic prevention and control measures. However, the psychological aftermath of the pandemic, including COVID-19 burnout, may persist for months or even years.[52] Therefore, it is very important to understand the harm of COVID-19 burnout to enhance the mental health and well-being of college students during and after the COVID-19 epidemic.[53] The study of COVID-19 burnout can provide more detailed information for the study of the impact of public health emergencies on individuals. Exploring the effect of COVID-19 burnout on the relationship between depressive symptoms and suicidal ideation is of great significance for the safety of individuals experiencing depressive symptoms.

According to Rickelman and Houfek's interactional model of suicidal behaviors, the association between depressive symptoms and suicidal ideation is intricate, influenced by emotional regulation strategies and environmental factors. The current study proposes two hypotheses: reappraisal plays a mediating role between depressive symptoms and suicidal ideation; COVID-19 burnout moderates the relationship between depressive symptoms and suicidal ideation. This study can provide evidence for policies and practices to improve the mental health of college students.

Materials and Methods

Participants and Procedure

Convenience sampling was used to enroll participants from one college university in Shanghai, China. The online questionnaire survey (https://www.wjx.cn/) was employed to collect data from mid-October 2022. The data was collected before the Chinese government announced the end of COVID-19 epidemic control measures (December 5, 2022). The instruction explained the purpose, content, anonymity, confidentiality principles, and non-judgmental nature of this survey. Participants were asked to complete the questionnaire independently based on their actual situation.

A total of 670 college students were selected as the research participants. After excluding 19 questionnaires that did not obtain informed consent and 64 invalid questionnaires, a total of 587 valid questionnaires were obtained with a validity rate of 90.17%. Among the student participants, 261 (44.5%) were male, and 326 (55.5%) were female; 202 (34.4%) were freshmen, 154 (26.2%) were sophomores, 147 (25.0%) were juniors, 67 (11.5%) were seniors, and 17 (2.9%) were graduate students. The age range was from 17 to 28 years old, with an average age of 19.53 and standard deviation (SD) of 1.42. This study was approved by the Academic Research Department of Shanghai Customs College, Shanghai, China.

Measurements

Center for Epidemiologic Studies Depression Scale (CES-D)

Depressive symptoms was measured using the Center for Epidemiologic Studies Depression Scale adapted from Radloff.[54] This 20-item scale was designed specifically to assess the frequency of current depressive symptoms and focuses on affective or mood-related aspects of depression. Respondents were asked to rate the frequency of symptoms over the past week on a 0–3 scale, with four reverse-scored items that were transformed prior to calculating the total score. The total CES-D score ranges from 0 to 60, with a higher score indicating a greater frequency of depressive symptoms. Previous research has shown that this scale has good reliability and validity in the Chinese cultural context.[55] In this study, the one-factor model of CES-D had acceptable goodness of fit: $\chi^2(165) = 427.571$, the root mean square error of approximation (RMSEA) = 0.052, the comparative fit index (CFI) = 0.917, the Tucker–Lewis index (TLI)=0.904, the standardized root mean square residual (SRMR) = 0.056, and the Cronbach's α coefficient of this scale was 0.897.

Positive and Negative Suicide Ideation (PANSI)

Suicidal ideation was assessed using the Positive and Negative Suicide Ideation scale developed by Osman et al[56] and translated and revised by.[57] The PANSI scale consists of 14 items assessing positive (six items) and negative (eight items) dimensions of suicidal ideation. Responses were scored on a five-point Likert scale ranging from 1 (never) to 5 (always), with reverse scoring applied to the positive items. Total scores were obtained by adding the scores of the positive and negative items, with a higher total score indicating stronger suicidal ideation. Previous research has demonstrated the good psychometric properties of the PANSI scale.[57] In this study, the two-factor model of the PANSI scale had acceptable goodness of fit: $\chi^2(75) = 180.451$, RMSEA = 0.049, CFI = 0.953, TLI=0.943, SRMR = 0.038, and the Cronbach's α coefficient of this scale was 0.897.

Emotion Regulation Scale (ERS)

The Emotion Regulation Scale developed by Wang et al[58] was used to assess individuals' use of reappraisal as an emotional regulation strategy. The original scale was constructed based on the Gross[28] model of emotional regulation processes and primarily assesses two emotional regulation strategies: reappraisal and expressive suppression. The original scale comprises 14 items, with each regulation strategy containing seven items. These items evaluate the regulation of five basic emotions (disgust, anger, sadness, fear, and happiness) and include two global items assessing the frequency of an individual's use of each strategy. The scale employs a 7-point rating system ranging from "strongly disagree" to "strongly agree", with higher scores indicating more frequent use of the emotional regulation strategy. Previous research has demonstrated that the ERS has good reliability and validity.[41] In this study, the one-factor model of the reappraisal subscale had acceptable goodness of fit: $\chi^2(14) = 28.846$, RMSEA = 0.043, CFI = 0.983, TLI=0.975, SRMR = 0.024, and the Cronbach's α coefficient for the subscale was 0.830.

COVID-19 Burnout Scale (COVID-19-BS)

The COVID-19 Burnout Scale developed by Yıldırım and Solmaz[41] is a 10-item measure adapted from the Burnout Measure-Short Version.[59] Modifications to the original items primarily involved replacing "your work" with "COVID-19" and altering the response format. An example item is "When you think about COVID-19 overall, how often do you feel hopeless?" Items are rated on a 5-point Likert scale ranging from 1 (never) to 5 (always), with higher scores indicating greater levels of burnout related to COVID-19. The total score is obtained by summing all 10 items, yielding a possible range of 10–50. In this study, the one-factor model of the COVID-19-BS had acceptable goodness of fit: $\chi^2(26) = 73.930$, RMSEA = 0.056, CFI = 0.983, TLI=0.971, SRMR = 0.028, and the Cronbach's α coefficient of this scale was 0.922.

Statistical Analysis

This study utilized SPSS 24.0 software for descriptive statistics, Pearson correlation analysis and moderated mediation effect testing, Mplus8.3 was used for common method factor control testing. Initially, we descripted the empirical procedure in the questionnaire design to reduce potential common method bias, and methods were used to test for common method bias. Then, we conducted descriptive statistics to describe the mean, standard deviation (SD), maximum and minimum values for depressive symptoms, suicidal ideation, reappraisal and COVID-19 burnout. Pearson correlation analysis was employed to examine the relationship between depressive symptoms, suicidal ideation, reappraisal, COVID-19 burnout gender and age among college students. Finally, the PROCESS V3.4 macro[60] was applied to investigate the mediating and moderating effect. Specifically, model 15 was used to analyze the mediating effect of reappraisal on depressive symptoms and suicidal ideation of college students, and the moderating effect of COVID-19 burnout on this mediator. Subsequently, a simple slope analysis was conducted to analyze the moderating effect of COVID-19 burnout further.

Results

Control and Testing of Common Method Bias

To reduce potential common method bias, we controlled for the empirical procedure in the questionnaire design as much as possible through anonymous answering, balanced positive and negative questions, and moderate changes in instructions and scoring methods. Two methods were used to test for common method bias: (1) Harman's single-factor test method,[61] which resulted in five factors with characteristic roots greater than 1, with the first factor explaining 25.31% of the variation (far less than the critical value of 40%); (2) Common method factor test method,[62] in which the common factor of all variables is set to 1, and all items of variables are used as explicit variables for confirmatory factor analysis, with single-factor model fit the data

inadequately (χ^2/df = 10.662, CFI = 0.464, TLI = 0.430, and RMSEA = 0.129). Considering the findings of these two methods, it can be concluded that no serious common method bias occurred during this study.

Descriptive Statistics

Pearson correlation analysis (see Table 1) showed that depressive symptoms was significantly positively correlated with suicidal ideation and COVID-19 burnout and significantly negatively correlated with reappraisal. Reappraisal was significantly negatively correlated with suicidal ideation and COVID-19 burnout. Suicidal ideation was significantly positively correlated with COVID-19 burnout.

Moderated Mediation Model Testing

The moderated mediation analysis examined the potential effects of depressive symptoms on suicidal ideation, and the role of reappraisal as a mediator, as well as COVID-19 burnout as a moderator in this relation. All variables were standardized. Gender and age were controlled in all analyses. The Results (see Table 2) indicate that the main effect of depressive symptoms ($\beta = -0.322$, $p < 0.001$) on reappraisal was significant, the main effects of reappraisal ($\beta = -0.100$, $p = 0.002$) and COVID-19 burnout ($\beta = 0.072$, $p = 0.048$) on suicidal ideation were significant, the interaction effect of reappraisal and COVID-19 burnout on suicidal ideation was significant ($\beta = 0.092$, $p < 0.001$), and the interaction effect of depressive symptoms and COVID-19 burnout on suicidal ideation was significant ($\beta = 0.070$, $p = 0.005$). The SPSS 24.0 PROCESS macro analysis yielded bias-corrected percentile bootstrap results (Table 3), with a moderated mediation index was −0.030, the Boot SE was 0.012, and the 95% confidence interval (CI) was [−0.053, −0.005]. The results showed that the impact of depressive symptoms on suicidal ideation through reappraisal and COVID-19 burnout was established.

When a significant interaction effect was found, a conditional indirect effect test was conducted to examine the relationship between reappraisal and suicidal ideation at high (1 SD above the mean) and low (1 SD below the mean)

Table 1 Results of Descriptive Statistics Analysis

Variables	Range	Mean (SD)	1	2	3	4
1. Depressive symptoms	0~51	11.16(8.97)	1			
2. Suicidal ideation	14~66	24.13(7.45)	0.680***	1		
3. Reappraisal	7~49	35.13(7.46)	−0.320***	−0.307***	1	
4. COVID-19 burnout	10~50	21.29(8.55)	0.519***	0.416***	−0.256***	1
5. Gender	1~2	1.56(0.50)	−0.010	0.015	−0.028	0.072
6. Age	17~28	19.53(1.42)	−0.025	0.015	−0.056	0.090*

Notes: Gender (1 = boys, 2 = girls); *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table 2 The Results of the Moderated Mediation Model Testing

Variables	*β*	*SE*	t	*95% CI*
Reappraisal				
Gender	−0.031	0.039	−0.784	−0.108, 0.046
Age	−0.063	0.039	−1.607	−0.140, 0.014
Depressive symptoms	−0.322	0.039	−8.207***	−0.399, −0.245
Suicidal ideation				
Gender	0.013	0.030	0.441	−0.046, 0.072
Age	0.028	0.030	0.912	−0.032, 0.087
Depressive symptoms	0.577	0.038	15.042***	0.502, 0.653
Reappraisal	−0.100	0.032	−3.133**	−0.162, −0.037
COVID-19 burnout	0.072	0.025	1.985*	0.001, 0.144
Depressive symptoms × COVID-19 burnout	0.070	0.025	2.855**	0.023, 0.119
Reappraisal × COVID-19 burnout	0.092	0.027	3.359***	0.038, 0.146

Notes: *p < 0.05, **p < 0.01, ***p < 0.001.

Table 3 The Bootstrap Results of the Moderated Mediation Model

	Effect	SE	95% CI
Depressive symptoms → Suicidal ideation			
Low COVID-19 burnout	0.501	0.054	0.395, 0.607
High COVID-19 burnout	0.649	0.038	0.574, 0.723
Depressive symptoms → Reappraisal → Suicidal ideation			
Index of moderated mediation	−0.030	0.012	−0.053, −0.005
Low COVID-19 burnout	0.064	0.017	0.032, 0.098
High COVID-19 burnout	0.002	0.021	−0.036, 0.047

values of COVID-19 burnout following the procedure suggested by Aiken and West.[63] The results (see Figure 1) indicated that reappraisal was significantly negatively associated with suicidal ideation for students with low COVID-19 burnout scores ($\beta = -0.217$, $p < 0.001$) but not for students with high COVID-19 burnout scores ($\beta = -0.009$, $p > 0.05$). When COVID-19 burnout was strong, the protective effect of reappraisal on suicidal ideation was not demonstrated.

The main effect of depressive symptoms on suicidal ideation ($\beta = 0.577$, $p < 0.001$) and the interactive effect of depressive symptoms and COVID-19 burnout on suicidal ideation were significant ($\beta = 0.070$, $p = 0.005$). These results indicate that COVID-19 burnout might moderate the relationship between depressive symptoms and suicidal ideation. Simple slope analyses (see Figure 2) showed that the effect size of depressive symptoms on suicidal ideation was higher

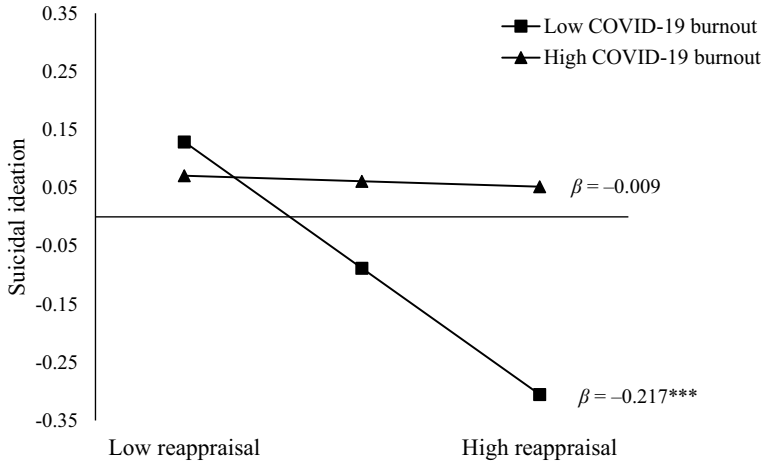

Figure 1 Simple slopes for the interactions between reappraisal and COVID-19 burnout in relation to suicidal ideation.

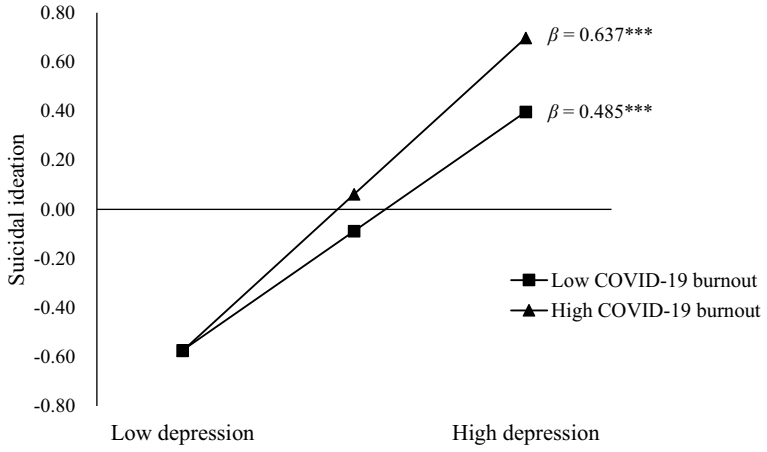

Figure 2 Simple slopes for the interactions between depressive symptoms and COVID-19 burnout in relation to suicidal ideation.

for students with high COVID-19 burnout scores ($\beta = 0.637$, $p < 0.001$) than for students with low COVID-19 burnout scores ($\beta = 0.485$, $p < 0.001$).

We computed the conditional direct effect of depressive symptoms on suicidal ideation, and the conditional indirect effect of depressive symptoms on suicidal ideation through reappraisal at different levels of COVID-19 burnout. As shown in Table 3, the 95% confidence interval of the indirect effect contained zero when COVID-19 burnout was at the high level (+1 SD), and did not contain zero when COVID-19 burnout was at the low level (−1SD). This result indicates that reappraisal mediated the relation between depressive symptoms and suicidal ideation only when COVID-19 burnout was low. We also found COVID-19 burnout at the high level have a more significant direct effect of depressive symptoms on suicidal ideation than COVID-19 burnout at the low level.

Discussion

This study focuses on the effect of depressive symptoms on suicidal ideation of college students and its potential mechanism. This study found that, consistent with the research hypothesis, depressive symptoms have direct and indirect effects on suicidal ideation through the mediation of emotion regulation strategies and COVID-19 burnout. The emotion regulation strategy of reappraisal can reduce suicidal ideation of individuals with depressive symptoms, and is a protective factor to interfere with the relationship between depressive symptoms and suicidal ideation. The relationship between reappraisal and suicidal ideation, as well as the relationship between depressive symptoms and suicidal ideation, was moderated by COVID-19 burnout. Reappraisal was less protective against suicidal ideation in the case of high COVID-19 burnout. The results of this study have important theoretical and practical implications for reducing the risk of suicide in individuals with depressive symptoms. When intervening in individuals with depressive symptoms, reappraisal training can help reduce the harm caused by depressive symptoms and reduce the likelihood of suicidal ideation in college students. The results of this study also make clear the harm of COVID-19 burnout to individual health and risk to individual life safety. In the aftermath of a public health emergency, we must be especially alert to burnout and the harm it can cause to individuals.

The study found a significant positive correlation between depressive symptoms and suicidal ideation, which is consistent with previous findings.[22,25] Depressive symptoms reflect a negative emotional state, leading to individuals experiencing long-term pain and feelings of helplessness and despair, thereby increasing the risk of suicidal tendencies.[64,65] The cognitive theory of depressive symptoms suggests that negative beliefs about oneself and the future lead to depressive symptoms,[66] which in turn increases negative attribution.[67] According to the despair theory of suicide, negative attribution styles indirectly increase the risk of future suicidal thoughts and behaviors by increasing the perception of despair.[68] The association between the severity factor of depressive symptoms and suicidal ideation was much stronger, which is consistent with previous studies.[69]

The findings suggest that reappraisal plays a mediating role in the relationship between depressive symptoms and suicidal ideation. This is consistent with the first study hypothesis. When the reappraisal of individuals with depressive symptoms increased, the risk of suicidal ideation decreased. Reappraisal is seen as a positive conservation strategy. This is consistent with the results of previous studies.[27] Rajappa et al[37] believe that suicide is an attempt to escape negative emotions, and suicidal ideation and behavior will occur when individuals lack emotion regulation strategies to cope with emotional distress. This view shows the importance of emotional regulation in suicidal. Reappraisal is defined as an attempt to reinterpret an emotion-triggered situation in a way that changes the meaning and alters the impact of the emotion.[70] Reappraisal aims to reduce negative emotions by changing the interpretation or evaluation of emotional stimuli, so it can reduce the level of depressive symptoms. Individuals who adopt reappraisal are more likely to share their emotions (both positive and negative) with others, maintain close relationships with friends, have stronger social networks, and maximize the experience of positive emotions, and thus enable individuals to achieve adaptive outcomes Carlson et al.[27,71] Previous research has primarily focused on risk factors of suicidal ideation in individuals with depressive symptoms, such as feelings of despair and psychological distress.[65] However, limited research has been reported on protective factors. The results of this study suggest that reappraisal is a protective factor against suicidal ideation, and interventions to cultivate reappraisal emotion regulation strategies can be adopted in the future to prevent suicide.

The results of this study suggest that COVID-19 burnout significantly moderates the reappraisal of the mediating model between depressive symptoms and suicidal ideation. This is consistent with the second study hypothesis. This buffering effect of reappraisal on suicidal ideation in individuals with depressive symptoms is diminished in those with high pandemic burnout. This aligns with previous findings.[51,64] According to the Conservation of Resources (COR) theory,[72] individuals with

more resources are more likely to cope better and survive adversity. When individuals face severe stress, their resources are slowly depleted in the process of coping with stressors. Once resources are consumed to a certain extent, various symptoms will appear as a signal of resource exhaustion. Under the stress caused by the COVID-19 pandemic, the negative impact of burnout counteracts the benefits of positive emotional regulation strategies. Research has shown that burnout enhances the risk of suicidal ideation, and recovery from burnout is associated with a significant reduction in suicidal ideation, indicating that burnout is a risk factor for suicidal ideation.[73]

Finally, we found that COVID-19 burnout moderates the effect of depressive symptoms on suicidal ideation, consistent with previous findings.[74] COVID-19 burnout is associated with many negative effects on mental health, such as depressive symptoms and anxiety symptoms.[75] There is a significant positive correlation between depressive symptoms and COVID-19 burnout. COVID-19 burnout is a state of exhaustion experienced after facing the stressors of COVID-19, which can lead to depressive symptoms.[76] Both depressive symptoms and burnout are risk factors for suicide.[77] The findings of this study suggest that the interaction of the two factors may increase suicidal ideation.

The study also has limitations. First of all, the subjects of this study are Chinese college students, and it is necessary to consider the unique social ecology and cultural differences among Chinese college students compared to adolescents from other racial and ethnic backgrounds.[78] Second, this study recruited participants by means of convenient sampling, which may lead to underrepresentation of the sample and uneven distribution of the sample. Moreover, the relatively small sample size of this study may limit the generalizability and significance of the results. Third, all variables were self-reported, and the findings may have been influenced by reporting bias. Fourth, this study was essentially a cross-sectional study and thus could not establish causality between variables. In future research, longitudinal studies with larger sample sizes should be conducted to address these limitations. Numerous factors can influence suicidal ideation, including family environment, gender, economic status, and psychological resilience, which were not considered in this study. Exploring these factors in future work could provide a more comprehensive understanding of the topic. Fifth, mindfulness and stress reduction techniques can be considered in studies of interventions for suicidal ideation in individuals with depressive symptoms.

Conclusions

Depressive symptoms were significantly associated with suicidal ideation. For individuals with depressive symptoms, reappraisal is a protective factor against suicidal ideation, and COVID-19 burnout counteracts the protective effect of reappraisal against suicidal ideation. Depressive symptoms and COVID-19 burnout are risk factors for suicidal ideation.

Data Sharing Statement

Data are available from the corresponding author upon reasonable request.

Ethics Approval Statement

The informed consents were obtained from each participant before the questionnaire survey. The research involving human participants were reviewed and approved by the Academic Research Department of Shanghai Customs College, Shanghai, China.

Acknowledgments

This research was supported by grants from 2022 Shanghai Philosophy and Social Sciences Planning Project (2022ZSH004) and the Ministry of Education of Humanities and Social Science Project(22ZDSJ3122).

We extend our gratitude to all the college students who participated in our study. Lijie Ren and Ye Chen are co-first authors.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Kalin NH. Insights into suicide and depression. *Am J Psych*. 2020;177(10):877–880. doi:10.1176/appi.ajp.2020.20081207
2. Cheng Q, Zhang X, Lui C, Yip PSF. Suicide Research in Mainland China, Hong Kong, and Macau Over Three Decades. *Crisis*. 2021;42(6):455–464. doi:10.1027/0227-5910/a000743
3. Arria AM, O'Grady KE, Caldeira KM, Vincent KB, Wilcox HC, Wish ED. Suicide ideation among college students: A multivariate analysis. *Archives Suicide Res*. 2009;13(3):230–246. doi:10.1080/13811110903044351
4. Fei F, Liu H, Leuba I, et al. Suicide rates in Zhejiang Province, China, from 2006 to 2016: A population-based study. *J Epidemiol Commun Health*. 2019;73(8):745–749. doi:10.1136/jech-2018-211556
5. Zhao S, Zhang J. Suicide risks among adolescents and young adults in rural China. *Int J Environ Res Public Health*. 2014;12(1):131–145. doi:10.3390/ijerph120100131
6. Wulz A, Law R, Wang J, Wolkin A. Leveraging data science to enhance suicide prevention research: A literature review. *Inj Prev*. 2021; 28: injuryprev–2021. doi:10.1136/injuryprev-2021-044322
7. Kohut H, Goldberg A. *How Does Analysis Cure?* University of Chicago Press; 1984.
8. Krug EG, Mercy JA, Dahlberg LL, Zwi AB. The world report on violence and health. *Lancet*. 2002;360(9339):1083–1088. doi:10.1016/S0140-6736(02)11133-0
9. Musci RJ, Hart SR, Ballard ED, et al. Trajectories of suicidal ideation from sixth through tenth grades in predicting suicide attempts in young adulthood in an Urban African American cohort. *Suicide Life Threat Behav*. 2016;46(3):255–265. doi:10.1111/sltb.12191
10. Large M, Corderoy A, McHugh C. Is suicidal behaviour a stronger predictor of later suicide than suicidal ideation? A systematic review and meta-analysis. *Aust N Z J Psychiatry*. 2021;55(3):254–267. doi:10.1177/0004867420931161
11. Cole-King A, Green G, Gask L, Hines K, Platt S. Suicide mitigation: A compassionate approach to suicide prevention. *Adv Psychiatric Treat*. 2013;19(4):276–283. doi:10.1192/apt.bp.110.008763
12. Nock MK, Borges G, Bromet EJ, et al. Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *Br J Psychiatry*. 2008;192(2):98–105. doi:10.1192/bjp.bp.107.040113
13. Chen Y, Zhang Y, Yu G. Prevalence of mental health problems among college students in mainland China from 2010 to 2020: A meta-analysis. *Adv Psychol Sci*. 2022;30(5):991–1004. doi:10.3724/SP.J.1042.2022.00991
14. Li ZZ, Li YM, Lei XY, et al. Prevalence of suicidal ideation in Chinese college students: A meta-analysis. *PLoS One*. 2014;9(10):e104368. doi:10.1371/journal.pone.0104368
15. Rickelman BL, Houfek JF. Toward an interactional model of suicidal behaviors: Cognitive rigidity, attributional style, stress, hopelessness, and depression. *Arch Psychiatr Nurs*. 1995;9(3):158–168. doi:10.1016/s0883-9417(95)80039-5
16. Joormann J, Gotlib IH. Emotion regulation in depression: Relation to cognitive inhibition. *Cogn Emot*. 2010;24(2):281–298. doi:10.1080/02699930903407948
17. Bin JIAO, Jing-wen LU, YANG S, Chong CHEN. LIU Tie-qiao. Structural Equation Modeling Analysis of Adolesents' Life Events, Cognitive Emotion Regulation, Depression and Suicide Ideation. *Chin J Clin Psychol*. 2010;18(04):480–482.
18. Arango-Tobón OE, Tabares ASG, Serrano SJO. Structural Model of Suicidal Ideation and Behavior: Mediating Effect of Impulsivity. *An Acad Bras Cienc*. 2021;93(4):e20210680. doi:10.1590/0001-3765202120210680
19. Pandey GN, Zhang H, Sharma A, Ren X. Innate immunity receptors in depression and suicide: Upregulated NOD-like receptors containing pyrin (NLRPs) and hyperactive inflammasomes in the postmortem brains of people who were depressed and died by suicide. *J Psychiatry Neurosci*. 2021;46(5):E538–E547. doi:10.1503/jpn.210016
20. Beck AT. Thinking and Depression: i. Idiosyncratic Content and Cognitive Distortions. *Arch Gen Psychi*. 1963;9(4):324. doi:10.1001/archpsyc.1963.01720160014002
21. Du R, Jiang G. Suicidal behaviors: risk factor, psychological theory and future research. *Adv Psychol Sci*. 2015;23(8):1437–1452. doi:10.3724/SP.J.1042.2015.01437
22. Sullivan SA, Lewis G, Gunnell D, Cannon M, Mars B, Zammit S. The longitudinal association between psychotic experiences, depression and suicidal behaviour in a population sample of adolescents. *Soc Psychiatry Psychiatr Epid*. 2015;50(12):1809–1817. doi:10.1007/s00127-015-1086-2
23. Cheng Y, Zhang XM, Ye SY, Jin HM, Yang XH. Suicide in Chinese Graduate Students: a Review From 2000 to 2019. *Front Psychiatry*. 2020;11:579745. doi:10.3389/fpsyt.2020.579745
24. Wang Y, Shi Z, Luo Q. Association of depressive symptoms and suicidal ideation among university students in China. *Medicine*. 2017;96:e6476. doi:10.1097/MD.0000000000006476
25. Bazrafshan MR, Jahangir F, Mansouri A, Kashfi SH. Coping Strategies in People Attempting Suicide. *Intl J High Risk Behav Addi*. 2014;3(1):e16265. doi:10.5812/ijhrba.16265
26. Harkavy-Friedman JM, Nelson EA, Venarde DF, Mann JJ. Suicidal Behavior in Schizophrenia and Schizoaffective Disorder: examining the Role of Depression. *Suicide Life Threat Behav*. 2004;34(1):66–76. doi:10.1521/suli.34.1.66.27770
27. Ong E, Thompson C. The Importance of Coping and Emotion Regulation in the Occurrence of Suicidal Behavior. *Psychol Rep*. 2019;122(4):1192–1210. doi:10.1177/0033294118781855
28. Gross JJ. Emotion regulation: affective, cognitive, and social consequences. *Psychophysiology*. 2002;39(3):281–291. doi:10.1017/S0048577201393198
29. Gross JJ. The Emerging Field of Emotion Regulation: an Integrative Review. *Rev Gen Psychol*. 1998;2(3):271–299. doi:10.1037/1089-2680.2.3.271
30. Gross JJ. Emotion Regulation: current Status and Future Prospects. *Psychol Inq*. 2015;26(1):1–26. doi:10.1080/1047840X.2014.940781
31. Schäfer JÖ, Naumann E, Holmes EA, Tuschen-Caffier B, Samson AC. Emotion regulation strategies in depressive and anxiety symptoms in youth: a meta-analytic review. *J Youth Adolescence*. 2017;46(2):261–276. doi:10.1007/s10964-016-0585-0
32. Forbes EE, Miller A, Cohn JF, Fox NA, Kovacs M. Affect-modulated startle in adults with childhood-onset depression: relations to bipolar course and number of lifetime depressive episodes. *Psychiatry Res*. 2005;134(1):11–25. doi:10.1016/j.psychres.2005.01.001
33. Ellis AJ, Beevers CG, Wells TT. Attention Allocation and Incidental Recognition of Emotional Information in Dysphoria. *Cognitive Ther Res*. 2011;35(5):425–433. doi:10.1007/s10608-010-9305-3

34. Mathews A, MacLeod C. Cognitive Vulnerability to Emotional Disorders. *Annu Rev Clin Psycho*. 2005;1(1):167–195. doi:10.1146/annurev.clinpsy.1.102803.143916
35. De Raedt R, Koster EHW. Understanding vulnerability for depression from a cognitive neuroscience perspective: a reappraisal of attentional factors and a new conceptual framework. *Cognit Affective Behav Neurosci*. 2010;10(1):50–70. doi:10.3758/CABN.10.1.50
36. Richmond S, Hasking P, Meaney R. Psychological Distress and Non-Suicidal Self-Injury: the Mediating Roles of Rumination, Cognitive Reappraisal, and Expressive Suppression. *Arch Suicide Res*. 2017;21(1):62–72. doi:10.1080/13811118.2015.1008160
37. Rajappa K, Gallagher M, Miranda R. Emotion Dysregulation and Vulnerability to Suicidal Ideation and Attempts. *Cognitive Ther Res*. 2012;36(6):833–839. doi:10.1007/s10608-011-9419-2
38. Khan Y, O'Sullivan T, Brown A, et al. Public health emergency preparedness: a framework to promote resilience. *BMC Public Health*. 2018;18(1):1344. doi:10.1186/s12889-018-6250-7
39. Hannan C, Mayne SL, Kelly MK, et al. Trends in Positive Depression and Suicide Risk Screens in Pediatric Primary Care During COVID-19. *Acad Pediatr*. 2023;23(6):1159–1165. doi:10.1016/j.acap.2022.12.006
40. Burn-out an "occupational phenomenon": international Classification of Diseases; 2023. Availabe from: https://www.who.int/news/item/28-05-2019-burn-out-an-occupational-phenomenon-international-classification-of-diseases. Accessed December 18, 2023.
41. Sun Y, Zhu S, ChenHuang G, et al. COVID-19 burnout, resilience, and psychological distress among Chinese college students. *Front Public Health*. 2022;10:1009027. doi:10.3389/fpubh.2022.1009027
42. Yıldırım M, Solmaz F. COVID-19 burnout, COVID-19 stress and resilience: initial psychometric properties of COVID-19 burnout scale. *Death Stud*. 2022;46(3):524–532. doi:10.1080/07481187.2020.1818885
43. Zisook S, Doran N, Mortali M, et al. Relationship between burnout and Major Depressive Disorder in health professionals: a HEAR report. *J Affect Disord*. 2022;312:259–267. doi:10.1016/j.jad.2022.06.047
44. Thuynsma C, de Beer LT. Burnout, depressive symptoms, job demands and satisfaction with life: discriminant validity and explained variance. *South Afr J Psychol*. 2017;47(1):46–59. doi:10.1177/0081246316638564
45. Zhang Y, Bao X, Yan J, Miao H, Guo C. Anxiety and depression in Chinese students during the COVID-19 pandemic: a meta-analysis. *Front Public Health*. 2021;9:697642. doi:10.3389/fpubh.2021.697642
46. Mayne SL, Hannan C, Davis M, et al. COVID-19 and Adolescent Depression and Suicide Risk Screening Outcomes. *Pediatrics*. 2021;148(3):e2021051507. doi:10.1542/peds.2021-051507
47. Ryan E, Hore K, Power J, Jackson T. The relationship between physician burnout and depression, anxiety, suicidality and substance abuse: a mixed methods systematic review. *Front Public Health*. 2023;11:1133484. doi:10.3389/fpubh.2023.1133484
48. Thiers BH. Burnout and Suicidal Ideation among U.S. Medical Students. *Year Dermatol Dermat Surg*. 2009;2009:290–291. doi:10.1016/S0093-3619(08)79167-6
49. Stehman C, Testo Z, Gershaw R, Burnout KA, Out D. Suicide: physician Loss in Emergency Medicine, Part I. *West J Emerg Med*. 2019;20(3):485–494. doi:10.5811/westjem.2019.4.40970
50. Seibert GS, Bauer KN, May RW, Fincham FD. Emotion regulation and academic underperformance: the role of school burnout. *Learn Individ Differ*. 2017;60:1–9. doi:10.1016/j.lindif.2017.10.001
51. Van Der Heijden F, Dillingh G, Bakker A, Prins J. Suicidal Thoughts Among Medical Residents with Burnout. *Arch Suicide Res*. 2008;12(4):344–346. doi:10.1080/13811110802325349
52. Sher L. The impact of the COVID-19 pandemic on suicide rates. *QJM*. 2020;113(10):707–712. doi:10.1093/qjmed/hcaa202
53. Uysal S, Dönmez İ. Examination of Late COVID-19 Pandemic Stress, Burnout, Hopelessness, and Depression Among University Students According to Demographic Characteristics. *Sage Open*. 2024;14(2). doi:10.1177/21582440241245008
54. Radloff LS. The CES-D Scale: a Self-Report Depression Scale for Research in the General Population. *Appl Psych Meas*. 1977;1(3):385–401. doi:10.1177/014662167700100306
55. Ren L, Han X, Li D, Hu F, Mo B, Liu J. The association between loneliness and depression among Chinese college students: affinity for aloneness and gender as moderators. *Eur J Dev Psychol*. 2021;18(3):382–395. doi:10.1080/17405629.2020.1789861
56. Osman A, Gutierrez PM, Kopper BA, Barrios FX, Chiros CE. The Positive and Negative Suicide Ideation Inventory: development and Validation. *Psychol Rep*. 1998;82(3):783–793. doi:10.2466/pr0.1998.82.3.783
57. Wang X, Gong H, Kang X, Liu W, Dong X, Ma Y. Reliability and validity of Chinese revision of Positive and Negative Suicide Ideation in high school students. *Chin J Health Psychol*. 2011;19(8):964–966. doi:10.13342/j.cnki.cjhp.2011.08.014
58. Wang L, Liu H, Li Z, Du W. A study on the reliability and validity of the Emotional Regulation Scale. *Chin J Health Psychol*. 2007;(6):503–505. doi:10.13342/j.cnki.cjhp.2007.06.012
59. Malach-Pines A. The burnout measure, short version. *Int J Stress Manage*. 2005;12(1):78–88. doi:10.1037/1072-5245.12.1.78
60. Hayes AF. Introduction to mediation, moderation, and conditional process analysis: a regression-based approach. *Guilford Press*. 2014;51(3).
61. Zhou H, Long L. Statistical testing and control methods for common method deviations. *Adv Psychol Sci*. 2004;6(942–950).
62. Dandan T, Zhonglin W. Common method bias testing: issues and suggestions. *Psychol Sci*. 2020;43(1):215–223. doi:10.16719/j.cnki.1671-6981.20200130
63. Aiken LS, West SG. Multiple Regression: Testing and Interpreting Interactions. *Sage Publi Inc*. 1991;xi:212.
64. Nakhostin-Ansari A, Akhlaghi M, Etesam F, et al. Suicidal Ideation and Its Associated Factors in Medical, Dental, and Pharmacy Students: a Cross-Sectional Study during COVID-19 Pandemic. *Psych J*. 2022;2022:e8139351. doi:10.1155/2022/8139351
65. Wu C, Chen Z, Yu L, Duan W, Jiang G. The impact of depression and despair on suicidal ideation: the mediating effect of psychological pain. *Chin J Clin Psychol*. 2015;23(6):1040–1043+1002. doi:10.16128/j.cnki.1005-3611.2015.06.019
66. Beck AT, Kovacs M, Weissman A. Assessment of suicidal intention: the Scale for Suicide Ideation. *J Consult Clin Psychol*. 1979;47(2):343–352. PMID: 469082. doi:10.1037//0022-006x.47.2.343
67. Abramson LY, Metalsky G, Alloy LB. Hopelessness depression: a theory-based subtype of depression. *Psychol Rev*. 1989;96(2):358–372. doi:10.1037/0033-295X.96.2.358
68. Abramson LY, Alloy LB, Hogan ME, et al. Suicidality and cognitive vulnerability to depression among college students: a prospective study. *J Adolesc*. 1998;21:473–487. doi:10.1006/jado.1998.0167

69. Witte TK, Joiner TE, Brown GK, et al. Factors of suicide ideation and their relation to clinical and other indicators in older adults. *J Affect Disord*. 2006;94:165–172. doi:10.1016/j.jad.2006.04.005
70. Gross J, John O. Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. *J Person Social Psych*. 2003;85:348–362. doi:10.1037/0022-3514.85.2.348
71. Carlson E, Saarikallio S, Toiviainen P, Bogert B, Kliuchko M, Brattico E. Maladaptive and adaptive emotion regulation through music: a behavioural and neuroimaging study of males and females. *Front Human Neurosci*. 2015;9:466. doi:10.3389/fnhum.2015.00466
72. Hobfoll SE. Conservation of resources: a new attempt at conceptualizing stress. *Am Psychol*. 1989;44:513–524. doi:10.1037/0003-066X.44.3.513
73. Dyrbye LN, Thomas MR, Massie FS, et al. Burnout and suicidal ideation among U.S. *Medical Students Ann Intern Med*. 2008;149(5):334–341. doi:10.7326/0003-4819-149-5-200809020-00008
74. Kuhn CM, Flanagan EM. Self-care as a professional imperative: physician burnout, depression, and suicide. *Can J Anaesth*. 2017;64(2):158–168. doi:10.1007/s12630-016-0781-0
75. Moroń M, Yildirim M, Jach Ł, Nowakowska J, Atlas K. Exhausted due to the pandemic: validation of coronavirus stress measure and COVID-19 burnout scale in a Polish sample. *Curr Psychol*. 2021;1–10. doi:10.1007/s12144-021-02543-4
76. Łaskawiec-żuławińska D, Grajek M, Krupa-Kotara K, et al. Burnout and Life Satisfaction among Healthcare Workers Related to the COVID-19 Pandemic (Silesia, Poland). *Behav Neurol*. 2024;9945392. doi:10.1155/2024/9945392
77. Mann JJ, Apter A, Bertolote J, et al. Suicide Prevention Strategies: a Systematic Review. *JAMA*. 2005;294(16):2064. doi:10.1001/jama.294.16.206
78. Robinson WL, Whipple CR, Keenan K, et al. Suicide in African American adolescents: understanding risk by studying resilience. *Annu Rev Clin Psychol*. 2022;18:359–385. doi:10.1146/annurev-clinpsy-072220-021819