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Association between school bullying and self-harm in Chinese children and adolescents: the mediating role of mindfulness

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Abstract

Background Non-suicidal self-injury (NSSI) poses a significant challenge to the health and well-being of children and adolescents, with prior studies suggesting a strong association with experiences of school bullying. While mindfulness has been identified as a protective factor against NSSI, its mediating role in the relationship between school bullying and NSSI remains insufficiently investigated. Using a representative sample from Yunnan Province, China, this study aims to contribute to the understanding of the relationship between school bullying, NSSI, and mindfulness.

Methods A population-based sample of 5897 adolescents in two places of Yunnan Province were surveyed by using self-administered questionnaires. Logistic regression model was used to measure the association between school bullying and NSSI. Path model was further fitted to examine the mediation of mindfulness in the association between school bullying and NSSI.

Results The lifetime NSSI prevalence in our study sample was 34.6% (95% CI: 30.3%–39.0%). School bullying was associated with an increased risk of NSSI (OR = 2.02, 95% CI: 1.68–2.43), while a higher mindfulness score was associated with a reduced NSSI risk (OR = 0.98, 95% CI: 0.97–0.99). Path analysis showed mindfulness significantly mediated the relationship between school bullying and NSSI, accounting for 34.0% of the total association. Among all dimensions of mindfulness, mindfulness observing, describing, and acting with awareness significantly mediated the association, with acting with awareness showing the strongest mediation.

Conclusions The findings indicate a positive correlation between school bullying and NSSI, with mindfulness serving as a significant mediator in this association. Enhancing mindfulness among children and adolescents could be an effective strategy to mitigate school bullying associated NSSI.

Keywords Non-suicidal self-injury, School bullying, Mindfulness, Mental health

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Background

Non-suicidal self-injury (NSSI) is a serious public health concern, characterized by socially unacceptable, direct, and deliberate destruction of one's own body tissue without lethal intent [1]. Adolescents are relatively vulnerable to NSSI, studies revealed that the risk of NSSI in adolescents increases substantially after the age of 12, peaking between ages 12 and 16 [2]. In community samples, approximately 13%–45% adolescents have reported engaging in NSSI during their lifetime [1]. A systematic review of global NSSI studies estimated the lifetime prevalence of NSSI among adolescents to be 17.2% [3], while an epidemiological study in China ($n = 11831$) reported a higher prevalence of 26% [4]. NSSI poses significant risks to adolescent physical and psychological health, seriously impairs their social functioning and considerably increases their future suicide risk [5]. The main risk factors for NSSI include mental illnesses, negative family environments, and childhood experiences of abuse or neglect [6–8]. Adolescents with traumatic experiences may resort to NSSI as a way to manage emotional distress [9, 10]. Additional risk factors include depressive disorders, anxiety disorders, attention-deficit/hyperactivity disorder, conduct disorder, borderline personality disorder, and eating disorders [11–13].

School bullying, defined as repeated aggressive behavior of an individual or group targeting a weaker peer [14]. While bullying can occur across the lifespan, it is most prevalent during school years [15]. The lifetime prevalence of traditional bullying victimization is 25.13% among Australian youths [16], and over 30% of American children and adolescents reported experiencing bullying at school [17]. In China, a review recapitulated that 2% to 66% of children and adolescents had experienced traditional school bullying [18]. Chronic bullying victimization has adverse effects on physical and mental health, contributing to symptoms such as headaches, nausea, fatigue, sleep disturbances, depression, anxiety, loneliness, and an elevated risk of self-harm and suicide [19, 20]. Studies indicate a positive correlation between peer victimization and NSSI, with bullied adolescents being 2.1 times more likely to engage in NSSI compared to their non-bullied peers [21, 22]. Preventing school bullying may thus serve as a promising strategy for reducing NSSI among adolescents.

Mindfulness, a concept rooted in Buddhist-meditation practices, refers to purposeful, moment-by-moment, nonjudgmental attending to present experiences [23]. Mindfulness can be a specific practical training method, a mental state or process, or a personal trait or tendency. Mindfulness level, as a positive personality trait, may also serve as a risk buffer in the association between bullying victimization and adverse outcomes. Individuals with higher levels of mindfulness showed reduced impulsivity and hostility [24]. Additionally, mindfulness can moderate the impact of bullying victimization on depressive symptoms, with higher levels of mindfulness mitigating the negative psychological effects of bullying [19]. High levels of mindfulness can help bullied children avoid focusing on their victimization, reduce feelings of worthlessness, and enhance coping abilities [25]. Studies found that mindfulness could mediate the effect of depressive symptoms on NSSI to a certain extent, which providing empirical support for the protective effect of mindfulness on NSSI [26].

These previous findings suggest the potential mediating role of mindfulness in the association between school bullying and NSSI. Examining this association holds significant public health implications, particularly for designing interventions aim at reducing NSSI linked to school bullying. In this cross-sectional study, we analyzed the association between school bullying and NSSI in a large representative sample of adolescents in Yunnan province, China, and explored whether mindfulness plays a mediating role in this link.

Material and method

Subjects

A cross-sectional survey was carried out in Yuxi city and Zhenxiong county, Yunnan province, in October 2021. A two-stage simple random cluster sampling approach was adopted to identify participants. In the first stage, 23 schools were randomly selected from all primary and secondary schools in the survey sites; In stage 2, we randomly selected 2–3 classes from each grade of each selected school. Considering that those aged 10 years and older are able to understand the concept of death and suicide [27], only students aged 10 to 17 years were included in the study. We excluded students who had hearing disability, were severely ill, and refused to participate. Prior to the survey, written informed consents were obtained from both the legal guardians and the participants. The study protocol was approved by the Ethics Review Board of Kunming Medical University.

Procedures and assessments

Data was collected using a self-report questionnaire. The quality of the questionnaire was supervised by undergraduate and graduate students with backgrounds in medicine and psychology during the data collection period. The questionnaire consisted of five sections: socio-demographic information, school bullying behaviors, mindfulness, NSSI behaviors, depression and anxiety.

NSSI behaviors

NSSI behaviors were assessed using the Modified Version of Adolescents Self-harm Scale [28]. This scale has demonstrated good reliability and validity for evaluating NSSI behaviors among Chinese adolescents. It includes 18 items that cover the most frequently reported forms of self-injury among Chinese youths, with two-subscales: frequency and severity of NSSI. The criterion for NSSI behavior is defined as a reported history of at least one instance of self-harm, the criterion of "repeated NSSI" is defined as two or more occurrences of a specific self-injury behavior. Severe NSSI is defined as the severity of any self-harm behavior is "moderate" or above. The Cronbach's α for Modified Version of Adolescents Self-harm Scale in our sample was 0.81 (Bootstrap 95% CI: 0.79–0.83).

School bullying

School bullying behaviors were evaluated by the Chinese Version of Olweus Bully/Victim Questionnaire [29]. The questionnaire consists of two parts: one for bullying behaviors and the other for bullied behaviors, with a total of 14 items. Each item provides five response options: never (scored 0), once or twice (scored 1), two or three times a month (scored 2), once a week (scored 3), and several times a week (scored 4). Once the subjects answered "two or three times a month" or more frequent in any one of the seven questions in the bullied behavior questionnaire, they will be defined as bullied students. The measure of bullying behavior was the same as that of the bullied behavior. If the subjects were screened positive in both dimensions, they were classified as bullying-bullied subjects. The rest of the subjects were included as non-participants. The Cronbach's α for the Olweus Bully/Victim Questionnaire in our sample was 0.78 (Bootstrap 95% CI: 0.77–0.80).

Mindfulness

Mindfulness was measured by the Five Facet Mindfulness Questionnaire (FFMQ) [30, 31]. The scale contains 39 items rated on a five-point likert scale ranging from 1 (never or very rarely true) to 5 (very often or always true). The items can be organized into five subscales that represent different aspects of mindfulness: observing, describing, acting with awareness, nonjudging, and nonreactivity. The total score can range from 39 to 174, with higher scores indicating a higher level of mindfulness [32]. The Cronbach's α for the FFMQ in our sample was 0.70 (Bootstrap 95% CI: 0.687–0.711).

Depression

The Patient Health Questionnaire (PHQ-9) was adopted to evaluate the past two weeks depressive symptom of the participants. The PHQ-9 contains 9 items, with each item scored from 0 to 3 based on severity, yielding a maximum score of 27. A score of 4 or less indicates the absence of depressive symptoms [33]. The Cronbach's α for PHQ-9 in our sample was 0.878 (Bootstrap 95% CI: 0.871–0.884).

Anxiety

The Generalized Anxiety Disorder Assessment (GAD-7) was used to evaluate anxiety status over the past two weeks. The GAD-7 consists of 7 items, each scored from 0 to 3, with a maximum combined score of 21. A combined score of 4 or less suggests no anxiety [34]. The Cronbach's α for GAD-7 in our sample was 0.902 (Bootstrap 95% CI: 0.896–0.907).

Statistical analysis

Descriptive statistics were used to delineate socio-demographic characteristics, NSSI, school bullying, and mindfulness. Univariate logistic regression models were used to screen for factors related to NSSI, and the statistical significance level was set at less than 0.1, two-tailed. Multivariate binary logistic regression models were used to examine the adjusted associations between school bullying and NSSI. Finally, path models were established to test the mediation of mindfulness as well as its five dimensions in bullying-NSSI association. The statistical significance level of multivariate binary logistic regression and mediation analysis was set at less than 0.05, two-tailed. All analyses were conducted by using the R software (Version 4.0.3, The R Foundation for Statistical Computing, Vienna, Austria). Since cluster sampling was performed in this study, the "survey" package of R software was used to adjust for the clustering effect.

Results

Sample characteristics and prevalence of NSSI

A total of 5,970 participants were identified, of whom 28 were excluded due to being aged 18 years or older, and 45 were excluded due to missing data. As a result, 5,897 students were included in the final analysis, with a response rate of 98.8%. The mean age of the respondents was 13.62 years (SE = 0.03), and 51.4% were girls. The Han majority accounted for 82.4% of the participants. Detailed socio-demographic characteristics were summarized in Table 1. The lifetime prevalence of NSSI

Table 1 Characteristics of 5897 students surveyed

Characteristics	Total (*N* = 5897)	Boys (*N* = 2866)	Girls (*N* = 3031)	*p* value
Socio demographics				
Age: yrs, mean (SE)	13.62(0.03)	13.55(0.04)	13.71(0.04)	0.02[a]
Grade: *N* (%)				
Primary school	1478(25.1)	766(51.8)	712(48.2)	< 0.01[b]
Junior high school	2778(47.1)	1362(49.0)	1416(51.0)	
Senior high school	1641(27.8)	738(45.0)	903(55.0)	
Ethnicity: *N* (%)				
Han majority	4859 (82.4)	2369(48.8)	2490(51.2)	0.82[b]
Minorities	1038(17.6)	497(47.9)	541(52.1)	
Left-behind children: *N* (%)				0.709[b]
Yes	1324 (22.5)	637 (22.2)	687 (22.7)	
No	4573 (77.5)	2229 (77.8)	2344 (77.3)	
Anxiety: *N* (%)				
Yes	1690(28.7)	659(39.0)	1031(61.0)	< 0.01[b]
No	4207(71.3)	2207(52.5)	2000(47.5)	
Depression: *N* (%)				
Yes	2429(41.2)	1012(41.7)	1417(58.3)	< 0.01[b]
No	3468(58.8)	1854(53.5)	1614(46.5)	
Self-harm behaviors: *N* (%)				
Yes	2043(34.6)	849(41.6)	1194(58.4)	< 0.01[b]
No	3854(65.4)	2017(52.3)	1837(47.7)	
Self-harm repetition: *N* (%)				
Yes	1122(54.9)	457(40.7)	665(59.3)	0.22[b]
No	921(45.1)	392(42.6)	529(57.4)	
Self-harm severity: *N* (%)				
Yes	417(20.4)	150(36.0)	267(64.0)	< 0.01[b]
No	1626(79.6)	699(43.0)	1906(57.0)	
Mindfulness: median (IQR)				
Total score	119.00 (16.00)	120.00 (16.00)	119.00 (16.00)	< 0.001[c]
Mindfulness observing	21.00 (9.00)	21.00 (9.00)	21.00 (9.00)	0.459[c]
Mindfulness describing	24.00 (8.00)	24.00 (9.00)	23.00 (8.0)	0.003[c]
Mindfulness nonreactivity	18.00 (6.00)	18.00 (6.00)	18.00 (6.00)	0.144[c]
Mindfulness nonjudging	26.00 (8.00)	26.00 (8.00)	26.00 (10.00)	0.37[c]
Mindfulness acting with awareness	32.00 (10.00)	32.00 (9.00)	32.00 (9.00)	< 0.001[c]
School bullying				< 0.001[b]
Victim	660 (11.2)	354 (12.4)	306 (10.1)	
Bully-victim	73 (1.3)	53 (1.8)	20 (0.7)	
Bully	44 (0.7)	34 (1.2)	10 (0.3)	
Non- involvement	5120(86.8)	2425 (84.6)	2695 (88.9)	

[a] Design-based t-test

[b] Design-based Chi-squared test

[c] Design-based rank-sum test

was 34.6% (95% CI: 30.3%–39.0%). Among those who reported engaging in NSSI, 54.9% (95% CI: 47.2%–62.0%) reported repeated episodes, and 20.4% (95% CI: 14.6–28.0) reported severe NSSI.

Association between school bullying, mindfulness, and NSSI

The univariate logistic regression model identified age, sex, grade, symptoms of depression and anxiety, school bullying, both the combined score of mindfulness and its dimensions

Table 2 Associated factors of NSSI

Variables	Outcome: NSSI behaviors				
	Crude OR (90% CI)	Adjusted OR (95%CI)	Adjusted OR (95%CI)	Adjusted OR (95%CI)	Adjusted OR (95%CI)
Age(+ 1 year)	1.12(1.04–1.21)	1.05 (0.98–1.14)	1.03 (0.96–1.11)	1.04 (0.97–1.12)	1.05 (0.98–1.12)
Sex: Girls (Ref: Boys)	1.54(1.11–2.16)	1.36 (0.90–2.07)	1.30 (0.85–1.96)	1.36 (0.89–2.08)	1.40 (0.92–2.15)
Current education level (Ref: Primary school)					
Junior high school	2.01(1.36–2.97)	1.32 (1.00–1.75)	1.26 (0.96–1.66)	1.32 (1.02–1.71)	1.29 (0.97–1.72)
Senior high school	1.84(1.31–2.58)	0.95 (0.55–1.64)	0.86 (0.52–1.44)	0.97 (0.59–1.60)	0.91 (0.61–1.36)
Left-behind children: Yes (Ref: No)	1.57 (1.28, 1.91)	1.15 (0.94–1.40)	1.09 (0.88–1.35)	1.05 (0.86–1.29)	1.06 (0.85–1.31)
Ethnicity (Ref: Han majority)					
Minorities	0.87(0.75–1.00)				
Anxiety: Yes (Ref: No)	4.90(3.30–7.29)	1.91 (1.48–2.46)	1.72 (1.31–2.26)	1.67 (1.27–2.20)	1.48 (1.13–1.93)
Depression: Yes (Ref: No)	6.06(4.43–8.30)	3.59 (2.93–4.40)	3.36 (2.81–4.03)	3.10 (2.57–3.74)	2.63 (2.20–3.15)
Mindfulness Total score (+ 1 unit)	0.95(0.94–0.96)		0.97 (0.96–0.98)	0.98 (0.97–0.99)	
Mindfulness Observing (+ 1 unit)	1.02(1.01–1.03)				1.02 (1.01–1.04)
Mindfulness Describing (+ 1 unit)	0.89(0.88–0.91)				0.95 (0.94–0.96)
Mindfulness Nonreactivity (+ 1 unit)	0.99(0.98–1.01)				
Mindfulness Nonjudging (+ 1 unit)	0.98(0.97–0.99)				1.02 (1.00–1.04)
Mindfulness Acting with awareness (+ 1 unit)	0.88(0.87–0.90)				0.95 (0.94–0.97)
Bullying victim: Yes (Ref: No)	2.88(2.43–3.40)	2.13 (1.80–2.53)		2.02 (1.68–2.43)	1.83 (1.51–2.22)

as statistically significant factors for NSSI (Table 2). After controlling for potential confounders, the multivariate logistic regression model suggested that the combined score of mindfulness was associated with the reduction of the NSSI risk (OR =0.98, 95% CI: 0.97–0.99), while school bullying was associated with the increased risk of NSSI (OR =2.02, 95% CI: 1.68–2.43). Four dimensions of mindfulness were associated with NSSI: mindfulness observing (OR =1.02, 95%CI: 1.01–1.04), mindfulness nonjudging (OR =1.02, 95% CI: 1.00–1.04), mindfulness describing (OR =0.95, 95% CI: 0.94–0.96), and mindfulness acting with awareness (OR =0.95, 95%CI: 0.94–0.97) (Table 2). We extra examined the link between school bullying, mindfulness, repetition and severity of NSSI, the analytical results were provided in supplementary material, Table S1 and S2. Overall, these results were consistent with those derived from the complete sample.

Mediation of mindfulness in the school bullying-SH association

Based on the results of multivariate logistic regression model, we constructed a possible mediating model for school bullying, NSSI, and mindfulness. The path model suggested that the combined score of mindfulness had a significant mediating role: the indirect effect was 0.064(−0.15*−0.426), accounting for 34.0% of the total association between school bullying and NSSI (Fig. 1). Subsequently, we estimated the mediation of mindfulness by its dimensions. The analytical results showed that mindfulness observing, mindfulness describing, and mindfulness acting with awareness exhibited significant mediating effects: the indirect effects were 0.001 (0.029*0.032), 0.028 (−0.144*−0.194), and 0.092 (−0.198*−0.466), respectively, accounting for 0.5%, 14.2%, and 46.7% of the total associations (Fig. 2).

We constructed several path models to examine the potential mediating effects of mindfulness in the relationship between school bullying and NSSI severity, as well as NSSI repetition. Significant mediation of mindfulness was observed only in the association between school bullying and NSSI severity: the indirect effect was 0.033 (−0.117*−0.286), accounting for 12.1% of the total association (Fig. 1). Among the mindfulness dimensions, mindfulness observing was a significant mediator in the association between school bullying and self-harm severity (Fig. 2).

Subgroup analysis

Further subgroup analysis revealed generally expansive and comparable mediation for the dimensions of mindfulness describing and mindfulness acting with awareness across study subjects of different sex, age, and left-behind status. Mindfulness describing showed a stronger mediation in younger children, left-behind children, and girls. Mindfulness acting with awareness had the highest mediating effect in the overall sample, with slightly higher effects in girls and left-behind children. For NSSI

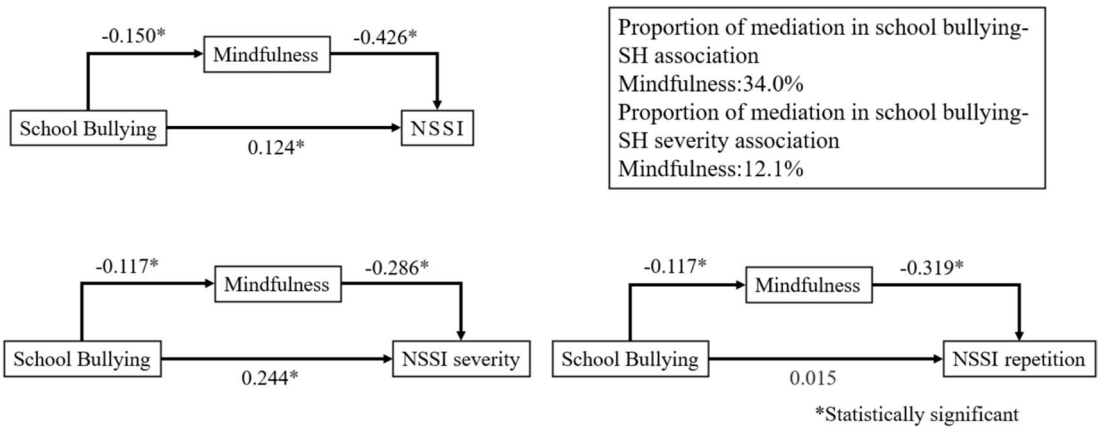

Fig. 1 Mediation of mindfulness in the association among school bullying, NSSI, NSSI repetition, and NSSI severity

severity, mindfulness observing and mindfulness describing showed low or non-significant effects across most subgroups. Mindfulness acting with awareness had a significant mediating effect in all subgroups, with a stronger effect observed in younger children (Fig. 2).

Discussion

In this cross-sectional study with a large sample of 5897 Chinese children and adolescents, we found that school bullying was significantly associated with increased NSSI risk. Moreover, mindfulness prominently mediated the association between school bullying and NSSI, especially for the dimensions of mindfulness describing and mindfulness acting with awareness. Further performed subgroup analysis revealed similarly expansive mediation of mindfulness in children and adolescents of different age, sex, and left-behind status. These major findings highlight the promising role of mindfulness in preventing NSSI risk for children and adolescents who are involved in school bullying.

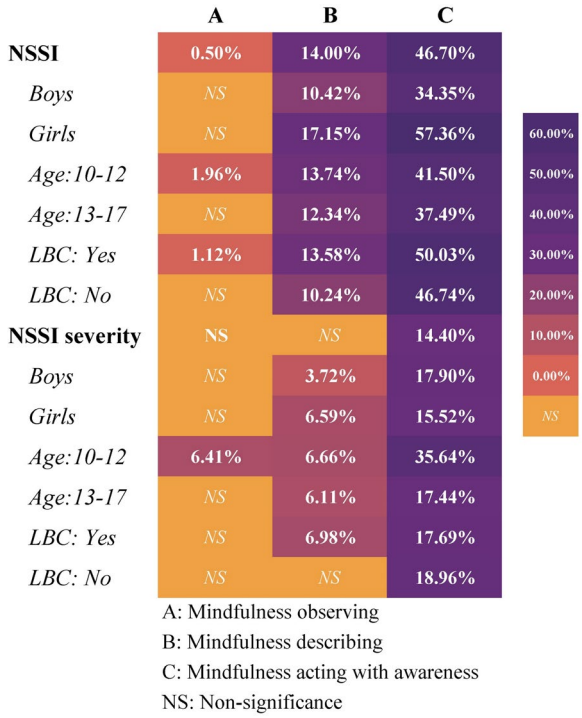

Fig. 2 Subgroup analysis for proportions of mediation by dimensions of mindfulness in the associations between school bullying, NSSI, and NSSI severity

We found that 34.6% of the participants reported NSSI in their lifetime, a prevalence significantly higher than both international and previous Chinese studies [35, 36]. The differences in prevalence of school bullying probably can be attributed to sample heterogeneity, the definition of NSSI, and the assessment tools used. Our study measures lifetime prevalence, while other studies often measure prevalence over one year or six months. Additionally, our sample was drawn from a region in China with a large proportion of left-behind children, a group that is particularly vulnerable to NSSI [37, 38], which may partly explain the high prevalence that we observed. These findings highlight NSSI as a major public health issue among adolescents in this under-developed province in southwestern China.

Consistent with previous research, children and adolescents who had experienced school bullying were at an elevated risk of NSSI [8, 22, 39]. Our study also confirmed that mindfulness was negatively correlated with NSSI, and that the association between school bullying and NSSI was partially mediated by mindfulness. The mechanisms through which mindfulness impacts NSSI could be multifaceted. Mindfulness helps individuals regulate emotions, reduce ruminative thinking, and increase acceptance of distressing emotions, which in turn may reduce the need to self-injure [40–43]. Mindfulness plays a key role in emotion regulation, which is central to the

prevention of NSSI. Studies have shown that mindfulness helps individuals become more aware of their emotional states and better able to manage difficult emotions without resorting to maladaptive coping strategies such as self-harm [44]. This emotional awareness and regulation may reduce the urge to engage in self-injury as a way of coping with emotional distress. Moreover, mindfulness enhances self-compassion and acceptance [45], which are crucial for individuals who struggle with self-injury behaviors. Research has shown that individuals with higher levels of self-compassion are less likely to engage in self-harm, as they are better able to cope with distress without turning to self-punitive behaviors [46].

The mechanisms of mindfulness in mitigating NSSI are further supported by previous studies on mindfulness-based interventions (MBIs). Dialectical behavior therapy (DBT) has been proved effective in intervening NSSI [47]. Mindfulness is associated with emotional awareness and regulation [48], and it may be central to therapies like DBT [49]. Mindfulness may be developed through an intervention or engagement in regular mindfulness practice [24]. A meta-analysis suggests that mindfulness-based therapy may be a promising intervention for treating anxiety and depressive symptoms [50]. With the guidance and supervision of the mental health professional, enhancing mindfulness has been suggested a beneficial approach to help adolescents who had self-injured [51–53]. Mindfulness programs for children and adolescents are thriving in schools, focusing on inner experiences to improve self-awareness and ultimately prevent or reduce problem behaviors on campus [54].

Furthermore, our additional analysis revealed that among all dimensions of mindfulness, only mindfulness observing, describing, and acting with awareness played significant mediating roles. Mindfulness observing means realizing or attending to internal and external experiences. In this study, mindfulness observing was positively correlated with NSSI, which was different from other dimensions. Observing has not been related to psychological well-being with nonmeditator samples, and it is beneficial only in samples of meditators [31, 32]. Mindfulness acting with awareness means paying attention to activities carried out at the present time. Acting with awareness is associated with better emotion regulation [32]. It can reduce the impact of stressful events on other psychological symptoms, and be predictive to the association between stressors and NSSI [41, 55]. Mindfulness describing means using words to describe internal experiences. The capacity to describe inner states has been found to be related to reduced experiential avoidance of distressing experiences and increased concrete thinking [56]. The ability to describe events and label internal experiences with words, in turn, encourages social support and effective problem solving in stressful situations [57].

The main strengths of this study include the large sample of primary and middle school students in China, along with a scientifically rigorous research design and implementation. However, several limitations should be acknowledged. First, the study subjects were drawn from a single province in China, which may limit the generalizability of the findings to the general Chinese adolescents. Second, as a cross-sectional study, it does not allow for the establishment of causal relationships. Longitudinal studies are needed to further corroborate our major findings. Future research should also incorporate in-depth qualitative data and more representative samples from different regions of China to address these limitations.

Conclusion

The prevalence of NSSI, repeated NSSI, and severe NSSI among children and adolescents aged 10–17 years is notably high, emphasizing the importance and urgency of NSSI intervention in this region of China. The key findings of our study are highly relevant for constructing intervention strategies in preventing NSSI among children and adolescents. For primary and middle school students who have experienced school bullying, interventions aiming at enhancing mindfulness may be effective in preventing the subsequent self-harm behaviors. However, our study sample was drawn from a single region, which may limit the generalizability of the findings. Additionally, the cross-sectional design prevents causal inferences. Future longitudinal studies with more diverse and representative samples are needed to further validate our major findings.

Abbreviations

NSSI	Non-Suicidal Self-Injury
MASHS	The Modified version of Adolescents Self-Harm Scale
FFMQ	Five Facet Mindfulness Questionnaire
GAD-7	General Anxiety Disorder-7
PHQ-9	Patient Health Questionnaire-9
CI	Confidence interval
SE	Standard error
IQR	Interquartile range
OR	Odds ratio

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-025-22991-y.

Supplementary Material 1.

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None.

Authors' contributions
YX and JL conceived the study. CZ, FL and HR conducted statistical analysis and drafted the manuscript. YC, DF, SL, GZ, YH, and YX assisted with data collection, cleaning, and statistical analysis. YX and JL critically revised the manuscript. All authors provided critical revision of the manuscript for important intellectual content.

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Data availability
The datasets analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The study was conducted in accordance with the ethical standards of the institutional and national research committees and with the 1964 Helsinki Declaration and its subsequent revisions or similar ethical standards. The study protocol was reviewed and approved by the Ethics Review Board of Kunming Medical University. Informed consents were obtained from both the participants and their legal guardians prior to the survey.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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