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# Childhood emotional maltreatment affects depression of adolescents with mood disorders: the mediating role of functions of non-suicidal self-injury

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## Abstract

**Background** Childhood emotional maltreatment, non-suicidal self-injury and depression are prevalent among adolescents with mood disorders. While existing model indicated that childhood emotional maltreatment, functions of non-suicidal self-injury and depression are interrelated, not much is understood about the interplay of functions of non-suicidal self-injury in the relationship between childhood emotional maltreatment and depression. Thus, the goal of this research was to ascertain how functions of non-suicidal self-injury relate to childhood emotional maltreatment and depression.

**Methods** The participants were adolescents with mood disorders from three hospitals in Sichuan Province, data was collected using self-administered questionnaires, including the Childhood Trauma Questionnaire, Ottawa Self-injury Inventory-Functions, and Childhood Depression Inventory. SPSS26.0 software and PROCESS v3.3 model 4 were used for analysis.

**Results** In all, 235 adolescents ( $M_{age}=14.8$ ,  $SD=1.62$ ) participated in the research. The functions of non-suicidal self-injury ( $r=0.289$ ,  $P<0.01$ ) and depression ( $r=0.475$ ,  $P<0.01$ ) were considerably positively connected with childhood emotional maltreatment, and the functions of non-suicidal self-injury were strongly positively correlated with depression ( $r=0.364$ ,  $P<0.01$ ). The direct impact of childhood emotional maltreatment on depression in adolescents was found to be significant (95% *CI* 0.434, 0.828) in the mediated effects model. Additionally, the indirect effect of childhood emotional maltreatment on depression through functions of non-suicidal self-injury was found to be significant (95% *CI* 0.055, 0.236), with a mediating effect value of 17.58%.

**Conclusion** Childhood emotional maltreatment has a direct impact on depression, but it also has an indirect influence through mediation roles of functions of non-suicidal self-injury. Medical staff should take care of the mental

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health of adolescents hospitalized for mood disorders so that they can clarify the role of functions of NSSI in lowering depressive symptoms and improving quality of life and create more targeted and effective intervention plans.

**Keywords** Childhood emotional maltreatment, Depression, Non-suicidal self-injury, Adolescents, Mood disorder

## Introduction

Depression is common among adolescents with mood disorders. The prevalence of adolescent depression has increased in recent years, and with the trend of lower-aged, a previous study has reported that 75% of adults with depression had experienced it during adolescence [1]. Globally, 25.2% of adolescents were depressed during the COVID-19 pandemic, according to a recent meta-analysis, while in China, the prevalence is 19.85% [2]. In addition, adolescent depression not only impairs the psychosocial functioning and scholastic performances, but also increases the risk of chronicity in adulthood [3], it is one of the major contributors to the disease and disability in 10–19 years old, accounting for 5.7% (10–14 years old) and 9.9% (15–19 years old) of the global disease burden [4]. In summary, it is essential to identify potential causal mechanisms such as these that may ultimately induce new treatments and take targeted interventions to prevent the development of depression.

## Depression and childhood emotional maltreatment

The pathogenesis of adolescent depression is sophisticated, and affected by many factors, including genetic and environmental factors [5]. Among environmental factors, adolescents who have suffered childhood maltreatment (CM) may be more prone to develop depression than those who have not, according to strong evidence linking environmental factors to the pathophysiology of depression [6, 7]. Nevertheless, the majority of research has focused on childhood abuse of both sexual and physical nature. In contrast, childhood emotional maltreatment (CEM), a type of abuse that is easily overlooked but widely exists, is related to depression [8, 9]. The practice of covert abuse is known as CEM, it includes isolated incidents, as well as caregivers failing to provide a suitable environment for the child's growth over some time, it may lead to abnormal physical, mental, and social development in children, such as behaviors manifest like contempt, blame, threats, fear or ridicule [8, 10]. Due to its covertness, it has received little attention, however, it's more prevalent. A study indicated that CEM (46.1%) accounted for more prevalence than other types of abuse [11], and a meta-analysis drew the same conclusion that CEM showed a larger effect size than other abuse [12]. Studies have found that CEM is close to depression [13]. Rose and Abramson believed that CEM was more likely to cause depression and the development of a negative cognitive style than physical or sexual abuse because emotional abusers ingrained depressed cognition in their

victims [14]. As remarked above, this study hypothesized that CEM can significantly predict depression among adolescents with mood disorders. Considering the substantial harm that depression causes and its correlation with CEM, this study also thoroughly investigated the underlying mechanisms between depression and CEM to manage, prevent, and anticipate the influence of CEM on adolescent depression.

## Depression and functions of NSSI

Non-suicidal self-injury (NSSI), referring to the direct and intentional injuries of individuals' body tissue without suicidal thoughts [15], become a global issue of mental health among adolescents. Characterized by its recurrent nature among patients with mood disorders, adolescents, their peers, and their families are all negatively affected by NSSI, a disease that deteriorates not only their bodies, and mental health but also increases the risk of suicide attempts. Depression and NSSI often co-occur among adolescents with mood disorders [16], and are consistent with more severe clinical symptoms, both of them have high comorbidity and correlation. Studies found that the detection rate of NSSI in adolescents with mood disorders was 52–81.3% [17–19]. It has been reported that depression and NSSI were closely related [20]. However, through literature review, numerous studies have focused on the behavioral characteristics of NSSI, such as frequency, and patterns [21], and few studies have explored the functions of NSSI (to be referred to as benefiting mechanisms, supporting or reinforcing NSSI motivation for NSSI patients). Given the strong association between depression and NSSI, functions of NSSI as the most important part of NSSI, it is imperative that this study investigate the underlying mechanisms between depression and functions of NSSI to forecast the effect of functions of NSSI on individual depression and to intervene and prevent it promptly.

## Functions of NSSI and CEM

The correlation between functions of NSSI and CEM has been proved by theoretical models and empirical studies. A new benefits and barriers theory model of NSSI confirms maltreatment generated initially NSSI via negative self-association, communication motivation with NSSI, and increased affiliation with NSSI to get affective benefits [22]. Meanwhile, the Four-function model also proposed that CEM was the distal risk factor of NSSI in adolescents, as CEM can lead to intrapersonal and interpersonal vulnerabilities (e.g., poor communication skills)

to respond to stressful life events ineffectively [15]. Additionally, there is well-documented evidence that NSSI is related to CEM [23, 24].

*A previous study has demonstrated the small-to-medium correlations between CEM and NSSI during adolescence and the existence of a recent history of NSSI [25]. Empirical research has also supported this association. Calvo et al. pointed out the positive correlation between CEM and NSSI in adolescents aged 10–17 who were enrolled in two hospitals in the United States [26].*

Zheng et al. confirmed a longitudinal association between CEM and NSSI. As remarked above, it can be inferred that CEM has an effect on NSSI. Functions of NSSI as an important component of NSSI, it can be hypothesized that CEM having a predictive effect on functions of NSSI but further research is needed to prove it.

#### **Relationship between CEM, functions of NSSI, and depression**

Adolescents with mood disorders who suffer from CEM are more prone to predicting NSSI behavioral motivation [27, 28]. CEM has been indicted as one of the plausible explanatory factors for depression [8]. Previous studies have implicated an increased likelihood of depression in adolescents with mood disorders with a history of CEM or those with high NSSI behavioral motivation [9]. In summary, it is tenable to suggest that CEM can lead to defective functions of NSSI, which in turn can heavily affect depression. Although previous studies have connected CEM with depression [13, 29], it is still unknown how differentiable potential components interact and contribute to this relationship. Some models have indicated that functions of NSSI may mediate the relationship between CEM and depression [15, 22]. One potential reason is that when adolescents experience CEM, they may occur to NSSI motives to cope with these isolated incidents, including contempt, blame, and ridicule, and their functions of NSSI were different. In turn, contempt, blame, ridicule are positively related to negative emotions such as depression, suggesting the mediating effect of functions of NSSI on the risk of depression among adolescents exposed to CEM. However, there is a lack of empirical research to verify this conclusion.

Previous studies have demonstrated an association with CEM and an increased risk of depression. Closely relevant is that functions of NSSI may affect the linkage between CEM and depression. Although the integrated theoretical model and a new benefits and barriers theory model of NSSI [15, 22] suggest a potential link among CEM, the functions of NSSI, and depression [30], little is known about the mediation process underlying

the association. This study is designed to fill this gap by exploring the role of functions of NSSI between CEM and depression. Best case scenario, the study's results could contribute to our understanding of the mechanism and prevention of depression in adolescents with mood disorders as well as how functions of NSSI interact with CEM and depression in this population. Therefore, we conducted a cross-sectional study to investigate CEM, the functions of NSSI, and depression, explore the complex relationships of these variables among adolescents with mood disorders. In this article, we put forward the following hypothesis: The functions of NSSI are a mediator between CEM and depression in adolescents.

## **Method**

### **Participants**

A multi-center cross-sectional study was conducted in Sichuan Province, China. Adolescents from three hospitals were recruited using a convenience sampling method between January 1, 2022, and February 1, 2023. Inclusion criteria were (1) age 11–18 years [31]; (2) Diagnosis of a depressive episode or bipolar disorder (in the depressive phase) ICD-10 by two experienced psychiatrists; (3) understanding all questionnaire contents; (4) no other serious physical diseases (e.g., heart disease) or mental illnesses (e.g., schizophrenia). In total, 235 (79.6% females,  $M_{age}=14.8$ ,  $SD=1.62$ ) adolescents aged between 11 and 18 years participated in this research. This sample consists of bipolar disorder (80.9%) and depression (19.1%). Among them, 94.5% were ethnic Han, 54.9% lived in the city, 56.6% were not the only child in the family, 2.1% were in primary school, 55.3% were in junior high school, and 42.6% were in senior high school or vocational school. In terms of disease, the course of disease lasting more than one year was 72.7%, frequency of disease attacks and hospitalization more than three times were 16.8%, and 12.4%, respectively. Of all parents, 40.8% of mothers and 37.2% of fathers had a high school education or above. Regarding the family structure, 34% were nuclear families, 15.3% were single-parent families, 15.7% were blended families, and 34.9% were stem families.

### **Procedure**

This research was approved by the academic committee and ethics committee. Under the instructions of trained researchers, questionnaires were completed from adolescents in hospitals. All of the adolescents and their parents have signed informed consent before participating in this study, and they could withdraw anytime during this study, if some information was missing or unreasonable in the questionnaire, it is considered invalid.

## Measures

### Childhood emotional maltreatment

CEM was assessed using part of the Childhood Trauma Questionnaire (CTQ), a 5-item retrospective, self-report Likert scale (1–5, means never to always) measuring exposure to CEM, with higher total scores indicating more severe childhood emotional maltreatment [32]. When the score is more than 13, CEM is considered to be present [33]. Chinese researchers Zhao et al., [33] revised the Chinese version of this questionnaire in 2005 and tested its reliability and validity (*Cronbach's coefficient*=0.62, *Correlation coefficients*=0.67).

### Ottawa Self-injury inventory-functions

The functions of NSSI were identified using the part of Ottawa Self-injury Inventory, developed by Nixon et al., [34], that is the Ottawa Self-Injury Inventory-Functions (OSI-F), a self-assessment scale includes four dimensions, that is internal emotional regulation, social influence, external emotional regulation, sensory seeking. Likert-5 points, ranging from 1 to 5 (1=never true to 5=always), are used for scoring. The adolescent would see the related functional factor as the driving force behind NSSI behavior to a greater extent the higher the functional factor score. *Cronbach's 0.926* for the reliability and validity scale of this scale.

### Childhood Depression Inventory

To measure depression, we used the Childhood Depression Inventory (CDI), which was developed by Kovacs and revised by Chinese researcher Wu et al., [35]. It includes 27 items and five dimensions (anhedonia, negative emotion, low self-esteem, inefficiency, and interpersonal problems). On a 0–2 point scale, each item on the scale contains three options that describe the degree of depression; higher scores denote a higher degree of depression. The total CDI score spans from 0 to 54, with various clinical cut-off scores (such as >13, 13–18, and >=19) suggested to reflect heightened depression symptoms in adolescents [36]. In this study, the *Cronbach's coefficient* of this scale was 0.93.

## Data analysis

With SPSS 26.0, all statistical analyses of the data were carried out. First, for the primary study variables, descriptive statistics were created. Second, the relationship between the primary variables was examined using a correlation analysis. Lastly, using PROCESS 3.3 model 4, a regression model was built to examine the mediating effect. Seeing that prior research clarified that adolescent gender, and age were associated with depression [37], these variables were included as covariates in statistical analyses. The variable gender was dichotomous,

with 1 denoting male and 0 female. The variable of age was continuous.

## Results

### Common method bias and test

The Harman single-factor technique was used because the cross-sectional design may have resulted in common data bias. There were sixteen eigenvalues greater than one, according to the test, and the first component only accounted 19.72% of the variation, or less than 40%. This suggests that there is no bias related to common approach.

### Univariate analyses and correlation analyses among variables

The score (Means and standard deviations) of CEM, functions of NSSI, and depression were  $12.210 \pm 4.704$ ,  $33.468 \pm 15.336$ , and  $29.520 \pm 8.187$ , respectively. Childhood emotional maltreatment was significantly positively correlated with the functions of NSSI ( $r=0.289$ ,  $P<0.01$ ) and depression ( $r=0.475$ ,  $P<0.01$ ), the functions of NSSI were significantly positively correlated with depression ( $r=0.364$ ,  $P<0.01$ ). Results of descriptive statistics and correlation analyses among the study variables are presented in Tables 1 and 2.

### The causal stepwise regression analysis of the mediation model of functions of NSSI between CEM and depression

The mediating effect was tested in PROCESS model 4 while controlling for gender and age variables. Taking CEM as the predictive variable and the functions of NSSI as the outcome variable, the results illustrated that CEM had a significantly positive effect on the functions of NSSI ( $\beta=0.289$ ,  $P<0.001$ ). Then the CEM and the functions of NSSI were regarded as the predictive variable, and depression was perceived as the outcome variable, the results revealed that CEM and the functions of NSSI had a significantly positive effect on depression ( $\beta=0.404$ ,  $P<0.001$ ;  $\beta=0.289$ ,  $P<0.001$ ), the mediating effect test showed that functions of NSSI played a mediating role between childhood emotional maltreatment and depression, which indicated that the functions of NSSI play a mediating role between the childhood emotional maltreatment and depression. The results of moderated mediation analyses are reported in Table 3.

### The mediating role of functions of NSSI in the association between CEM and depression

The mediating effect of functions of NSSI on the CEM and depression was examined using the Bootstrap method, the results showed that in the mediated effects model, the direct effect of CEM on adolescent depression levels was significant (95% *CI* 0.434, 0.828); the indirect effect of CEM on adolescent depression

**Table 1** Univariate analyses of depression in different groups (N = 235)

Variable	N(%)	Depression (x ± s)	t(F)	P
Gender			-3.330	0.001
Male	48(20.4)	26.080 ± 8.535		
Female	187(79.6)	30.400 ± 7.879		
Age			3.347	0.000
11–14 years old	106(1.3)	31.450 ± 7.240		
15–18 years old	129(5.5)	27.930 ± 8.597		
Diagnosis			0.710	0.480
Bipolar disorder	190(80.9)	30.310 ± 8.396		
Depression	45(19.1)	29.330 ± 8.147		
Ethnic			0.270	0.791
Han	222(94.5)	29.560 ± 8.185		
Others	13(5.5)	28.900 ± 8.522		
Residence			0.599	0.550
City	129(54.9)	29.000 ± 8.058		
Town	66(28.1)	30.050 ± 7.778		
Village	40(17.0)	30.330 ± 9.281		
Only child or not			1.715	0.088
Yes	102(43.4)	30.560 ± 7.626		
No	133(56.6)	28.720 ± 8.534		
Education level.			4.105	0.000
Primary and junior high school	135(57.4)	31.350 ± 7.347		
Senior high school or vocational school.	100(42.6)	27.050 ± 8.64		
Family structure			4.476	0.004
Nuclear family	80(34.0)	8.970 ± 1.003		
Single-parent family	36(15.3)	7.633 ± 1.272		
Blended family	37(15.7)	8.805 ± 1.447		
Stem family	82(34.9)	6.699 ± 0.74		
CEM			-6.780	0.000
Not	134 (57.0)	33.340 ± 6.920		
Yes	101 (43.0)	26.640 ± 7.904		

through functions of NSSI was also significant (95% CI 0.055, 0.236). The total effect (path  $c=0.475$ ), indirect effects (path  $a*b=0.0835$ ,  $a=0.289$ ,  $b=0.289$ ) and direct effects (path  $c'=0.404$ ) were reported in the form

of unstandardized beta coefficients, and the proportion mediated was calculated by dividing indirect effect by total effect (path  $a*b/c$ ), the mediating effect value was 17.58%, which indicating a significant mediating effect, seeing Fig. 1; Table 4.

**Discussion**

To our knowledge, this is the first study to explore the underlying mechanisms of CEM on depression by investigating the mediation role of the functions of NSSI in a sample of adolescents with mood disorders. The results indicated that CEM indirectly impacted adolescent depression through the functions of NSSI, forming a mediating model.

**Relative factors analysis of depression in adolescents with mood disorders**

Previous studies have shown that adolescents have a high prevalence of depression, for example, China is 24.3% [38], Iran is 24.6% [39], Myanmar is 27.2% [40]. In addition, our study indicated that there existed significant differences in the total CDI scores where gender, educational background, and family structure were concerned. In the light of gender, Kuehner supported our results [41]. Such differences between men and women may be due to the influence of congenital sex factors, as boys are apt to release their internal pressure through physical exercise and communication with others when they encounter problems, while girls do not. As for educational background, Wang and Ding revealed that senior high school students had a higher prevalence of depressive symptoms than junior high school students and primary school students [42], which is inconsistent with our results. The reasons for these inconsistent results are debatable, it may be due to differences in participants (adolescents with mood disorders vs. adolescents) and scale (CDI vs. Center for Epidemiologic Studies Depression Scale). In accordance with family structure, compared with the nuclear family, single-parent family (OR=1.45) and blended family (OR=1.69) were positively

**Table 2** Correlation analyses among variables (N = 235)

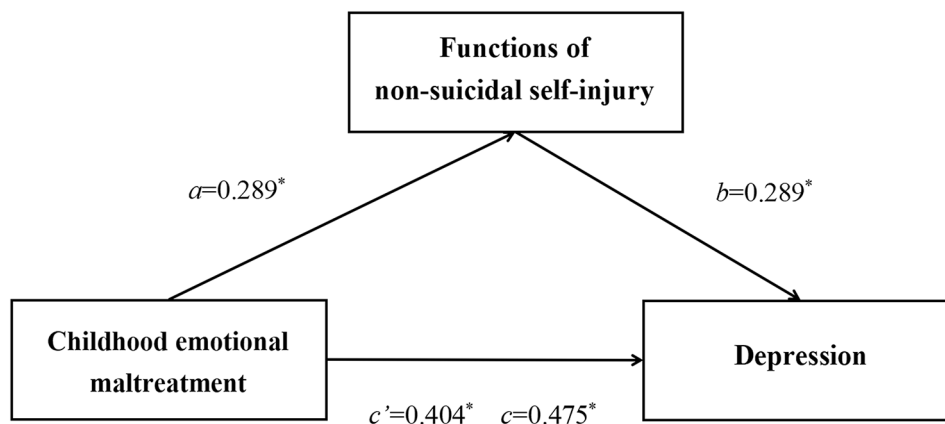
Variables	1	2	3	4	5	6	7	8	9
1. Internal emotional regulation	1								
2. Social influence	0.402**	1							
3. External emotional regulation	0.650**	0.336**	1						
4. Sensation seeking	0.391**	0.323**	0.350**	1					
5. Functions of NSSI	0.862**	0.740**	0.742**	0.602**	1				
6. Childhood emotional maltreatment	0.231**	0.190**	0.213**	0.261**	0.289**	1			
7. Depression	0.362**	0.197**	0.301**	0.221**	0.364**	0.475**	1		
8. Gender	0.023	0.049	-0.009	0.108	0.051	0.067	0.213**	1	
9. Age	0.058	-0.024	0.018	-0.016	0.018	-0.190**	-0.234**	-0.123	1

Notes: 1 means Internal emotional regulation, 2 means Social influence, 3 means External emotional regulation, 4 means Sensation seeking, 5 means Functions of NSSI, 6 means Childhood emotional maltreatment, 7 means Depression, 8 means Gender, 9 means Age, \*\* means  $P < 0.01$



**Table 3** Causal stepwise regression analysis of functions of NSSI between CEM and depression (N=235)

Regression model outcome variable	Predictor variable	Overall fit index		Regression coefficient and significance			
		R	R <sup>2</sup>	F	β	t	P
Functions of non-suicidal self-injury	Gender	0.301	0.090	7.657	1.551	0.041	0.519
	Age				0.756	0.080	0.216
	Childhood emotional maltreatment	0.289	0.083	21.186	0.289	4.603	0.000
Depression	Gender	0.524	0.275	29.179	0.168	2.964	0.003
	Age				-0.130	-2.269	0.024
	Childhood emotional maltreatment	0.475	0.226	67.924	0.475	8.242	0.000
Depression	Gender	0.578	0.334	28.791	0.157	2.891	0.004
	Age				-0.151	-2.721	0.007
	Childhood emotional maltreatment	0.531	0.282	45.572	0.404	6.945	0.000
	Functions of non-suicidal self-injury	0.531	0.282	45.572	0.289	4.267	0.000



**Fig. 1** Model of the mediating effect of functions of non-suicidal self-injury on childhood emotional maltreatment and depression. Note: \* means  $p < 0.001$ ,  $a$  means the path coefficient of CEM for functions of NSSI,  $b$  means the path coefficient of functions of NSSI for depression after controlling for CEM,  $c$  means total effect of CEM on depression,  $c'$  means direct effect of CEM on depression after controlling for functions of NSSI

**Table 4** Bootstrap test of the mediating effect of functions of non-suicidal self-injury on childhood emotional maltreatment and depression

Effects	Effect value	S.E	Boot LLCI	Boot ULCI
Total effect	0.764	0.099	0.568	0.960
Direct effect (CEM→Depression)	0.631	0.1	0.434	0.828
Indirect effect (CEM→functions of NSSI→Depression)	0.133	0.047	0.055	0.236

correlated with depressive symptoms [42]. Adolescents in single-parent families often have insufficient family cohesion, problematic parent-adolescent communication, and psychological confusion as their psychological adjustment ability is insufficient, inevitably they may develop depression, anxiety, hostility, and other negative psychological problems. As is known to all, a bad family atmosphere is an important factor leading to the occurrence of psychological problems in adolescents [43]. In a blended family, a bad parent-child relationship would result in an inharmonious and high-conflict family atmosphere, adolescents are apt to feel depressive, anxious, and other negative feelings.

**Childhood emotional maltreatment has a direct predictive effect on depression**

Consistent with previous studies [44], our study found that CEM has a direct predictive effect on depression. Mills confirmed the correlation between the experience of CEM and a high risk of depression among the number of 7,223 Australian adolescents [45]. Meanwhile, Chen drew the same conclusion among 1,313 Chinese adolescents [46]. Moreover, studies also showed that CEM had a clear dose-response effect on depression [47]. Jaffee found adolescents with first episodes of depression experienced more incidents of CEM than adults with depression [48]. As remarked above, the more experiences of emotional maltreatment adolescents have, the more severe their symptoms of depression will be. Having CEM experience is also significantly associated with recurrent depressive disorders, and early-onset chronic depression in adulthood [49]. The reason for this is that, as CEM is a constant stressor, it affects the normal function of hormones, and neurotransmitters of the brain, and leads to adolescent depression through structural remodeling of the hippocampus region of the brain

[50]. Gold also pointed out that the striking influence of depression can be attributed to the unique introverted attribution type cognitive mode developed by CEM [51]. In consequence, this suggests that to present an empirical basis for the detection and treatment of adolescent depression, focus should be directed to the experience of CEM among adolescents.

### **The functions of NSSI plays a mediating role between CEM and depression**

This study's findings indicated that CEM can significantly positively predict functions of NSSI, and functions of NSSI can also significantly positively predict depression, which are consistent with earlier studies [52]. Tan et al. [53] have inferred that the reasons CEM can predict functions of NSSI may be related to the fact that CEM, as an early traumatic experience, occurs in an individual's childhood, at this time, the individual's self-defense mechanism is not mature enough to take effective defense mechanisms for negative emotions such as indifference to the outside world, which may lead to individuals having thoughts of attacking, punishing themselves through NSSI. Some studies suggested that the mechanism of functions of NSSI affecting depression may be related to the dysfunction of the hypothalamic-pituitary-adrenal axis, endogenous opioid peptides, and the abnormality of the reward neural circuit, genetics [54, 55].

The mediating effect test showed that functions of NSSI played a mediating role between CEM and depression, and the mediating effect value was 17.58%, suggesting that CEM can not only directly affect depression but also indirectly through the functions of NSSI. According to the psychological structure theory of Freud and integrated viewpoints, the mechanism of functions of NSSI originated from individual susceptibility to early inducements such as childhood emotional maltreatment, pre-behavioral recognition and emotional response of individual heterogeneity, emotion change, and negative reinforcement such as depression [56–58]. The more negative situations individuals experience in early life, the higher the likelihood of accumulating or compounding developmental risks, and thus the greater the risk of developing suicidal idealization [59]. Understandingly, CEM may induce adolescent susceptibility, impair the normal development of cognition, evaluation, and processing of life events, and adolescents would come up with negative emotions, perform NSSI behavior, and eventually suffer from depression. This study found a partial mediation role of functions of NSSI on the effects of CEM on depression. This suggests that factors other than functions of NSSI may also explain the impact of CEM on depression, such as emotion regulation [60], a factor that is not covered in this study. Therefore, more investigation is necessary to completely comprehend how the

functions of NSSI interact with other potential aspects regarding the association between CEM and depression in adolescents with mood disorders.

### **Limitations and implications**

In our study, we not only took into account common demographic variables but also the role of functions of NSSI in CEM and depression for the first time. However, a few potential limitations need to be considered. First, a cross-sectional design was used to examine our hypothesis, as it could not draw causal conclusions, here needs a longitudinal design to confirm the findings in the future. Secondly, the sample size in this study is pretty small and data were collected by self-report questionnaires in adolescents, which is prone to self-reporting bias, so the multiple sample size should be appropriately expanded and data were collected through multiple methods. Third, in the study population, we included both bipolar and unipolar disorder patients, all of whom were in the depression stage, and different disease subtypes may have a certain impact on the results. Nevertheless, there are some promising implications. This study adds to the growing body of knowledge on the link between CEM and adolescent depression by exploring whether the functions of NSSI mediate this link. The findings indicated that functions of NSSI had a mediating effect between CEM and adolescent depression. It is suggested that researchers should pay more attention to the key role functions of NSSI in the mental health of adolescents, and medical staff should attend to the mental health of adolescents with mood disorders in the hospital, so that they can formulate more targeted and effective intervention measures by clarifying the function of NSSI, to alleviate the symptom of depression, and improve their quality of life. Moreover, CEM was found to expose the impact of depression, suggesting that CEM is a significant candidate to be targeted in prevention and intervention efforts. In the future, early intervention to strengthen childhood social-emotional functioning might mitigate the impact of maltreatment, and potentially also avert future psychopathology [61].

### **Conclusions**

This study investigated the underlying mechanisms of the association between childhood emotional maltreatment and adolescent depression and constructed a structural model of childhood emotional maltreatment, functions of NSSI, and depression. This study suggests that childhood emotional maltreatment may not only have a direct effect on depression but may also have an indirect effect on depression through functions of NSSI.

### **Abbreviations**

CEM Childhood emotional maltreatment  
NSSI Non-suicidal self-injury

CTQ Childhood Trauma Questionnaire  
 CDI Childhood Depression Inventory

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12888-024-06185-1>.

Supplementary Material 1

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We are grateful to the participants of this study for their participation.

## Author contributions

Qian You performed the statistical analyses, interpreted the results, and drafted the manuscript; Ying Ou performed data collection, developed the hypotheses, interpreted the results, and drafted the manuscript; Na Meng participated in the design, and performed data collection and statistical analyses; Linlin Guo participated in the design and coordination of the study, and collected data; Yinghua Ye participated in the design and coordination of the study; Xing Xie participated in the design and collected data; Wei Yuan conceived of the study, participated in its design and coordination; Qiaoling Liao conceived of the study, participated in its design and coordination; Juan Chen conceived of the study, participated in the study design, developed the hypotheses, oversaw the data analysis, interpreted the results, and revised the manuscript. All authors read and approved the final manuscript.

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## Data availability

The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

## Declarations

### Ethics approval and consent to participate

This research was approved by the academic committee and ethics committee of West China Hospital, Sichuan University 2022(708), The third hospital of Mianyang 2022 (8), The Fourth People's Hospital of Chengdu 2022 (03). All procedures performed in this study involving human participants were by the ethical standards of the institutional and/or national research committee. All participants gave their informed consent, and individuals under the age of 18 had their parents' or legal guardians' informed consent as well. Every technique was used in accordance with the applicable rules and regulations.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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