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Effect of sense of self on nonsuicidal self-injury in college students: a regulated mediating model

Yang Li¹, Fangzhao Xu², Zeng Yi³, Fan Ou¹, Shanshan Tao¹ and Xiaoling He^{2*}

Abstract

Objective This study aims to examine the relationship and mechanism between sense of self and nonsuicidal self-injury among college students, providing a new theoretical basis for predicting and preventing such behavior.

Methods A total of 1350 college students completed the Sense of Self scale, nonsuicidal self-injury questionnaire, frustration scale, and social problem-solving questionnaire.

Results (1) Negative Sense of Self predicts frustration, and frustration positively predicts nonsuicidal self-injury. (2) Frustration serves as a partial mediator in the relationship between sense of self and nonsuicidal self-injury. (3) The impulsive-negligent social problem-solving style regulates the first half of the mediation model by influencing the relationship between sense of self and frustration.

Conclusion Frustration, mediated by sense of self, increases the risk of nonsuicidal self-injury, and this relationship is moderated by the impulsive-negligent social problem-solving style. Sense of Self is a necessary but not sufficient condition for nonsuicidal self-injury, indirectly influencing such behavior through frustration triggered by stress events.

Keywords Sense of Self, Frustration, Impulse-negligent Social problem solving style, Nonsuicidal self-injury

Introduction

Nonsuicidal self-injury (NSSI) refers to deliberate and direct actions by individuals to harm their body tissues without suicidal intent. NSSI is a significant global public health issue with widespread prevalence [1]. The lifetime prevalence of NSSI in the general population is

approximately 5%, meanwhile, as a coping strategy for maladjusted individuals, NSSI is more likely to occur in clinical population than in the general population, especially in patients with depression and bipolar disorder with poor emotional regulation and coping ability [2]. NSSI poses a specific risk factor for suicide [3], leading to severe physical and mental harm to individuals and imposing a substantial medical and economic burden on society [4].

NSSI is particularly prevalent during puberty, peaking in early and late adolescence and decreasing in middle age [5]. College students, who are primarily in the early and late stages of youth, represent a high-risk group for NSSI. Previous studies have established a strong association between NSSI and borderline personality disorder

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(BPD) [6]. The association between borderline personality disorder (BPD) and non-suicidal self-injury (NSSI) can be traced back to 1880. Some scholars once found the existence of NSSI in clinical samples of BPD [6]. Subsequent research has continued to investigate this relationship, consistently demonstrating a correlation between BPD and NSSI. Studies indicate that the prevalence of NSSI among individuals with BPD can reach as high as 70–75% [7]. Moreover, a study found NSSI behavior in both patients with and without BPD during the observation period, but the NSSI score of the patients with BPD was significantly higher than that of the non-patients [8].

The prevalence of BPD in the general population is 2% [9], and identity disorder is the core symptom of BPD [10], which is associated with self-injury behavior in BPD patients [11]. A low sense of self is a core feature of BPD, and individuals with high BPD traits tend to have a lower self-perception [12]. Frustration is a common psychological experience among college students [13]. It has been suggested that NSSI is one of the primary negative reactions following setbacks among college students [14]. Studies have identified self-identity as a primary influencing factor in frustration [15]. Individuals with a low sense of self often lack self-understanding and easily confuse their thoughts and values with those of others [16], aligning with the key components of self-identity [15]. Moreover, stressful life events, which refer to events triggering negative emotions, play a significant role in NSSI behavior [17], and frustration is a common negative emotion. The impulsive-negligent social problem-solving style, belonging to the quality-stress dimension in the individual sense of self model, influences the regulation of the first half of the mediation model, specifically affecting the relationship between sense of self and frustration.

While previous research has primarily focused on the neurobiological and brain science aspects of the association between BPD and NSSI, the relationship between sense of self and NSSI in the context of BPD has not received sufficient attention. Additionally, most empirical studies on sense of self have been conducted abroad, primarily exploring its pathological aspects and its relationship with the interpersonal environment and self-identity. Empirical research on sense of self in China is limited. Therefore, this study aims to investigate the relationship between sense of self and NSSI, the mediating role of frustration between sense of self and NSSI, and the moderating effect of the impulsive-negligent social problem-solving style. The findings will contribute to the understanding of sense of self development and provide insights for predicting and preventing NSSI among college students.

Nonsuicidal self-injury

Nonsuicidal self-injury (NSSI) refers to the deliberate act of harming or damaging one's body tissue without suicidal intent and is not recognized by social culture [18]. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) published by the American Psychiatric Association, NSSI has been incorporated into Part III, wherein proposed diagnostic criteria are delineated. According to these criteria, an individual is considered to exhibit NSSI if they have not engaged in suicidal behavior for a minimum duration of five consecutive days within the preceding year.

The causes of NSSI are influenced by various factors, including neurobiological and psychosocial factors. Neurobiological research on NSSI is still in its early stages, focusing on structural and functional neuroimaging and physiological factors influenced by endogenous opioid peptides [19]. Psychological research on NSSI encompasses personal predisposing factors and external environmental factors [20]. Personal predisposing factors include emotional skills deficits such as poor emotional awareness, low expression desire, and inhibition disorders in emotional regulation, including sadness and anger [21]. NSSI behaviors among adolescents are often associated with higher levels of depression and anxiety [22]. Impulsive personality traits and a strong sense of loneliness are often present in individuals engaging in NSSI [23]. The level of self-esteem has also been linked to the incidence of NSSI, with lower self-esteem associated with a higher likelihood of engagement in NSSI [24]. Among external environmental factors, family plays a significant role in personality formation and the physical and mental development of individuals. Family trauma has been closely associated with NSSI behaviors [25]. Low levels of parent-child attachment can lead to negative emotions such as guilt, shame, depression, and self-denial, increasing the risk of NSSI [26]. The school environment directly affects students' psychological and behavioral characteristics, and factors such as academic pressure, peer relationships, and teacher punishment can act as triggers for NSSI behavior [27]. Childhood abuse, including physical, emotional, sexual, and neglectful aspects, have also been positively correlated with the incidence of NSSI, indicating that childhood abuse significantly increases the risk of engaging in NSSI [28]. Additionally, negative life events acting as strong stressors, in conjunction with poor individual psychological coping resources, can contribute to NSSI behaviors [29].

College students represent a high-risk group for NSSI, with foreign meta-analyses reporting a detection rate of 13.4% among young people aged 18–24 [30], while a domestic meta-analysis found a detection rate of 16.6% among college students [30]. NSSI behaviors among college students not only cause physical harm but also

impact emotional well-being and interpersonal communication [31]. Therefore, it is crucial to explore the influencing factors and mechanisms of NSSI to promote the mental health of college students.

Sense of self

Sense of Self refers to an individual's cognitive representation of the self, which differentiates it from the subjective experience of the self (I am) and primarily focuses on the perception of the object self (who am I) to distinguish between self and nonself, such as the environment [32]. In the context of BPD or related studies, four aspects of low sense of self have been consistently identified. These include (a) a lack of self-understanding and (b) confusion of feelings, thoughts, and opinions with those of others [33]; DSM-IV emphasizes (c) sudden shifts in emotions and values and (d) a sense of vulnerability.

Low sense of self is a prominent characteristic of BPD. Among the ten discrete forms of personality disorders recognized by the American Psychiatric Association, BPD is one. Key characteristics of low sense of self in BPD include unstable interpersonal relationships, intense negative emotions, fear of abandonment, prolonged feelings of emptiness, and identity disturbances. Moreover, a low sense of self contributes to the development of psychological problems and disorders such as schizophrenia, personality disorders, and eating disorders [34]. It serves as a common feature among various personality disorders and mental illnesses. The psychological state of individuals influenced by different levels of self can give rise to mental illness and related problems. Evans et al. suggest that low sense of self is clinically related to psychological problems, with BPD serving as the prototype of low sense of self [35].

Individuals with a low sense of self in the context of BPD often experience a heightened sense of vulnerability. Jørgensen's questionnaire survey revealed that individuals with BPD tend to rely on external cues rather than internal characteristics to establish their presence [36]. You et al. found that individuals with BPD often use extreme external behaviors, such as self-injury, to stimulate their internal sense of self [37]. Studies have demonstrated a strong association between individuals with high BPD traits and a lower self-perception, which is also a core feature of BPD. As early as 1880, some foreign scholars observed the occurrence of NSSI among their clinical samples with BPD, subsequently deepening research on the relationship between BPD and NSSI. Sansone et al. reported significantly higher NSSI correlation scores in individuals with BPD than in those without BPD [38]. Other studies found that the incidence of NSSI in the BPD population can reach 75–80% [39].

Given the close association between BPD and NSSI, where individuals with BPD exhibit a higher incidence of

NSSI, it can be speculated that there may be a relationship between sense of self and NSSI. Hypothesis 1 posits that sense of self may have a predictive effect on NSSI among college students.

The mediating role of frustration

Frustration refers to a negative emotional experience resulting from subjective and objective factors [13]. Among college students, frustration is a commonly experienced psychological phenomenon associated with pressure, disappointment, depression, and tension when their motivation and needs are not met [40].

Research has identified various sources of frustration among college students, including interpersonal relationships, romantic relationships, academic performance, physical and daily life, employment, and school management [41]. The causes of college students' frustration encompass both family and social factors, as well as individual physical and psychological factors.

Exploratory factor analysis of college students' frustration identified six main factors influencing frustration, ranked from strongest to weakest impact. The primary factor is self-identity ($t = -6.291, P < 0.001$), which encompasses personal confidence, concern for others, interpersonal tension, and more [15]. Among the four core features of sense of self, self-identity and the influence of others' thoughts and values align with the primary factors of self-identity. In other words, the level of sense of self can influence an individual's experience of frustration.

Zhang Jiandong highlighted five primary negative reactions among college students following psychological setbacks, with NSSI being one of the reactions. Frustration and a low capacity to cope with frustration can lead to feelings of despair [14]. Previous studies have shown a significant positive correlation between feelings of despair and thoughts of self-injury, with higher levels of despair indicating a greater likelihood of engaging in NSSI [42].

Some researchers have explained the occurrence of mental disorders and suicidal behavior through the diathesis-stress model [43]. In this model, stress refers to various stressful events, while diathesis encompasses individual physiological and psychological elements. Nock's integrated model of NSSI emphasizes the role of stressful life events as significant drivers of NSSI behavior [17]. Stress life events generally include events that trigger negative emotions [16], with frustration being a common negative emotion. The experience avoidance model suggests that after stress events induce negative emotions, those emotions can easily trigger NSSI behavior. NSSI serves as a means to alleviate negative emotions. Within the quality-stress interaction model, psychological quality encompasses factors such as temperament, personality traits, self-concept, cognitive style, and

coping abilities/styles [46]. Sense of Self, referring to an individual's cognitive representation of the self, exhibits characteristics such as a lack of self-understanding and a tendency to confuse one's thoughts and values with those of others. Individuals with a diminished sense of self also lack a clear sense of self. Previous research has demonstrated a significant relationship between these three variables—sense of self, frustration, and NSSI. However, no study has examined them together. Therefore, this study aims to construct an NSSI quality-stress model with sense of self as the quality variable and frustration as the stress variable. Hypothesis 2 proposes that frustration mediates the relationship between sense of self and NSSI.

The regulation of impulsive-negligent social problem-solving style

Impulsive-negligent social problem-solving style represents one of the five factors within the social problem-solving framework [44]. Social problem solving refers to the cognitive-behavioral self-directed process through which individuals, couples, or groups deal with specific problems in social situations and find corresponding solutions [45]. Based on their previous research and the validation of the Social Problem-Solving Inventory (SPSI), Maydeu-Olivares and D'Zurilla proposed a five-factor model for social problem solving: two problem-solving orientations (positive and negative) and three problem-solving styles (rational, evasive, and impulsive-negligent) [45]. The impulsive-negligent social problem-solving style falls within the latter category. Barratt et al. define impulsivity as a personality trait characterized by rapid and unplanned responses to internal and external stimuli, disregarding the potential negative consequences for oneself or others [46]. D'Zurilla and Nezu describe the impulsive-negligent social problem-solving style as one where individuals continuously attempt problem-solving strategies and skills but do so impulsively, carelessly, incompletely, imperfectly, and with minimal thought [45]. Individuals with this style tend to consider only a few solutions and impulsively choose the first idea that comes to mind without exploring multiple problem-solving options [47]. The implementation of problem-solving strategies is typically rapid, unsystematic, careless, and inappropriate, resulting in incomplete and unmonitored problem-solving outcomes [47].

Individuals with a high impulsive-negligent social problem-solving style tend to have a lower ability to cope with frustration, making them more susceptible to frustration and depression when faced with problems [48]. The impulsive-negligent social problem-solving style is significantly and positively associated with frustrated emotions such as depression and anxiety [49]. Sense of Self can influence an individual's impulsive-negligent social problem-solving style, subsequently affecting the level of

frustration experienced and increasing the risk of NSSI. Based on the quality-stress interaction model, with sense of self and impulsive-negligent social problem-solving style as quality variables and the frustration induced by stress events as the stress variable, Hypothesis 3 posits that the impulsive-negligent social problem-solving style regulates the first half of the path linking sense of self and frustration to NSSI.

The present study

This study aims to examine whether frustration mediates the relationship between sense of self and NSSI among college students and whether the impulsive-negligent social problem-solving style moderates the direct or indirect associations between sense of self and NSSI (Fig. 1).

Objects and methods

Study subjects

The study recruited participants from six universities. A total of 1,380 questionnaires were distributed, out of which 1,362 were returned. After excluding incomplete or invalid responses, 1,350 valid questionnaires were collected, with 644 (47.7%) from males and 706 (52.3%) from females. Among the participants, 377 (27.9%) were only children, and 973 (72.1%) had siblings. Participants ranged in age from 17 to 21 and were university students. Ethical approval for the study was obtained from the Ethics Committee of Nanchang University. Prior to data collection, participants were provided with written informed consent, which included a brief description of the research project. They were informed that their participation was voluntary, their responses would be kept confidential, and their identities would remain anonymous. Participants were assured that their answers would be used solely for research purposes, and they had the right to withdraw from the study at any time without consequences. All questionnaires were completed in the same order, and trained graduate students administered the measurements. The entire process of completing the questionnaires took approximately 30 min.

Measures

Sense of self

The Sense of Self Scale consists of 12 items. The scale assesses four dimensions of sense of self: self-knowledge, variability of sensory thoughts, confusion of one's own thoughts and values with others, and personal presence. Participants rate their agreement with each item on a 4-point Likert scale, ranging from 1 (very unlike me) to 4 (very like me). Higher scores indicate a lower sense of self. The Chinese version of the Sense of Self Scale, revised by Lu Xinxin, was used in this study, and the scale demonstrated good internal consistency with a Cronbach's α coefficient of 0.80 [53]. Sample questionnaire

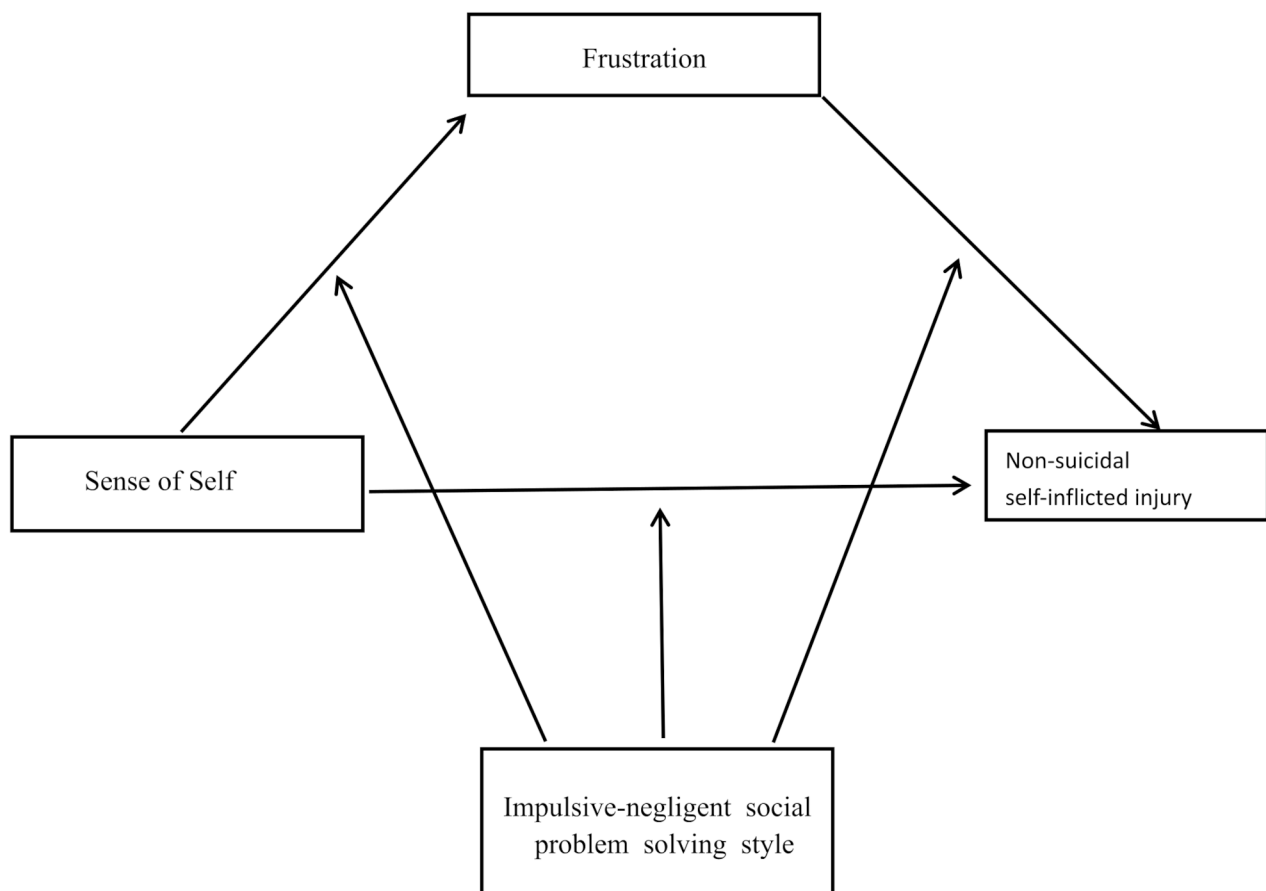


Fig. 1 Intermediary regulation model

questions: “I have a hard time figuring out my own personality, interests, and opinions” “I sometimes wonder if people can really feel my presence”.

Non-suicidal Self-Injury questionnaire

The NSSI questionnaire was adapted from the definition of NSSI by Graze based on the Zheng Ying questionnaire [54]. This questionnaire assesses NSSI behavior by capturing the frequency of NSSI acts and the severity of resulting harm. The NSSI score ranges from 0 (no acts) to 4 (more than 5 acts), while the degree of harm is categorized into five levels: none, mild, moderate, severe, and very severe, corresponding to scores of 0, 1, 2, 3, and 4, respectively. The total NSSI score is obtained by summing the item scores, with higher scores indicating a higher level of NSSI behavior. The questionnaire demonstrated good internal consistency in this study, with a Cronbach’s α coefficient of 0.88. Sample questionnaire questions: “Intentionally cut my own skin with a knife, glass, etc.” “Intentionally poke the wound to prevent it from healing”.

The frustration scale

The Frustration Scale, developed by Keller and Dauenhimer, consists of four items that assess individuals’ subjective experience of frustration, including feelings of frustration, disappointment, sadness, and frustration [55]. Participants rate their agreement with each item on a 7-point scale, ranging from 1 (very inconsistent) to 7 (very consistent). The total score on the Frustration Scale reflects the overall level of frustration, with higher scores indicating higher levels of frustration. The scale exhibited acceptable internal consistency, with a Cronbach’s α coefficient of 0.70. Sample questionnaire questions: “I feel frustrated” “I feel Disappointed”.

Social problem-solving questionnaire

The Social Problem-Solving Questionnaire (SPSI-R), revised by Faye Wong based on D’Zurilla’s social problem-solving questionnaire, was used in this study (53–54). The revised Chinese version of the questionnaire consists of 32 items that assess five dimensions of social problem solving: positive and negative problem-solving tendencies, as well as rational, evasive, and impulsive-negligent problem-solving methods. Participants rate

Table 1 Correlation analysis of variables ($n = 1350$)

	Average value	Standard deviation	impulsive-negligent social problem-solving style	Sense of Self	Frustration	NSSI
impulsive-negligent social problem-solving style	10.32	2.84	1			
Sense of Self	30.91	4.22	-0.36**	1		
Frustration	17.01	5.24	0.30**	-0.35**	1	
NSSI	1.77	5.71	0.08**	-0.11	0.18**	1

Note: * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. same below

Table 2 Mediating role of frustration

NSSI	Effect Value	Boot Standard error	Boot CI lower limit	Boot CI Upper limit
Direct effect	-0.0694	0.0152	-0.1025	-0.0430
The mediating effect of frustration	-0.0771	0.0218	-0.1282	-0.0417

their agreement with each item on a 5-point scale, ranging from 1 (fully met) to 5 (completely inconsistent). Confirmatory factor analysis supported the validity of the 5-factor structure of the questionnaire, demonstrating good convergent and discriminant validity. The impulsive-negligent social problem-solving dimension was measured using the questionnaire, with a Cronbach's α coefficient of 0.85. Sample questionnaire questions "When there is an important problem to solve, I feel afraid" "When faced with a problem, I see it as a challenge to myself".

Data Analysis

Data analysis was performed using SPSS 22.0 and the SPSS macro-PROCESS. Descriptive statistics were calculated, followed by Pearson correlation coefficients to examine the associations between variables. Multiple mediation models involving the relationships between sense of self, NSSI, frustration, and impulsive-negligent problem-solving style were examined using the PROCESS macro (Models 4 and 59).

Results

Common method deviation test

The data for the three main variables in this study were collected using self-report method, and there is a possibility of common variance. In order to control the bias caused by common methods, measures such as centralized class testing, reverse scoring, and anonymous filling were adopted for data collection. Harman's univariate test was conducted. The results showed that eight factors had eigenvalues greater than 1, explaining 61.355% of the total variance. The first factor accounted for 21.133% of the variance, which is below the critical criterion of 40%. These findings indicate the absence of serious common method bias.

Means, standard deviations, and correlation matrix

Table 1 presents the means, standard deviations, and correlation coefficients for all variables. Sense of Self scores exhibited a positive correlation ($r = 0.35, p < 0.01$) with frustration and a significant negative correlation ($r = -0.18, p < 0.01$) with NSSI. Impulsive-inattentive social problem solving was negatively correlated with self-sense ($r = -0.36, p < 0.01$), positively correlated with frustration ($r = 0.30, p < 0.01$), and positively correlated with self-injury ($r = 0.08, p < 0.01$).

Intermediary model test with conditioning

As shown in Table 1, significant correlations were found between college students' sense of self and frustration, as well as between frustration and NSSI, satisfying the prerequisites for conducting a mediation analysis. To investigate the mediating role of frustration between sense of self and NSSI, a mediation analysis was performed using Model 4 in the PROCESS program developed by Hayes. The results revealed that sense of self negatively predicted frustration ($\beta = -0.353, t = -8.9405, p < 0.01$), frustration positively predicted NSSI among college students ($\beta = 0.184, t = 5.3144, p < 0.01$), and sense of self was not a significant predictor of NSSI among college students ($\beta = -0.108, t = 0.8548, p > 0.01$). The bootstrap 95% confidence intervals for the direct effect of sense of self on NSSI included 0, and the bootstrap 95% confidence intervals for the mediating effect of frustration also include 0 (see Table 2). These findings indicate that frustration partially mediated the relationship between sense of self and NSSI among college students.

Next, a moderated mediation model was analyzed using Model 59, and the results are presented in Table 3. After adding the impulsive-negligent social problem-solving style to the model, sense of self scores significantly and negatively predicted frustration ($\beta = -0.6280, t = -7.0512, p < 0.01$), and the impulsive-negligent social problem-solving style was a significant predictor of

Table 3 Intermediary models with moderating effects

Regression equation		Fitting index			Coefficient Significance	
Dependent variable	Independent variable	R	R2	F	β	t
Frustration	Sense of Self (a)	0.4046	0.01637	87.9296**	-0.6280	-7.0512**
	Impulsive negligent social problem solving style (b)				-0.04213	-1.7855**
	a×b				0.00256	3.3681**
NSSI		0.02027	0.00411	11.5354**		
	Sense of Self (a)				-0.0985	-0.8612
	Impulsive negligent social problem solving style (b)				-0.05162	-1.2779
	Frustration (c)				-0.00626	-0.6116**
	a×b				0.0039	0.3937
	c×b				0.00249	2.5036

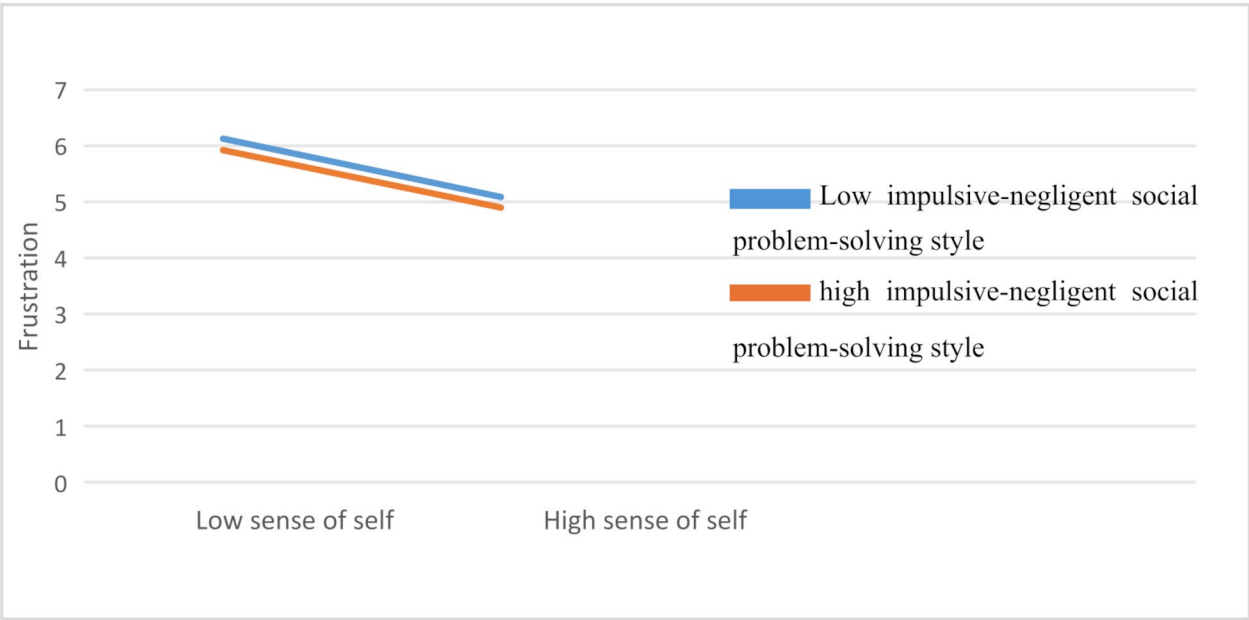


Fig. 2 Moderating Role of Impulsive-negligent social problem-solving style

frustration ($\beta=-0.4213$, $t=-1.7885$, $p<0.01$). The interaction term between sense of self and impulsive-negligent social problem-solving style significantly predicted frustration ($\beta=0.0256$, $t=3.3618$, $p<0.01$). However, sense of self was not a significant predictor of NSSI ($\beta=-0.0985$, $t=0.8612$, $p>0.05$), and the impulsive-negligent social problem-solving style was not a significant predictor of NSSI ($\beta=-0.5162$, $t=-1.2779$, $p>0.05$). Frustration remained a significant predictor of NSSI ($\beta=0.0626$, $t=-0.6116$, $p<0.01$), while the interaction of sense of self and impulsive-negligent social problem-solving style, as well as the interaction of frustration and impulsive-negligent social problem-solving style, were not significant predictors of NSSI.

Further analysis using simple slope analysis revealed that the negative predictive effect of low sense of self levels on frustration was significant under both low

impulsive-negligent social problem-solving tendencies ($\beta=-0.0578$, $p<0.01$) and high impulsive-negligent social problem-solving tendencies ($\beta=-0.0771$, $p<0.01$). However, the decrease in frustration was more pronounced with increasing sense of self in the low impulsive-negligent social problem-solving style than in the high impulsive-negligent social problem-solving style, as depicted in Fig. 2.

Discussion

Impact of sense of self on the NSSI of college students

The results of this study indicated that sense of self was not significantly associated with NSSI, and there was no direct effect of self-perception on NSSI among college students. Previous studies have shown that sense of self is a core feature of BPD, and BPD is characterized by a low sense of self. NSSI has been frequently observed in

clinical samples of individuals with BPD, and research has demonstrated a strong correlation between BPD and NSSI. Consequently, it was hypothesized that there might be a relationship between sense of self and NSSI. However, in this study, no significant association was found between sense of self and NSSI. This could be attributed to several factors. First, NSSI often occurs in response to stressors beyond individual stimuli and is associated with the experience of negative emotions, as suggested by the NSSI experience avoidance model [54]. The occurrence of NSSI is influenced by the severity of stressors and the level of negative emotional experiences. Second, the diathesis-stress interaction model posits that the development of psychological disorders such as NSSI is influenced by various factors, including external coping resources and social support [43]. Only individuals who fail to effectively cope with stressors are likely to develop NSSI. Considering these complex factors, the lack of a direct impact of sense of self on NSSI in this study suggests the need for future research to explore the influence of sense of self on NSSI by considering stress events, protective factors, and varying levels of negative emotional experiences.

Mediation effect analysis of frustration

This study examined frustration as a mediator between sense of self and NSSI, and the results revealed a significant mediation effect. Sense of Self negatively predicted frustration, indicating that lower levels of self-perception were associated with higher levels of frustration. This finding aligns with previous empirical studies that identified self-identity as a significant influencing factor in college students' mental health [15]. The five factors within self-identity primarily reflect aspects related to others' perceptions, personal identity, and key features of sense of self, indicating that a low sense of self can negatively impact an individual's experience of frustration.

Furthermore, frustration positively predicted NSSI among college students, consistent with previous findings [42]. NSSI is a common negative response among college students facing psychological setbacks. The NSSI experience avoidance model suggests that individuals experience negative emotional states when confronted with stimuli and choose to engage in NSSI as a means of avoidance. This temporary alleviation of negative emotions reinforces NSSI behavior [54]. Frustration experienced by college students in the absence of effective coping strategies increases their risk of engaging in NSSI. The integration models of NSSI also indicate that stressful life events are significant drivers of NSSI behaviors [17]. When college students encounter stressful life events, they experience heightened levels of frustration, leading to a higher propensity for using NSSI as a coping mechanism.

The mediation analysis sheds light on the underlying mechanism through which sense of self affects NSSI. The quality-stress interaction model emphasizes that the severity of mental illness or mental health levels depends on psychological qualities, stressors, and other protective factors. Self-concept and cognitive styles fall within the dimension of psychological qualities, while frustration represents a stressor [16]. Psychological qualities, such as sense of self, influence an individual's response to stressors (frustration), which subsequently affects their mental health levels. When the stress response is unsuccessful, it can lead to mental health issues such as NSSI. These findings highlight the importance of not only enhancing psychological qualities to improve sense of self but also guiding individuals to learn healthy and effective emotional regulation strategies to enhance their ability to cope with frustration and reduce the intensity of frustration experiences [55].

Analysis of the moderating effect of impulsive-negligent social problem-solving style

Moderating effects study the conditions under which X affects Y, when there is an effect, and when the effect is greatest [56]. Further analysis revealed that an impulsive-negligent social problem-solving style moderates the mediation process between sense of self and NSSI through frustration. This moderation effect occurs in the first half of the mediation model path. When the level of impulsive-neglectful social problem solving style was higher, the negative predictive effect of ego on frustration was stronger. The results showed that compared with the low level of impulsive-inattentive social problem solving style, the high level of impulsive-inattentive social problem solving style increased the risk of NSSI.

Individuals with a high impulsive-negligent social problem-solving style are more likely to experience lower levels of frustration when faced with a low sense of self. This, in turn, indirectly increases their risk of engaging in NSSI. This finding is consistent with the results of previous research on the impulsive-negligent social problem-solving style. One of the three universal tendencies associated with this style is poor frustration tolerance, making individuals more susceptible to frustration and experiencing negative emotional states [53]. Frustration, for college students, refers to the negative emotional experiences such as pressure, disappointment, sadness, and anxiety that arise when their needs and motivations are not fulfilled. Previous studies have demonstrated positive associations between an impulsive-negligent social problem-solving style and depression as well as worry and anxiety [48–50]. According to the quality-stress interaction model theory, the impulsive-negligent social problem-solving style belongs to the cognitive style dimension of psychological qualities [16]. Psychological

qualities, such as an impulsive-negligent social problem-solving style, influence an individual's response to stressors (frustration), which subsequently affects the intensity of frustration experiences. This indirectly increases the probability of engaging in NSSI. Individuals with a high impulsive-negligent social problem-solving tendency experience greater frustration than those with low tendencies when their sense of self is low. Therefore, interventions aimed at reducing NSSI risk among college students should focus not only on improving social problem-solving abilities but also on promoting a shift from negative and impulsive problem-solving styles to positive and rational problem-solving styles. This can help reduce frustration experiences and subsequently decrease the risk of NSSI among college students.

Study limitations

Despite the valuable findings obtained in this study regarding the relationship between college students' sense of self and NSSI, there are several limitations that should be acknowledged. First, the study design only allowed for correlation analysis, preventing the establishment of causal relationships between sense of self, frustration, impulsive-negligent social problem-solving style, and nonsuicidal self-injury. Further research employing longitudinal or experimental designs is needed to establish causal connections. Second, the sample primarily consisted of students from selected universities in China, which may limit the generalizability of the findings to the wider population of college students in China. The extent to which the research results can be extrapolated to other demographic groups remains uncertain. Replication studies with diverse samples are necessary to validate and extend the current findings. Third, while this study focused on psychological quality dimensions such as sense of self and impulsive-negligent social problem-solving style, it is important to consider other factors such as stressors, external protective factors, and social support. Future studies should adopt a comprehensive approach that examines the interplay between psychological qualities, stressors, and external protective factors. Utilizing multiple sources of data and employing a broader perspective will contribute to a more comprehensive understanding of the key determinants of NSSI among college students and inform effective prevention and intervention strategies.

Conclusion

This study highlights the significant negative correlation between sense of self and frustration, the positive predictive effect of frustration on NSSI, and the mediating role of frustration between sense of self and NSSI. Additionally, an impulsive-negligent social problem-solving style was found to influence the mediation process between

sense of self and NSSI through frustration. These findings underscore the importance of addressing sense of self, frustration, and impulsive-negligent social problem-solving style as key factors in understanding and preventing NSSI among college students. Strategies aimed at improving sense of self, enhancing frustration tolerance, and promoting positive and rational social problem-solving skills can effectively reduce the risk of NSSI among college students. This study provides valuable insights and a foundation for the development of prevention and intervention programs targeting NSSI in college settings.

Implications and suggestions

This study provides educators and mental health professionals of Chinese college students with valuable insights into nonsuicidal self-injury among college students. First, it is important to recognize the positive impact of sense of self on college students' growth and development. Sense of self increases college students' risk for nonsuicidal self-injury by influencing levels of frustration. College students may experience confusion and uncertainty in their studies and lives, so it is critical to provide positive guidance and support to help them strengthen their sense of self. Educators and mental health professionals can play an important role in helping college students understand and cope with frustrating events in their lives by promoting positive reassessment, encouraging different perspectives, and facilitating emotion regulation strategies.

Second, it is necessary to reduce the level of frustration and adjust the impulsive-negligent social problem-solving tendencies of college students. It is important to educate college students on how to deal with frustrating events scientifically and effectively, and to promote the change from impulsive-negligent social problem solving style to rational problem solving style. The quality stress theory suggests that improving the psychological quality of individuals can help them cope with stressful life events more effectively. By guiding college students to improve their self-quality, enhance their level of coping with difficulties, reduce the risk of non-suicidal self-injury, and cope with life with a positive attitude, they can improve their psychological well-being.

In summary, this study highlights the importance of promoting sense of self, reducing frustration, and adjusting impulsive-neglect problem-solving styles in Chinese college students. By providing guidance and support, educators, parents, and mental health professionals can help college students cope with challenges and promote positive growth and development.

Author contributions

Yang Li designed the study, carry out entire study, analyze data, obtained the result. Fangzhao Xu and Yi Zeng participated in writing and translating the article. Fan Ou and Shanshan Tao collected data and promote the study.

XiaoLing He supervised the study, designed the study and revised the article. All authors reviewed the manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of Jiangxi Education Department (protocol code 21YB008 and 2021/01 of approval).

Competing interests

The authors declare no competing interests.

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