BMJ Open

Cross-sectional study of cybervictimisation and non-suicidal self-injury among college students in China: a chain mediation effect of emotion dysregulation and social exclusion

Xiaoli Liao [ID],[1] Liu Xine,[2] Juan Ni[3]

¹School of Nursing, Sun Yat-sen University, Guangzhou, Guangdong, China
²Xiangya School of Nursing, Central South University, Changsha, Hunan, China
³Hunan Traditional Chinese Medical College, Zhuzhou, Hunan, China

Correspondence to
Liu Xine;
liuxine_nurse@163.com

ABSTRACT

Objectives This study aimed to elucidate the relationship between cybervictimisation and non-suicidal self-injury (NSSI) behaviours among college students in China, with a particular focus on the mediating roles of emotion dysregulation and social exclusion.

Design A cross-sectional survey was conducted among a convenience sample of college students.

Setting The study was performed among college students from public universities in Hunan Province, China, between October 26 and November 26, 2023.

Participants A total of 1467 college students aged 19.52±1.16 years participated in the survey.

Outcome measures Data were collected through an online questionnaire that included a general information form, the Ottawa Self-Injury Inventory, the Brief Cyberbullying and Cybervictimisation Scale, the Social Exclusion Questionnaire for Chinese Undergraduates and the Difficulties in Emotion Regulation Scale.

Results The study sample consisted of 1467 college students, with a mean age of 19.52±1.16 years. Pearson's correlation analysis revealed significant positive correlations between NSSI behaviours and cybervictimisation (r=0.58, p<0.01), social exclusion (r=0.64, p<0.01) and emotion dysregulation (r=0.69, p<0.01). Multivariate regression analysis identified significant predictors of NSSI behaviours, including gender (β=0.06, p<0.05), being a left-behind child (β=−0.20, p<0.05), being the only child (β=0.07, p<0.05), cybervictimisation (β=0.32, p<0.001), emotion dysregulation (β=0.41, p<0.001) and social exclusion (β=0.15, p<0.001). Mediation effect analysis revealed a chain mediation effect where cybervictimisation influenced NSSI behaviours through the mediating roles of emotion dysregulation and subsequent social exclusion (all p<0.001).

Conclusions This study confirms previous research by highlighting the positive relationship between cybervictimisation and NSSI behaviours, and advances the field by identifying a chain mediation effect involving emotion dysregulation and social exclusion among this relationship. These findings highlight the critical need

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The use of a substantial sample of 1467 college students provides a robust empirical foundation for analysing the relationships between key variables, enhancing the statistical power of the reported results and strengthening the confidence of the observed effects.

⇒ The identification of a chain mediation effect involving emotion dysregulation and social exclusion offers significant theoretical and practical contributions, expanding current understanding by clarifying the processes through which cybervictimisation may be linked to NSSI behaviours.

⇒ The cross-sectional design of the study constrains the ability to draw causal inferences, restricting the assessment of the directionality of the observed relationships among interested variables.

⇒ The use of self-reported measures introduces potential biases, such as common method variance and social desirability effects, compromising the validity of the data.

to incorporate strategies for managing both emotion dysregulation and social exclusion in the prevention and intervention of NSSI behaviours among adolescents exposed to cybervictimisation.

INTRODUCTION

Non-suicidal self-injury (NSSI) refers to the intentional destruction of body tissues, typically repetitive and socially unacceptable, in the absence of any suicidal intention.[1 2] NSSI can manifest in various forms, including cutting, scratching, hitting, carving, scraping and burning body parts, with cutting being the most common type.[3 4] NSSI behaviour has emerged as a significant public health concern around the world, with extensive epidemiological evidence revealing high

prevalence rates of such behaviour among adolescents and young adults. For instance, a meta-analysis examined the global prevalence of NSSI behaviours among a non-clinical sample of adolescents during the period 2010–2021, which included 62 original studies with 264 638 adolescents, and reported a global lifetime prevalence of 22.0% and a global 12-month prevalence of 23.2% among non-clinical adolescents.[5] Furthermore, a scoping review examined the prevalence of NSSI behaviours among the Chinese population, which reported a lifetime prevalence of 24.7%, a 12-month prevalence of 24.9% and a 6-month prevalence of 17.4% among Chinese adolescents.[6] NSSI behaviour usually starts in early adolescence,[7] peaks in later adolescence and continues into young adulthood.[8 9] The college years represents a crucial transitional phase for adolescents, marking their shift from late adolescence to early adulthood. Epidemiological surveys and theoretical studies identify NSSI behaviour as a prevalent mental health concern among young adults on university campuses.[10] The occurrence of NSSI behaviour exhibits two peaks, with an onset peak of NSSI behaviours around the age of 14–16 years and a second peak of NSSI behaviours around the age of 20–24 years.[11 12] Previous research indicates that 30–40% of emerging adults report lifetime histories of NSSI behaviour, while 15–20% of college students report engaging in NSSI behaviour during their university years.[13–15] Although NSSI behaviour is not yet classified as a distinct disorder in the Diagnostic and Statistical Manual of Mental Disorders, it is acknowledged as an undiagnosed disorder warranting further investigation.[16] NSSI behaviour constitutes a significant public health concern at the international level with high detection rates and severe health consequences.[17] NSSI behaviour acts as not only a gateway to endure the pain of self-injury but also a habituation process to acquire the capacity of suicide. Adolescents who engage in NSSI behaviours often develop a higher tolerance for physical pain and a reduced fear of death, which can facilitate the acquisition of suicidal capability and increase the risk of eventual suicide attempts.[18 19] NSSI behaviour constitutes a critical public health crisis and a pervasive mental health issue, attributable not only to the direct physical harm in body tissues but also to the strong predictive link between NSSI behaviours and subsequent suicidal actions.[20] The self-punishment model proposes NSSI behaviour as a means of expressing negative emotions, whereby individuals engage in NSSI behaviours as a maladaptive coping strategy to alleviate their emotional distress.[21] NSSI behaviour represents a deviant adaptation strategy that adolescents employ to cope with and adapt to distress and strain arising from stressful life events and painful experiences.[22] The high prevalence and the clinical significance of NSSI behaviours emphasise further academic efforts and clinical initiatives to identify the critical predictors and mediators of NSSI behaviours among adolescents. Understanding these critical predictors and mediators of NSSI behaviours is essential for supporting the development and implementation of prevention measures and intervention strategies. The interpersonal model of NSSI behaviour posits that the experience of stressful events and painful situations could heighten the risk for NSSI behaviours.[23]

The rapid development and advancement of the internet and digital technologies have profoundly reshaped the landscape of social communication and interaction, shifting the locus of interpersonal connection and exchange from the tangible physical world to the virtual cyber realm.[24] The 53rd Statistical Report on China's Internet Development indicates that the number of internet users reached 1.092 billion, with an internet penetration rate of 77.5%, and the number of mobile users reached 1.091 billion, with a mobile penetration rate of 77.4% in China.[25] Accompanying the technological revolution are not only considerable conveniences but also significant challenges, with cyberbullying emerging as a particularly concerning issue, especially among adolescent populations. Cyberbullying represents a form of interpersonal aggressive behaviour that occurs through electronic means, such as the internet, mobile phones and other digital media.[26 27] Cyberbullying is conceptually distinct from traditional bullying in that cyberbullying necessitates the use of the internet and digital technologies to communicate aggressive messages.[28] The absence of temporal and spatial constraints in the internet and digital technologies facilitates the occurrence of cyberbullying at any time in any location. The phenomenon of cyberbullying warrants further attention as existing empirical evidence consistently reveals a relatively high prevalence within adolescent populations. College students are the most active users of the internet and digital technologies, highlighting the necessity of investigating cyberbullying within this demographic for educational and healthcare significance. For instance, a systematic review examined the global prevalence of cybervictimisation and found that the prevalence rates of cybervictimisation ranged from 13.99% to 57.5% and China ranked fourth (44.5%) among the covered countries, with a prevalence rate of 44.5%.[29] In addition, a cross-sectional study examined the incidence of cybervictimisation in social media and online games among Chinese college students, which found a high prevalence of cybervictimisation up to 64.32% among college students.[30] The rapid proliferation of internet technologies and the widespread use of social media platforms have substantially intensified the prevalence and severity of cyberbullying among adolescents. Unlike traditional forms of bullying, cyberbullying exerts more profound and deleterious impacts on victims due to its pervasive nature and covert qualities. This form of victimisation transcends the boundaries of the traditional school setting, making it a persistent and pervasive experience for adolescents. Cybervictimisation represents a major public health issue among adolescents,[31] which inflict more severe damage than traditional bullying to adolescents.[32] The experiences of cybervictimisation serve as a significant predictor of various adverse psychological, behavioural and educational outcomes among youth.[33]

Adolescents who experience cybervictimisation are prone to commit deviant acts like NSSI behaviours to alleviate distress and strain. The integrated theoretical model of the development and maintenance of NSSI behaviour highlights the connection between cybervictimisation and NSSI behaviours, where NSSI behaviour functions as a maladaptive strategy to cope with aversive emotional experiences and adverse social situations.[34] Both cross-sectional investigations and longitudinal studies have confirmed the association between cybervictimisation and NSSI behaviours.[35 36] A longitudinal study of 1987 Chinese adolescents examined the association between cybervictimisation and NSSI behaviours over a 12-month period, which found a longitudinal positive association between cybervictimisation and NSSI behaviours among these adolescents.[36] Given the pervasive nature and deleterious impact of cyberbullying, further work is needed to explore its pernicious consequences and action mechanisms. While theoretical models and empirical studies emphasise the significance of adverse experiences in the prediction of NSSI behaviours, the explanatory mechanism for the relation between cybervictimisation and NSSI behaviours remains unclear.[34]

Emotion regulation refers to the extrinsic and intrinsic processes through which individuals monitor, evaluate and modify their emotional responses, particularly regarding their intensity and duration, in order to achieve desired outcomes and meet situational demands.[37] Emotion dysregulation refers to difficulties in monitoring, evaluating and modifying emotional responses, which includes a limited awareness of emotions, an inadequate acceptance of emotions, an inability to refrain from impulsive behaviours and an inflexible application of effective emotion regulation strategies.[38] Previous evidence indicated that the presence of emotion dysregulation correlates with a broad spectrum of mental health issues, including anxiety, depression and behavioural problems.[39] The experiential avoidance model posits emotional dysregulation as a critical predictor for NSSI behaviours[40] as individuals may engage in NSSI behaviours as a means to alleviate adverse emotional experiences. Social exclusion refers to the experience of being ignored, isolated, rejected or excluded by others, making individuals feel less accepted, respected and supported by others.[41 42] The self-punishment model proposes NSSI behaviour as a maladaptive strategy to release adverse emotions arising from stressful events and painful situations.[21]

Despite the recognition of the relationship between cybervictimisation and NSSI behaviours, the processes through which these variables are linked require further exploration. Therefore, this study aimed to investigate the relationship between cybervictimisation and NSSI behaviours among college students in China, with a particular focus on the mediating roles of emotional dysregulation and social exclusion. The specific objectives are (1) quantify the prevalence of NSSI behaviours among Chinese college students; (2) investigate the relationships between cybervictimisation, emotional dysregulation, social exclusion and NSSI behaviours; (3) examine the predictive effects of cybervictimisation, emotional dysregulation and social exclusion on NSSI behaviours; and (4) explore the mediating effects of emotional dysregulation and social exclusion in the relationship between cybervictimisation and NSSI behaviours. Elucidating the relationships and mechanisms among these variables is crucial for supporting the development and implementation of prevention measures and intervention strategies to mitigate the adverse effects of cyberbullying on NSSI behaviours.

METHODS

This study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology guidelines for cross-sectional research.

Study design and setting

The present investigation employed a cross-sectional survey design to examine the associations between cybervictimisation, emotion dysregulation, social exclusion and NSSI behaviours among college students. The study was conducted among a convenience sample of college students recruited from several public universities located in Hunan Province, China. The data were collected via online questionnaire from October 26 to November 26,2023.

Study participants

The study participants were recruited through a convenience sampling approach from public universities located in Hunan Province.

Inclusion criteria were registered as full-time undergraduate student at public universities; able to understand and complete the self-report questionnaires in Chinese; provided informed consent to voluntarily participate in the study. Exclusion criteria were submitted questionnaires with identical responses across all items, and submitted questionnaires with patterned responses (eg, repetitive or zigzag patterns) across all items.

Sample size

The sample size was calculated using the formula $N = Z_{1-\alpha/2}^2 P(1-P)/d^2$. $Z_{1-\alpha/2}$ is the standard normal deviate aligned with the desired confidence level, α is the type I error, P is the estimated prevalence of the outcome variable and d is the desired error. α was set as 0.05, $Z_{1-\alpha/2}$ was set as 1.96 and d was set as 0.03. The prevalence of NSSI behaviours among college students was set as a reference value of 24.4%.[43] The initial calculation indicated a required sample size of 787 participants. To account for a 20% potential rate of invalid questionnaires, the final sample size was increased to 945 participants to ensure reliable results.

Recruitment

The electronic questionnaire was created using Wenjuanxing and distributed using WeChat. The online questionnaire was structured into three sections: the first section provided inclusion and exclusion criteria, enabling potential participants to determine their eligibility; the second section included an information sheet and an informed consent form, ensuring participants were fully informed about the study and consented to participate; and the third section contained the survey items for data collection.

A survey poster, which included the study title and a QR code, was designed and downloaded from Wenjuanxing. This poster was distributed to college students via counsellors at public universities in Hunan Province. Potential participants were able to access the online questionnaire by scanning the QR code on the poster using their mobile devices or computers. Participants were required to review the inclusion and exclusion criteria and confirmed their eligibility by selecting the 'Eligible' button. Participants were then required to read the information sheet and consent form and indicated their agreement by clicking the 'Agree' button. Only after completing these preliminary steps, which aimed to verify eligibility and obtain informed consent, were participants able to access and complete the survey questionnaire. Participants were given the flexibility to complete the survey at their convenience, which aimed to facilitate higher response rates and encourage more accurate responses.

Measurement

General information form

A self-designed general information form was used to gather demographic data from participants, including gender, age, whether being a left-behind child, whether being the only child and family economic status. Gender was divided into 'male' and 'female'. Whether being a left-behind child and whether being the only child were answered as 'Yes' or 'No'. Family economic status was classified into 'poor', 'fair' and 'good'.

Ottawa Self-injury Inventory

The revised Non-Suicidal Self-Injury Behavior Scale, adapted from the Ottawa Self-injury Inventory (OSI),[44] was used to assess NSSI behaviours among participants during the past year. This scale has been validated among Chinese adolescents with mental disorders,[45] exhibiting high reliability and validity within the Chinese context. This scale incorporates a frequency subscale designed to assess the self-reported occurrence of NSSI behaviours within the past 1, 6 and 12 months. Participants were instructed to rate the frequency of NSSI behaviours using a 4-point scale, ranging from 0 to 3, representing the following frequencies: 0 time, 1 time, 2 times and 3 times or more. The scale has been extensively evaluated across diverse settings, consistently demonstrating robust reliability and validity.[46 47]

Brief Cyberbullying and Cybervictimisation Scale

The cybervictimisation subscale from the Brief Cyberbullying and Cybervictimisation Scale (BCCS) was used to assess cybervictimisation among participants since entering university.[48 49] The original scale was developed by Shapka,[49] and the Chinese version was subsequently translated and revised by Xie et al.[48] The Chinese version has been used and validated in Chinese adolescents, demonstrating high reliability and validity.[48] This scale contained 12 items across 2 subscales, including cyberbullying and cybervictimisation. Each item was scored on a 5-point Likert-type scale, ranging from 0 (never) to 4 (always). The average of the raw scores across all items reflects the severity of cybervictimisation, with higher scores indicating more severe experiences.

Social Exclusion Questionnaire for Chinese Undergraduates

The Social Exclusion Questionnaire for Chinese Undergraduates (SEQ-CU) was employed to measure social exclusion among participants during the past year.[50 51] This questionnaire was developed by Chinese scholar Wu based on a literature review and structured interview.[50] This scale has been used and validated in Chinese college students, exhibiting favourable reliability and validity.[50] The questionnaire contained 19 items across 2 dimensions, including direct exclusion dimension and indirect exclusion dimension. Participants were asked to report how often they experienced these situations using a 5-point Likert-type scale, ranging from 1 (never) to 5 (always). The total score, derived from the sum of all item scores, reflects the degree of social exclusion, with higher scores indicating more severe social exclusion.

Difficulties in Emotion Regulation Scale

Difficulties in Emotion Regulation Scale (DERS) was employed to assess emotion dysregulation among adolescents since entering university.[52 53] This instrument contained 16 items designed to measure emotion dysregulation across 5 dimensions, including lack of emotional clarity, difficulties engaging in goal-directed behaviour, impulse control difficulties, limited access to emotion regulation strategies and non-acceptance of emotional responses. Participants were asked to rate the frequency of different emotion regulation strategies using a 5-point Likert-type scale, ranging from 1 (never) to 5 (always). The total score is computed by summing all item responses, with higher total score indicating higher emotion regulation difficulty and lower emotion regulation ability. This scale has been extensively used and validated in previous research, consistently demonstrating favourable psychometric properties and measurement invariance across different populations.[54 55]

Statistical analysis

Statistical analyses were conducted using SPSS V.22.0 for Windows. All tests were two-sided, with a significance level set at p<0.05. Descriptive statistics for continuous variables were reported as means and SD, while categorical

variables were summarised using frequencies and percentages. χ^2 tests were employed for categorical variables, and t-tests were used for continuous variables to compare demographic characteristics. Pearson's correlation analysis was performed to examine the correlations between NSSI behaviours, cybervictimisation, social exclusion and emotion dysregulation. Multivariate regression analysis was used to assess the predictive effects of demographic variables, cybervictimisation, emotion dysregulation and social exclusion on NSSI behaviours.

Model 6 in the PROCESS macro was used to investigate the chain mediation effect, whereby emotion dysregulation (M1) and social exclusion (M2) sequentially mediated the relationship between cybervictimisation (X) and NSSI behaviours (Y). A bootstrapping procedure with 95% CIs was applied to determine the statistical significance of the chain mediation effect. The effect was considered significant if the 95% CI for the indirect effect did not include zero.

PATIENT AND PUBLIC INVOLVEMENT STATEMENT

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

RESULTS

A total of 1724 questionnaires were collected, of which 257 were invalid, resulting in 1467 valid questionnaires and an effective response rate of 85.09%.

Common method biases test

Harman's single-factor test was conducted to evaluate potential common method bias inherent in self-reported measures used in this study. An exploratory factor analysis

of all items resulted in the extraction of 16 factors, with eigenvalues exceeding 1. The first factor explained only 16.14% of the total variance, well below the critical threshold of 40%, indicating that common method bias did not substantially impact the results of the current study.

Demographic characteristics of participants

Table 1 details the demographic characteristics of the study participants. The sample consisted of 1467 college students, with a mean age of 19.52±1.16 years.

The participants were categorised into the NSSI group (n=258) and non-NSSI group (n=1209) based on the presence of NSSI behaviour in the past 12 months. Statistical comparisons between these groups revealed significant differences in gender, whether being a left-behind child and whether being the only child (p<0.05). The NSSI group had a higher proportion of females (98.45% vs 95.20%, p<0.017), a greater proportion of being a left-behind child (53.10% vs 28.12%, p<0.001) and a higher percentage of being the only child (13.18% vs 20.93%, p<0.004) compared with the non-NSSI group. There were no significant differences between the groups in terms of age (p=0.114) and family economic status (p=0.972).

Correlation analysis of scale scores

Table 2 presents the Pearson's correlation analysis of variables. Pearson's correlation analysis revealed significant positive associations between NSSI behaviours and cybervictimisation (r=0.58, p<0.01), social exclusion (r=0.64, p<0.01), as well as emotion dysregulation (r=0.69, p<0.01).

Multivariate regression analysis

Online supplemental table S1 presents the multivariate regression analysis of NSSI behaviours. In the first step, demographic variables, including gender, age, being

Table 1 The demographic characteristics of participants (n=1467)

Features	All (n=1467)	NSSI (n=258)	Non-NSSI (n=1209)	t/z	P value
Gender					
Male	63	4	59	−2.39	0.017
Female	1404	254	1150		
Age (M±SD)	19.52±1.16	19.42±1.14	19.54±1.16	1.58	0.114
Being a left-behind child				−7.77	<0.001
Yes	477	137	340		
No	990	121	869		
Being the only child				−2.85	0.004
Yes	287	34	253		
No	1180	224	956		
Family economic status				−0.035	0.972
Poor	232	49	183		
Fair	907	144	763		
Good	327	65	262		

NSSI, non-suicidal self-injury.

Table 2 Pearson's correlation analysis of variables

Variable	Mean	SD	1	2	3	4
NSSI behaviours	0.79	1.86	1			
Cybervictimisation	2.32	4.52	0.58***	1		
Social exclusion	45.41	5.61	0.64***	0.43***	1	
Emotion dysregulation	39.91	5.32	0.69***	0.48***	0.85***	1

**p<0.001.

a left-behind child, being the only child and family economic status, were entered into the regression model. The results showed that gender (β=0.06, p<0.05), being a left-behind child (β=−0.20, p<0.05) and being the only child (β=0.07, p<0.05) were significant predictors of NSSI behaviours. In the second step, cybervictimisation was added to the regression model. The results revealed that cybervictimisation was a significant predictor of NSSI behaviours (β=0.56, p<0.001) after controlling for demographic variables. In the third step, emotion dysregulation was added to the regression model. Both cybervictimisation (β=0.32, p<0.001) and emotion dysregulation (β=0.54, p<0.001) emerged as significant predictors of NSSI behaviours. In the fourth step, social exclusion was added to the regression model. Cybervictimisation (β=0.32, p<0.001), emotion dysregulation (β=0.41, p<0.001) and social exclusion (β=0.15, p<0.001) emerged as significant predictors of NSSI behaviours.

Chain mediation analysis

The chain mediation analysis, conducted using Model 6 of the PROCESS macro, is presented in online supplemental table S2. This analysis was designed to examine the sequential mediating roles of emotion dysregulation (M1) and social exclusion (M2) in the relationship between cybervictimisation (X) and NSSI behaviours (Y).

The total effect of cybervictimisation on NSSI behaviours was found to be significant, with a coefficient of 0.24 (95% CI: 0.22 to 0.26, p<0.001). This total effect consisted of both a direct effect (coefficient=0.13, 95% CI: 0.11 to 0.15, p<0.001) and an indirect effect (coefficient=0.11, 95% CI: 0.09 to 0.12, p<0.001). The indirect effect was further decomposed into two distinct pathways. The first pathway examined the effect of cybervictimisation on NSSI behaviours via emotion dysregulation. This pathway demonstrated a significant indirect effect of 0.08 (95% CI: 0.06 to 0.10, p<0.001), indicating that cybervictimisation contributes to heightened emotion dysregulation, which in turn increases the likelihood of engaging in NSSI behaviours. The second pathway revealed a sequential mediation effect in which cybervictimisation first exacerbates emotion dysregulation, which then increases the experience of social exclusion, ultimately contributing to a higher incidence of NSSI behaviours. The indirect effect for this sequential pathway was 0.03 (95% CI: 0.01 to 0.04, p<0.001). This finding underscores the complex, cascading nature of the mediation process, where emotion dysregulation and social exclusion function together as significant mediators in the pathway from cybervictimisation to NSSI behaviours. A visual representation of the sequential mediation model, illustrating the relationships among the key variables, is provided in figure 1.

DISCUSSION

This study extends and refines existing research by elucidating the positive correlation between cybervictimisation and NSSI behaviours among college students within the Chinese context. The findings of this study reveal that the experience of cybervictimisation increases the risk of NSSI behaviours among college students through chain-mediating mechanisms of emotion dysregulation and social exclusion. These results offer valuable theoretical
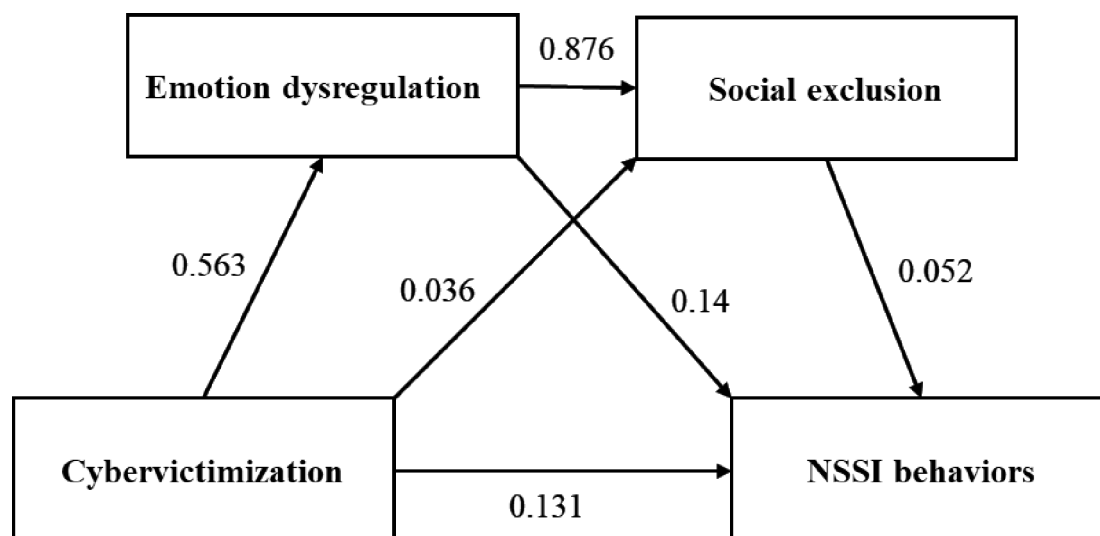
Figure 1 A sequential mediation model of cybervictimisation and non-suicidal self-injury (NSSI) behaviours.

insights into the processes connecting cybervictimisation to NSSI behaviours, with important implications for designing preventive and intervention strategies targeting these behaviours among adolescents. The experience of cybervictimisation is associated with an increased likelihood of emotion dysregulation and an intensified sense of social exclusion, both of which may contribute to the occurrence of NSSI behaviours. These results have substantial implications for designing preventive measures and intervention strategies targeting NSSI behaviours among adolescents who experience cybervictimisation. Future research should focus on further refining this mechanistic model to offer a more nuanced theoretical framework and practical guidance, thereby contributing to the development of more effective prevention and treatment approaches for NSSI behaviours among adolescents who experience cybervictimisation.

The college years represent a critical developmental transition from adolescence to adulthood, characterised by significant psychological, emotional and social changes. The college years constitute a unique developmental period that marks the transition from adolescence to adulthood. The prevalence of NSSI behaviours remains high among adolescents, with a first peak emerging in the middle of adolescence and a second peak occurring around the age of 20 years.[1 2 56 57] These findings were consistent with existing literature, which has similarly reported significant NSSI prevalence among college students. For instance, a cross-sectional study of 2328 Chinese first-year college students documented a 12-month prevalence of 16.6% for NSSI thoughts and 8.0% for NSSI behaviours.[58] Furthermore, Kiekens et al[59] analysed cross-national data from 20 842 first-year students across 24 universities in nine countries and revealed a lifetime prevalence of 17.7% and a 12-month prevalence of 8.4% for NSSI behaviours among first-year college students.[59] In addition, Kiekens et al[11] estimated the incidence of NSSI behaviours among college students during their first two years of college and observed 12-month incidence rate of 10.3% in the first year and 6.0% in the second year among Belgian students.[11] These results underscore the high prevalence of NSSI behaviours during the critical college transition period, emphasising the importance of identifying predictors and mechanisms to guide effective prevention and intervention strategies. Educational institutions should implement psychological support programmes and psychological consultation services to promptly identify and address the risk factors associated with NSSI behaviours, as well as to effectively develop and enhance resilience to mitigate NSSI behaviours. Future longitudinal studies should be performed to track the developmental trajectory and evolutionary patterns of NSSI behaviours throughout the college years, which will provide valuable insights into the temporal dynamics and causal relationships between NSSI behaviours and associated risk factors.

The development of digital technologies and the popularity of social media have revolutionised the form of interpersonal communication, giving rise to the concerning phenomenon of cyberbullying. Cyberbullying represents a form of bullying wherein individuals use digital media or online platforms to disseminate harmful or offensive content with the intent to inflict psychological distress or emotional harm on others. This study found that college students experience varying degrees of cyberbullying, highlighting the importance of addressing the prevalence and consequences of such incidents. This finding was consistent with existing literature, which similarly reported that college students encountered varying degrees of cyberbullying. For instance, a cross-sectional study of 8098 Chinese college students aged 17–26 reported a 12-month prevalence of 7.82% for cyberbullying.[60] Moreover, a systematic scoping review examined cyberbullying prevalence among adolescents across nine countries and reported the prevalence median of 23.0% in China compared with 5.0% in Australia, 5.2% in Sweden and 6.3% in Germany.[61] Furthermore, Cénat et al[62] examined the prevalence of cyberbullying among college students in France, involving 4626 students aged 15–23 years, and found that 19% of college students experienced cyberbullying in the past year.[62] In addition, Alrajeh et al[63] investigated the prevalence of cyberbullying among university students in Qatar, with a sample of 836 students aged 18–24 years, and revealed that 29.2% of university students experienced cyberbullying.[63] These findings collectively underscore the significant prevalence of cyberbullying among college students across diverse cultural and geographical contexts, emphasising the importance of addressing the prevalence and consequences of cyberbullying. Educational institutions should adopt multifaceted strategies that integrate evidence-based preventive measures with responsive interventions to foster a culture of online safety and reduce the incidence of cyberbullying. Robust anti-cyberbullying policies and protocols should be developed and implemented within educational systems, featuring comprehensive guidelines and regulations for reporting, investigating and addressing incidents of cyberbullying. Educational institutions should provide cyberbullying education and digital citizenship training for faculty and students to enhance their awareness and effectiveness in identifying and preventing cyberbullying.

The present study observed a positive correlation between cybervictimisation and NSSI behaviours, indicating the experience of cybervictimisation increased the risk of NSSI behaviours. This finding was consistent with previous studies, which have consistently demonstrated an association between cybervictimisation and NSSI among adolescents. Adolescents exposed to cyberbullying may resort to NSSI as a coping mechanism to alleviate psychological distress and emotional strain, in accordance with the interpersonal model of NSSI behaviours.[64] Similarly, a cross-sectional study of 1509 Chinese college students explored the relationship between cyberbullying victimisation and suicidal ideation, which implicated cyberbullying victimisation as a positive predictor

of suicidal ideation among college students.[65] Additionally, a cross-sectional investigation of 4626 French undergraduates aged 15–23 years examined the association between cybervictimisation and suicidality and found that students exposed to cyberbullying exhibited higher prevalence of both suicidal ideations and suicidal attempts.[62] This finding was consistent with the general strain theory, which suggested that stressful and painful experiences can drive adolescents to engage in deviant behaviours such as NSSI as a way to relieve emotional distress and psychological strain.[66] This finding underscores the necessity of both academic efforts and clinical practice in addressing and mitigating the psychological effects of cyberbullying. Educational institutions should collaborate with healthcare professionals to develop and implement comprehensive prevention measures and intervention strategies to mitigate the adverse impacts of cybervictimisation and reduce the incidence of NSSI behaviours. Future research should adopt longitudinal design to investigate the dynamic and causal relationships between cybervictimisation and NSSI behaviours, which will elucidate the temporal impacts of cybervictimisation on NSSI behaviours and clarify the causal pathways from cybervictimisation to NSSI behaviours.

This study identified a chain mediation role of emotion dysregulation and social exclusion in the relationship between cybervictimisation and NSSI behaviours, replicating and extending previous research on this topic. For example, Wang *et al* used an empirical approach to examine the effects of social exclusion on self-injury among adolescents and found that social exclusion positively predicted future self-injury behaviours among adolescents.[67] Furthermore, Chen *et al* conducted a cross-sectional study among 700 college students and found a positive relationship between cyberbullying and NSSI behaviours under the medication role of social exclusion.[68] Moreover, Li *et al*[69] conducted a cross-sectional study of 577 middle-school students in China with a mean age of 14.38, and moderated mediation analysis supported a moderation effect of emotional reactivity among the relationship between cybervictimisation and NSSI behaviours.[69] In addition, Zhao *et al*[70] performed a cross-sectional study of 2523 adolescents aged between 11 and 16 years, and latent moderated structural equation model revealed that emotion reactivity mediated the association between cybervictimisation and NSSI behaviours.[70] These findings suggest that prevention measures and intervention strategies should address emotion dysregulation and social exclusion, such as developing emotional regulation skills and fostering social inclusion atmosphere, to mitigate the adverse impact of cybervictimisation and reduce the risk of NSSI behaviours. Mental health services and programmes should incorporate psychological consultation and support to enhance emotional resilience and promote social integration among college students, thereby counteracting the detrimental effects of cybervictimisation and reducing the risk of NSSI behaviours. Future research should continue to refine the mechanistic model underlying the relationship between cybervictimisation, emotion dysregulation, social exclusion and NSSI behaviours. Longitudinal studies and experimental designs could provide more robust insights into the causal relationships and temporal dynamics among these variables.

LIMITATION

The present study faced some common limitations inherent in cross-sectional investigations, which warrant consideration and exploration in future research. First, the present survey recruited a homogeneous sample from a single location, potentially limiting the generalisability of the findings to more diverse populations. Future studies should aim to replicate the relationship between cybervictimisation and NSSI behaviours among a representative sample from a broader range of backgrounds. Second, the present study employed a self-reported questionnaire for data collection, which may introduce biases such as common method bias and social desirability effects. Future research should use multiple sources of information and multiple techniques of data collection to mitigate the risk of subjective influences and enhance the reliability of findings. Additionally, the cross-sectional design of the study restricts causal interpretations of the observed associations and limits the dynamic evaluation of the involved variables. While the results indicate significant correlations among the studied variables, the temporal precedence and causal directions of these relationships remain ambiguous and necessitate further longitudinal research. Finally, this study focused solely on cyberbullying victimisation without addressing cyberbullying perpetration and traditional bullying behaviours. Existing literature underscores the significant prevalence of traditional bullying, particularly verbal and physical aggression, among college student populations.[71] Previous studies indicate that the experiences of both cyberbullying victimisation and perpetration can have detrimental effects on the mental health of college students.[72] Therefore, future research should explore a broader spectrum of bullying behaviours, encompassing both cyber and traditional forms, as well as examining both victimisation and perpetration, to achieve a comprehensive understanding of the individual and collective impacts of these various forms of bullying on NSSI behaviours.

CONCLUSION

NSSI behaviour has emerged as a significant health concern and social issue among adolescents, closely associated with psychological disorders and potential future suicidal behaviours. The high prevalence and clinical significance of NSSI behaviours underscore the importance of identifying predictors and mediators to effectively prevent and reduce the occurrence of this destructive behaviour. The interpersonal model of NSSI behaviours

posits that the experience of negative interpersonal events increases the likelihood of NSSI behaviours.

The present study elucidates the significant association between cybervictimisation and NSSI behaviours among a sample of Chinese college students. This study reveals a complex chain mediation involving emotion dysregulation and social exclusion, wherein the experience of cybervictimisation not only directly increases the risk of NSSI behaviours but also indirectly elevates the likelihood of NSSI behaviour through the mediating roles of emotional dysregulation and social exclusion. This underscores the critical importance of considering both interpersonal and intrapersonal factors in understanding and addressing NSSI behaviours. These findings offer critical perspectives and implications for the prevention and intervention of NSSI behaviours, emphasising the significant roles of emotional dysregulation and social exclusion in mediating the adverse effects of cybervictimisation on NSSI behaviours. The high prevalence of NSSI behaviours and the detrimental consequences of cybervictimisation underscore the urgent need for the development and implementation of comprehensive preventive measures and intervention strategies. The identified chain mediation effect through emotion dysregulation and social exclusion emphasises the necessity for comprehensive strategies targeting both interpersonal and intrapersonal factors in the prevention and intervention of NSSI behaviours. This study makes a significant contribution to the understanding of the complex mechanisms underlying NSSI behaviours, with important implications for developing and implementing effective prevention measures and intervention strategies targeting vulnerable populations.

ORCID iD
Xiaoli Liao http://orcid.org/0000-0002-7198-4188

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