

CYBERBULLYING VICTIMIZATION AND SUICIDAL IDEATION AMONG COLLEGE STUDENTS: THE MODERATING EFFECT OF NATURE CONNECTEDNESS

Yongzhan Li and Genyuan Du
Xuchang University (China)

Abstract

To explore the moderating effect of nature connectedness on cyberbullying victimization and suicidal ideation, 1568 students from 7 universities were randomly selected. A survey was conducted using a general data questionnaire, the Cyber Bullying Behavior Scale, the Beck Suicide Ideation Scale and the Nature Connectedness Scale. The results showed that (1) the report rate of suicidal ideation was 7.21% and there were significant differences according to cyberbullying victimization or no, gender and course; (2) cyberbullying victimization correlated positively with suicidal ideation, and nature connectedness correlated negatively with suicidal ideation; and (3) nature connectedness negatively moderated the relationship between cyberbullying victimization and suicidal ideation. In conclusion, suicidal ideation among college students is closely related to cyberbullying victimization and nature connectedness. Cyberbullying and suicidal ideation in students can be addressed by improving their connection with nature.

KEY WORDS: *social networking sites, suicidal ideation, nature connectedness.*

Resumen

Para explorar el efecto moderador de la conexión con la naturaleza en la victimización por ciberacoso y la ideación suicida se seleccionaron al azar 1568 estudiantes de 7 universidades. Se realizó una encuesta con un cuestionario de datos generales, la "Escala de comportamiento de ciberacoso", la "Escala de ideación suicida de Beck" y la "Escala de conexión con la naturaleza". Se encontró que (1) la tasa de ideación suicida era del 7,21% y había diferencias significativas según fueran víctimas o no de ciberacoso, el sexo y el curso; (2) la victimización por ciberacoso correlacionó positivamente con la ideación suicida y la conexión con la naturaleza correlacionó negativamente con la ideación suicida; y (3) la conexión con la naturaleza moderó negativamente la relación entre la victimización por ciberacoso y la ideación suicida. En conclusión, la ideación

This work was supported by the second batch of Emerging Engineering Education research and practice project of Ministry of Education in China "The exploration and practice of construction of industrial college in the face of autonomous and controllable information technology" [grant number: E-JSJRJ20201325]; and Henan Province 2024 UGS collaborative education reform pilot project "Research on mechanism of UGS collaborative education in Xuchang University" [grant number: 12].

Correspondence: Yongzhan Li, Education College, Xuchang University, 461000 Xuchang (China). E-mail: liyongzhan@126.com

suicida entre los estudiantes universitarios está estrechamente relacionada con la victimización por ciberacoso y la conexión con la naturaleza. Se puede intervenir en el ciberacoso y la ideación suicida en estudiantes mejorando su conexión con la naturaleza.

PALABRAS CLAVE: *redes sociales, ideación suicida, conexión con la naturaleza.*

Introduction

With the popularization of the Internet and the development of information technology, cyberbullying has become a global social problem that has attracted wide attention (Bottino et al., 2015). Cyberbullying refers to the malicious behavior of individuals or groups intentionally and repeatedly attacking and hurting others through media platforms in the form of online communication, which is an extension and expansion of traditional bullying in the virtual world of the Internet (Smith., 2008). Cyberbullying has been described as an “invisible fist” that is easy to attack but difficult to resist, making it more prevalent than traditional bullying (Smith., 2008). It uses electronic means of communication to harass, humiliate, threaten, or socially ostracize others, and has the freedom, anonymity, and trans-time and space unmatched by traditional bullying, resulting in a wider range of impacts (Kessel-Schneider et al., 2015) and more long-lasting and severe harm (Li et al., 2021), and it is more likely to cause internalized and externalized problems such as sleep disorders, depressive symptoms, suicidal ideation, and even self-harming and suicidal behaviors (Shi et al., 2020; Zhang & Wu, 2023).

Adolescents are vulnerable to cyberbullying (Bauman et al., 2013), but as one of the main groups of Internet use, college students are also susceptible to cyberbullying (Hu & Xiong, 2024). Recent surveys have shown that the incidence of cyberbullying among college students ranges from 11.49% to 91.35% (Yuan et al., 2017; Zhang et al., 2020). Currently, cyberbullying among college students is increasingly becoming a focus of research in sociology, psychology, education, and other disciplines, and the strong association between cyberbullying and suicidal ideation has been supported by a growing body of empirical research (Bonnano & Hymel, 2013; Kee et al., 2024; Maurya et al., 2022; Quintana-Orts et al., 2022). However, it should be mentioned that the internal mechanisms and boundary conditions of cyberbullying affecting suicidal ideation have not yet been explored in depth, and it is undoubtedly of great academic theoretical value and practical guidance to carry out relevant research in this area. In view of this, based on an extensive literature review, this study focused on the relationship between human and nature, and introduces the variable of nature connectedness for an in-depth investigation, in order to have a further understanding of the relationship between cyberbullying and suicidal ideation among college students, and to provide a theoretical basis and practical guidance for the scientific prevention and intervention of college students' suicidal behaviors.

Suicide has been a major global public health problem (Zhang et al., 2022). According to the World Health Organization (WHO), about 800,000 people worldwide die by suicide every year, and about 280,000 people commit suicide in

China every year (WHO, 2019). In recent years, the overall suicide rate in China has decreased significantly, but the suicide rate of adolescents and college students remains high, which has become an urgent problem to be solved (Liu et al., 2017; WHO, 2019).

The suicide rate of college students in China is about 0.2 per thousand, and suicide has become the leading cause of unnatural death among college students (Liu & Xiao, 2011; Zhang et al., 2024), accounting for 47.2% of the unnatural deaths (Liu et al., 2024; Yang & Li, 2015), and about 70% have expressed or implied suicidal ideation to their friends and family before committing suicide (Wang et al., 2021; Zhang et al., 2008). Suicidal ideation refers to the presence of death, suicide and related contents in an individual's mind, which generates thoughts about the plan and outcome of suicide (Yu et al., 2021). Suicidal ideation is the initial stage of suicidal behavior, which can cause subsequent suicide preparation, attempts and committing suicide which leads to incomplete suicide or death (Xu, 2016). Many studies have shown that suicidal ideation is a prerequisite for committing suicide (Paashaus et al., 2019), a risk factor for suicide attempts and suicidal behaviors, and can significantly positively predict suicide (Zhu et al., 2019). Some researchers have suggested that suicidal ideation is the most sensitive prediction stage of suicidal behavior, as well as the key stage of prevention and intervention of suicidal behaviors (Li & Chen, 2016). In view of this, it is of great practical significance to explore the influencing factors and mechanisms of suicidal ideation (Zhu et al., 2019).

According to the Stress Dissonance Theory of Suicide (Zhang, 2005), a variety of stressors can lead to suicidal ideation, including crisis and lack of crisis coping skills. Chronic cyberbullying is undoubtedly a serious crisis experienced by individuals.

Due to the fact that cyberbullying is not limited by time and space, and that the Internet itself is characterized by anonymity and concealability, which makes it impossible for victims of bullying to effectively deal with cyberbullying, they usually can only take a passive attitude to endure cyberbullying, and respond in a silent way, and seldom seek help from their relatives, friends, or teachers (Mishna, Saini, & Solomon, 2009), which creates a vicious cycle of being bullied - tolerating - being bullied again.

As it is difficult for the victims of bullying to effectively cope with cyberbullying, it leads to a vicious circle of cyberbullying, which accumulates the negative emotions, aggravates inferiority complex and inner conflicts (Hu et al., 2019), and ultimately leads to the loss of meaning in life (Ha et al., 2022). The Stress Dissonance Theory of Suicide suggests that when an individual encounters a crisis, if he or she fails to cope with it effectively, he or she will be trapped in intense conflict and pain, which can easily induce suicidal ideation and attempts to solve the inner conflict and pain through such an extreme method as suicide (Zhang, 2005). Based on the existing research literature and findings, this study proposed the following hypothesis:

H1: Cyberbullying victimization positively predicts suicidal ideation among college students.

Cyberbullying victimization may be a risk factor for suicidal ideation, so how to eliminate or mitigate the effect of cyberbullying on individual suicidal ideation? We turned our eyes to nature. Human beings evolved from nature, which is the mother that nurtures human beings and has a wide range of adaptive values for human physical and mental health (Wang et al., 2022). Zelenski and Nisbet (2014) pointed out that improving the relationship between human and nature is an important pathway to promoting human health and happiness. Based on this, this study examined the role of nature connectedness in the influence of cyberbullying on individual suicidal ideation from the perspective of human-nature relationship, with a view to enhancing the effectiveness of suicide prevention and intervention on college students, so as to improve the mental health of individuals. The Biophilia Hypothesis also recognizes that humans have an innate need for connectedness to nature, just as infants have an attachment to their mothers (Wilson, 1984). Ecological psychology also believes that nature is an important source of human intimacy. An individual's need to belong can be satisfied not only through connectedness to people, but also through connectedness to nature (Baxter & Pelletier, 2019). Connectedness to nature is the degree to which individuals experience themselves as integrated and connected to nature (Mayer & Frantz, 2004), reflecting the extent to which individuals incorporate nature into their self-awareness. The intimate relationship between human and nature has a similar function to that of a good interpersonal relationship, and nature connectedness can be used as an alternative form of interpersonal relationship, thus effectively reducing loneliness (Wang & Lei, 2018).

According to the nature decompression theory, human beings have been living in the embrace of nature for a long time, and in the benign interaction with nature, the natural environment has an important decompression and healing effect on the human body and mind, and contact with nature can help to eliminate fatigue, improve cognition, and effectively promote the physical and mental health of individuals (Ulrich et al., 1991).

Cyberbullying victimization is actually being attacked and ostracized by others, which can cause individuals to have numerous negative psychological experiences that undermine their well-being (Brown et al., 2006; Dill & Dill, 1998; Kraft, 2006). Research has shown that socially excluded individuals can gain a sense of connection and acceptance by seeking contact with nature (Wilson, 1984). In addition, individuals interacting with their pets may also gain a sense of connection and belonging to some extent (Endo et al., 2020; Hawkins et al., 2021). Researchers have also found that natural connectedness has a restorative function that can effectively help individuals restore resources that have been depleted due to coping with stress (Kaplan, 1995), promote self-regulation (Beute & de Kort, 2014), enhance self-control (Izenstark & Ebata, 2017), improve individual self-esteem, and help inhibit individuals' problematic behaviors (Tang, Sullivan, & Chang, 2015). Individuals with high nature connectedness usually pay more attention to grand things such as ecological environment rather than their own interests, which makes their vision broader, allowing them to transcend their own narrow perspectives (Wang et al., 2020). This facilitates the weakening of negative cognitions and negative emotions associated with negative life events

(Schweitzer, Glab, & Brymer, 2018), promotes self-pleasure (Wang, Caiyu, Luo, Runfeng, Ji, Shao-hua, 2022), and allows individuals to experience a stronger sense of meaning and well-being in their lives (Howell, Passmore, & Buro, 2013), thereby avoiding serious suicidal ideation. On the contrast, individuals with low nature connectedness pay more attention to the real social life and their own value interests, thereby their horizons are not broad enough, and their self-consciousness is obviously egocentric (Wang et al., 2018), and it is difficult to transcend their own narrow perspectives (Wang et al., 2020). When persistently experiencing negative life events, they will lower their self-appraisal, and have more negative emotional experiences (Wang et al., 2022), fail to be pleased with themselves, and find it difficult to experience meaning in life and well-being (Howell, Passmore, & Buro, 2013), which makes them susceptible to suicidal ideation. Overall, the experience of integration with nature enables individuals to transcend their own narrow perspectives and deepen their self-cognition, which in turn enhances their meaning in life (Chen et al., 2019) and strengthens the desire to survive (Victor Frank, 2003). This suggests that nature connectedness may play a certain buffering role between cyberbullying and suicidal ideation. Therefore, the following hypotheses were proposed:

H2: Nature connectedness moderates the effects of cyberbullying victimization on college students' suicidal ideation.

This study aimed to examine the status of college students' suicidal ideation, and to test the moderating role of nature connectedness in the relationship between cyberbullying victimization and suicidal ideation among college students.

Method

Participants

The participants ($n= 1568$) were all undergraduate students who will get a bachelor's degree. They ranged in age from 18 to 23 years old, with an average age of (19.83 ± 1.34) years old, including 841 males (53.64%) and 727 females (46.36%); 550 first-year students (35.08%), 514 second-year students (32.78%) and 504 third-year students (32.14); 637 students (40.63%) from urban and 931 students from rural (59.37%); 137 students serving as class leaders (8.74%) and 1431 students not serving as class leaders (91.26%).

Instruments

- a) *Ad hoc socio-demographic questionnaire*. A self-designed questionnaire was used to investigate the basic information of the participants, including gender (male and female), grade (freshman, sophomore, junior), place of origin (urban and rural), and class leaders (yes or no).
- b) *Cyberbullying Victims' Behaviors Scale (CVBS; You, 2013)*. The CVBS was used to measure participants' cyberbullying victimization. The CVBS consists of 12 items, including the dimensions of cyberverbal bullying (5 items), identity concealment (2 items), and cyberfraud (5 items). An item example is "Some

persons have used offensive or hurtful words against me on the Internet” . The items were rated on a 5-point Likert scale, ranging from 1 “never” to 5 “always” . The total score of 12 was judged as no cyberbullying, and the rest were judged as having been cyberbullied. The higher the total score is, the more cyberbullying an individual experiences. In this study, Cronbach’s alpha coefficient for the scale was .87.

- c) *Beck Scale for Suicide Ideation* (Beck et al., 1979), Chinese version (BSI-CV) by Li et al. (2011). The BSI-CV was used to measure the intensity of participants’ suicidal ideation. The revised scale consists of 19 items, including two subscales: suicidal ideation (5 items) and suicidal tendency (14 items). Only the 5-item subscale measuring suicidal ideation was used in this study to measure the intensity of suicidal ideation in the last week. Item examples are as follows: “Active suicide wish” and “Passive suicide wish” . The items were rated on a 3-point Likert scale, ranging from 0 “no” to 2 “strong” . A total score of 0 was judged as no suicidal ideation, and a total score greater than 0 was judged as suicidal ideation. The higher the total score, the stronger the individual’s suicidal ideation. In this study, Cronbach’s alpha coefficient for the scale was .81.
- d) *Connectedness to Nature Scale* (CNS; Mayer & Frantz, 2004). The CNS is widely used internationally, was selected to measure the participants’ level of nature connectedness. The revised scale consists of 14 items (Cheung et al., 2020). Item examples are as follows: “I often feel a sense of oneness with the natural world around me” and “When I think of my life, I imagine myself to be part of a larger cyclical process of living” . The items were rated on a 5-point Likert scale, ranging from 1 “totally disagree” to 5 “totally agree” . The higher the total score, the higher the level of nature connectedness. In this study, Cronbach’s alpha coefficient for the scale was .83.

Procedure

Using stratified cluster random sampling method, students from seven universities in four cities of Henan Province were selected for questionnaire survey. Approval for the study was obtained from both the administrators of the seven universities and the Academic Ethics Committee of the university where the authors work. After obtaining the consent of the leaders of the faculties of the selected universities, two classes each of freshmen, sophomores and juniors were randomly selected in each university, and the participants completed the questionnaire online by scanning the QR code on their cell phones. The average survey response time was 28 minutes. A total of 1680 students were surveyed and informed consent was obtained from all of them. After excluding invalid questionnaires with obviously logical errors, 1568 valid questionnaires were obtained, with a valid response rate of 93.33%.

Data processing and analysis

SPSS 21.0 statistical software was used for data entry and management. Statistical analysis mainly included descriptive statistical analysis, correlation analysis and regression analysis. Given fewer missing values, they were replaced with the mean values.

The data in this study were all from participants' self-report, which may lead to common method bias. For this reason, Harman' s single-factor test was used to test for common method bias. The results showed that there were 8 factors with eigenvalues greater than 1, and the variance explained by the first factor was only 16.06%, which was much smaller than the critical criterion of 40% (Podsakoff et al., 2003). Thus, there is no obvious common method bias in this study.

Results

Comparison of the detection rate of suicidal ideation among different groups

Among 1568 participants, 113 had suicidal ideation in the last week, the detection rate was 7.21%. The differences in the detection rates of suicidal ideation were statistically significant in terms of gender and grade level ($\chi^2= 9.75, 8.63, p< .01$, respectively). Specifically, the detection rate of suicidal ideation among male participants was higher than that among female ones, and the detection rate of suicidal ideation among freshmen was higher than that among sophomores and juniors (Table 1).

Table 1

Comparison of the detection rate of suicidal ideation among different groups (N= 1568)

Option	Number	Suicidal ideation		χ^2
		Reported number (detection rate)		
Gender				
Male	841	77 (9.16%)		9.75**
Female	727	36 (4.95%)		
Grade				
Freshmen	550	56 (10.18%)		8.63**
Sophomores	514	27 (5.25%)		
Juniors	504	30 (5.95%)		
Place of origin				
Urban	637	45 (7.06%)		2.24
Rural	931	68 (7.30%)		
Class leader				
Yes	137	9 (6.57%)		3.42
No	1431	104 (7.27%)		

Note: * $p< .05$.

Descriptive statistics and correlation analyses

Pearson correlation analysis showed that cyberbullying victimization was positively correlated with suicidal ideation ($r = .45, p < .001$), while nature connectedness was negatively correlated with suicidal ideation ($r = -.38, p < .001$). There was no significant correlation between cyberbullying victimization and nature connectedness ($r = -.07, p > .05$) (Table 2).

Table 2

The main variables' descriptive statistics and correlation analysis results ($N = 1568$)

Variable	<i>M (SD)</i>	1	2	3
Cyberbullying victimization	18.48 (3.74)	1.00		
Nature connectedness	43.52 (10.23)	-.07	1.00	
Suicidal ideation	0.54 (0.03)	.45***	-.38***	1.00

Note: *** $p < .001$.

Test of the moderating effect of nature connectedness

The PROCESS macro program (Model 1) developed by Hayes (2013) was used to test nature connectedness' moderating effect in the relationship between cyberbullying victimization and suicidal ideation. First, both independent variable and moderating variable were standardized. Second, controlling for gender, grade, place of origin, and class leader. The results showed that cyberbullying victimization had a significant positive effect on suicidal ideation ($\beta = .45, t = 9.56, p < .001$; the bootstrap 95% confidence interval [0.42, 0.48] did not contain 0). Meanwhile, the product term cyberbullying victimization \times nature connectedness had a significant predictive effect on suicidal ideation ($\beta = -.09, t = -4.11, p < .001$; the bootstrap 95% confidence interval [-.10, -.07] did not contain 0), indicating that nature connectedness moderated the effect of cyberbullying victimization on suicidal ideation. Therefore, the moderation model proposed in this study is supported by data (Table 3).

Further using simple slope analyses to examine the effects of cyberbullying victimization on suicidal ideation at different levels of nature connectedness. The results showed that cyberbullying victimization positively predicted suicidal ideation at both low ($M - SD$; $\beta = .54, 95\% \text{ CI} = [.52, .56], p < .001$) and high ($M + SD$; $\beta = .36, 95\% \text{ CI} = [.34, .38], p < .001$) levels of nature connectedness, but as the level of nature connectedness increased, the positive predictive effect of cyberbullying victimization on suicidal ideation gradually diminished (Figure 1).

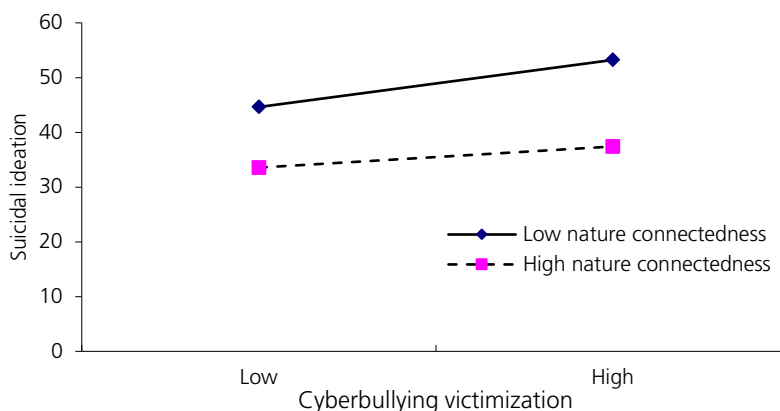
Table 3
The moderation model test for suicidal ideation ($N= 1568$)

Predictive variable	R	R^2	F	β	95% CI		t
					LL	UL	
	.39	.15	52.45***				
Gender				.10	.07	.14	2.66**
Grade				.08	.04	.13	1.98*
Place of origin				.05	.02	.08	1.02
Class leader				.06	.03	.08	1.13
Cyberbullying victimization				.45	.42	.48	9.56***
Nature connectedness				-.26	-.28	-.24	-6.84***
Cyberbullying victimization \times Nature connectedness				-.09	-.10	-.07	-4.11***

Notes: LL= lower limit; UL= upper limit. * $p < .05$; ** $p < .01$; *** $p < .001$.

Figure 1

The moderating effect of nature connectedness in the relationship between cyberbullying victimization and suicidal ideation



Discussion

Mainly based on Biophilia Hypothesis and nature decompression theory, this study revealed the boundary condition of cyberbullying victimization influencing suicidal ideation among college students from the perspective of nature connectedness, which is conducive to enriching the research literature about suicide and bullying.

In this study, the detection rate of suicidal ideation among college students in the last week was 7.21%, which was higher than the result (3.90%) of Cao et al.'s (2020) investigation in Shanxi Province, China, suggesting that the detection rate of suicidal ideation among college students in Henan Province is at a relatively

higher level, which should arouse the concern of the education authorities and all sectors of society. The reason why the detection rate of suicidal ideation in this study is higher than that of Cao et al. (2020) may be related to the rapid development of Internet information technology and the COVID-19 pandemic. Huang et al. (2020) have documented that with the increasing popularity of Internet, problematic internet use (PIU) is becoming more and more serious, which in turn increases the risk of suicidal ideation (SI) in the young. Sueki and Ueda (2022) have found that relatively young and economically vulnerable individuals are more likely to show exacerbated suicidal ideation during the COVID-19 pandemic.

This study compared the detection rate of suicidal ideation among college students with and without cyberbullying victimization, and the results showed significant differences between the two. Specifically, the detection rate of suicidal ideation among college students who were cyberbullied was significantly higher than that among those who were not cyberbullied, which is consistent with the findings of Yuan et al. (2017) survey among college students in Nanning, indicating that suffering from cyberbullying aggravates the suicidal ideation among college students.

In addition, this study found that there was a significant gender difference in the detection rate of suicidal ideation, and the detection rate of suicidal ideation among male college students were higher than that among female college students, which was consistent with the results of Nie (2016). The reason may be that male college students are usually more impulsive than female ones, therefore, when male college students encounter stressful life events, they are not good at both seeking social support around them and regulating their negative emotions, and thereby they usually suppress themselves and have a heavy burden of thought. At present, research findings on gender differences in suicidal ideation among college students are very inconsistent. For example, Zhuang et al.'s (2020) survey among college students in Jilin Province and Zhejiang Province in China showed that suicidal ideation among female students was higher than that among male students, and concluded that female students were relatively more sensitive and fragile, thought too much about things, and tended to have emotion-centered strategies when coping with stress, with large emotional fluctuations. When withstanding stress for a long period of time, they were prone to suicidal ideation. However, Ye et al. (2023) found no gender difference in the survey among college students in Nanjing City. Inconsistent findings may have a lot to do with the different measurement tools, meanwhile, the influence of the survey's time and regional differences should not be ignored. This study also found that the detection rate of suicide ideation was different in grades, specifically, the detection rate among freshmen was higher than that among sophomores and juniors, which may be related to freshmen's school adaptation. In addition to adapting to a new environment in terms of food, clothing, housing and transportation, freshmen also have to face problems and challenges in their studies. They are at the top of their class academically in high school, but when they get to college, due to the abundance of talent, many students find that no matter how hard they try, their grades remain mediocre. In high school, they are top academic achievers in their

class even grade, but when they get to college, due to a wealth of talent, many students find that no matter how hard they try, their academic performances remain mediocre. The loss of a sense of superiority and achievement can easily lead to more negative emotions such as anxiety and depression and more suicidal ideation among freshmen than among sophomores and juniors (Ye et al., 2023).

The correlation analysis showed that cyberbullying victimization was positively correlated with suicidal ideation, further confirming that cyberbullying is a risk factor for suicidal ideation among college students (Wang et al., 2017), and that the more severe the cyberbullying victimization among college students, the higher the frequency of suicidal ideation. In addition to supporting the Stress Dissonance Theory of suicide (Zhang, 2005), this result is also consistent with the Arousal Theory. According to Arousal Theory, suffering from cyberbullying is a negative life event, and victims of cyberbullying are exposed to a large amount of violent and negative information in the Internet, which remains in the subconscious mind of the individual, easily leading to the experience of negative emotions such as worry, frustration, distress, anxiety, and depression (Brown et al., 2006; Dill & Dill, 1998; Kraft, 2006).

Moreover, the experiences of being cyberbullied can also enhance adolescents' negative automatic thinking, resulting in negative self-evaluations such as "I'm really useless" or "I'm a mess", which can damage personal self-esteem and lead to severe inferiority complex and loss of meaning in life (Ha et al., 2022; Jiang et al., 2023), thus it is easy to generate suicidal ideation (Lai, 2016). This suggests that the relevant departments and educators should pay more attention to the negative impact of cyberbullying, and prevent and intervene in the occurrence of college student suicides and self-injuries by intervening in cyberbullying.

Multiple regression analyses indicated that nature connectedness was protective factor for suicidal ideation and play a positive moderating role in the process of cyberbullying victimization influencing college students' suicidal ideation; specifically, at high and low levels of nature connectedness, although cyberbullying victimization still predicted suicidal ideation, the predictive effect gradually decreased as the level of nature connectedness increased. That is to say, improving the level of college students' nature connectedness is conducive to mitigating the negative effects of cyberbullying on college students' suicidal ideation. The reason is inextricably linked to nature connectedness' essential characteristics. Nature connectedness reflects the extent to which individuals incorporate nature into their self-concept, and those with high nature connectedness usually have a pro-nature tendency, frequently getting close to nature, and obtaining a sense of security and belonging from it (Wang, 2021). Nature connectedness can be seen as an alternative form of interpersonal relationships, providing subjective support similar to that from good interpersonal relationships (Elsdek, 2019).

According to the nature decompression theory, human beings have been interacting with the natural environment during the evolutionary process, and the natural elements can automatically activate the decompression response of human beings, reduce the negative emotional experiences such as anxiety and depression,

supplement the resources of self-control, improve self-control, inhibit irrational behaviors, and promote the restoration of physical and mental functions, as well as enhance cognitive abilities, increase pro-sociality, and enhance meaning in life (Ulrich, 1984; Wang et al, 2022).

Thus, although cyberbullying victimization positively predicted suicidal ideation among college students, the predictive effects are correspondingly discounted and buffered at high levels of nature connectedness, whereas no such discounting and buffering effects occur at low levels of nature connectedness. In other words, suicidal ideation was less affected by cyberbullying among college students with high nature connectedness relative to those with low nature connectedness.

This study found that the detection rate of suicidal ideation among college students was as high as 7.21%, which was higher than the results of the survey conducted three years ago in Shanxi Province, suggesting that the detection rate of suicidal ideation among college students in Henan Province is at a relatively high level. Therefore, school managers, mental health educators and teachers should fully recognize the seriousness of the situation, grasp the first-hand data on cyberbullying among college students as soon as possible, make contact with students in more serious situations in a timely manner, and take targeted, scientific and reasonable measures to carry out practical and effective interventions.

An analysis of the differences in the detection rates of suicidal ideation found that there were significant differences in the detection rates of suicidal ideation in terms of gender and grade, specifically, the detection rate of male college students was higher than that of female college students, and the detection rate of freshmen was higher than that of sophomores and juniors. These findings suggest that in the process of intervening in college students' suicide, one should not exert efforts evenly, but must pay attention to group differences, and use the main efforts on those who are relatively more susceptible, such as the group of freshman male students. In this way, the intervention work can be targeted and achieve better practical effectiveness.

This study confirmed the positive association between cyberbullying victimization and suicidal ideation. According to this finding, school managers, mental health educators and teachers should pay attention to understanding and controlling risk factors in intervening in college students' suicide, so as to "prescribe the right medication" to improve the effectiveness of their interventions. In terms of the findings of this study, the impact of cyberbullying on suicidal ideation should be emphasized to prevent and intervene in the occurrence of suicide and self-injury among college students, starting from the intervention of cyberbullying.

It is worth noting that this study identified an important boundary condition for college students' cyberbullying victimization influencing suicidal ideation, i.e., the moderating role of natural connections. The finding suggests that compared with high nature connectedness college students, low nature connectedness ones who suffer from cyberbullying will have more serious suicidal ideation. This finding suggests that if mental health education departments can measure college students' level of nature connectedness and screen out low nature connectedness

students, those students can be guided to have deep contact and intimate interactions with nature, which can effectively improve their level of nature connectedness, and thus effectively mitigate the negative impact of cyberbullying on their suicidal ideation.

In summary, this study examined the effects of demographic variables on college students' cyberbullying and suicidal ideation, revealed the moderating role of nature connectedness in the relationship between cyberbullying victimization and suicidal ideation, enriched the research literature on cyberbullying and suicidal ideation, deepened the understanding of the relationship between cyberbullying and suicidal ideation among college students, and provided valuable empirical evidence for the relevant departments and educators to take scientifically sound measures on the intervention of adolescent suicide and cyberbullying.

There are some shortcomings and limitations in this study. First, the data in the study were based on retrospective self-reports, which are prone to the problem of common method bias (CMV). Although CMV was not significant through various regulatory measures in this study, it is advisable for subsequent researchers to use a combination of self-assessment and assessment by others in order to address the problem of a single source of data. Second, the cross-sectional design limited the explanatory power of our findings given that it was not possible to draw conclusions about causality. Therefore, subsequent studies could improve on this by using longitudinal studies or experimental designs to explore causal relationships between variables. Third, in exploring the boundary conditions by which cyberbullying victimization affects suicidal ideation, this study explore only one variable, nature connectedness. However, during the course of our study, we learned from the literature review that there are other variables, such as depression, social support, and resilience, that may potentially play a mediating or moderating role. Subsequent studies could introduce more variables to examine the underlying mechanisms and boundary conditions of the effects of cyberbullying on suicidal ideation to gain a deeper understanding of their relationship.

In conclusion, this study focused on exploring the role of nature connectedness between cyberbullying victimization and suicidal ideation among college students, while incidentally examining the differences of cyberbullying victimization and suicidal ideation in terms of demographic variables. The results showed that the detection rates of suicidal ideation among college students differed significantly in terms of the presence or absence of cyberbullying victimization, gender, and grade level; cyberbullying victimization was positively associated with suicidal ideation, and nature connectedness was negatively associated with suicidal ideation; and nature connectedness played a moderating role between cyberbullying victimization and suicidal ideation. Because college students' suicidal ideation is closely related to cyberbullying and nature connectedness, the school administration, mental health education departments and teachers can intervene in the occurrence of college students' cyberbullying and suicidal ideation by improving the level of college students' nature connectedness.

References

- Bauman, S., Toomey, R. B., & Walker, J. L. (2013). Associations among bullying, cyberbullying, and suicide in high school students. *Journal of Adolescence*, *36*(2), 341-350. doi: 10.1016/j.adolescence.2012.12.001
- Baxter, D. E., & Pelletier, L. G. (2019). Is nature relatedness a basic human psychological need? A critical examination of the extant literature. *Canadian Psychology/Psychologie Canadienne*, *60*(1), 21-34. doi: 10.1037/cap0000145
- Beck, A. T., Kovacs, M., & Weissman, A. (1979). Assessment of suicidal intention: The Scale for Suicide Ideation. *Journal of Consulting and Clinical Psychology*, *47*(2), 343-352.
- Beute, F., & de Kort, Y. A. W. (2014). Natural resistance: Exposure to nature and self-regulation, mood, and physiology after ego depletion. *Journal of Environmental Psychology*, *40*, 167-178. doi: 10.1016/j.jenvp.2014.06.004
- Bonnano, R., & Hymel, S. (2013). Cyber bullying and internalizing difficulties above and beyond the impact of traditional forms of bullying. *Journal of Youth Adolescence*, *42*, 685-697. doi: 10.1007/s10964-013-9937-1
- Bottino, S. M., Bottino, C. M., & Regina, C. G., et al. (2015). Cyberbullying and adolescent mental health: systematic review. *Cadernos de Saude Publica*, *31*(3), 463-475. doi: 10.1590/0102-311X00036114
- Brown, J. D., L'Engle, K. L., Pardun, C. J., Guo, G., Kenneavy, K., & Jackson, C. (2006). Sexy media matter: Exposure to sexual content in music, movies, television, and magazines predicts black and white adolescents' sexual behavior. *Pediatrics*, *117*(4), 1018-1027. doi: 10.1542/peds.2005-1406
- Cao, X., Ma, Z., Tian, M., Song, Y., & Li, Z. (2020). The relationship between childhood abuse experience and suicidal ideation among college students. *Chinese Journal of School Health*, *41*(4), 506-509. doi: 10.16835/j.cnki.1000-9817.2020.04.007
- Chen, X., Xiao, Z., & Wang, C. (2019). The relationship between natural connection and Internet addiction among college students: The mediating role of sense of meaning of life and boredom. *Journal of Xinyang Normal University (Philosophy and Social Sciences Edition)*, *39*(5), 45-49. doi: 10.3969/j.issn.1003-0964.2019.05.008
- Dill, K. E., & Dill, J. C. (1998). Video game violence: A review of the empirical literature. *Aggression and Violent Behavior*, *3*(4), 407-428. doi: 10.1016/S1359-1789(97)00001-3
- Elsadek, M., Liu, B., Lian, Z., & Xie, J. (2019). The influence of urban roadside trees and their physical environment on stress relief measures: A field experiment in Shanghai. *Urban Forestry & Urban Greening*, *42*, 51-60. doi: 10.1016/j.ufug.2019.05.007
- Endo, K., Yamasaki, S., Ando, S., Kikusui, T., Mogi, K., Nagasawa, M., Kamimura, I., Ishihara, J., Nakanishi, M., Usami, S., Hiraiwa-Hasegawa, M., Kasai, K., & Nishida, A. (2020). Dog and cat ownership predicts adolescents' mental well-being: A population based longitudinal study. *International Journal of Environmental Research and Public Health*, *17*(3), 884. doi: 10.3390/ijerph17030884
- Frank, V. (2003). *Seek the meaning of life*. Xinhua Publishing House.
- Ha, L., Chang, Q., & Chen, X. (2022). Influence of college students' psychological strain on suicidal ideation: The chain-mediating effect of sense of life meaning and psychache. *China Journal of Health Psychology*, *30*(8), 1228-1233. doi: 10.13342/j.cnki.cjhp.2022.08.022
- Hawkins, R. D., Hawkins, E. L., & Tip, L. (2021). "I can't give up when I have them to care for": People's experiences of pets and their mental health. *Anthrozoos: A Multidisciplinary Journal of The Interactions of People & Animals*, *34*(4), 543-562. doi: 10.1080/08927936.2021.1914434

- Hawkley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine, 40*(2), 218-227. doi: 10.1007/s12160-010-9210-8
- Hayes, A. (2013). Introduction to mediation, moderation, and conditional process analysis. *Journal of Educational Measurement, 51*(3), 335-337. doi: 10.1111/jedm.12050
- Howell, A. J., Dopko, R. L., Passmore, H. A., & Buro, K. (2011). Nature connectedness: Associations with well-being and mindfulness. *Personality and Individual Differences, 51*(2), 166-171. doi: 10.1016/j.paid.2011.03.037
- Hu, X., Yu, S., Liu, Q., & Zhang, W. (2019). The effect of cyber-victimization on suicidal ideation: The chain mediating role of self-esteem and emotional coping style among adolescents. *Psychological Development and Education, 35*(3), 368-375. doi: 10.16187/j.cnki.issn1001-4918.2019.03.15
- Hu, Z., & Xiong, M. (2024). The relationship between relative deprivation and cyberbullying in college students: The mediating effect of moral disengagement and moderating effect of moral identity. *Psychological Development and Education, 40*(3), 346-356. doi: 10.16187/j.cnki.issn1001-4918.2024.03.05
- Huang, Y., Xu, L., Mei, Y., Wei, Z., Wen, H., & Liu, D. (2020). Problematic Internet use and the risk of suicide ideation in Chinese adolescents: A cross-sectional analysis. *Psychiatry research, 290*, 112963. doi: 10.1016/j.psychres.2020.112963
- Izenstark, D., & Ebata, A. T. (2017). The effects of the natural environment on attention and family cohesion: An experimental study. *Children, Youth and Environments, 27*(2), 93-109. doi: 10.1353/cye.2017.0007
- Jiang, S., Ding, J., Liu, Y., Lu, Y., Li, X., & Chen, J. (2023). The effect of cyber-bullying/cyber-victimization on sleep quality in early adolescence: A serial mediation model of social anxiety and depression mood. *Psychological Development and Education, 39*(1), 85-96. doi: 10.16187/j.cnki.issn1001-4918.2023.01.10
- Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology, 15*(3), 169-182. doi: 10.1016/0272-4944(95)90001-2
- Kee, D. M. H., Anwar, A., & Vranjes, I. (2024). Cyberbullying victimization and suicide ideation: The mediating role of psychological distress among Malaysian youth. *Computers in Human Behavior, 150*, 108000. doi: 10.1016/j.chb.2023.108000
- Kessel-Schneider, S., O' Donnell, L., & Smith, E. (2015). Trends in cyberbullying and school bullying victimization in a regional census of high school students, 2006-2012. *Journal of School Health, 85*(9), 611-620. doi: 10.1111/josh.12290
- Kraft, E. (2006). Cyberbullying: A worldwide trend of misusing technology to harass others. *WIT Transactions on Information and Communication Technologies, 36*, 155-166. doi: 10.2495/IS060161
- Li, R., & Chen, J. (2016). A study on the relationship between coping style and suicidal ideation in junior high students. *China Journal of Health Psychology, 24*(9), 1402-1406. doi: 10.13342/j.cnki.cjhp.2016.09.031
- Li, X., Fei, L., Zhang, Y., Xu, D., & Tong, S. (2011). Reliability and validity of the Chinese version of Beck Scale for suicide ideation (BSI-CV) among university students. *Chinese Mental Health Journal, 25*(11), 862-866. doi: 10.3969/j.issn.1000-6729.2011.11.013
- Li, Y. (2016). Victimization and suicide in adolescents: Mediating effect of depression and its gender difference. *Chinese Journal of Clinical Psychology, 24*(2), 95-99. doi: 10.16128/j.cnki.1005-3611.2016.02.022
- Li, Y., Chang, J., Yuan, M., & Su, P. (2021). Research progress of adolescent cyberbullying. *Chinese Journal of School Health, 42*(11), 1751-1756. doi: 10.16835/j.cnki.1000-9817.2021.11.035

- Liu, Y., Zhang, S., Yang, L., & Wang, L. (2024). Exploration of the short-term dynamic variation in suicidal ideation and its risk factors among college students: Based on interpersonal theory of suicide. *Chinese Journal of Clinical Psychology, 32*(1), 32-38. doi: 10.16128/j.cnki.1005-3611.2024.01.006
- Liu, Z., Huang, Y., Ma, C., Shang, L., Zhang, T., & Chen, H. (2017). Suicide rate trends in China from 2002 to 2015. *Chinese Mental Health Journal, 31*(10), 756-767. doi: 10.3969/j.issn.1000-6729.2017.10.003
- Maurya, C., Muhammad, T., Dhillon, P., & Maurya, P. (2022). The effects of cyberbullying victimization on depression and suicidal ideation among adolescents and young adults: A three year cohort study from India. *BMC Psychiatry, 22*(1), 599. doi: 10.1186/s12888-022-04238-x
- Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology, 24*(4), 503-515. doi: 10.1016/j.jenvp.2004.10.001
- Mishna, F., Saini, M., & Solomon, S. (2009). Ongoing and online: Children and youth's perceptions of cyber bullying. *Children and Youth Services Review, 31*(12), 1222-1228. doi: 10.1016/j.childyouth.2009.05.004
- Nie, X. (2016). *A study on influencing factors of suicidal ideation among college students in a city* [Unpublished Master's thesis]. The Fourth Military Medical University.
- Paashaus, L., Forkmann, T., Glaesmer, H., Juckel, G., Rath, D., Schönfelder, A., & Teismann, T. (2019). Do suicide attempters and suicide ideators differ in capability for suicide. *Psychiatry Research, 275*, 304-309. doi: 10.1016/j.jenvp.2004.10.001
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *The Journal of Applied Psychology, 88*(5), 879-903. doi: 10.1037/0021-9010.88.5.879
- Quintana-Orts, C., Rey, L., & Neto, F. (2022). Beyond cyberbullying: Investigating when and how cybervictimization predicts suicidal ideation. *Journal of Interpersonal Violence, 37*(1-2), 935-957. doi: 10.1177/0886260520913640
- Schweitzer, R., Glab, H., & Brymer, E. (2018). The human-nature relationship: A phenomenological-relational perspective. *Frontiers in Psychology, 9*, 969. doi: 10.3389/fpsyg.2018.00969
- Shi, X., ZHU, Y., ZHANG, Y., Wang, S., & Qi, B. (2020). The relationship between cyberbullying victimization and suicidal behavior among college students: The chain mediating role of sleep disorders and depressive symptoms. *Chinese Journal of Clinical Psychology, 28*(6), 1125-1129. doi: 10.16128/j.cnki.1005-3611.2020.06.009
- Smith, P. K., Mahdavi, J., Carvalho, M., Fisher, S., Russell, S., & Tippett, N. (2008). Cyberbullying: Its nature and impact in secondary school pupils. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 49*(4), 376-385. doi: 10.1111/j.1469-7610.2007.01846.x
- Smith, T. W., Birmingham, W., & Uchino, B. N. (2012). Evaluative threat and ambulatory blood pressure: Cardiovascular effects of social stress in daily experience. *Health Psychology, 31*(6), 763-766. doi: 10.1037/a0026947
- Sueki, H., & Ueda, M. (2022). Short-term effect of the COVID-19 pandemic on suicidal ideation. *Crisis, 43*(4), 315-322. doi: 10.1027/0227-5910/a000797
- Tang, I. C., Sullivan, W. C., & Chang, C. Y. (2015). Perceptual evaluation of natural landscapes: The role of the individual connection to nature. *Environment and Behavior, 47*(6), 595-617.
- Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science, 224*(4647), 420-421. doi:10.1126/science.6143402

- Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology, 11*(3), 201-230. doi: 10.1016/S0272-4944(05)80184-7
- Wang, C. (2021). Ecological dimension of self-construction: Connotation, positive effect and promotion path. *Chinese Journal of Clinical Psychology, 29*(2), 311-315, 322. doi: 10.16128/j.cnki.1005-3611.2021.02.019
- Wang, C., Ji, S., & Chen, X. (2020). The relationship between nature connectedness and life meaning experience of college students: The mediating role of nature appreciation. *Journal of Xinyang Normal University(Philosophy and Social Sciences Edition), 40*(5), 45-65. doi: 10.3969/j.issn.1003-0964.2020.05.008
- Wang, C., & Lei, L. (2018). Current situation of college students' nature connectedness and its influence on depression. *Heilongjiang Researches on Higher Education, 2*, 89-93.
- Wang, C., Luo, R., & Ji, S. (2022). Nature connectedness and envy in social networking site use: The mediating role of sense of meaning in life and upward social comparison. *Chinese Journal of Clinical Psychology, 30*(3), 619-624. doi: 10.16128/j.cnki.1005-3611.2022.03.024
- Wang, J., Meng, Y., & Lin, L. (2021). Relationship between college students' ruminant thinking and suicidal ideation: Moderating role of family environment. *Heilongjiang Researches on Higher Education, 39*(4), 137-141. doi: 10.19903/j.cnki.cn23-1074/g.2021.04.025
- Wang, W., Zhang, Z., Li, Y., Wu, X., Zhao, F., & Yang, B., et al. (2017). A study on the correlation between cyberbullying and suicide-related behaviors among adolescents in some vocational colleges in Anhui Province. *Chinese Journal of Disease Control and Prevention, 21*(6), 611-614. doi: 10.16462/j.cnki.zhjbkz.2017.06.017
- WHO. (2019). *Suicide in the world: Global health estimates*. Retrieved July 23, 2023, from <https://www.who.int/publications-detail/suicide-in-the-world>
- Wilson, E. O. (1984). *Biophilia*. Harvard University Press.
- Xu, K. (2016). The mediating effect of self-esteem on gender role conflict and suicidal ideation of middle school students. *Chinese Journal of School Health, 37*(10), 1562-1565. doi: 10.16835/j.cnki.1000-9817.2016.10.038
- Yang, Z., & Li, Y. (2015). An analysis on unnatural deaths of college students. *Studies of Psychology and Behavior, 13*(5), 698-701.
- Ye, Z., YangHang, Y., Zhu, L., & Sun, Y. (2023). The impact of life events on suicidal ideation among college students: The chain mediating role of core self-evaluation and perceptive social support. *Journal of Campus Life & Mental Health, 21*(4), 263-267. doi: 10.19521/j.cnki.1673-1662.2023.04.007
- You, Y. (2013). *Revising scale for cyberbullying victims' behaviors and analyzing the influential factors* [Unpublished Master's thesis]. Zhejiang Normal University.
- Yu, S., Wu, C., Wang, B., Quan, J., & Yue, W. (2021). Cyberbullying victimization and suicidal ideation among primary and secondary school students: A moderated mediation model. *Chinese Journal of Disease Control and Prevention, 25*(2), 227-230. doi: 10.16462/j.cnki.zhjbkz.2021.02.020
- Yuan, L., Chen, L., & Pan, L. (2017). Current situation of cyberbullying and its influence on suicidal ideation among Nanning college students. *Chinese Journal of School Health, 38*(6), 945-947. doi: 10.16835/j.cnki.1000-9817.2017.06.048
- Zhang, J. (2005). A preliminary study on "stress dissonance theory" of suicide. *Chinese Mental Health Journal, 19*(11), 778-782. doi: CNKI:SUN:ZXWS.0.2005-11-022
- Zhang, P., Wang, P., Zhang, W., Zhang, L., & Zhang, D. (2024). The relationship between suicidal ideation, parent-child attachment, peer attachment and sense of life meaning in college students. *Chinese Mental Health Journal, 38*(7), 618-624.

- Zhang, S., & Wu, J. (2023). The impact of rough parenting on cyberbullying among middle school students: The role of depression and basic psychological needs. *China Journal of Health Psychology, 31*(8), 1206-1211. doi: 10.13342/j.cnki.cjhp.2023.08.018
- Zhang, X., Zhang, X., & Zhang, Z. (2008). Suicidal attempts and the influencing factors of middle school students in Hangzhou. *Chinese Journal of School Health, 29*(4), 324-326.
- Zhang, Y., Cao, X., Ma, Z., Wang, Q., Cao, X., & Wang, L. (2020). A study on the relationship between cyberbullying and suicidal behavior among college students. *Chinese Journal of School Health, 41*(4), 535-538. doi: 10.16835/j.cnki.1000-9817.2020.04.015
- Zhang, Y., Wang, K., Zhang, Y., & Wang, L. (2022). The effect of childhood psychological abuse and neglect on suicidal ideation: The mediating role of alexithymia and moderation role of search for meaning. *Journal of Psychological Science, 45*(05), 1206-1214. doi: 10.16719/j.cnki.1671-6981.20220523
- Zhu, X., Tian, L., & Huebner, E. S. (2019). Trajectories of suicidal ideation from middle childhood to early adolescence: Risk and protective factors. *Journal of Youth and Adolescence, 48*(9), 1818-1834. doi:10.1007/s10964-019-01087-y
- Zhuang, W., Li, Y., Jiang, T., & Tang, J. (2020). Relationship between childhood negative life events and suicidal ideation among college students. *Chinese Journal of School Health, 41*(2), 254-257. doi: 10.16835/j.cnki.1000-9817.2020.02.025

RECEIVED: April 13, 2024

ACCEPTED: June 19, 2024