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The influence of adolescents' core self-evaluation on cyberbullying: The mediating role of loneliness

Longyang Shang

Guangdong Medical University, Dongguan City, Guangdong Province, 523000, China

Abstract: *In order to understand the influence of adolescents' core self-evaluation on cyberbullying behavior, explore the mediating role of loneliness, and provide theoretical basis for the intervention measures to prevent cyberbullying behavior. In this study, the revised core self-assessment Scale, loneliness scale and cyberbullying behavior were used as 5-point scores to conduct a cluster sampling survey on 3218 senior high school students in 3 middle schools in Dongguan City. Statistical software such as SPSS27.0 was used to investigate the relationship between cyberbullying behavior, core self-evaluation and loneliness. The results showed that there was a significant negative correlation between core self-evaluation and cyberbullying behavior ($p < 0.001$), a significant negative correlation between loneliness and cyberbullying behavior ($p < 0.001$), and a significant positive correlation between loneliness and cyberbullying behavior ($p < 0.001$). Loneliness had an intermediary effect between core self-evaluation and cyberbullying behavior. The mediating effect accounted for 64.2% of the total effect, and when loneliness was included as the mediating effect, the prediction effect of core self-evaluation on cyberbullying behavior was not significant. Therefore, the influence of core self-evaluation on the behavior of cyberbullying others is mainly influenced by the mediating effect of loneliness.*

Keywords: *Cyberbullying; Core self-evaluation; Loneliness; Juvenile*

1. Literature review and question raising

With the continuous popularization of mobile phones, the age of teenagers holding mobile phones is getting younger and younger, and the number of young Internet users is surging, but the three views of teenagers are not fully mature and established, and the good and bad of the network make it difficult for teenagers to distinguish, and the adverse effects of the network are more obvious for teenagers. In 2021, a survey of 2,546 American students aged 13-17 showed that 23.2% of adolescents had experienced cyberbullying in May and June of that year, and 4.9% had experienced cyberbullying of others[1]. The inducements of cyberbullying are multifaceted, such as teenagers' own factors, family environment, class atmosphere, online time, academic performance, self-esteem level, loneliness, social anxiety, etc [2] ., all have an impact on and predict cyberbullying behavior.

In short, taking effective measures, strengthening supervision, and stopping and punishing such acts in a timely and effective manner will help curb and eliminate this harm.At the same time, in the research on cyberbullying behavior, researchers have mostly studied from the perspective of the bullied and less on the perpetrator of bullying, so this study discusses from the perspective of cyberbullying perpetrators, so as to provide a further theoretical basis for preventing and predicting cyberbullying behavior

2. Objects and Methods

2.1 Objects

A total of 3218 senior 1 students from 3 middle schools in Dongguan City, Guangdong Province were selected by cluster sampling method to complete the questionnaire survey. Finally, 3,218 questionnaires were collected, of which 3,132 were valid, including 1,525 males and 1,607 females, with a response rate of 97.3%,as can be seen from Table 1.

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Table 1: Basic information of subjects (N = 3132)

variable	type	frequency	percentage
gender	man	1525	48.7
	woman	1607	51.3
urban and rural	urban	2246	71.7
	rural	886	28.3
only children or not	only children	522	16.7
	non-only child	2610	83.3
left-behind children or not	left-behind children	395	12.6
	un-left-behind children	2737	87.4

2.2 Research tools

2.2.1 Core self-evaluation

The Chinese version of the core self-evaluation scale developed by Ren Zhihong and Ye Yiduo (2009) [3]was used. There are 8 questions, which are scored on a Likert-5 scale, with scores of 1, 2, 3, 4, and 5 respectively: Completely disagree, disagree, unsure, agree, and completely agree. The higher the score of the scale, the higher the core self-evaluation level, and the 1, 2, 3, 5, 6, and 8 items were inversely scored. The scale has a α coefficient of 0.859 for Clonbach.

2.2.2 Loneliness

The Children's Loneliness Scale by Li Xiaowei, Zou Hong, and Liu Yan (2014)[4] was used. The scale includes 21 items, which are scored by Likert-5 points, and the average score of the social ability perception dimension is added to the scores of the other three dimensions, and the average score is taken as the total average score of loneliness, in which the perception dimension of one's own social ability (1, 3, 4, 7, 11, 17 items) is inversely scored. The scale has a α coefficient of 0.944 for Clonbach.

2.2.3 Cyberbullying of others

Use the questionnaire to fill in "the number of times I have bullied others on the Internet in the past six months (intimidating, provoking or humiliating others in the form of text, pictures, voices, etc.)", and use the Likert-5 point score, which is "never, only once or twice, two or three times a month, about once a week, and several times a week" as 1, 2, 3, 4, 5.

2.2.4 Survey Methodology

The paper version of the questionnaire is distributed, and the school class is issued as the unit for on-site filling, and the questionnaire is collected by the school as the unit after filling in, and then the data is entered.

3. Results

3.1 Comparison of differences in demographic variables between cyberbullying behaviour and core self-evaluation

The independent sample t-test of middle school students' cyberbullying behavior, gender, whether they were only children, their place of origin, and whether they were left-behind children were all compared under the premise of homogeneity. As can be seen from Table 2, there was a significant difference in gender (p<0.001), and the cyberbullying behavior of men (1.11±0.46) was more statistically different than that of women (1.03±0.24) High: There were no significant differences in cyberbullying in terms of whether they were only children, where they came from, and whether they were left-behind children.

The independent sample t-test of the core self-evaluation of middle school students in gender, whether they are only children, places of origin and whether they are left-behind children can be compared, all of which are compared under the premise of homogeneity of variance. As can be seen from Table 2, there were significant differences in the core self-assessment by gender (p<0.001), the core self-evaluation of females (3.06±0.75) was lower than that of males (3.35±0.72), there was no

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significant difference in core self-evaluation in terms of whether they were only children, there was a significant difference in core self-evaluation in terms of place of origin (p<0.05), the core self-evaluation of urban household registration (3.18±0.75) was lower than that of rural core self-evaluation (3.26±0.73), and there was no significant difference in core self-evaluation in terms of whether left-behind children were left-behind children.

The loneliness of middle school students was compared under the premise of homogeneity of variance by independent sample t-test of gender, whether they were only children, place of origin and whether they were left-behind children. As can be seen from Table 2, there were no significant differences in loneliness in terms of whether or not the loneliness was an only child, whether it was an only child, and whether the student was from. There was a significant difference in loneliness among left-behind children (p<0.05), and the loneliness of left-behind children (2.35±0.71) was higher than that of non-left-behind children (2.26±0.71).

Table 2: Demographic differences in core self-evaluation, cyberbullying behavior, and loneliness (N = 3132)

	core self-evaluation			cyberbullying behavior			loneliness		
	$M \pm SD$	t	P	$M \pm SD$	t	P	$M \pm SD$	t	P
man	3.35±0.72	11.257	<0.001	1.11±0.46	5.99	<0.001	2.26±0.71	-1.131	0.258
woman	3.06±0.75			1.03±0.24			2.29±0.71		
only children	3.26±0.77	1.863	0.063	1.07±0.35	-0.065	0.948	2.29±0.75	0.696	0.486
non-only child	3.19±0.74			1.07±0.37			2.27±0.70		
rural household	3.26±0.73	2.899	<0.05	1.06±0.34	-0.714	0.475	2.25±0.68	-1.219	0.223
urban household	3.18±0.75			1.07±0.38			2.28±0.72		
left-behind children	3.15±0.74	-1.376	0.169	1.06±0.38	-0.638	0.524	2.35±0.71	2.413	<0.05
Non-left-behind children	3.21±0.75			1.07±0.37			2.26±0.71		

3.2 Descriptive statistics and correlation analysis of each variable

Table 2 lists the standard deviations of each variable and its Pearson correlation matrix. Correlation analysis showed that self-core evaluation was significantly negatively correlated with cyberbullying (r = -0.072, p < 0.01) and place of origin (r = -0.052, p < 0.01). Loneliness was significantly negatively correlated with self-core evaluation (r = -0.524, p < 0.01) and whether left-behind children were left behind (r = -0.043, p < 0.05), and was significantly positively correlated with cyberbullying (r = 0.101, p < 0.01). The relationships between the variables support subsequent hypothesis testing.

Table 3: Descriptive statistical results of each variable and correlation between variables (N = 3132)

Variable	$M \pm SD$	1	2	3	4	5	6	7
gender	1.51±0.50	1						
only children	1.07±0.251	0.108**	1					
origin of student	1.72±0.45	-0.074**	-0.064**	1				
left-behind children	1.87±0.332	-0.021	0.049**	0.013	1			
Cyberbullying behavior	1.07±0.369	-0.025	0.001	0.013	0.011	1		
core self-evaluation	3.2±0.749	0.028	-0.033	-0.052**	0.025	-0.072**	1	
loneliness	2.27±0.712	-0.022	-0.012	0.021	-0.043*	0.101**	-0.524**	1

*.At the 0.05 level (two-tailed), the correlation is significant.

**.At the 0.01 level (two-tailed), the correlation is significant.

3.3 Loneliness is a mediating test of core self-evaluation and cyberbullying behavior

As can be seen from Table 3, the correlation between the variables is in line with the premise of the mediation test, so the mediating effect test of loneliness is carried out. According to the mediating test

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process [5] proposed by scholar Wen Zhonglin, the mediating role of loneliness in cyberbullying behavior and core self-evaluation was tested by using the PROCESS 4.1 macro program (Model 4) to test the mediating role of loneliness in cyberbullying behavior and core self-evaluation with gender, whether they are only children, place of origin and whether they are left-behind children as control variables, core self-evaluation as independent variables, cyberbullying behavior as dependent variables, and loneliness as mediating variables. The test results of this study are shown in Table 4.

Table 4: Moderating test of loneliness in core self-evaluation and cyberbullying (N = 3132)

predictive variable	Equation1:Cyberbullying behavior		Equation2:loneliness		Equation3:Cyberbullying behavior	
	β	*t*	*β*	*t*	*β*	*t*
gender	-0.11	-6.133***	-0.128	-7.076***	-0.122	-6.709***
only children	0.013	0.748***	0.012	0.661	0.013	0.747
origin of student	0.015	0.841	0.01	0.57	0.011	0.599
left-behind children	0.01	0.576	0.013	0.718	0.015	0.841
core self-evaluation	-0.096	-5.323***	-0.096	-5.323***	-0.056	-2.619*
loneliness					0.075	3.588***
R^2	0.012		0.021		0.025	
F	9.635***		28.331***		12.871***	

As can be seen from Table 4, the core self-assessment can significantly and positively predict cyberbullying (β = -0.096, t = -5.323, p < 0.001), and after adding loneliness as a mediating variable, the core self-assessment can not only directly predict cyberbullying (β= -0.056, t = -2.619, p < 0.05), but also predict cyberbullying (β = 0.075, t = 3.588, p < 0.001).

In order to further test the mediating effect of loneliness on the relationship between core self-evaluation and cyberbullying behavior, the Bootstrap test was used to calculate the 95% confidence interval and analyze the effect of the mediation model. If the 95% confidence interval did not include 0, the mediating effect was significant [6]. The specific results are shown in Table 5.

Table 5: The mediating role of loneliness in core self-evaluation and cyberbullying behavior

path	predictive variable	dependent variable	*R*	R^2	*F*	*SE*	*t*	*95%CI*
c	core self-evaluation	cyberbullying behavior	0.0715	0.0051	16.0928	0.0088	-4.0116***	[-0.525,-0.0180]
a	core self-evaluation	loneliness	0.5241	0.2747	1185.1669	0.0145	-34.4263***	[-0.5266,-0.4698]
b	loneliness	cyberbullying behavior	0.1033	0.0107	16.8891	0.0108	4.1952***	[0.0242,0.0667]
c’	core self-evaluation	cyberbullying behavior				0.0103	-1.2270	[-0.0328,0.0076]

Notes: ***P <0.001

According to the data in Table 5, the core self-assessment had a significant effect on predicting cyberbullying behavior, where c = -0.0353, p< 0.001; The core self-assessment had a significant predictive effect on loneliness, where a = -0.4982, p < 0.001;When core self-evaluation and loneliness were taken into account, the core self-evaluation had no significant predictive effect on cyberbullying behavior,c'= -0.0126, p = 0.2199;Loneliness had a significant predictive effect on cyberbullying behavior, b = 0.0454, p < 0.001.The bias-adjusted percentile Bootstrap method test showed that loneliness had a significant mediating effect between core self-evaluation and cyberbullying behavior, with ab=-0.0226, BootSE=0.0069, 95% CI [-0.0369, -0.0099], and the mediating effect accounting for ab/(ab+c')= 64.20%. The mediation path is shown in Figure 2.

4. Discussion

4.1 Demographic differences in core self-evaluation and cyberbullying of others

After analyzing the differences in the demographic variables of the core self-evaluation of middle

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school students, it was found that the core self-evaluation was significantly different in gender and place of origin. In terms of the significant difference between genders in core self-evaluation, it is consistent [7] with Huang Zexin's (2023) conclusion that women have a lower core self-evaluation than men, which is worth further exploration, and may be related [8] to the different internal mechanisms between boys and girls. This may be due to the fact that in high school, the core self-evaluation is more susceptible to personal experience and external interference, urban students are more in a complex environment, and they face greater pressure to go on to higher education than rural students, and too much information affects the self-evaluation system that is being formed, and they are more sensitive to negative evaluations and are easy to integrate into the self-evaluation system [9].After analyzing the demographic variables of cyberbullying among middle school students, it was found that there were significant differences in gender in cyberbullying behavior. In terms of significant differences between genders in cyberbullying behavior, men's cyberbullying behavior is higher than that of women, which is consistent with previous studies by scholars (Williams & Guerra, 2007; This may be due to the reason of gender role identity, affected by gender role identity and social expectation adaptation, men are more aggressive than women, and men are more often exposed to violent environments, and may imitate and learn from aggressive behaviors, such as violent games, interactions with peers, etc., and adolescents in adolescence have a growing sense of self, physical and mental imbalance, are more likely to produce aggressive behavior, and adapt to show higher cyberbullying behavior [10] .

After analyzing the demographic variables of loneliness among middle school students, it was found that loneliness was significantly different in whether left-behind children were left-behind or not. This is consistent with the conclusion of previous studies, which may be that left-behind children have been separated from their parents for a long time, lack of communication and emotional care, lack of strong feelings and attachment to their parents, and experience a higher sense [11] of loneliness when encountering conflicts and setbacks, especially in school.

4.2 Core self-evaluation and cyberbullying behavior

This study shows that there is a significant negative relationship between core self-evaluation and cyberbullying and loneliness, loneliness and cyberbullying behavior, and loneliness and whether to stay behind.

Other researchers have shown that individuals with high self-core evaluation will actively seek solutions to solve problems, individuals with low self-core evaluation will be more passive in the face of problems [12] , students with low self-core evaluation will also have lower self-confidence and self-esteem, and will be more negative in dealing with things, and self-core evaluation will be negatively correlated [13] with emotional dimensions Therefore, in the face of the situation that others are not compatible with themselves, they are more likely to cyberbully others such as abusiveness, especially the anonymity and concealment of the Internet, which may further promote the cyberbullying of others and bring the bad emotions in reality to the Internet to vent. At the same time, individuals with high self-evaluation and high recognition have a lower sense of loneliness, many researchers believe that loneliness is a negative emotion of dissatisfaction with social relationships, individuals with high core self-evaluation tend to have high social support [14] and are more satisfied with social relationships, and loneliness is naturally not high, while individuals with low social relationships have higher loneliness, dissatisfied with social relationships in real life, and have low core self-evaluation, which is more likely to produce cyberbullying behavior.

4.3 The mediating role of loneliness

This study found that self-core evaluation was a predictor of cyberbullying through loneliness, in which loneliness played a complete mediating role, accounting for 64.2%. That is, through a low self-core evaluation, it leads to a high sense of loneliness, which leads to the behavior of cyberbullying others. According to the social information processing model, individuals with high loneliness will have social maladaptation, shyness, and withdrawal [15]due to deviations in one or some aspects of information processing In the face of negative social evaluation and negation, it is more likely to produce loneliness and more negative life events. Adolescents with low core self-esteem are often not confident enough about their performance in social processes. They pay more attention to various negative information from the outside world and its negative consequences in social interaction (Chang et al., 2012), and are more likely to adopt withdrawal or even avoidance behaviors (Wood et al., 2022), which makes it difficult for their actual communication situation to meet their own communication needs, which may affect the change of adolescents' loneliness.

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In the path of feeling lonely and cyberbullying others, according to the frustration-aggression hypothesis, it is believed that the aggressive behavior stems from frustration, and some studies have shown that negative events in adolescents' lives can increase their likelihood of bullying others in the online environment, and the negative factors in the environment can make adolescents think that they are threatened, and then may form aggressive behaviors to defend or protect themselves. At the same time, the online environment lacks the supervision and sight of everyday others, and adolescents' aggressive tendencies caused by frustration are more likely to turn into bullying behaviors on the Internet [16], such as communication on online issues and communication in games. On the one hand, when individuals face a strong sense of loneliness for a long time, they often describe themselves with negative characteristics and have negative views of others, which can easily hinder the individual's interpersonal communication, cause conflict, and even lead to obvious aggressive behavior. On the other hand, lonely individuals are closed in their hearts and often get angry in interpersonal interactions because they misinterpret the intentions of others, and anger is one of the important causes of aggressive behavior. As a result, individuals who develop feelings of loneliness tend to behave aggressively [17].At the same time, recent evolutionary theories of loneliness suggest that loneliness-related aversion triggered by loneliness experiences motivates individuals to reconnect with others, i.e., reaffiliation motive (RAM). Loneliness in early adolescence may promote individuals to produce more peer interaction behaviors, and after two years of follow-up research, loneliness can predict relational aggression through friendship quality, and friendship quality plays a longitudinal mediating role between loneliness and relational aggression, that is, loneliness can significantly positively predict friendship quality, and then reduce relational aggression [18] . This also provides us with more perspectives on how loneliness can be used to attack others.

In summary, this study further confirms that there is a close correlation between core self-evaluation and cyberbullying behavior, and loneliness plays a complete mediating role between core self-evaluation and cyberbullying behavior. In terms of effectively preventing the occurrence of cyberbullying of others, this enlightens us to effectively reduce the occurrence of cyberbullying by improving the core self-evaluation of adolescents and reducing loneliness.

5. Conclusion

(1) There is a significant negative correlation between core self-evaluation and cyberbullying behavior, a significant negative correlation between core self-evaluation and loneliness, and a significant positive correlation between loneliness and cyberbullying behavior.

(2) Self-core evaluation negatively predicted the behavior of cyberbullying others, self-core evaluation negatively predicted loneliness, and loneliness positively predicted the behavior of cyberbullying others.

(3) Loneliness plays a completely mediating role between core self-evaluation and adolescents' cyberbullying behavior.

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