

Childhood Maltreatment and Adolescent Cyberbullying Perpetration: A Moderated Mediation Model of Callous—Unemotional Traits and Perceived Social Support

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Abstract

Although childhood maltreatment has been shown to play an important role in adolescent cyberbullying perpetration, little is known about mediating and moderating mechanisms underlying this relationship. The current study investigated the mediating role of callous-unemotional (CU) traits in the association between childhood maltreatment and adolescent cyberbullying perpetration, as well as the moderating role of perceived social support. A total of 2,407 Chinese adolescents (aged 11–16 years,

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$M_{\text{age}} = 12.75$ years, $SD = 0.58$) completed the measures of childhood maltreatment, CU traits, cyberbullying perpetration, and perceived social support. The results showed that CU traits partially mediated the relationship between childhood maltreatment and adolescent cyberbullying perpetration. Furthermore, perceived social support moderated the relationship between childhood maltreatment and CU traits, as well as CU traits and cyberbullying perpetration. Specifically, childhood maltreatment had a greater impact on CU traits for adolescents with higher levels of perceived social support and the predictive function of CU traits on cyberbullying perpetration was stronger for adolescents with low levels of perceived social support.

Keywords

childhood maltreatment, callous-unemotional traits, cyberbullying perpetration, perceived social support

Introduction

With the rapid development of electronic information and communication technology, cyberbullying perpetration has become a major problem among young people around the world and its incidence is on the rise (Kowalski et al., 2014). It is also a major issue for Chinese adolescents (Bai et al., 2020; P. Wang, Wang et al., 2019; Wang, Yang et al., 2021; Wang, Zhao et al., 2019) because the total number of adolescent internet users (aged 10–19 years) is estimated to be 174 million by the end of March 2020 (China Internet Network Information Center, 2020). For instance, 34.84% of Chinese adolescents report cyberbullying to others (Zhou et al., 2013). Cyberbullying perpetration is usually defined as repeated and deliberate attacks on individuals who often fail to protect themselves in a cyber environment (Kowalski et al., 2012). It can lead to a range of negative outcomes, such as anxiety, depression, substance abuse, and suicide ideation (Kowalski et al., 2014; Kwan et al., 2020). Therefore, it is of theoretical and practical importance to explore those factors that may contribute to an increase in adolescent cyberbullying perpetration.

Recently, two cross-sectional studies of Western society find that childhood maltreatment, as a risk factor, is significantly associated with adolescent cyberbullying perpetration. Specifically, adolescents from Canada (Hébert et al., 2016) and Turkey (Emirtekin et al., 2021) who have experienced childhood maltreatment are more likely to perpetrate cyberbullying. The aggravating effect of childhood maltreatment on adolescent

cyberbullying perpetration can be explained by social learning theory (Hong et al., 2012). First, adolescents learn and strengthen how to abuse by observing maltreatment behaviors of their parents. Second, adolescents who experience childhood maltreatment learn to view aggression (e.g., bullying) as a reasonable way to cope with disagreements (Wang, Yang et al., 2017; Wang, Zhao et al., 2020). This may lead them to become aggressive in online contexts.

It is important to note that the study of child maltreatment in Chinese culture lags far behind Western culture (Wang, Yang et al., 2017; Wang, Yang et al., 2021). China is a collectivist society that emphasizes family relationships and the parent–child relationship is considered more important than other relationships. Thus, the exacerbating effect of childhood maltreatment on adolescents' cyberbullying perpetration may be stronger in China than in other countries. This interpretation is supported by a longitudinal study (Wang, Yang et al., 2021) and emphasizes that childhood maltreatment has a unique contribution to the prediction of Chinese adolescents' cyberbullying perpetration after six months, even after controlling for adolescents' gender, age, perceived school climate, deviant peer affiliation, moral identity, perspective-taking, and empathic concern (Wang, Yang et al., 2021).

Although researchers have begun to examine the link between childhood maltreatment and adolescent cyberbullying perpetration, the underlying mechanisms that could account for this link (i.e., mediating mechanisms) and alter it (i.e., moderating mechanism) still remain largely unexplored. Based on the general aggression model (Anderson & Bushman, 2002), situational factors (e.g., childhood maltreatment and perceived social support) and personal traits (e.g., CU traits) can affect the individuals' cyberbullying perpetration (Fang, Wang, Yuan, & Wen, 2020; Kowalski et al., 2014). Therefore, the current study utilized a Chinese adolescent sample to determine whether callous-unemotional (CU) traits mediated the relationship between childhood maltreatment and cyberbullying perpetration and whether the mediating process could be moderated by perceived social support.

The Mediating Effect of CU Traits

CU traits characterize youth who lack remorse and guilt, have the shallow affect, and are insensitive to the distress of others (Frick et al., 2014). These traits have been consistently associated with aggressive (e.g., bullying and cyberbullying), antisocial behaviors, and even criminal behavior (Frick et al., 2014; Frick & White, 2008). Three cross-sectional studies indicate that CU

traits are positively associated with cyberbullying perpetration among Spanish adolescents (Orue & Calvete, 2019), American adolescents (Wright et al., 2019), and Chinese college students (Fang, Wang, Yuan, Wen, & Yu et al., 2020). A longitudinal study further indicates that after controlling for baseline cyberbullying perpetration, CU traits significantly predict adolescent cyberbullying perpetration one year later (Fanti et al., 2012).

The adaptive calibration model proposes that CU traits arise as coping strategies aimed for adaptation to stressful environments (Del Giudice et al., 2011). Individuals exposed to maltreating families endure tremendous pressure, thereby those individuals often use CU traits to protect themselves from child maltreatment. Based on the adaptive calibration model, adolescents with more experience of childhood maltreatment are more likely to report CU traits. Many cross-sectional studies support this view by showing that childhood maltreatment is positively associated with CU traits in children (McDonald et al., 2017), male juvenile offenders (Bisby et al., 2017; Kimonis et al., 2013), and young adults (Carlson et al., 2015; Fang, Wang, Yuan, & Wen, 2020). A longitudinal study further clarifies the stability of this relationship (Walters, 2018). That is, the initial levels of childhood maltreatment can positively predict the development of CU traits after 18 months, but the initial levels of CU traits could not significantly predict the development of childhood maltreatment after 18 months (Walters, 2018).

Most importantly, three studies indicate that CU traits mediate the relationship between childhood maltreatment and aggressive behaviors (Carlson et al., 2015; McDonald et al., 2017) as well as childhood maltreatment and moral disengagement (Fang, Wang, Yuan, & Wen, 2020). Although not yet tested, it is reasonable to expect that CU traits would mediate the relationship between childhood maltreatment and cyberbullying perpetration.

Perceived Social Support as a Moderator

Although childhood maltreatment may increase the risk of cyberbullying perpetration through the mediating role of CU traits, not all individuals who are exposed to childhood maltreatment homogeneously experience higher levels of CU traits and show more cyberbullying perpetration. It is necessary to explore potential moderating variables that may exacerbate or attenuate the relationship between childhood maltreatment and cyberbullying perpetration. Thus, the present study would examine whether the direct and indirect relationships between childhood maltreatment and cyberbullying perpetration via CU traits would be moderated by perceived social support.

Perceived social support refers to an individual's confidence that ample support will be available during times of need (Barrera, 1986). For

adolescents, the main sources of social support are family, peers, and other important people (e.g., teachers). A longitudinal study indicates that adolescents living in low-income communities with higher levels of parent support in wave 1 are less likely to report CU traits in wave 2, even if adolescents are exposed to community violence in both waves (Davis et al., 2015). Likewise, a meta-analysis also indicates that perceived social support is negatively associated with cyberbullying perpetration (Kowalski et al., 2014). A longitudinal study further shows that family social support can negatively predict cyberbullying perpetration one year later, even after control for CU traits and baseline cyberbullying perpetration, cyber-victimization, school bullying, school victimization, media violence exposure, narcissism, impulsivity, gender, and family structure (Fanti et al., 2012). Thus, perceived social support as a protective factor can significantly reduce adolescents' CU traits and cyberbullying perpetration.

Two models theorize the moderating effects of perceived social support in the relationship between a stressor (e.g., childhood maltreatment) and negative outcomes (Rueger et al., 2016). The stress-buffering model indicates that perceived social support can mitigate the relationship between childhood maltreatment and negative outcomes (Figure 1a). Consistent with the stress-buffering model, some empirical studies indicate that perceived social support can buffer the impact of child maltreatment on violent offending (Maschi, 2006), and emotional and social problems (Lo et al., 2021).

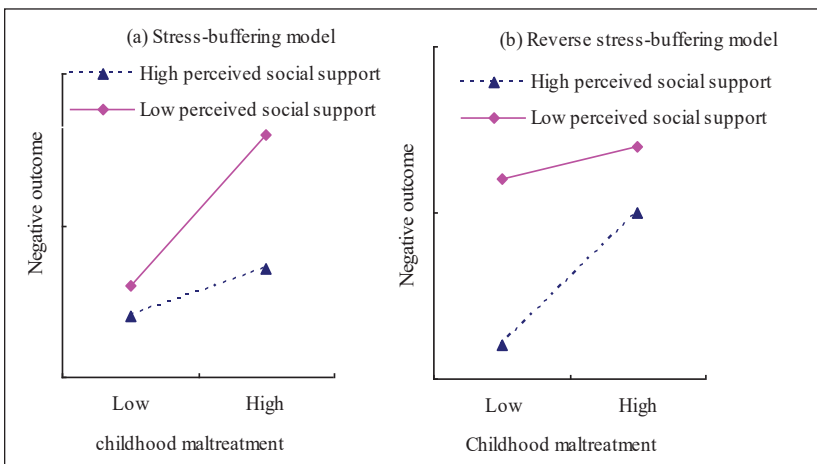


Figure 1. Two different moderating models of perceived social support on the relationship between childhood maltreatment and negative outcome.

Conversely, the reverse stress-buffering model argues that perceived social support may aggravate the association between a stressor (e.g., childhood maltreatment) and negative outcomes (i.e., CU traits and cyberbullying perpetration, Figure 1b). This is because perceived social support may lose its capability to offset risk once childhood maltreatment reaches a certain level. This model does not deny the possible beneficial impacts of perceived social support on high-risk adolescents, but implies that it may not be enough to defend adolescents from negative outcomes in the face of severe childhood maltreatment. Consistent with the reverse stress-buffering model, some studies find that the relationship between cyber victimization and depression as well as cyber victimization and rumination is much stronger for adolescents with higher levels of social support (Fang, Wang, Wen et al., 2020; Li et al., 2018).

To our knowledge, no prior study has examined the moderating effect of perceived social support on the direct and indirect relationships between childhood maltreatment and adolescent cyberbullying perpetration. Given that previous findings of perceived social support have been mixed, without presupposing a specific moderating pattern, we hypothesized perceived social support would moderate the direct and indirect relationships between childhood maltreatment and adolescent cyberbullying perpetration.

The Present Study

Taken together, the purposes of the current research were two-fold. First, the current research tested whether CU traits would mediate the relationship between childhood maltreatment and cyberbullying perpetration. Second, we tested whether the direct and indirect relationships between childhood maltreatment and cyberbullying perpetration were moderated by perceived social support (Figure 2). Based on the literature review, we proposed the following hypotheses.

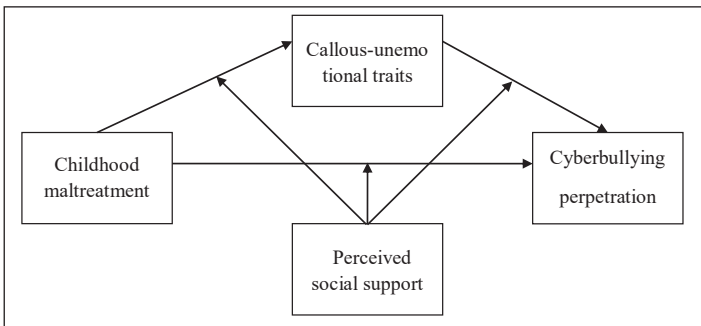


Figure 2. The proposed moderated mediation model.

Hypothesis 1: CU traits would mediate the relationship between childhood maltreatment and adolescent cyberbullying perpetration.

Hypothesis 2a: The relationships between childhood maltreatment and CU traits as well as CU traits and cyberbullying perpetration would be moderated by perceived social support.

Hypothesis 2b: The direct relationship between childhood maltreatment and adolescent cyberbullying perpetration would be moderated by perceived social support.

Method

Participants

The data comes from a part of the first wave of an ongoing longitudinal study, in which random cluster sampling was used to recruit 2,407 students from 7 junior high schools in Taiyuan and Changzhi city, Shanxi province, China (Wang, Gao, Yang, Zhao, & Wang, 2020). The total sample included 1,191 boys, 1,202 girls, and 14 participants who did not report gender. The mean age of these students was 12.75 years ($SD = 0.58$, range = 11–16). We chose this age group because cyberbullying rates peak in early adolescence (Kowalski et al., 2014) and are much higher for adolescents aged 12–15 years as Slonje and Smith (2008) asserted. Concerning the educational level of the participants' parents, 27.4% and 26.1% of their fathers and mothers respectively had completed a bachelor's degree or higher level. A total of 27.4% and 27.7% of their fathers and mothers respectively had completed senior high school level; 38.5% and 39.0% of their fathers and mothers respectively had completed junior high school level; and 6.7% and 7.2% of their fathers and mothers respectively had completed primary school or lower level. Concerning per capita monthly household income of the participants' family, 12.2% of families have a per capita monthly income of less than 1000 yuan; 20.8% of families have a per capita monthly income of between 1000 and 2000 yuan; 24.3% of families have a per capita monthly income of between 2000 and 3000 yuan; 42.7% of families have a per capita monthly income of more than 3000 yuan. According to data from the Sixth National Population Census, our sample was representative of Chinese families (National Bureau of Statistics of China, 2011).

Measures

Childhood maltreatment

Childhood maltreatment was assessed by the Childhood Trauma Questionnaire-Short Form developed by Bernstein et al. (2003). It includes

five dimensions: physical abuse, physical neglect, emotional abuse, emotional neglect, and sexual abuse. There are five items in each dimension. An example item was as follows: “People in my family said hurtful or insulting things to me.” Items were assessed on a 5-point scale ranging from 1 (never true) to 5 (very often true). Responses to all items were averaged with higher scores indicating higher levels of childhood maltreatment. This scale has been used among the Chinese participants before (e.g., Wang, Yang et al., 2017; Wang, Yang et al., 2021). Cronbach’s α was 0.87 in this study.

CU traits.

CU traits were measured by the Inventory of Callous-unemotional Traits (Frick, 2004), a 24-item self-report questionnaire. It includes three dimensions: callousness, uncaring, and unemotional. An example item was as follows: “I seem very cold and uncaring to others”. Items were assessed on a 4-point scale ranging from 1 (not at all true) to 4 (definitely true). Responses to all items were averaged, with higher scores indicating higher levels of CU traits. This scale has been used among the Chinese participants before (e.g., Wang, Gao et al., 2017; Fang, Wang, Yuan & Wen, 2020). Cronbach’s α was 0.76 in this study.

Cyberbullying perpetration.

The nine-item Cyberbullying Scale was used to examine adolescents’ levels of cyberbullying perpetration. This scale developed by Wright et al. (2015) has been used in Chinese adolescents (Wang, Yang et al., 2021). Adolescents rated each item (e.g., “How often do you spread bad rumors about another peer online or through text messages”) on a 5-point scale ranging from 1 (never) to 5 (all the time). Responses to all items were averaged with higher scores indicating higher levels of cyberbullying perpetration. Cronbach’s α was 0.93 in the study.

Perceived social support.

Perceived social support was measured by the Multidimensional Scale of Perceived Social Support (Zimet et al., 1988). This scale consists of twelve items with three domains of support: family, teacher, and significant others. An example item is “My family really tries to help me.” Each item was rated on a 7-point scale (1 = strongly disagree, 7 = strongly agree), with higher scores indicating greater perceived social support. This scale has been used among the Chinese participants before (Li et al., 2018; Wang, Gao et al., 2020). Cronbach’s α was 0.95 in this study.

Family socioeconomic status.

Family socioeconomic status was a factor score ($M = 0$, $SD = 1$) derived from a principal component analysis of the mothers' education, the fathers' education, and family income, with higher scores reflecting higher levels of family socioeconomic status (Li et al., 2018).

Procedure

This investigation was approved by the corresponding author's University Ethics Committee. Participants completed paper-based questionnaires in their classrooms. Trained postgraduate students conducted the measures using scripts and a manual of procedures to ensure standardization of the data collection process. Informed consent was obtained from the participants before data collection. Participants were informed that their participation was voluntary and they could terminate the participation anytime they want. All of the participants were given a pen as an incentive after completing the survey.

Analytic Plan

Before examining our study hypothesis, missing data were imputed with maximum likelihood estimation in the form of the expectation maximum (EM) algorithm using SPSS 20.0 (Wang, Gao et al., 2020). EM uses a two-step, iterative process based on maximum likelihood estimation to obtain missing values (Dempster et al., 1977). Newman (2014) pointed out that EM provides more accurate estimates compared to other methods of replacing missing data and recommended EM as one of the best ways to address missing data. Second, whether data followed normal distribution was examined. The skewness and kurtosis of childhood maltreatment, CU traits, and perceived social support (See Table 1) fell within the acceptable range (i.e., skewness $< |2.0|$ and kurtosis $< |7.0|$; Hancock & Mueller, 2010). However, the distributions of cyberbullying perpetration (skewness = 3.77, kurtosis = 17.35) were somewhat skewed. Thus, we used a natural logarithmic transformation on the overall mean scores of cyberbullying perpetration to approximate the normal distributions. The transformed cyberbullying perpetration (skewness = 2.55, kurtosis = 6.57) was used for the following analyses. Third, multicollinearity was not a serious threat in this study according to the variance inflation factors (1.05–1.41 $< 5\%$; O'Brien, 2007). All study variables were standardized in Model 4 and Model 59 before data analyses.

Table 1. Descriptive Statistics and Correlations among Variables of Interest.

	M	SD	1	2	3	4
1. Childhood maltreatment	1.56	0.51	I			
2. CU traits	2.07	0.36	0.38***	I		
3. Cyberbullying perpetration	1.21	0.50	0.27***	0.31***	I	
4. Perceived social support	5.34	1.25	-0.37***	-0.45***	-0.19***	I
Skewness	-	-	1.53	-0.06	2.55	-0.75
Kurtosis	-	-	2.05	-0.51	6.57	0.37

Note. CU = Callous-Unemotional. *** $p < .001$.

To test our study hypotheses, we conducted a series of analyses. First, descriptive statistics and Pearson correlations were calculated among the study variables. Second, the PROCESS macro for SPSS (Model 4) was applied to examine the mediating effect of CU traits (Hayes, 2013). Third, the PROCESS macro (Model 59) was applied to examine the moderating effect of perceived social support on the direct and indirect links between childhood maltreatment and cyberbullying perpetration. Fourth, the bootstrap confidence intervals (CIs) determine whether the effects in Model 4 and Model 59 are significant, based on 5,000 random samples (Hayes, 2013). An effect is regarded as significant if the CIs do not include zero. One advantage of the bootstrap method is that it does not require the normal distribution assumption and thus provides a more powerful test than traditional methods based on formulas with a normality assumption (Hayes, 2013). Finally, the Johnson-Neyman technique was used to examine the significant regions (Hayes, 2013) if the moderating effect of perceived social support was significant. Specifically, the Johnson-Neyman technique provides a region for the moderator, in which the simple slope of the outcome variable to the predictive variable is significantly different from zero. In all analyses, we controlled for relevant covariates (i.e., gender, age, and family socioeconomic status) by entering them as predictor variables into regression equations.

Results

Preliminary Analyses

The means, SDs, skewness, kurtosis, and Pearson correlations for the study variables are reported in Table 1. As the results showed, childhood maltreatment was positively correlated with CU traits and cyberbullying perpetration, and negatively correlated with perceived social support. CU traits were

positively correlated with cyberbullying perpetration and negatively correlated with perceived social support. Cyberbullying perpetration was negatively correlated with perceived social support.

Testing for Mediation Effect

We used Model 4 of the PROCESS macro (Hayes, 2013) to test the mediating effect of CU traits on the relationship between childhood maltreatment and cyberbullying perpetration (Hypothesis 1). The results of the mediation analysis are presented in Table 2. As shown in Table 2, the findings (see Model 1) first revealed that childhood maltreatment was positively associated with cyberbullying perpetration ($\beta = 0.28$, $SE = 0.02$, $p < .001$) after controlling for covariates. Second, the results also indicated that childhood maltreatment was positively associated with CU traits ($\beta = 0.36$, $SE = 0.02$, $p < .001$) (see Models 2). Third, CU traits were positively related to cyberbullying perpetration ($\beta = 0.25$, $SE = 0.02$, $p < .001$) (see Models 3). Moreover, Model 3 also showed that the residual direct association between childhood maltreatment and cyberbullying perpetration was significant ($\beta = 0.18$, $SE = 0.02$, $p < .001$). Therefore, Hypothesis 1 was supported. CU traits partially mediated the relationship between childhood maltreatment and cyberbullying

Table 2. Testing the Mediation Effect of Childhood Maltreatment on Cyberbullying Perpetration

Predictors	Model 1 (Cyberbullying perpetration)		Model 2 (CU)		Model 3 (Cyberbullying perpetration)	
	β	SE	β	SE	β	SE
Gender	-0.12**	0.04	-0.21***	0.04	-0.06	0.04
Age	0.06**	0.02	0.04*	0.02	0.05*	0.02
SS	-0.08***	0.02	-0.09***	0.02	-0.06**	0.02
CM	0.28***	0.02	0.36***	0.02	0.18***	0.02
CU traits					0.25***	0.02
R^2	0.11		0.18		0.16	
F	65.11***		115.86***		82.49***	

Note. Each column is a regression model that predicts the criterion at the top of the column. CM = childhood maltreatment. CU = Callous-unemotional. SS = Socioeconomic status. Socioeconomic status is a factor score with a mean of 0 and a standard deviation of 1. The beta values are standardized coefficients, and thus they can be compared to determine the relative strength of different variables in the model. Gender was dummy coded such that 0 = Boy and 1 = Girl.

* $p < .05$. ** $p < .01$. *** $p < .001$.

perpetration (indirect effect = 0.09, SE = 0.01, 95% CI = [0.073, 0.113]). The mediation effect accounts for 33.12% of the total effect of childhood maltreatment on cyberbullying perpetration (Wen & Fan, 2015).

Moderated Mediation Effect Analysis

To test the moderated mediation model, we used Model 59 of the SPSS macro PROCESS compiled by Hayes (2013). The results of the moderated moderation test are shown in Table 3. As Table 3 shows, after controlling for the covariates, Model 1 indicated that childhood maltreatment significantly and positively predicted CU traits ($\beta = 0.27$, SE = 0.02, $p < .001$). Moreover, childhood maltreatment interacted with perceived social support in predicting CU traits ($\beta = 0.12$, SE = 0.02, $p < .001$). To further determine the nature of this moderation effect, we used the Johnson-Neyman technique to examine the regions of significance (Hayes, 2013). This analysis of the region of significance found a lower bound of -3.17 and an upper bound of -1.74 . This result indicated that the regression of CU traits on childhood maltreatment was significant and negative at values of perceived social support less than

Table 3. Testing the Moderated Mediation Effect of Childhood Maltreatment on Cyberbullying Perpetration.

Predictors	Model 1 (CU traits)		Model 2 (Cyberbullying perpetration)	
	β	SE	β	SE
Gender	-0.23***	0.04	-0.06	0.04
Age	0.05*	0.02	0.05*	0.02
SS	-0.06**	0.02	-0.06**	0.02
CM	0.27**	0.02	0.17***	0.02
PSS	-0.38***	0.02	-0.04	0.02
CM × PSS	0.12***	0.02	-0.01	0.02
CU traits			0.25***	0.02
CU traits × PSS			-0.09***	0.02
R ²	0.300		0.172	
F	154.70**		55.58**	

Note. Each column is a regression model that predicts the criterion at the top of the column. CM = childhood maltreatment. CU = Callous-unemotional. SS = Socioeconomic status. PSS = perceived social support. The beta values are standardized coefficients, and thus they can be compared to determine the relative strength of different variables in the model. Gender was dummy coded such that 0 = Boy and 1 = Girl.

* $p < .05$. ** $p < .01$. *** $p < .001$.

-3.17, not significantly different from zero at values of perceived social support between -3.17 and -1.74, and significant and positive at values of perceived social support greater than -1.74. Thus, the positive impact of childhood maltreatment on CU traits was stronger for adolescents who had higher perceived social support, which was consistent with the reverse stress-buffering model (Figure 3). The full model accounted for 30% of the variance in CU traits ($R^2 = 0.30, p < .001$).

Model 2 of Table 3 showed CU traits significantly and positively predicted cyberbullying perpetration ($\beta = 0.25, SE = 0.02, p < .001$), and CU traits interacted with perceived social support in predicting cyberbullying perpetration ($\beta = -0.09, SE = 0.02, p < .001$). As shown in Figure 4, the regression of cyberbullying perpetration on CU traits was significant and positive between

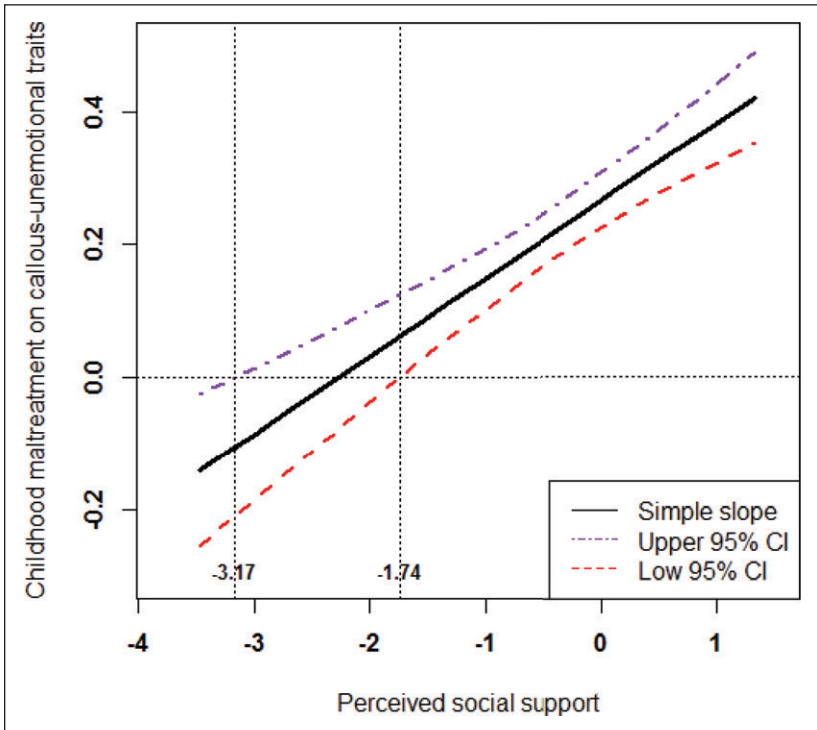


Figure 3. The conditional association between childhood maltreatment and callous-unemotional traits as a function of perceived social support.

Note. The dark line indicates the simple slope of childhood maltreatment on callous-unemotional traits. CI = confidence interval.

the minimum possible values of perceived social support -3.47 and the maximum possible values 1.33 . Thus, the positive impact of CU traits on cyberbullying perpetration was weaker for adolescents who had higher perceived social support, which was consistent with the stress-buffering model (Figure 4). The full model accounted for 17% of the variance in cyberbullying perpetration ($R^2 = 0.17, p < .001$). Furthermore, childhood maltreatment significantly and positively predicted cyberbullying perpetration ($\beta = 0.17, SE = 0.02, p < .001$), but this relationship was not moderated by perceived social support ($\beta = -0.01, SE = 0.02, p = .62$).

To summarize, perceived social support moderated the first part of the mediation process (the impact of childhood maltreatment on CU traits) and the second part of the mediation process (the impact of CU traits on

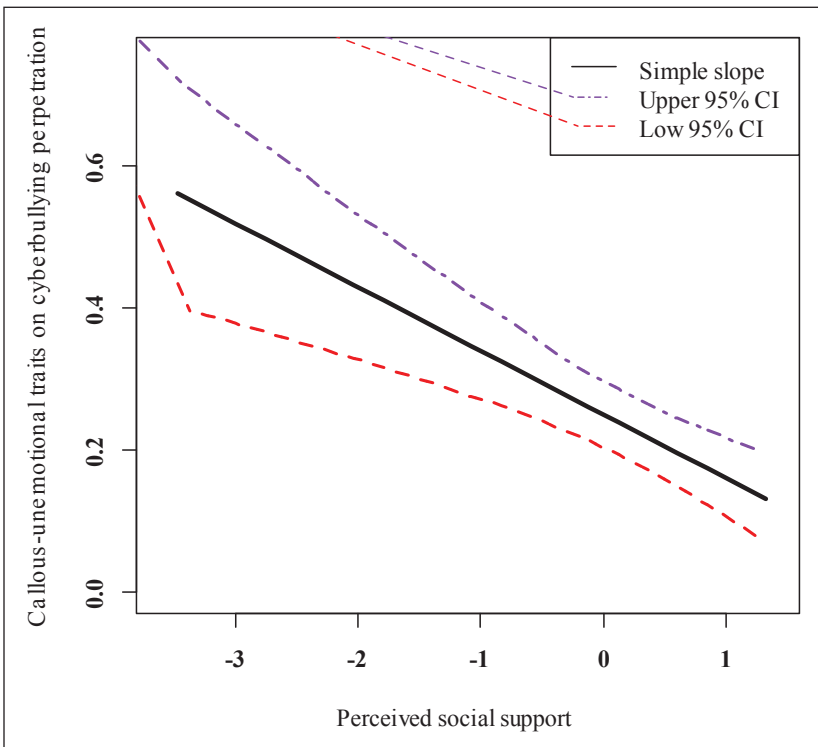


Figure 4. The conditional association between callous-unemotional traits and cyberbullying perpetration as a function of perceived social support.

Note. The dark line indicates the simple slope of callous-unemotional traits on cyberbullying perpetration. CI = confidence interval.

cyberbullying perpetration). Therefore, Hypothesis 2a was supported. However, the residual direct relationship between childhood maltreatment and cyberbullying perpetration was not moderated by perceived social support. Thus, Hypothesis 2b was not supported.

Discussion

Although the effect of childhood maltreatment on adolescent cyberbullying perpetration has accumulated considerable empirical support (Emirtekin et al., 2021; Hébert et al., 2016; Wang, Yang et al., 2021), the underlying mediation and moderation mechanisms are less clear. Thus, we formulated a moderated mediation model to test how childhood maltreatment works and whether all adolescents are equally influenced by childhood maltreatment. Our findings indicated that childhood maltreatment was significantly and positively associated with cyberbullying perpetration among Chinese adolescents and CU traits partially mediated this relationship. Furthermore, perceived social support moderated the relationship between childhood maltreatment and CU traits as well as CU traits and cyberbullying perpetration.

The Mediating Role of CU Traits

As predicted, CU traits partially accounted for the association between childhood maltreatment and adolescent cyberbullying perpetration. Thus, CU traits could serve as a “bridge” linking childhood maltreatment to adolescent cyberbullying perpetration. To the best of our knowledge, this is the first study that examines the mediating role of CU traits in the link between childhood maltreatment and adolescent cyberbullying perpetration.

In addition to the overall mediation result, each of the separate links in our mediation model is noteworthy. For the first stage of the mediation process (i.e., childhood maltreatment → CU traits), according to our findings, adolescents who experienced childhood maltreatment have higher levels of CU traits. This finding is congruent with the adaptive calibration model (Del Giudice et al., 2011). In other words, the development of CU traits is considered as a functional adaptation to childhood maltreatment. First, maltreated children may become unresponsive to maltreatment, which will lead them to deny being the maltreatment and thus to avert the conscious awareness of painful emotions and preserve the relationship with the abuser. This interpretation aligns with the previous finding (Kerig et al., 2012). Kerig and colleagues highlight that emotional numbing mediates the association between trauma and callousness. Second, maltreated children may suppress their

emotional responses to increase their readiness to attack or flee (Carlson et al., 2015; Del Giudice et al., 2011).

For the second stage of our mediation model (i.e., CU traits → cyberbullying perpetration), the present study found that individuals with higher level of CU traits were more likely to perpetrate cyberbullying. Two possible explanations exist for these findings. First, adolescents with CU traits have been found to exhibit low fearfulness and insensitivity to punishment (Pardini et al., 2003), which leads adolescents with high CU traits to ignore the consequences of behaviors and perpetrate cyberbullying. Second, adolescents with CU traits are insensitive to negative emotions and have difficulty in recognizing them (Frick et al., 2003). Likewise, due to the Chinese cultural tradition of suppressing emotional expression (Fang, Wang, Yuan, Wen, & Yu et al., 2020; Fung et al., 2009), it may be more difficult for the Chinese adolescents with CU traits to recognize the negative emotions of victims. This deficiency in the ability to process negative emotions may lead Chinese adolescents to easily disregard the apparent distress that they cause victims and perpetrate cyberbullying.

The Moderating Role of Perceived Social Support

Our results also showed that perceived social support moderated the relationship between childhood maltreatment and CU traits as well as CU traits and cyberbullying perpetration. Two specific patterns of protection emerged: stress-buffering and reverse stress-buffering. Specifically, the relationship between childhood maltreatment and CU traits was stronger for adolescents with higher levels of perceived social support, as shown by the reverse stress-buffering model. That is, although perceived social support serves as an important protective factor at low levels of childhood maltreatment, its benefits were erased under high levels of childhood maltreatment. Two possible explanations are as follows. First, according to attachment theory (Bowlby, 2005), adolescents with childhood maltreatment experiences are less likely to develop secure attachment styles (Yu et al., 2020). Therefore, even if adolescents receive more social support from peers and teachers, attachment insecurity will make it difficult for them to develop a sense of trust in others, preventing perceived social support from playing a protective role. This interpretation is supported by a longitudinal study (Davis et al., 2015) and emphasizes that parental support measured in wave 1 did not attenuate the effect of violence exposure measured in wave 1 on CU traits measured in the wave 2. Second, childhood maltreatment is a serious problem for Chinese adolescents (Wang, Yang et al., 2017; Wang, Yang et al., 2021), many Chinese parents still hold the attitude that “the rod makes an obedient son”, and so

even high levels of perceived social support cannot offset the deleterious impacts of childhood maltreatment on CU traits.

In contrast, perceived social support served as a buffer factor in the effect of CU traits on adolescent cyberbullying perpetration. This means that perceived social support alleviates the impact of CU traits on cyberbullying perpetration. Perceived social support provides adolescents with a sense of feeling connected to and supported by other individuals and, thus, may protect adolescents from the potential negative effects of CU traits. To our knowledge, no prior study has examined the moderating effect of perceived social support in the relationship between CU traits and adolescent cyberbullying perpetration. Our results fill this gap in understanding the importance of perceived social support in attenuating the negative effects of CU traits.

Contrary to our expectations, perceived social support did not moderate the relationship between childhood maltreatment and adolescent cyberbullying perpetration. This finding suggests that high childhood maltreatment is a salient risk factor for adolescent cyberbullying perpetration and perceived social support does not serve as a buffer against the adverse impact of high childhood maltreatment. The reasons are as follows. First, because of perpetrators of child maltreatment are most often parents, maltreated children and adolescents may be less likely to turn to their family for support. This interpretation is supported by work finding that family support did not moderate the relationship between child maltreatment and internalizing behaviors (Lo et al., 2021). Second, although maltreated adolescents may try to seek other sources of support, they may not have adequate social skills and confidence to build meaningful relationships with others (Lo et al., 2021). The mixed results of perceived social support would inspire future researchers to distinguish its moderating effect in different domains.

Limitations and Future Directions

Several limitations need to be considered when interpreting the findings. First, our study was cross-sectional and could not establish causal relationships. Although we were guided by theory and examined the impact of childhood maltreatment on CU traits, it is also possible that adolescent CU traits will cause more negative parenting (e.g., corporal punishment; Hawes et al., 2011). Therefore, future longitudinal design needs to clarify whether there is a reciprocal relationship between childhood maltreatment and adolescent CU traits. Second, though we paid attention to the potential impact of environmental factors (i.e., childhood maltreatment) on adolescent CU traits, we could not exclude the confounding effect of biological factors (i.e., gene) in the intergenerational transmission of CU traits. Two meta-analyses have

shown that genetic factors have a significant effect on CU traits (Dhanani et al., 2018; Moore et al., 2019). Further studies focus on the combined contributions of genetic and environmental factors to CU traits. Third, CU traits only partially mediate the relationship between childhood maltreatment and cyberbullying perpetration. Therefore, future studies should consider other factors such as moral disengagement that could further help explain this relationship (Kowalski et al., 2014; Wang, Yang et al., 2017; Wang, Yang et al., 2021). Fourth, a study showed that Chinese boys were more likely to engage in cyberbullying perpetration than girls in middle school (Wang, Wang, & Lei, 2019), so further studies should consider examining the gender effects in the indirect effects of childhood maltreatment on cyberbullying perpetration via CU traits. Finally, clustered data (i.e., students are nested within seven schools) might violate the assumption of ordinary least squares regression that each observation is independent of all other observations in the data set. However, seven schools were not sufficient for multilevel modeling (Hox, 1998), so it should be noted that there is no explanation for the fact that data is nested within schools.

Despite these limitations, the current study has several theoretical and practical contributions. From a theoretical perspective, this study further extends previous research by confirming the mediating role of CU traits and the moderating role of perceived social support. This will contribute to a better understanding of how and when childhood maltreatment influences adolescent cyberbullying perpetration. From a practical perspective, our study may provide information about how to reduce adolescent cyberbullying perpetration. For example, increasing adolescents' social support is a crucial component of intervention programs that target at reducing adolescent cyberbullying perpetration. It is important to note, however, that the protective role of perceived social support should not be exaggerated as its protective capacity may be overwhelmed at increased levels of childhood maltreatment.

Conclusion

In summary, although further replication and extension are needed, this study is an important step in unpacking how childhood maltreatment relates to adolescent cyberbullying perpetration. It shows that CU traits serve as one potential mechanism by which childhood maltreatment is associated with more cyberbullying perpetration. The focus on CU traits brings additional nuances in linking childhood maltreatment to adolescent cyberbullying perpetration. Importantly, this mediation mechanism is moderated by perceived social support. These findings suggest that adolescents' CU traits and perceived social support may be key targets for prevention and intervention programs dealing

with cyberbullying perpetration. We hope this study will inspire future researchers to better understand the phenomenon of cyberbullying perpetration and to advance the field of cyberbullying research.

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