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Cybervictimization and loneliness among Chinese college students: A moderated mediation model of rumination and online social support

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ABSTRACT

Although cybervictimization has been shown to play an important role in loneliness, little is known about mediating and moderating mechanisms underlying this relationship. In the present study, we examined the mediating role of rumination in the association between cybervictimization and loneliness and the moderating role of online social support. Four hundred and fifty-nine Chinese college students completed the measures of cybervictimization, rumination, loneliness, and online social support. The results indicated that cybervictimization was significantly and positively associated with loneliness, and rumination partially mediated this relationship. Moderated mediation analysis further indicated that the relationship between cybervictimization and rumination was moderated by online social support, and this relationship was only significant for college students with high online social support. The relationship between rumination and loneliness was also moderated by online social support, while this relationship is only significant for college students with low online social support.

1. Introduction

For more than a decade, cybervictimization has become a serious public health issue, and its prevalence is increasing (Camerini, Marciano, Carrara, & Schulz, 2020; Quintana-Orts, Rey, & Neto, 2020; Tokunaga, 2010). Cybervictimization is defined as a negative experience of being intentionally and repeatedly bullied through electronic or digital media from which victims cannot easily defend themselves (Li et al., 2018; Ouyang et al., 2020; Tokunaga, 2010). The forms of cybervictimization include being the target of flaming, harassment, outing and trickery, exclusion, impersonation, cyber-stalking, and sexting (Willard, 2007). A *meta*-analysis revealed that on average approximately 20–40% of Western countries' youths have experienced cyberbullying (Tokunaga, 2010). Another *meta*-analysis of eighty English-language studies in adolescents has shown mean prevalence rates of 15% for cybervictimization (Modecki, Minchin, Harbaugh, Guerra, & Runions, 2014). Recently, a systematic review indicates that thirty-five longitudinal studies reported on prevalence rates for cybervictimization ranging from 1.9 to 84.0 percent (median = 14.4 percent) (Camerini et al., 2020). It is also a serious problem for Chinese young people because the total number of youth netizen was estimated to be 369 million by the end of March 2020 (Center, 2020). For instance, 36.27% of mainland Chinese college students (Zhu et al., 2016) and 68% of Hong Kong college students (Leung, Wong, & Farver, 2018) reported being cybervictimized. A *meta*-analysis also demonstrated that cybervictims in high school were more likely to be cybervictims in college (Watts, Wagner, Velasquez, & Behrens, 2017). Cybervictimization among college students is an emerging issue that deserves attention.

Cybervictimization is associated with a series of adverse outcomes, such as depression, anxiety, low self-esteem and suicide (Camerini et al., 2020; Quintana-Orts et al., 2020; Tokunaga, 2010). Some empirical studies also have supported the idea that cybervictimization is significantly and positively associated with loneliness (Camerini et al., 2020; Cañas, Estévez, León-Moreno, & Musitu, 2020; Estévez, Estévez, Segura, & Suárez, 2019; Heiman, Olenik-Shemesh, & Eden, 2015; Shou & Chen, 2015; Wright, 2016). At the same time, offline peer victimization was also found to be positively linked to loneliness (Cao et al., 2020; Povedano, Cava, Monreal, Varela, & Musitu, 2015; Wang et al., 2020; Wu, Zhang, Su, & Hu, 2015; Zimmer-Gembeck, Trevaskis, Nesdale, & Downey, 2014). Although cybervictims are more likely than non-cybervictims to feel loneliness, much less is known about how and when cybervictimization increases the risk of college students'

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loneliness. Thus, the present study aimed to replicate the relationship between cybervictimization and loneliness and extend previous literature by utilizing a sample of college students to examine the mediating effect of rumination and the moderating effect of online social support.

1.1. Cybervictimization and loneliness

Loneliness is a distressful emotional state in which one holds the undesired perception of having few social relationships and being isolated from others (Peplau & Perlman, 1982). Ample cross-sectional studies have shown that cybervictimization is associated with increased loneliness (Cañas et al., 2020; Estévez et al., 2019; Heiman et al., 2015; Shou & Chen, 2015). Most importantly, a systematic review of longitudinal studies shows that cybervictimization significantly and positively predicts later loneliness (Camerini et al., 2020). For example, Wright (2016) shows that cybervictimization is linked positively to adolescents' loneliness one year later, even after controlling initial cybervictimization and face-to-face victimization. The effect of cybervictimization on loneliness can be explained by the stress exposure model (Chu, Fan, Lian, & Zhou, 2020; van den Eijnden, Vermulst, van Rooij, Scholte, & van de Mheen, 2014). According to this theory, victims may interpret cyberbullying as a form of negative peer evaluation or social rejection from peers, which may exacerbate their negative self-evaluation (Chu et al., 2020). Negative self-evaluation can reduce victims' motivation to build and maintain social relationships, thus making them less socially engaged and resulting in loneliness (Zhao et al., 2018).

1.2. The mediating effect of rumination

Rumination is defined as repetitive thoughts and obsessing on symptoms, causes, and consequences of past personal distress (Nolen-Hoeksema, 1991, 2000). The stress-reactive model of rumination emphasizes that stress can significantly induce and exacerbate rumination (Smith & Alloy, 2009). That is, rumination generally takes place after a stressful event such as cybervictimization. Furthermore, the response styles theory (Nolen-Hoeksema, 1991) believed that rumination, as a maladaptive response style, can exacerbate the negative effects of adverse life events on psychological condition by increasing negative thoughts and hindering social interaction. That is, cybervictimization might increase the feeling of loneliness by repeatedly experiencing feelings of social rejection and exclusion from others. Using the stress-reactive model of rumination and response styles theory as a theoretical standpoint, we proposed our first hypothesis: rumination would mediate the relationship between cybervictimization and loneliness (Hypothesis 1).

Consistent with this theoretical framework, ample cross-sectional studies have shown that both offline peer victimization (Chu, Fan, Liu, & Zhou, 2019; Mathieson, Klimes-Dougan, & Crick, 2014; Monti, Rudolph, & Miernicki, 2017) and cybervictimization (Chu et al., 2019; Zhong, Lai, & Tang, 2015) are significantly and positively associated with rumination. Moreover, two longitudinal studies further manifest that cybervictimization can significantly increase college students' rumination three weeks later (Feinstein, Bhatia, & Davila, 2014) and adolescents' rumination one year later (Jose & Vierling, 2018), even after controlling the initial rumination.

In addition, there is accumulating evidence to support rumination is strongly correlated with mental health problems such as loneliness (Borawski, 2019; Gan, Xie, Duan, Deng, & Yu, 2015; Zawadzki, Graham, & Gerin, 2013). Most importantly, two cross-sectional studies indicate that rumination mediates the relationship between cybervictimization and Chinese adolescents' depression (Chu et al., 2019; Zhong et al., 2015). Two longitudinal studies also show that rumination mediates the relationship between cybervictimization and American college students' depression (Feinstein et al., 2014) as well as cybervictimization and New Zealand adolescents' worse sleep (Jose & Vierling, 2018). Unfortunately, to our knowledge, no research to date has examined whether rumination mediates the relationship between cybervictimization and loneliness. Thus, the present study would examine this mediating effect.

1.3. The moderating effect of online social support

Although cybervictimization may be significantly associated with loneliness through the mediating role of rumination, not all individuals suffering from cyberbullying increase rumination and feel more loneliness. Thus, it is important to explore those factors that may increase or diminish (i.e., moderate) the strength of the associations among cybervictimization, rumination, and loneliness. Online social support is defined as the sense of identity and belonging that individuals get when they are understood and respected in the process of emotion, information, and material exchange in online interpersonal interaction (Liang, 2008). The forms of online social support include peer support, information support, affection support, and instrumental support (Liang, 2008). A systematic review shows that online social support from Facebook can effectively reduce feelings of loneliness (Gilmour, Machin, Brownlow, & Jeffries, 2019). According to the social support buffering hypothesis (Cohen & Wills, 1985), social support buffers individuals from the influence of stressful events (e.g., cybervictimization) and the impact of some risk factors (e.g., rumination).

Consistent with this theoretical framework, two longitudinal studies indicate that perceived social support from parents and teachers can separately weaken the relationship between cybervictimization and adolescents' depression after one year (Wright, 2017) as well as cybervictimization and adolescents' academic performance after one year (Wright, 2018). Surprisingly, only one cross-sectional study to our knowledge found that online social support alleviated the adverse effects of peer victimization on depression (Cole, Nick, Zelkowitz, Roeder, & Spinelli, 2017). Similarly, only one cross-sectional study to our knowledge indicated that perceived social support from family and friends attenuated the effect of rumination on negative affect (Puterman, DeLongis, & Pomaki, 2010).

However, two recent studies show that perceived social support plays a reverse stress-buffering role in the moderating effect of cybervictimization and negative consequences (Li et al., 2018; Ouyang et al., 2020). That is, a protective factor (i.e., social support) strengthens the relationship between a risk factor and negative outcomes. Specifically, Li et al. (2018) found that the relationship between cybervictimization and depression as well as cybervictimization and psychological insecurity were stronger for adolescents with a high level of perceived social support. Similarly, Ouyang et al. (2020) found that the relationship between cybervictimization and alcohol use was stronger for adolescents with a high level of perceived social support.

To our knowledge, no previous research has examined the moderating effect of online social support in the direct and indirect relationships between cybervictimization and loneliness. Given that previous findings of social support have been mixed, without presupposing a specific moderating pattern, we hypothesized online social support moderates the direct and indirect links between cybervictimization and loneliness.

To sum up, we proposed a moderated mediation model linking cybervictimization to college students' loneliness, in which rumination was a mediator and online social support was a moderator (Fig. 1).

2. Method

2.1. Participants

In the present study, we used a convenient sampling to recruit five hundred college student participants from six universities in Guangdong Province, China. After excluding participants with invalid data, four hundred and fifty-nine participants were included in the full

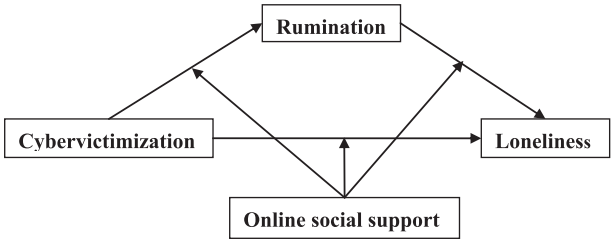

Fig. 1. The proposed moderated mediation model.

analyses. The mean age of the participants was 20.70 (SD = 1.66, range = 18–24). 68.63% (315/459) of the participants were female, 77.8% (357/459) of the participants had one or more siblings, and 57.1% (262/459) of the participants reported their place of residence as urban. We chose college students because they spend more time on the internet than adolescents due to the decline in parental control, decreased academic stress and learning burdens, and increased the popularity of digital products (Feinstein et al., 2014; Wang et al., 2019). As a result, college students may be particularly likely to experience cybervictimization and its negative consequences.

2.2. Measures

Cybervictimization. Cybervictimization was measured by the Chinese version (Zhou et al., 2013) of Cybervictimization Inventory (Erdur-Baker & Kavsut, 2007). Eighteen activities of cybervictimization are depicted on this scale. An example activity is "Someone spread rumors about me online". Respondents were asked to indicate the number of times that they were cybervictimized in the past semester on a four-point scale ranging from 1 (*never*) to 4 (*more than five times*). This scale has shown adequate reliability and validity among the Chinese population (Chu et al., 2019; Zhou et al., 2013). Responses to all items were averaged, with higher scores indicating higher levels of cybervictimization. Cronbach's α was 0.94 in the study.

Rumination. Rumination was measured by the Chinese version (Han & Yang, 2009) of the Ruminative Response Scale (Nolen-Hoeksema & Morrow, 1991). Although the original scale includes three dimensions, to constructing a measure of rumination unconfounded with depression content, only two dimensions (10 items) were used in the present study, namely brooding (e.g., "Think 'Why can't I handle things better?'") and reflection (e.g., "Write down what you are thinking and analyze it") (Treynor, Gonzalez, & Nolen-Hoeksema, 2003). This scale has shown adequate reliability and validity among the Chinese population (Gan et al., 2015; Han & Yang, 2009; Liu, Yang, Zhu, & Zhang, 2019; Zhong et al., 2015). Participants rated each item on a four-point scale (1 = *never*, 4 = *always*), with higher scores indicate a higher tendency to ruminate. Cronbach's α for the two subscales were 0.81 and 0.71, respectively.

Loneliness. Loneliness was measured by the Chinese version (Wang, Wang, & Ma, 1999) of the UCLA Loneliness Scale (Russell, Peplau, & Cutrona, 1980). Participants rated the 20 items (e.g., "How often do you feel that you are no longer close to anyone?") on a four-point scale ranging from 1 (*never*) to 4 (*always*). This scale has shown adequate reliability and validity among the Chinese population (Liu et al., 2019; Shou & Chen, 2015). Responses to all items were averaged, with higher scores indicating higher levels of loneliness. Cronbach's α was 0.88 in the study.

Online Social Support. Online Social Support Scale developed by Liang (2008) is a 23-item questionnaire. This scale was developed for adolescents in the Chinese population, and its psychometric properties were also examined in the Chinese adolescent and college student population (Liang, 2008). Many previous studies have used this scale (e.g., Yang, Liu, & Zhou, 2017; Zhao, Zhang, Liu, Wang, & Zhou, 2012), and it showed good reliability and validity in Chinese samples. This scale includes four dimensions: information support (5 items, e.g., "I can get interesting sports and entertainment information from others through networking"), peer support (8 items, e.g., "I get emotional support from my online friends when I am down or upset"), affection support (6 items, e.g., "When I post my success message online, someone will congratulate me"), and instrumental support (4 items, e.g., "I can exchange items with people through the Internet"). Each item was scored from 1 (*strongly disagree*) to 5 (*strongly agree*). Responses to all items were averaged, with higher scores representing higher levels of online social support. Cronbach's α for the four subscales were 0.89, 0.89, 0.84, and 0.76, respectively.

2.3. Procedure

This investigation was approved by the first author's University Ethics Committee. We obtained assent from all participating college students before the data collection. College students filled out questionnaires in a quiet classroom and were free to withdraw from the study at any time. The anonymity of the study was emphasized before data collection.

2.4. Data analysis

First, responses with missing data were excluded from the data processing, and then whether data followed normal distribution was examined. The skewness and kurtosis of rumination, loneliness, and online 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 cybervictimization (skewness = 2.82, kurtosis = 9.74) were somewhat skewed. Thus, we used a natural logarithmic transformation on the overall mean scores of cybervictimization to approximate the normal distributions. The transformed cybervictimization (skewness = 1.95, kurtosis = 3.81) was used for the following analyses.

Second, descriptive statistics and Pearson correlations were calculated among the study variables. Third, the PROCESS macro for SPSS (Model 4) was applied to examine the mediating effect of rumination (Hayes, 2013). Fourth, the PROCESS macro (Model 59) was applied to examine the moderating effect of online social support in the direct and indirect links between cybervictimization and loneliness. The bootstrap confidence intervals (CIs) determine whether the effects in Model 4 and Model 59 are significantly based on 5000 random samples (Hayes, 2013). An effect is regarded as significant if the CIs do not include zero. All study variables were standardized in Model 4 and Model 59 before data analyses.

3. Result

3.1. The prevalence of cybervictimization and preliminary analyses

Of the 315 female college students, 29.84% (94/315) reported having no experienced cyberbullying during the last semester. Of the 144 male college students, 20.14% (29/144) reported having no experienced cyberbullying during the last semester. That is, prevalence

Table 1
Descriptive statistics and correlations among variables of interest.

	M	SD	1	2	3	4
1. Cybervictimization	0.19	0.23	1			
2. Rumination	2.35	0.51	0.15**	1		
3. Loneliness	2.29	0.39	0.19**	0.21**	1	
4. Online social support	3.29	0.56	−0.09*	0.04	−0.18**	1
Skewness	–	–	1.95	0.39	−0.37	−0.48
Kurtosis	–	–	3.81	0.43	0.57	0.96

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table 2
Testing the mediation effect of cybervictimization on loneliness.

Predictors	Model 1 (Loneliness)		Model 2 (Rumination)		Model 3 (Loneliness)	
	β	*t*	*β*	*t*	*β*	*t*
Gender	−0.06	−0.60	−0.01	−0.08	−0.06	−0.59
CV	0.20	4.06***	0.15	3.04**	0.17	3.51***
Rumination					0.19	4.06***
R^2	0.04		0.02		0.07	
F	8.51***		5.08**		11.36***	

Note. CV = Cybervictimization. Each column is a regression model that predicts the criterion at the top of the column. The beta values are standardized coefficients, thus they can be compared to determine the relative strength of different variables in the model. Gender was dummy coded such that 0 = female and 1 = male. **p < 0.01. *** p < 0.001.

rates for cybervictimization in the current study are 70.16% for females and 79.86% for males, respectively. In addition, Table 1 shows means, SDs, skewness, kurtosis, and Pearson correlations for the study variables. As the results showed, cybervictimization were positively correlated with rumination and loneliness, and negatively correlated with online social support. Rumination was positively correlated with loneliness. Loneliness was negatively correlated with online social support.

3.2. Testing for mediation effect

In Hypothesis 1, we assumed that rumination would mediate the relationship between cybervictimization and loneliness. This hypothesis was tested with Model 4 of the PROCESS macro (Hayes, 2013). As Table 2 shows, cybervictimization was positively associated with rumination ($\beta = 0.15, t = 3.04, p < 0.001$), which in turn was positively related to loneliness ($\beta = 0.19, t = 4.06, p < 0.001$). The positive direct association between cybervictimization and loneliness remain significant ($\beta = 0.17, t = 3.51, p < 0.001$). Therefore, Hypothesis 1 was supported. Rumination partially mediated the relationship between cybervictimization and loneliness (indirect effect = 0.03, SE = 0.012, 95% CI = [0.01, 0.06]). The mediation effect accounts for 14% of the total effect of cybervictimization on loneliness.

Since rumination includes two dimensions of brooding and reflection, we also tested two mediation models with brooding and reflection, respectively. The result showed that brooding partially mediated the relationship between cybervictimization and loneliness (indirect effect = 0.03, SE = 0.01, 95% CI = [0.01, 0.05]). The mediation effect accounts for 13.3% of the total effect of cybervictimization on loneliness. Reflection also partially mediated the relationship between cybervictimization and loneliness (indirect effect = 0.02, SE = 0.01, 95% CI = [0.003, 0.044]). The mediation effect accounts for 10.2% of the total effect of cybervictimization on loneliness (see supplemental materials for detail).

3.3. 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 online social support moderation test are shown in Table 3. Model 1 of Table 3 shows that the product (interaction term) of cybervictimization and online social support had a significant positive effect on rumination ($\beta = 0.13, t = 3.49, p < 0.001$). For descriptive purposes, we plotted predicted cybervictimization against rumination, separately for low and high levels of online social support (Fig. 2). Simple slope tests showed that for college students with high online social support (1 SD above the mean), cybervictimization significantly predicted rumination, $b_{simple} = 0.31, p < 0.001$. However, for college students with low online social support (1 SD below the mean), the relationship between cybervictimization and rumination became non-significant, $b_{simple} = 0.05, p = 0.47$. Therefore, the moderating role of online social support is consistent with the reverse stress-buffering model.

Table 3
Testing the moderated mediation effect of cybervictimization on loneliness.

Predictors	Model 1 (Rumination)		Model 2 (Loneliness)	
	β	*t*	*β*	*t*
Gender	−0.01	−0.08	−0.09	−0.88
CV	0.18	3.63***	0.18	3.73***
OSS	0.03	0.73	−0.19	−4.14***
CV × OSS	0.13	3.49***	0.02	0.60
Rumination			0.20	4.30***
Rumination × OSS			−0.12	−3.18**
R^2	0.05		0.12	
F	6.03***		10.45***	

Note. Each column is a regression model that predicts the criterion at the top of the column. CV = Cybervictimization. OSS = Online Social Support. The beta values are standardized coefficients, thus they can be compared to determine the relative strength of different variables in the model. Gender was dummy coded such that 0 = female and 1 = male.
**$p < 0.01$. ***$p < 0.001$.

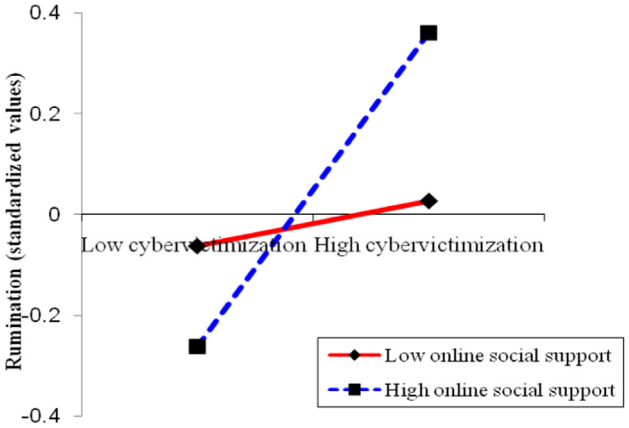

Fig. 2. Interaction between cybervictimization and online social support on rumination.

Moreover, model 2 of Table 3 shows that the product (interaction term) of rumination and online social support had a significant negative effect on loneliness ($\beta = -0.12, t = -3.18, p < 0.01$). For descriptive purposes, we plotted predicted rumination against loneliness, separately for low and high levels of online social support (Fig. 3). Simple slope tests showed that for college students with low online social support (1 SD below the mean), rumination significantly predicted loneliness, $b_{simple} = 0.32, p < 0.001$. However, for college students with high online social support (1 SD above the mean), the relationship between rumination and loneliness became non-significant, $b_{simple} = 0.07, p = 0.22$. Thus, the moderating role of online social support is consistent with the stress-buffering model. In addition, the moderating effect of online social support was not significant in the

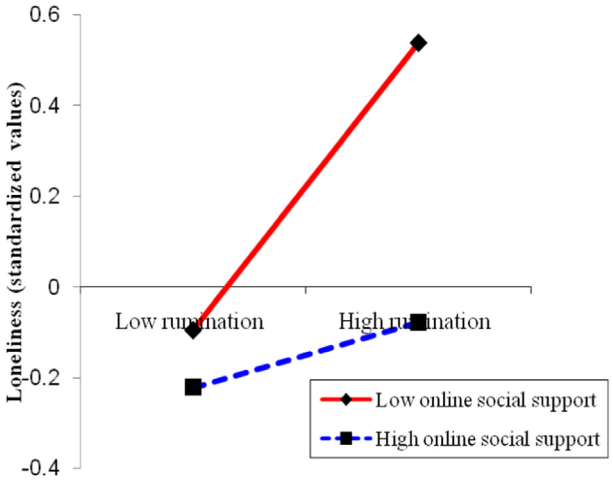

Fig. 3. Interaction between rumination and online social support on loneliness.

relationship between cybervictimization and loneliness.

Since online social support includes four dimensions: peer support, information support, affection support, and instrumental support, a 4 (types of moderator) × 2 (types of mediator) factorial design with 8 different conditions were used to evaluate moderated mediation model (Model 59 of the SPSS macro PROCESS). The results are as follows. First, when brooding is a mediator, for the first stage of the mediation process (i.e., cybervictimization → brooding), the product of cybervictimization and peer support had a significant positive effect on brooding ($\beta = 0.17$, $t = 3.77$, $p < 0.01$); the product of cybervictimization and affection support had a significant positive effect on brooding ($\beta = 0.14$, $t = 3.56$, $p < 0.001$); the product of cybervictimization and information support had a significant positive effect on brooding ($\beta = 0.10$, $t = 2.89$, $p < 0.01$); the product of cybervictimization and instrumental support had no significant predictive effect on brooding. Second, when brooding is a mediator, for the second stage of the mediation process (i.e., brooding → loneliness), only the product of brooding and peer support had a significant negative effect on loneliness ($\beta = -0.10$, $t = -2.77$, $p < 0.01$).

Third, when reflection is a mediator, for the first stage of the mediation process (i.e., cybervictimization → reflection), the product of cybervictimization and peer support had a significant positive effect on reflection ($\beta = 0.11$, $t = 2.40$, $p = 0.02$); the product of cybervictimization and affection support had a significant positive effect on reflection ($\beta = 0.09$, $t = 2.17$, $p = 0.03$); the product of cybervictimization and instrumental support had a significant positive effect on reflection ($\beta = 0.13$, $t = 2.77$, $p < 0.01$); the product of cybervictimization and information support had no significant predictive effect on reflection. Fourth, when reflection is a mediator, for the second stage of the mediation process (i.e., reflection → loneliness), the product of reflection and peer support had a significant negative effect on loneliness ($\beta = -0.15$, $t = -3.80$, $p < 0.001$); the product of reflection and affection support had a significant negative effect on loneliness ($\beta = -0.10$, $t = -2.33$, $p = 0.02$); the product of reflection and instrumental support had a significant negative effect on loneliness ($\beta = -0.10$, $t = -2.35$, $p = 0.02$); the product of reflection and information support has no significant predictive effect on loneliness. Fifth, the moderating effect of online social support was not significant in the relationship between cybervictimization and loneliness under all conditions (see supplemental materials for detail).

4. Discussion

Although the effect of cybervictimization on loneliness has accumulated considerable empirical support (Camerini et al., 2020; Cañas et al., 2020; Estévez et al., 2019; Heiman et al., 2015; Shou & Chen, 2015; Wright, 2016), the underlying mediation and moderation mechanisms are less clear. Thus, we formulated a moderated mediation model to test how cybervictimization works and whether all individuals are equally influenced by cybervictimization. Our findings indicated that cybervictimization was significantly and positively associated with loneliness among Chinese college students, and rumination partially mediated this relationship. Furthermore, online social support moderated the relationship between cybervictimization and rumination as well as rumination and loneliness.

4.1. The mediating role of rumination

As predicted, rumination partially accounted for the association between cybervictimization and loneliness among college students. Therefore, rumination is not only an outcome of cybervictimization, but also a catalyst of loneliness. To the best of our knowledge, this is the first study that examines the mediating role of rumination in the link between cybervictimization and loneliness among college students.

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., cybervictimization → rumination), we found that cybervictimization was positively associated with rumination. This finding coincides with the previous studies (Chu et al., 2019; Feinstein et al., 2014; Jose & Vierling, 2018; Zhong et al., 2015) and supports the stress-reactive model of rumination (Smith & Alloy, 2009). There are two possible explanations for this founding. First, cybervictimization can cause college students' increased participation in rumination about how to reduce the difference between current states (e.g., being bullied online) and desired goals (e.g., being popular online) in interpersonal relationships (Watkins, 2008). Second, frequent exposure to cybervictimization may disrupt individuals' social self-efficacy, leading them to choose to withdraw from subsequent stressful situations instead of proactively solving problems (Monti et al., 2017). Therefore, cybervictimization may catalyze for maladaptive responses such as rumination.

For the second stage of the mediation process (i.e., rumination → loneliness), the present study found that rumination significantly accelerated feelings of loneliness. This finding supports the response styles theory (Nolen-Hoeksema, 1991). Rumination can prompt college students to continuously recall bullied experience (Nolen-Hoeksema, 1991, 2000). Accordingly, repeatedly experiencing the feeling of being excluded and isolated by others increases greater loneliness among college students (Zhao et al., 2018). Thus, rumination triggers more negative emotions (e.g., loneliness) and leads to a higher level of pessimism (Nolen-Hoeksema, 1991, 2000; Zheng, Zhou, Liu, Yang, &, Fan, 2019). Furthermore, according to the social compensation theory (Boniel-Nissim & Sasson, 2018), college students who feel lonely in the offline context go online to make a friend alleviate loneliness. However, the fact that college students are cybervictimized makes them experience more negative peer evaluation and rejection. The interaction of lack of belonging both offline and online makes college students feel more lonely.

4.2. The moderating role of online social support

The results also showed that online social support moderated the relationship between cybervictimization and rumination as well as rumination and loneliness. Two types of moderation patterns emerged: The stress-buffering model and the reverse stress-buffering model. Specifically, the relationship between cybervictimization and rumination was exacerbated by online social support, as shown by the reverse stress-buffering model. Some previous studies have provided evidence for this moderation pattern (Li et al., 2018; Ouyang et al., 2020). One explanation is that college students with high levels of online social support are more likely to spend more time on the internet (Brailovskaia, Rohmann, Bierhoff, Schillack, & Margraf, 2019; Fang,

Wang, Wen, & Zhou, 2020; Liu & Ma, 2018), thereby increasing their risk of being cyberbullied (Sampasa-Kanyinga & Hamilton, 2015), and ultimately leading to increased rumination (Chu et al., 2019; Zhong et al., 2015). Another possible explanation is the conflict between being cyberbullied (i.e., not being liked by others) and high online social support (i.e., being liked by others) makes college students have a cognitive dissonance, which promotes them rumination about how to reduce their cognitive dissonance.

Following the stress-buffering model, the relationship between rumination and loneliness was alleviated by perceived social support. Specifically, the relationship between rumination and loneliness was significant for college students with low online social support, while it was not significant for college students with high online social support. Therefore, online social support can be regarded as a hopeful indicator to distinguish whether college students with high rumination would present high feelings of loneliness. One possible explanation is that, for college students with high online social support, they can get comfort, warmth, and encouragement from their online peers when they need to face the negative consequences of rumination. That is, online social support provides college students with a sense of feeling connected to and supported by others and therefore may compensate for rumination evoked by cybervictimization. In contrast, a low level of online social support may make college students feel excluded from social relationships with others and thus may not prevent the feeling of loneliness from rumination caused by cybervictimization.

Contrary to our expectation, online social support did not moderate the relationship between cybervictimization and loneliness. There are two possible explanations. One possible explanation is that college students who are cybervictimized may be rejected and isolated by online peers and not has enough online social supports. Another possible explanation is that college students feel embarrassed or ashamed about the experience of cybervictimization and therefore choose to hide their experience of cybervictimization as a secret and rather than seek social support and help from others (Mathieson et al., 2014). Thus, even with a high level of online social support, college students who are cybervictimized could only dwell on the negative effect of cybervictimization. The mixed results of online social support would inspire future researchers to distinguish its moderating effect in different domains.

4.3. Limitations and future directions

Several limitations need to be considered when interpreting the findings. First, our cross-sectional data limit causal inferences. Future research should use longitudinal designs to test our moderated mediation model. Second, the present study used college students' self-report to collect data. To assess the possible common method bias, Harman's one-factor test (Podsakoff & Organ, 1986) was conducted on all measurement items. In the current study, the results showed that the first factor did not account for the majority of the variance (only 15.77% < 40%), and there was no general factor in the unrotated factor structure. Therefore, common method variance was unlikely to be a serious threat in this study. Third, the current study used a convenient sample of college students, and the majority of the participants were female. The generalizability of the findings should be further verified by an adolescent sample with a more equal proportion of both genders.

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 rumination and the moderating role of online social support. This will contribute to a better understanding of how and when cybervictimization influence loneliness. From a practical perspective, our study may provide information about how to reduce college students' loneliness. For example, college students may also reduce their loneliness by increasing online social support and decreasing cybervictimization. Furthermore, educators and practitioners should focus more on college students with a high level of rumination and let them know the negative effect of rumination and teach them to alleviate rumination in cyberspace.

5. Conclusion

In summary, although further replication and extension are needed, this study is an important step in unpacking how cybervictimization relates to the loneliness of Chinese college students. It shows that rumination serves as one potential mechanism by which cybervictimization is associated with more feelings of loneliness. The focus on rumination brings additional nuances in linking cybervictimization to the loneliness of college students. Moreover, the relationship between cybervictimization and rumination is moderated by online social support, and this relationship is only significant for college students with high online social support. The relationship between rumination and loneliness is also moderated by online social support, and this relationship is only significant for college students with low online social support.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.childyouth.2020.105085.

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