A path to relief from the intertwined effects of school bullying and loneliness: the power of social connectedness and parental support

Huaqiang Liu[1], Zhensong Lan[2*], Qing Wang[3], Xuefang Huang[4] and Jianming Zhou[5]

Abstract

Background School bullying is a widespread phenomenon affecting a considerable proportion of adolescents worldwide, yet the relationship between school bullying and loneliness has received little attention. The aim of the present study was to understand the relationship between experiencing school bullying and loneliness among adolescents and to explore the role of social connectedness and parental support in this dynamic.

Methods We used cluster sampling to select 1277 students between grades 7 and 12 in four middle schools across two cities in Sichuan Province, China. Data were collected via questionnaires and analysis was conducted using descriptive statistics, chain mediation model tests, and moderation model tests.

Results We found that bullying was significantly positively correlated with adolescent loneliness ($r = 0.55$, $P < 0.001$). Additionally, social connectedness played a mediating role between bullying and adolescent loneliness (effect size 51.57%). After controlling for gender, age, and household registration type, parental support moderated the relationship between bullying and loneliness among adolescents ($\beta = -0.05$, $P < 0.01$). As the level of parental support increased, the positive predictive effect of bullying on loneliness weakened significantly, although this moderating effect was not significant among participants who were not "left-behind" children.

Conclusion The study findings confirmed the relationship between school bullying and loneliness and revealed the internal logical relationship among social connectedness, parental support, loneliness, and school bullying. Our findings are valuable in preventing the negative effects of school bullying on left-behind children.

Keywords Bullying, Loneliness, Adolescents, Social connectedness, Parental support

*Correspondence:
Zhensong Lan
224071@sr.gxmu.edu.cn
[1]School of Law and Public Administration, Yibin University, Yibin 644000, Sichuan, China
[2]School of Humanities and Social Sciences, Guangxi Medical University, No.22, Shuangyong Road, Qingxiu District, Nanning 530021, Guangxi, China
[3]School of Sociology and Humanities, Jiangxi University Of Finance And Economics, Nanchang 330013, Jiangxi, China
[4]School of Teacher Education, Hechi University, Yizhou 546300, Guangxi, China
[5]Institute of Physical Education, NanJing Xiao Zhuang University, Nanjing 210013, Jiangsu, China

Introduction

School bullying and loneliness are prevalent issues in the interpersonal relationships of adolescents [1, 2]. These two factors may influence each other owing to the mutually reinforcing nature of internalizing and externalizing behaviors, which can lead to long-term consequences for both perpetrators and victims of bullying at school [3]. The high incidence of school bullying causes substantial harm and represents a persistent challenge in school education and management [4]. According to a multinational survey by the World Health Organization, 9–13% of children aged 11 to 15 years reported having been bullied in recent months [5]. In a meta-analysis regarding the prevalence of bullying and cyberbullying, the average rate of traditional bullying (both perpetrator and victim roles) was 35%, and the average rate of cyberbullying was 15% [6]. A survey of 104,825 primary and secondary school students across 29 counties in China revealed that the prevalence of school bullying was 33.36% [7]. Being bullied can have long-term negative effects on health and is widely recognized as one of the most important public health concerns during adolescence [5]. School bullying can serve as a precursor to loneliness among adolescents. According to evolutionary theory [8], individuals who violate societal norms in some way are often ostracized by their peers. As a breach of social rules, bullying can negatively affect both the perpetrator and victim [9, 10]. Studies indicate that loneliness during early adolescence is linked to peer bullying [11]. Additionally, the experience of loneliness increases with increased frequency of peer bullying [12].

In recent years, schools worldwide have developed and implemented various school violence intervention programs; however, the effectiveness of these interventions has fallen short of expectations [13]. The reason for this lies in the fact that these school bullying intervention programs have not adequately addressed factors beyond the school environment [14]. Most previous studies on bullying have focused on loneliness from the victim's perspective [15]. How school bullying affects an adolescent's sense of loneliness and whether other factors have a role in this process require further exploration. The social–ecological model provides a useful framework for examining and exploring the social phenomenon of school bullying [16]. In this study, we aimed to explore the impact of bullying and social connectedness on adolescent loneliness and to analyze the mechanisms via which parental support could improve the relationship among school bullying, social connectedness, and loneliness in adolescents. Our study's findings have practical implications for preventing and intervening with respect to loneliness experienced by adolescents who are bullied at school.

The relationship between bullying and loneliness

Bullying is generally understood as a result from an imbalance of power [17], where perpetrator engages in rough or aggressive behavior toward the victim, with the intent to cause psychological, emotional, or physical harm [18]. Bullying can also involve repeated and prolonged acts of aggression or deliberate behavior by a group or individual against someone who is unable to easily defend themself [19]. Research has shown that adolescents who are bullied tend to exhibit higher levels of depression and anxiety than their non-bullied counterparts, along with signs of poor social adjustment [20] or a desire for social interaction with hesitancy to proactively engage in peer interaction [21]. Although loneliness can lead to certain positive outcomes such as a deeper understanding of oneself, loneliness tends to arise from an individual's painful or hurtful experiences [22]. Individuals who feel lonely exhibit objective or subjective social isolation and experience painful emotions of not feeling accepted owing to actual or perceived isolation or a lack of contact with others [23]. The prolonged social distress caused by bullying can also lead to physical symptoms in some individuals [21].

Studies have indicated that the victims of bullying often experience feelings of loneliness [24], which in turn, leads to a sense of isolation and alienation [25]. Adolescents who are bullied often experience anxiety and insecurity about themselves [26] and frequently feel lonely or rejected at school [20, 26]. In Europe, as many as 36% of students who are frequently bullied report feeling lonely at school [27]. To further clarify the relationship between bullying and adolescent loneliness, we proposed the following hypothesis [H1]: There is a significant positive correlation between bullying and loneliness among adolescents.

The mediating role of social connectedness between bullying and loneliness

Bullying is closely linked to an individual's "social environment". [28] Social–ecological theory suggests that both bullying and victimization are shaped by multiple factors, including individual, family, school, peer group, community, and societal influences [29]. The belongingness hypothesis suggests that evolutionary selection has guided humans to interact with others, and has driven them to engage in social activities and establish close relationships [30]. If these interactions are not present, there is a motivational force or need for connection, which can lead to the root pain of loneliness [31]. Some scholars have proposed that chronic loneliness and poor social skills are related to negative peer interactions, and children who are more readily accepted by their peers and have greater opportunities for social interaction are less likely to experience loneliness compared with those

Liu *et al. BMC Public Health*   (2025) 25:1850

Page 3 of 12

who have low social connectedness [32, 33]. Considered a negative interpersonal experience, bullying can disrupt an individual's connection with their peers and undermine their psychological safety [34], leading to feelings of social isolation and a lack of social interaction [30]. This, in turn, can manifest as loneliness.

Loneliness is most commonly understood as actual or perceived social isolation, that is, an actual or perceived lack of social contact. [30]. People who experience feelings of loneliness tend to have low levels of social connectedness [35] and a more negative outlook owing to the lack of a good social support system. These individuals also struggle to actively engage in social interaction [36]. Different types of social relationships can provide various types of social capital or meet different interpersonal needs [37]. The stress-buffering theory emphasizes that social support primarily helps children with emotional or affective stress by offering opportunities for catharsis and venting in relational interactions, as well as buffering when internalizing pain [38]. The ability to form friendships, the quality of these relationships, and peer support play crucial roles in protecting victims from the adverse effects of bullying [39, 40, 41, 42, 43]. In fact, individuals who feel lonely are those who most need communication with others and seek to establish good interpersonal relationships to obtain important emotional support and friendship [44]. We additionally proposed the following hypothesis [H2]: Social connectedness plays a mediating role between school bullying and adolescent loneliness.

The moderating role of parental support between bullying and loneliness

Adolescence is a critical stage in psychological development, and seeking social support during this time is vital [45]. Family structure and education are key factors that influence adolescent development [46]. Although peer relationships are central to adolescents' social lives, the parent–child relationship is equally important [47], a factor often overlooked in past studies on school bullying [48]. When adolescents do not receive sufficient social support from their families, this can negatively affect their self-confidence and lead to emotional issues such as loneliness [49, 50]. The family is a key factor influencing a child's risk of being involved in bullying and of loneliness [51]. One study showed that adolescents with secure early attachment to their parents were more likely to form positive relationships, [52] whereas a lack of secure attachment could lead to peer conflict, rejection, and behavioral problems [53].

Attachment theory suggests that children and adolescents in distress develop a tendency to seek parental support, and those who receive consistent support from their parents tend to feel safer [54]. Contrarily, when adolescents experience a persistent lack of parental support

during times of stress and emotional pain, they often shift their attention away from their parents and toward their environment in an attempt to suppress their negative emotions [55]. Both perpetrators and victims of bullying report receiving less parental social support than their peers who are not involved in bullying behaviors [56]. One study found that perceived parental autonomy support could negatively predict loneliness in children [51].

Parents can provide a supportive environment for adolescents that can offset the pressure of loneliness [57]. However, whether parental support is beneficial in reducing loneliness among adolescents who experience bullying remains unclear. We further proposed the following hypothesis [H3]: Parental support plays a moderating role between adolescents experiencing school bullying and loneliness.

Parental support, bullying, and loneliness among left-behind children

The term "left-behind children" emerged during the early 1990s; [58] this term is commonly used to describe children under age 18 years with one or both parents who migrate to work for more than 6 months, leaving them behind in their hometown. Owing to intergenerational care, a lack of emotional warmth, or neglect, some left-behind children exhibit extroverted, irritable behavior and struggle to control their emotions, often bullying others. Other children in this group tend to be introverted, exhibiting emotional coldness and loneliness [59]; these vulnerable traits make them easy targets for bullies, thereby reinforcing bullying behavior [57]. Early studies suggest that left-behind children are more likely to experience psychological health problems [60], with loneliness being among the most common and widespread issues [61]. Owing to weaker family structures, left-behind children are more prone to low self-esteem and more vulnerable to school bullying than non-left-behind children [57, 62, 63, 64]. These negative experiences often lead to further emotional and behavioral problems among the former group [65, 66].

After being bullied, left-behind children may struggle to regulate their negative emotions [67]. The absence of parental companionship and intimacy can intensify feelings of loneliness in these children [68, 69]. Over time, both internalizing and externalizing problems may emerge, with victims finding it difficult to regulate their emotions, leading to loneliness and more severe psychological and behavioral issues [70, 46]. School bullying negatively affects the mental and behavioral health of adolescents. In contrast, adequate parental support helps mitigate these effects. A lack of parental contact, understanding, and communication increases the likelihood of loneliness among adolescents [71]. For left-behind

Liu *et al. BMC Public Health*   (2025) 25:1850

Page 4 of 12

children, parental support is especially critical in preventing bullying and reducing its negative consequences. We proposed an additional hypothesis [H4]: Parental support moderates the relationship between bullying and loneliness among left-behind children.

Research methods

Participants

In this study, we selected adolescents between grades 7 and 12 in four middle schools across two cities in Sichuan Province, China, during January 2023. We conducted stratified cluster sampling according to class, with two classes selected from each grade in the four schools, totaling 1320 adolescent participants. A questionnaire survey was administered offline in a group setting. Of 1320 questionnaires distributed, 1277 valid surveys were collected after excluding those with invalid responses, accounting for 96.74% of the total. This study received ethical approval from the Human Research Ethics Committee of Yibin University in China (review report no. 2022042101Y).

Among all valid surveys, the average age was 14.34 years (standard deviation [SD] = 1.72), with 678 male (53.1%) and 599 female (46.9%) adolescents; 269 participants had urban household registration (21.1%), and 1008 had rural household registration (78.9%). In total, 211 adolescents were in the seventh grade (16.5%), 245 in the eighth grade (19.2%), 255 in the ninth grade (20.0%), 194 in the tenth grade (15.2%), 183 in the eleventh grade (14.3%), and 189 in the twelfth grade (14.8%). In total, 603 adolescents were left-behind children, comprising 47.22% of the sample. The remaining 674 children (52.78%) were non-left-behind children (Table 1).

Measurements

(A) **Loneliness Scale.** The "Adolescent Loneliness Scale," revised by Zou [72] was used as measurement tool to assess levels of adolescent loneliness. The scale comprises 21 items, covering four dimensions: emotional loneliness, perceived social competence, peer relationship evaluation, and satisfaction with important relationships. Participants were asked to score each item, for example, "I have no one to talk to in class." Each item was scored using a 5-point Likert scale, with scoring rules 1 = Never, 2 = Occasionally, 3 = Sometimes, 4 = Often, and 5 = Always. Items 1, 3, 4, 7, and 11 are reverse-scored; the others are forward-scored. Higher scores indicate stronger feelings of loneliness. In this study, the scale's Cronbach's alpha was 0.93; the Kaiser–Meyer–Olkin (KMO), and Bartlett's test value was 0.94.

(B) **Bullying Scale.** In this study, we used the Delaware Bully Victimization Scale (Student Form), as revised by Xie et al. [73] The revised scale includes 12 items, covering three dimensions: verbal bullying, physical bullying, and social/relational bullying. For example, "Others made fun of me and said some very hurtful things." The scale uses a 5-point Likert scoring system, with 0 = Never, 1 = Occasionally, 2 = Sometimes, 3 = Often, and 4 = Always. Higher scores indicate a greater degree of bullying victimization. In this study, the scale's Cronbach's alpha was 0.92, and the KMO and Bartlett's test value was 0.93, indicating good reliability and validity.

(C) **Social Connectedness Scale.** The Social Connectedness Scale, as revised by Fan et al., [74] served as the measurement tool to assess the level of social connectedness among adolescents included in this study. The scale comprises 20 items, divided into three dimensions: sense of integration, sense

Table 1 Demographic information (*N* = 1277)

Valiables	*N*(%)	Valiables	*N*(%)
Gender		**Left-behind children**	
Boy	678(53.1)	Yes	603(47.2)
Girl	599(46.9)	No	674(52.8)
Grade		**Age**	
Grade 7	211(16.5)	Age 10 and under	2(0.2)
Grade 8	245(19.2)	11-year-old	11(0.9)
Grade 9	255(20.0)	12-year-old	203(15.9)
Grade 10	194(15.2)	13-year-old	243(19.0)
Grade 11	183(14.3)	14-year-old	261(20.4)
Grade 12	189(14.8)	15-year-old	192(15.0)
Household registration		16-year-old	179(14.0)
Urban	269(21.1)	17-year-old	169(13.2)
Rural	1000(78.3)	18-year-old	13(1.0)
Other	8(0.6)	Age 19 and older	4(0.3)

Liu *et al. BMC Public Health*   (2025) 25:1850

Page 5 of 12

of acceptance, and engagement in life. Participants were asked to score each item, for instance, "I feel cut off from the world around me." Each item is scored on a 5-point Likert scale, with scoring rules 1 = Never, 2 = Occasionally, 3 = Sometimes, 4 = Often, and 5 = Always. On this scale, items 1, 2, 4, 5, 8, 10, 12, 14, 16, and 19 are reverse-scored. Higher scores indicate poorer social connectedness. In this study, the Cronbach's alpha of the scale was 0.92, and the KMO and Bartlett's test value was 0.94.

(D) **Parental Support Scale.** This study used the Chinese version of the Children's Aspirations and Social Support (CASS) scale, as revised by Luo et al. [75] The revised scale includes five subscales. The Parental Support Scale, a subscale of the CASS, comprises 12 items, covering four dimensions: emotional support, informational support, appraisal support, and instrumental support. For example, "My parents are proud of me." The frequency of behavior measure was scored on a 5-point Likert scale, with 0 = Never, 1 = Occasionally, 2 = Sometimes, 3 = Often, and 4 = Always. All items are reverse-scored, thus, higher scores indicate lower levels of parental support. In this study, the Cronbach's alpha was 0.95, and the KMO and Bartlett's test value was 0.96, indicating good reliability and validity.

Analysis method

The data analysis was performed using IBM SPSS 23.0. First, descriptive statistical analysis was conducted for the basic characteristics of included adolescents. Then, we carried out correlation analysis using the core variables bullying victimization, loneliness, social connectedness, and parental support. Finally, we analyzed the mediating effect analysis of social connectedness and the moderating effect of parental support using MODEL 59 in the PROCESS plugin. [76].

Results

Common method bias test

The Harman single-factor test was used to examine common method bias. In factor analysis of all the original items, 26 factors were extracted, with eigenvalues greater than 1. The first factor could explain 25.65% of the variance, which was below the critical value of 40%, indicating no serious common method bias was present in the data.

Descriptive statistical and correlation analyses

The results of descriptive statistical analysis and zero-order correlation analysis are presented in Table 2. Gender was significantly negatively correlated with bullying ($r = -0.065$, $P < 0.05$), indicating that girls experienced a significantly higher frequency of bullying than boys. There was a significant negative correlation between bullying and age ($r = -0.110$, $P < 0.001$), suggesting that younger age was associated with a higher frequency of bullying. However, parental support was significantly positively correlated with age ($r = 0.084$, $P < 0.01$), indicating that older adolescents had lower perceived levels of parental support. We found significant positive correlations between household registration type and bullying, loneliness, social connection, and parental support ($rs = 0.103$–0.187, $Ps < 0.001$), with adolescents who had urban household registration scoring higher on these four items, indicating that urban adolescents experienced higher levels of loneliness and bullying as well as lower levels of social connection and parental support. Our analysis of left-behind children revealed a significant negative correlation ($rs = -0.128$, $P < 0.001$) with parental support; these adolescents reported having lower levels of support from their parents.

We identified significant positive correlations between each pair of the four variables: bullying, social connection, parental support, and loneliness ($rs = 0.319$–0.817, $Ps < 0.001$). This indicated that a higher frequency of bullying was associated with stronger feelings of loneliness, lower levels of social connection, and lower levels of parental support, leading to more severe loneliness and

Table 2 Descriptive statistics and correlation analysis ($N = 1277$)

Variables	M	SD	1	2	3	4	5	6	7	8
1.Gender	0.47	0.50	1							
2. Age	14.34	1.72	0.078**	1						
3. Household Registration	0.79	0.41	0.066*	0.161***	1					
4.Left-behind Children	0.53	0.50	-0.044	0.081**	-0.204***	1				
5. Bullying	6.40	8.19	-0.065*	-0.110***	0.106***	-0.059*	1			
6. Loneliness	25.16	16.27	-0.043	0.036	0.103***	-0.009	0.553***	1		
7. Social Connectedness	29.60	14.26	-0.012	-0.04	0.135***	-0.020	0.467***	0.817***	1	
8. Parental Support	21.94	12.55	0.045	0.084**	0.187***	-0.128***	0.319***	0.431***	0.524***	1

Notes: Statistically significant values * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$; Gender: 0 for Boy and 1 for Girl; Household Registration: 0 for Urban household registration and 1 for Rural household registration. Left-behind Children: 0 represents left-behind children, and 1 represents non-left-behind children

bullying among the adolescents surveyed; these results support H1.

We used an independent samples *t*-test to further analyze differences in terms of bullying, loneliness, social connectedness, and parental support between left-behind and non-left-behind children. The results showed that left-behind children experienced significantly higher levels of bullying compared with non-left-behind children ($t = 3.67$, $P < 0.01$), and their social connectedness was notably lower ($t = 4.16$, $P < 0.05$). However, there were no significant differences in levels of loneliness ($t = 2.14$, $P > 0.05$) and parental support ($t = 0.02$, $P > 0.05$) between these two groups (Table 3).

Mediation and moderation model testing

Using Model 59 in the PROCESS plugin of IBM SPSS, [76] we conducted bootstrapped mediation effect tests (with 5000 iterations) to examine the moderating role of parental support between bullying, social connection, and loneliness, as well as to perform stratified tests according to whether the child was left behind or not. Among them, Model 1 was tested with a total sample of 1277 adolescents; Model 2 targeted 603 left-behind children with "weak parental relationships;" Model 3 targeted 674 non-left-behind children with "strong parental relationships." This method provided 95% confidence interval (CI) estimates for the mediation effect. If the 95% CI included 0, this indicated that the mediation effect was not significant; if the 95% CI did not include 0, the mediation effect was considered significant.

In Model 1, the analysis was conducted among a total sample of 1277 adolescents. We controlled for gender, age, and type of household registration, with bullying as the independent variable, social connection as the mediating variable, loneliness as the dependent variable, and parental support as the moderating variable. The results (Table 4) revealed that the direct effect of bullying on loneliness was significant (c'=0.2457, standard error [*SE*]=0.0185, $P < 0.001$). The indirect effect of bullying on loneliness through social connection was also significant (a*b = 0.2616, *SE* = 0.0230); the 95% CI (0.2181, 0.3078)

did not include 0, indicating that the mediation effect accounted for 51.57%; this finding supports H2 (see Fig. 1 for details).

In the total sample of 1277 adolescents, the moderating role of parental support in the model is as follows: The moderating effect of parental support between bullying and social connection was significant (β=−0.0808, $P < 0.001$, 95% CI [− 0.1234, − 0.0383]). The moderating effect of parental support between bullying and loneliness was also significant (β=−0.0502, $P < 0.01$, 95% CI [− 0.0833, − 0.0171]). Additionally, the moderating effect of parental support between social connection and loneliness was significant (β = 0.0789, $P < 0.001$, 95% CI [0.0474, 0.1105]). These findings all support H3.

As shown in Fig. 2, among the total sample of 1277 adolescents, for participants with low parental support scores (Low PS, M-1SD), bullying had a significant positive predictive effect on loneliness (β = 0.2958, $P < 0.001$, 95% CI [0.2385, 0.3532]. For participants with high parental support scores (High PS, M + 1SD), bullying also had a significant positive predictive effect on loneliness (β = 0.1599, $P < 0.001$, 95% CI [0.1562, 0.2347]). These results indicated that with increased parental support (i.e., lower scores), the positive predictive effect of bullying on loneliness tended to weaken.

In Model 2, analysis of a sample of 603 left-behind children (Table 4) revealed a significant direct effect of bullying on loneliness (c'=0.2133, *SE* = 0.0259, $P < 0.001$). The indirect effect of bullying on loneliness through social connection was also significant (a*b = 0.2671, *SE* = 0.0308, 95% CI [0.2099, 0.3300]), indicating that the mediation effect accounted for 55.60%. Moreover, the moderating role of parental support was significant in the pathways between bullying and social connection (β=−0.0913, $P < 0.01$), between bullying and loneliness (β=−0.0489, $P < 0.05$), and between social connection and loneliness (β = 0.0839, $P < 0.001$). The above findings support H4.

In Model 3, the analysis of a sample of 674 non-left-behind children (Table 4) showed a significant direct effect of bullying on loneliness (c'=0.3217, *SE* = 0.0375, $P < 0.001$). The indirect effect of bullying on

**Table 3** The difference test of different left-behind types (N = 1277)

| DV	IV	Case	M	SD	F	t
Bullying	0	603	7.28	8.66	7.763	3.67**
	1	674	5.61	7.66		
Loneliness	0	603	26.85	16.66	2.140	3.52
	1	674	23.65	15.78		
Social Connectedness	0	603	31.34	14.90	5.627	4.16*
	1	674	28.04	13.48		
Parental Support	0	603	23.65	12.63	0.002	4.62
	1	674	20.42	12.30		

Notes: Statistically significant values * $p < 0.05$, ** $p < 0.01$; DV, dependent variable; IV, independent variable,0 for Urban household registration and 1 for Rural household registration

Table 4 Analysis of mediation regulation model ($N = 1277$)

Variables	Model 1 (Total)		Model 2 (Left-behind)		Model 3 (Un-left-behind)	
	Social Connectedness	Loneliness	Social Connectedness	Loneliness	Social Connectedness	Loneliness
Constant	-0.0145 (0.0500)	-0.0220 (0.0345)	-0.0855 (0.0944)	0.1535 (0.0631)*	-0.0060 (0.0596)	-0.0237 (0.0425)
Gender	-0.0074 (0.0223)	-0.0205 (0.0151)	0.0035 (0.0329)	-0.0159 (0.0217)	-0.0197 (0.0305)	-0.0256 (0.0212)
Age	-0.0091 (0.0227)	0.0773 (0.0154)***	0.0145 (0.0330)	0.0755 (0.0219)***	-0.0195 (0.0318)	0.0714 (0.0222)***
Household Registration	0.0510 (0.0559)	-0.0600 (0.0379)	0.1574 (0.1009)	-0.2108 (0.0667)**	0.0014 (0.0698)	0.0061 (0.0487)
Bullying	0.3628 (0.0252)***	0.2457 (0.0185)***	0.3744 (0.0356)***	0.2133 (0.0259)***	0.3553 (0.0360)***	0.2717 (0.0269)***
Social Connectedness		0.7212 (0.0190)***		0.7265 (0.0272)***		0.7209 (0.0270)***
Parental Support	0.4110 (0.0238)***	-0.0205 (0.0179)	0.4606 (0.0350)***	-0.0156 (0.0262)	0.3572 (0.0330)***	-0.0244 (0.0250)
Bullying * Parental Support	-0.0808 (0.0217)*** [-0.1234,-0.0383]	-0.0502 (0.0169)** [-0.0833,-0.0171]	-0.0913 (0.0302)** [-0.1506,-0.0321]	-0.0489 (0.0235)* [-0.0949,-0.0028]	-0.0899 (0.0321)** [-0.1529,-0.0269]	-0.0446 (0.0247) [-0.0931,0.0038]
Social Connectedness * Parental Support		0.0789 (0.0161)*** [0.0474,0.1105]		0.0839 (0.0223)*** [0.0402,0.1277]		0.0754 (0.0238)** [0.0286,0.1221]
Bullying -> Parental Support ->		0.2616 (0.0230) [0.2181,0.3078]		0.2671 (0.0308) [0.2099,0.3300]		0.2606 (0.0333) [0.2034,0.3327]
Cases	1277	1277	603	603	674	674
R	0.6182	0.8465	0.6459	0.8583	0.5816	0.8343
R²	0.3822	0.7166	0.4172	0.7367	0.3383	0.6960
F	130.92***	400.74***	71.11***	207.72***	56.82***	190.33***

Notes: Statistically significant values * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$; Values in "( )" are standard errors; Values in "[ ]" represents a 95% confidence interval estimate of the path effect value
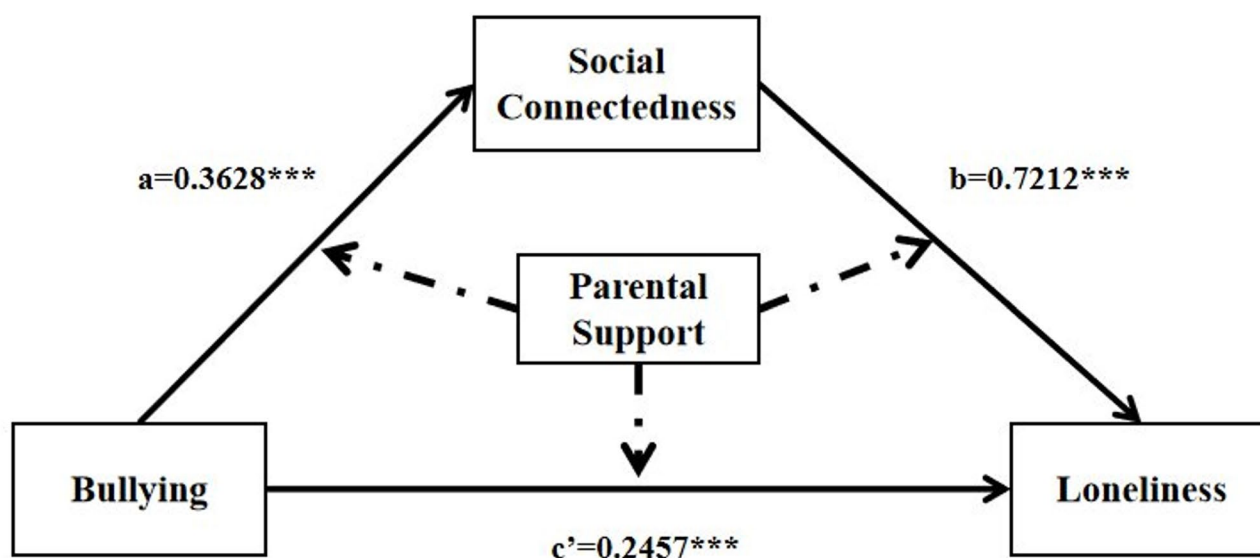
Fig. 1 Mediation regulatory pathway ($N = 1277$). Notes: Statistically significant values * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$
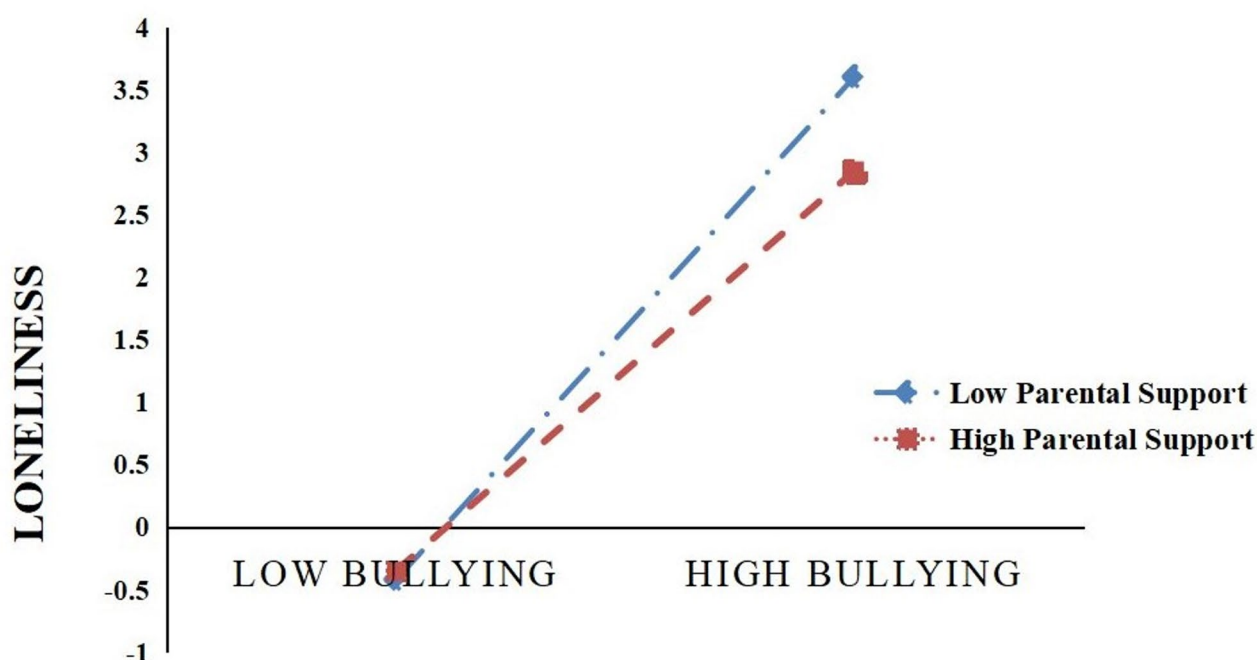
Fig. 2 The moderating effect of parental support on bullying and loneliness ($N = 1277$)

loneliness through social connection was also significant ($a*b = 0.1615$, $SE = 0.0503$, 95% CI [0.0978, 0.2475]), indicating that the mediation effect accounted for 33.42%. Additionally, the moderating effect of parental support was significant between bullying and social connection ($\beta = -0.0899$, $P < 0.01$) and between social connection and loneliness ($\beta = 0.0754$, $P < 0.01$); however, this was not significant between bullying and loneliness ($\beta = -0.0446$, $P = 0.071$).

Discussion

The findings of this study highlight the complex interplay among school bullying, social connection, and parental support in the development of adolescent loneliness. The present results strongly emphasize the fundamental role of the family environment in personal development [77, 78], as framed by social–ecological theory [29]. School bullying during adolescence is not only a common and harmful experience, but also exacerbates feelings of loneliness by undermining social connections. At the same time, the moderating role of parental support identified herein illustrates that preventing and addressing school bullying, as well as alleviating loneliness, require not only the involvement of schools but also active participation and support from families.

Our findings underscore the significant positive correlation between school bullying and adolescent loneliness, echoing Heinrich & Gullone [32] regarding the prevalence of loneliness during adolescence, as well as Vanderbilt and Augustyn [18] who reported the pervasiveness

and consequences of school bullying. Our study further confirms the assertions by Olweus [26], as well as Vanderbilt and Augustyn [18], that school bullying harms adolescents directly and can trigger a range of psychological and social issues, such as loneliness. This relationship may stem from feelings of social rejection and self-deprecation among youths who are bullied, as described by Hansen et al. [20], where victims often feel ostracized by peers and uncomfortable in social settings. Loneliness may also predict bullying [79]; adolescents who experience strong feelings of loneliness are also more likely to be bullied, necessitating greater attention from parents and schools.

The mediating role of social connection between school bullying and loneliness reveals a key mechanism: bullying increases loneliness by weakening social bonds among adolescents. This aligns with the belongingness hypothesis [30] as well as Perlman and Peplau's [80] theory that loneliness originates from a lack of satisfying social connections. Increasing social connections can help adolescents to increase their social support, which can effectively protect them from bullying [81]. Bullying experiences may lead adolescents to withdraw from establishing or maintaining positive peer relationships, thereby intensifying their loneliness, as reported by Eisenberger, Lieberman, and Williams [21], who noted that bullied individuals often avoid social activities.

The present results indicate that parental support can mitigate the impact of school bullying on loneliness, consistent with research by Bosmans et al. [54], underscoring

Liu *et al. BMC Public Health*   (2025) 25:1850

Page 9 of 12

the importance of parental roles and supportive family environments for adolescent mental health. Similarly, we further verified that parental support moderated the relationship between bullying and negative emotions in the Chinese setting [82]. Parental understanding, care, and support provide a secure foundation for adolescents to cope with school bullying, helping to alleviate feelings of loneliness and other negative psychological effects, highlighting the importance of integrating family factors into anti-bullying interventions at school, as emphasized by Lasgaard et al. [47] and Giordano [57], who identified the family as key in mitigating adolescent psychological distress. In our sample of non-left-behind children, the moderating effect of parental support on the relationship between school bullying and loneliness was not significant; however, this effect was significant in left-behind children. A possible explanation for this finding is that left-behind children are lacking in parental care and nurturing [83]. However, receiving parental support when bullied at school can significantly enhance the ability of these children to cope with the negative effects of bullying. This suggests that effective parental support is crucial for preventing loneliness among adolescents who experience school bullying.

Conclusion

The social–ecological theory can be used to model relationships between individual characteristics and multiple contexts [84, 85], such as the behavior patterns of bullies and victims, as well as bystanders and others in the school environment, with a particular emphasis on the influence of family [86]. This theory is particularly useful for understanding the complex dimensions of bullying to develop sensitive and effective interventions [87, 88]. In the present study, we explored the relationships among school bullying, social connectedness, parental support, and adolescent loneliness. The results not only emphasize the profound impact of school bullying on adolescents' mental health but also reveal the important roles of social connectedness and parental support in alleviating loneliness in this group.

Specifically, we found a significant correlation between parental support and loneliness and between school bullying and loneliness. Among left-behind children, parental support could significantly moderate the relationship between bullying and loneliness. However, among non-left-behind children, the moderating effect of parental support was not significant. This suggests that targeted interventions should account for the unique needs of left-behind children, particularly in terms of emotional and social support.

The above findings underscore the critical role of parental support in reducing loneliness experienced by left-behind children who have been bullied; these results also highlight the differences in emotional support needs of non-left-behind children. Therefore, promoting adolescent mental health and social adaptation require collaborative efforts from schools, families, and society to create a supportive and inclusive environment. Encouraging parents to actively engage in their children's lives and provide ongoing emotional support and guidance is crucial to preventing the negative effects of loneliness and school bullying among adolescents.

This study provides important perspectives for understanding the relationship between school bullying and adolescent loneliness. Nevertheless, the study has certain limitations. First, the cross-sectional design limits the ability to make causal inferences; future research should consider longitudinal or experimental designs to explore causality among these variables. Second, the study relies on self-report questionnaire data, which may be subject to self-report bias. Future research should include multiple sources of data, such as peer evaluations, teacher reports, or observational data, to enhance the reliability of the results. Furthermore, although we examined the roles of social connection and parental support, we did not address other potential moderating or mediating variables. Further exploration of these potential factors and their interactions with school bullying, social connections, and parental support is warranted. Specifically, targeted studies focusing on left-behind children are needed for a more comprehensive understanding of the mechanisms underlying adolescent loneliness. Such research will help develop more effective preventative and intervention strategies to address loneliness and bullying in this population.

Author contributions
All authors made a substantial contribution to the present work. Huaqiang Liu and Zhensong Lan were mainly responsible for the study conception, research, and design; Xuefang Huang, Qing Wang, and Jianming Zhou were primarily responsible for the execution and data acquisition, analysis, and interpretation; Huaqiang Liu, Zhensong Lan, and Xuefang Huang were mainly involved in drafting, revising, or commenting on the article.

Data availability
All data generated or analysed during this study are included in this published article.

Declarations

Ethical approval and consent to participate
This study was approved by the Human Research Ethics Committee of Yibin University, China (no. 2022042101Y). All methods were carried out

Liu *et al. BMC Public Health*   (2025) 25:1850

Page 10 of 12

in accordance with the Declaration of Helsinki and approved by the aforementioned ethics committee. This study did not cause any physical, emotional, or psychological issues for participants, nor did it involve any privacy risks or significant ethical concerns. Prior to the study, all participants, along with their parents or legal guardians and schools, were informed of the purpose, content, and use of the study. Participants were also informed that they could withdraw from the study at any time. Written informed consent was obtained from all participants. For participants under age 16 years, informed consent was obtained from their parent or legal guardian.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

References
1. Salmivalli C, Laninga-Wijnen L, Malamut ST, Garandeau CF. Bullying prevention in adolescence: solutions and new challenges from the past decade. Journal of research on adolescence. Official J Soc Res Adolescence. 2021;31(4):1023–46. https://doi.org/10.1111/jora.12688
2. Goossens L. Loneliness in adolescence: insights from Cacioppo's evolutionary model. Child Dev Perspect. 2018;12(4):230–4. https://doi.org/10.1111/cdep.12291
3. Lee EJ, Bukowski WM. Co-development of internalizing and externalizing problem behaviors. Causal direction and common vulnerability. J Adolesc. 2012;35(3):713–29. https://doi.org/10.1016/j.adolescence.2011.10.008
4. Chan HCO, Wong DS. Traditional school bullying and cyberbullying in Chinese societies: prevalence and a review of the whole-school intervention approach. Aggress Violent Beh. 2015;23:98–108. https://doi.org/10.1016/j.avb.2015.05.010
5. Langford R, Bonell C, Jones H, et al. The world health organization's health promoting schools framework: A Cochrane systematic review and meta-analysis. BMC Public Health. 2015;15(1):130. https://doi.org/10.1186/s12889-015-1360-y
6. Modecki KL, Minchin J, Harbaugh AG, Guerra NG, Runions KC. Bullying prevalence across contexts: A meta-analysis measuring cyber and traditional bullying. J Adolesc Health. 2014;55(5):602–11. https://doi.org/10.1016/j.jadohealth.2014.06.007
7. Chan HC, Wong DSW. Traditional school bullying and cyberbullying in Chinese societies: prevalence and a review of the whole-school intervention approach. Aggress Violent Beh. 2015;23:98–108. https://doi.org/10.1016/j.avb.2015.04.003
8. Cosmides L, Tooby J. Evolutionary psychology: new perspectives on cognition and motivation. Ann Rev Psychol. 2013;64:201–29. https://doi.org/10.1146/annurev.psych.121208.131628
9. Gökler R. Okullarda Akran Zorbalığı [Peer bullying in schools]. Int J Hum Sci. 2009;6(2):511–37.
10. Mutlu-Bayraktar, D. A systematic review of emotional design research in multimedia learning. Educ Inf Technol, 2024(29): 24603–24626. https://doi.org/10.1007/s10639-024-12823-8
11. Acquah EO, Topalli PZ, Wilson ML, Junttila N, Niemi PM. Adolescent loneliness and social anxiety as predictors of bullying victimization. Int J Adolescence Youth. 2016;21(3):320–31.
12. Bağrıaçık B, Mutu-Bayraktar D, Taşdelen AS. Examination of peer bullying and sense of loneliness in secondary school students in terms of various variables, Kastamonu. Educ J. 2024;32(3):420–34. https://doi.org/10.24106/kefdergi.1525343
13. Bjereld Y, Augustine L, Thornberg R. Measuring the prevalence of peer bullying victimization: review of studies from Sweden during 1993–2017. Child Youth Serv Rev. 2020;105:528. https://doi.org/10.1016/j.childyouth.2020.105528
14. Hong JS, Lee CH, Lee J, Lee NY, Garbarino J. A review of bullying prevention and intervention in South Korean schools: an application of the social–ecological framework. Child Psychiatry Hum Dev. 2014;45:433–42. https://doi.org/10.1007/s10578-013-0413-7
15. Andreou E, Didaskalou E, Vlachou A. Bully/victim problems among Greek pupils with special educational needs: associations with loneliness and self-efficacy for peer interactions. J Res Special Educational Needs. 2015;15:235–46. https://doi.org/10.1111/1471-3802.12028
16. Thornberg R. School bullying and fitting into the peer landscape: A grounded theory field study. Br J Sociol Educ. 2018;39(1):144–58. https://doi.org/10.1080/01425692.2017.1330680
17. Matthews KA, Jennings JR, Lee L, Pardini DA. Bullying and being bullied in childhood are associated with different psychosocial risk factors for poor physical health in men. Psychol Sci. 2017;28(6):808–21. https://doi.org/10.1177/0956797617697700
18. Vanderbilt D, Augustyn M. The effects of bullying. Paediatrics Child Health. 2010;20(7):315–20. https://doi.org/10.1016/j.paed.2010.03.008
19. Olweus D. Bullying at school: What we know and what we can do. Blackwell 1993.
20. Hansen TB, Steenberg LM, Palic S, Elklit A. A review of psychological factors related to bullying victimization in schools. Aggress Violent Beh. 2012;17(4):383–7. https://doi.org/10.1016/j.avb.2012.03.008
21. Eisenberger NI, Lieberman MD, Williams KD. Does rejection hurt? An fMRI study of social exclusion. Science. 2003;302(5643):290–2. https://doi.org/10.1126/science.1089134
22. Palmer BW. The effects of loneliness and social isolation on cognitive functioning in older adults: A need for nuanced assessments. Int Psychogeriatr. 2019;31(4):447–9. https://doi.org/10.1017/S1041610218001849
23. Jing Y, Xiang Y, Xiangxin Q. Correlation of loneliness, depression, and anxiety symptoms of the older in-patients. Studies of Psychology and Behavior, 2012;10(3):172. https://psybeh.tjnu.edu.cn/EN/Y2012/V10/I3/172
24. Storch EA, Brassard MR, Masia-Warner CL. The relationship of peer victimization to social anxiety and loneliness in adolescence. Child Study J. 2003;33(1):1–19.
25. Duyan V, Duyan GÇ, Çifti EG, Sevin Ç, Erbay E, İkizoğlu M. Lisede okuyan öğrencilerin yalnızlık durumlarına etki eden değişkenlerin incelenmesi [Examining the variables affecting the loneliness of high school students]. Eğitim ve Bilim, 2010;33(150).
26. Olweus D. School bullying: development and some important challenges. Ann Rev Clin Psychol. 2013;9:751–80. https://doi.org/10.1146/annurev-clinpsy-050212-185516
27. Schnepf SV, Boldrini M, Blaskó Z. Adolescents' loneliness in European schools: A multilevel exploration of school environment and individual factors. BMC Public Health, 2023;23:1917. https://doi.org/10.1186/s12889-023-19203-4
28. Strindberg J. I'm often alone: an ethnographic study of school loneliness and bullying in a Swedish elementary school. Child Youth Care Forum. 2023;52(4):875–92. https://doi.org/10.1007/s10566-022-09715-8
29. Swearer SM, Espelage DL, Koenig B. & others. A social-ecological model for bullying prevention and intervention in early adolescence. In S. M. Swearer, D. L. Espelage, & others, editors, Handbook of school violence and school safety. Routledge. 2012;333–355
30. Laursen B, Hartl AC. Understanding loneliness during adolescence: developmental changes that increase the risk of perceived social isolation. J Adolesc. 2013;36(6):1261–8. https://doi.org/10.1016/j.adolescence.2013.06.003
31. Hartup WW, Laursen B. Relationships as developmental contexts: retrospective themes and contemporary issues. In: Hartup WW, Laursen B, editors. Relationships as developmental contexts. Psychology; 1999;27–50.
32. Heinrich L, Gullone E. The clinical significance of loneliness: A literature review. Clin Psychol Rev. 2006;26:695–718. https://doi.org/10.1016/j.cpr.2006.04.002
33. Stavrova O, Ren D, Pronk T. Low self-control: A hidden cause of loneliness? Pers Soc Psychol Bull. 2022;48(3):347–62. https://doi.org/10.1177/01461672211007228
34. Sloman L, Taylor P. Impact of child maltreatment on attachment and social rank systems: introducing an integrated theory. Trauma Violence Abuse. 2016;17(2):172–85. https://doi.org/10.1177/1524838015584354
35. Lee RM, Draper M, Lee S. Social connectedness, dysfunctional interpersonal behaviors, and psychological distress: testing a mediator model. J Couns Psychol. 2001;48(3):310–8. https://doi.org/10.1037/0022-0167.48.3.310
36. Stavrova O, Ren D. Is more always better? Examining the nonlinear association of social contact frequency with physical health and longevity. Social Psychol Personality Sci. 2021;12(6):1058–70. https://doi.org/10.1177/1948550620961588
37. DiTommaso E, Spinner B. Social and emotional loneliness: A re-examination of Weiss' typology of loneliness. Pers Indiv Differ. 1997;22(3):417–27. https://doi.org/10.1016/S0191-8869(96)00204-5

38. Davidson LM, Demaray MK. Social support as a moderator between victimization and internalizing–externalizing distress from bullying. School Psychol Rev. 2007;36(3):383–405. https://doi.org/10.1080/02796015.2007.12087930

39. Pellegrini AD, Bartini M. A longitudinal study of bullying, victimization, and peer affiliation during the transition from primary school to middle school. Am Educ Res J. 2000;37(3):699–725. https://doi.org/10.3102/00028312037003699

40. Pellegrini AD. Bullying, victimisation, and sexual harassment during the transition to middle school. Educational Psychol. 2002;37(3):151–63. https://doi.org/10.1207/S15326985EP3703_2

41. Storch EA, Brassard MR, Masia-Warner C. The relationship of peer victimization to social anxiety and loneliness in adolescence. Child Study J. 2003;33(1):1–18.

42. Akos P, Galassi J. Middle and high school transitions as viewed by students, parents, and teachers. Prof School Couns. 2004;7(4):213–21.

43. Bayer JK, Mundy L, Stokes S, Hearps N, Allen G, Patton G. Bullying, mental health, and friendship in Australian primary school children. Child Adolesc Mental Health. 2018;23(4):334–40. https://doi.org/10.1111/camh.12261

44. Ni L. Analysis of the relationship between college students' loneliness, depression, and suicidal behavior. Sci Educ Guide. 2013;17209–24. https://doi.org/10.16400/j.cnki.kjdks.2013.09.019

45. Holt MK, Espelage DL. Perceived social support among bullies, victims, and bully-victims. J Youth Adolesc. 2007;36(8):984–94. https://doi.org/10.1007/s10964-006-9153-3

46. Li X, Chen F, Lin Y, et al. Research on the relationships between psychological problems and school bullying and non-suicidal self-injury among rural primary and middle school students in developing areas of China. Int J Environ Res Public Health. 2020;17(10):3371. https://doi.org/10.3390/ijerph17103371

47. Lasgaard M, Goossens L, Bramsen RH, Trillingsgaard T, Elklit A. Different sources of loneliness are associated with different forms of psychopathology in adolescence. J Res Pers. 2011;45(2):233–7. https://doi.org/10.1016/j.jrp.2010.12.005

48. Park J, Grogan-Kaylor A, Han Y. Trajectories of childhood maltreatment and bullying of adolescents in South Korea. J Child Fam Stud. 2021;30(4):1059–70. https://doi.org/10.1007/s10826-021-01913-7

49. Lasgaard M, Friis K, Shevlin M. Where are all the lonely people? A population-based study of high-risk groups across the life span. Soc Psychiatry Psychiatr Epidemiol. 2016;51(10):1373–84. https://doi.org/10.1007/s00127-016-1279-3

50. Ren Y, Ji B. Correlation between perceived social support and loneliness among Chinese adolescents: mediating effects of psychological capital. Psychiatria Danubina. 2019;31(4):421–8. https://doi.org/10.24869/psyd.2019.421

51. Inguglia C, Ingoglia S, Liga F, Lo Coco A, Lo Cricchio MG. Autonomy and relatedness in adolescence and emerging adulthood: relationships with parental support and psychological distress. J Adult Dev. 2015;22(1):1–13. https://doi.org/10.1007/s10804-014-9196-8

52. Kennedy JH, Kennedy CE. Attachment theory: implications for school psychology. Psychol Sch. 2004;41:247–59. https://doi.org/10.1002/pits.10153

53. Hong JS, Espelage DL. A review of research on bullying and peer victimization in school: an ecological systems analysis. Aggress Violent Beh. 2012;17(4):311–22. https://doi.org/10.1016/j.avb.2012.03.003

54. Bosmans G, Bakermans-Kranenburg MJ, Vervliet B, Verhees MW, van IJzendoorn MH. A learning theory of attachment: unraveling the black box of attachment development. Neurosci Biobehavioral Reviews. 2020;113:287–98. https://doi.org/10.1016/j.neubiorev.2020.03.014

55. Cassidy J, Shaver PR, editors. Handbook of attachment: theory, research, and clinical applications. 3rd ed. Guilford Press; 2016.

56. Demaray MK, Malecki CK. Perceptions of the frequency and importance of social support by students classified as victims, bullies, and bully/victims in an urban middle school. School Psychol Rev. 2003;32:471–89.

57. Giordano PC. Relationships in adolescence. Ann Rev Sociol. 2003;29(1):257–81. https://doi.org/10.1146/annurev.soc.29.010202.100047

58. Shangguan Z. More attention should be given to left-behind children. China Scholars Abroad. 1994;6:39–39. [in Chinese].

59. Yang D. Research on current situation, problems and coping strategies of rural left-behind children in the new era. Educ China after School. 2019;21:30–1.

60. Zhao F, Yu G. Parental migration and rural left-behind children's mental health in China: A meta-analysis based on mental health test. J Child Fam Stud. 2016;25(12):3462–72.

61. Ai H, Hu J. Psychological resilience moderates the impact of social support on loneliness of left-behind children. J Health Psychol. 2016;21(6):1066–73.

62. Li X, Zheng H, Tucker W, et al. Research on relationships between sexual identity, adverse childhood experiences, and non-suicidal self-injury among rural high school students in less developed areas of China. Int J Environ Res Public Health. 2019;16:3158. https://doi.org/10.3390/ijerph16173158

63. Zhang H, Zhou H, Cao R. Bullying victimization among left-behind children in rural China: prevalence and associated risk factors. J Interpers Violence. 2019. https://doi.org/10.1177/0886260519843287

64. Ge Y, Song L, Clancy RF, Qin Y. Studies on left-behind children in China: Reviewing paradigm shifts. In Y. Liu, editor, Child and Adolescent Development in China. New Directions for Child and Adolescent Development, 2019;163:115–135.

65. Fellmeth G, Rose-Clarke K, Zhao C, Busert LK, Zheng Y, Massazza A, Orcutt M. Health impacts of parental migration on left-behind children and adolescents: a systematic review and meta-analysis. Lancet. 2018;392(10164):2567–82.

66. Lu R, Zhou Y, Wu Q, Peng X, Dong J, Zhu Z, Xu W. The effects of mindfulness training on suicide ideation among left - behind children in China: A randomized controlled trial. Child Care Health Dev. 2019;45(3):371–9.

67. Cole DA, Dukewich TL, Roeder K, Sinclair KR, McMillan J, Will E. Linking peer victimization to the development of depressive self-schemas in children and adolescents. J Abnorm Child Psychol. 2014;42:149–60.

68. Civitci N, Civitci A, Fiyakali NC. Loneliness and life satisfaction in adolescents with divorced and non-divorced parents. Educational Sciences: Theory Pract. 2009;9:513–25.

69. Ling H, Fu E, Zhang JR. Peer relationships of left-behind children in China moderate their loneliness. Social Behav Personality: Int J. 2017;45(6):901–13.

70. Bowes L, Wolke D, Joinson C, Lereya ST, Lewis G. Sibling bullying and risk of depression, anxiety, and self-harm: A prospective cohort study. Pediatrics. 2014;134:e1032–9. https://doi.org/10.1542/peds.2014-0832

71. Mohammadreza H. Loneliness as a function of parent-child and peer relations. J Psychol. 1982;112(1):129–33. https://doi.org/10.1080/00223980.1982.9923538

72. Zou H. Adolescent peer relationship: developmental characteristics, functions, and influencing factors. Beijing Normal University; 2003.

73. Xie JS, Lv YX, George GB, Yang CY, Seth JM, Gong R. Reliability and validity of the Chinese version of the Delaware bullying victimization scale for students. Chin J Clin Psychol. 2015;23(4):594–6. https://doi.org/10.16128/j.cnki.1005-3611.2015.04.006

74. Fan XL, Wei J, Zhang JF. Reliability and validity of social bonding Scale-Revised in middle school students. J Southwest Normal Univ (Natural Sci Edition). 2015;08:118–22. https://doi.org/10.13718/j.cnki.xsxb.2015.08.022

75. Luo XF, Chen QS, Mu SK. Revision and preliminary application of the Chinese version of the social support scale for children and adolescents. Chin J Clin Psychol. 2017;25(4):671–4. https://doi.org/10.16128/j.cnki.1005-3611.2017.04.018

76. Hayes AF. Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guilford; 2017.

77. Hikmatovna MN. Influence of family environment on personal socialization. Multidisciplinary J Sci Technol. 2024;4(3):164–70.

78. Westrupp EM, Bennett C, Berkowitz T, Youssef GJ, Toumbourou JW, Tucker R, Sciberras E. Child, parent, and family mental health and functioning in Australia during COVID-19: comparison to pre-pandemic data. Eur Child Adolesc Psychiatry. 2023;32(2):317–30.

79. Al Qudah MF, Al-Barashdi HS, Hassan EMAH, Albursan IS, Heilat MQ, Bakhiet SFA, Al-Khadher MA. Psychological security, psychological loneliness, and age as the predictors of cyber-bullying among university students. Commun Ment Health J. 2020;56:393–403. https://doi.org/10.1007/s10597-019-00455-z

80. Perlman D, Peplau LA. Toward a social psychology of loneliness. In: Duck S, Gilmour R, editors. Personal relationships. Volume 3. Academic; 1981;31–56.

81. Wang X, Xie R, Ding W, Song S, Wu W, Wang X, Li W. Childhood abuse and adolescent school bullying: the mediating roles of perceived social support and loneliness. J Child Fam Stud. 2023;32(10):3120–33. https://doi.org/10.1007/s10826-022-02486-9

82. Liu Y, Peng J, Ding J, Wang J, Jin C, Xu L, Liu P. Anxiety mediated the relationship between bullying victimization and internet addiction in adolescents, and family support moderated the relationship. BMC Pediatr. 2025;25(1):8. https://doi.org/10.1186/s12887-024-05348-z

83. Zhao J, Liu X, Wang M. Parent-child cohesion, friend companionship and left-behind children's emotional adaptation in rural China. Child Abuse Negl. 2015;48:190–9.

84. Bronfenbrenner U, Morris P. The ecology of developmental process. In: Lerner RM, editor. The handbook of child psychology. Volume 1, 5th ed. Wiley; 1998;993–1029.

85. Espelage DL, Holt MK, Henkel RR. Examination of peer-group contextual effects on aggression during early adolescents. Child Dev. 2003;74:205–20. https://doi.org/10.1111/1467-8624.00531

86. Furlong MJ, Morrison GM, Grief JL. Reaching an American consensus: reactions to the special issue on school bullying. School Psychol Rev. 2003;32(4):456–70. https://doi.org/10.1080/02796015.2003.12087930

87. DeLara E. Bullying and violence in American schools. In: Dowd NE, Singer DG, Wilson RF, editors. Handbook of children, culture, and violence. Sage; 2006;323–36.

88. Limber SP. Peer victimization: the nature and prevalence of bullying among children and youth. In: Dowd NE, Singer DG, Wilson RF, editors. Handbook of children, culture, and violence. Sage; 2006;331–43.

Publisher's note