Incidence, risk factors and psychosomatic symptoms for traditional bullying and cyberbullying in Chinese adolescents

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A B S T R A C T

Introduction: The objectives were to determine the prevalence and risk factors of traditional bullying and cyberbullying in Chinese middle school children, and to explore the association between bullying and psychosomatic symptoms.
Methods: This cross-sectional study was conducted in urban and rural areas in Chongqing, Henan and Zhejiang provinces in 2018. A self-completion questionnaire was completed by students in the classroom setting.
Results: There were 3774 completed questionnaires: the mean age of respondents was 13.58 (SD 0.87). For traditional bullying, 1332 (35.6%) identified as victims, and 341 (9.5%) as perpetrators. For cyberbullying, 1170 (31.4%) identified as victims, and 622 (16.6%) as perpetrators. After controlling for confounders, risks for traditional victimization were being male, attending boarding school, low academic performance, and a poor relationship with parents. Traditional perpetrators were more likely to be male, and have a poor relationship with parents. Risks for being a victim or perpetrator of cyberbullying were the same: male sex, attending boarding school, and having a poor relationship with parents. Compared to non-victims, traditional victims and cyber victims were at least 1.5 times more likely to report headache and sleep problems; traditional victims were 1.3 times more likely, and cyber victims 1.4 times more likely to report abdominal pain.
Conclusions: Schools must take measures to raise awareness of bullying, to identify bullies and victims, and especially to protect the most vulnerable adolescents.

1. Introduction

Bullying has long been recognized as a serious problem in schools in many countries (Chan & Wong, 2015). Two distinct forms of bullying are now recognized: traditional bullying and cyberbullying. Traditional bullying is defined as intentional and harmful behavior that usually occurs with some repetitiveness (Hart, Hart, & Miethe, 2013). It can be divided into three categories: physical (e.g. hitting and pushing), verbal (name-calling) and psychological (threatening others, social isolation, spreading rumors or exclusion from groups) (Kowalski & Limber, 2007). Bullying creates an imbalance of power when a more dominant child (or children) overpowers a weaker child who has difficulty defending himself or herself against such behavior (Paez, 2018). With the rapid development of the Internet and the widespread use of smartphones, cyberbullying has emerged as a phenomenon, especially among young people. Cyberbullying has been defined as "an aggressive, intentional act that is carried out by a group or an individual, using electronic forms of contact, repeatedly, and over time, against a victim who cannot easily defend him or herself (Chan & Wong, 2015; Huang & Chou, 2010; Smith et al., 2008). It includes the sending of hurtful messages and content (e.g. pictures, video and text) directly to victims or to the Internet for public view (Hinduja and Patchin, 2008, 2013; Williams & Guerra, 2007). Cyberbullying enables children to inflict harm remotely, anonymously and irrespective of time and location (Patchin & Hinduja, 2016). The anonymity on the Internet makes it easy for children and adolescents to engage in cyberbullying without much concern. At its most extreme, cyberbullying perpetration could lead to sexual harassment, stalking episodes, and even death threats (Chan & Wong, 2015).

Unlike the Western literature, research on school bullying in the Asia region only started to emerge in the late 1990s. In 2001 the first study about school bullying in Mainland China was published. Bullying in Chinese societies can be viewed in the context of collectivism, which emphasizes on cohesiveness among individuals and prioritization of the

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group over the self, and it is highly valued in Chinese societies. School bullying has often been perceived as a collective conduct in Chinese societies which acts to maintain group conformity (Chan & Wong, 2015). Thus social exclusion is often observed as a key school bullying issue in Chinese societies (Chan & Wong, 2015).

The prevalence of all forms of bullying varies hugely in published studies. An international review which included 80 studies found a mean prevalence of 35% for traditional perpetration, 36% for traditional victimization, 16% for cyber perpetration, and 15% for cyber victimization (Modecki, Minchin, Harbaugh, Guerra, & Runions, 2014). In a review study of children and adolescents in four selected major Chinese societies including mainland China, Hong Kong, Macau and Taiwan, the prevalence of traditional bullying victimization ranged from 2% to 66% and perpetration from 2% to 68%; cyberbullying victimization ranged from 12% to 72% and the perpetration from 3% to 60% (Chan & Wong, 2015). The differences were mostly due to the lack of a standardized definition, and the use of different tools, different populations, locations, and age groups. Bullying has been found to be most common in the middle school age group or early teenage (Bauman, Toomey, & Walker, 2013).

The emergence of cyberbullying raises questions about whether it is carried out by the same individuals as traditional bullying, or whether it is different individuals, hence leading to increases in the incidence of bullying overall. While there has been some exploration of this in western countries like US (Dempsey, Sulkowski, Dempsey, & Storch, 2011; Paez, 2018) and Norway (Olweus, 2013) only a few Chinese study (Dan, 2018) has explored the co-occurrence of traditional bullying and cyberbullying. In addition, very few studies conducted on Chinese population about the bully-victim overlap phenomenon, that is, whether a subgroup of individuals bully each other, creating so-called bully-victims.

A number of cross-sectional studies and a few longitudinal studies have shown associations between traditional bullying victimization and psychological, psychosomatic, and physical health problems (Sourander & Ikonen, 2010). A study among 856 Norwegian adolescents aged 13–15 years, showed a dose-response relationship between traditional bullying victimization and negative physical and mental health outcomes (Natvig, Albrektsen, & Qvarnstrøm, 2001). However, very little research about this relationship has been published about Mainland China, and nothing has been published on the association between cyberbullying and psychosomatic disorders.

Therefore, this study had three aims: (1) to determine the prevalence of traditional bullying and cyberbullying in Chinese middle school children, (2) to explore the risk factors in both traditional bullying and cyberbullying, and (3) to explore the association between bullying victimization and psychosomatic symptoms. We conducted the study in middle schools because, as noted above, this is the peak age group for bullying in most settings (Bauman et al., 2013).

2. Methods

2.1. Participants

A cross-sectional survey was conducted with middle school students in rural and urban locations of Zhejiang, Henan and Chongqing provinces representing eastern, central and western China respectively. Zhejiang is a relatively wealthy eastern coastal province with a population of 57 million, Henan is a lower middle-income province with a population of 109 million, and Chongqing is a higher middle-income municipality with a population of 31 million. In China, urban areas refer to densely populated, industrial and commercially developed locations. Rural refers to areas where economy is centered on agricultural production and the population is scattered. The two urban schools in Zhejiang province were selected from middle schools in Xihu district, Hangzhou, one of the boom cities in China, and the two rural schools were from two nearby townships in western Zhejiang. In Henan

province, the one urban school was from Wolong district, Nanyang, the third wealthiest city in Henan, and the two rural schools were from two nearby townships in southwestern Henan. In Chongqing region, the one urban school was a private boarding school in Qianjiang district, and the three rural schools were from three nearby townships in prefectures of southeastern Chongqing.

At first, we contacted the headteachers of 16 schools, eight urban and eight rural, explained the research and asked if they were willing to participate. Eleven schools: four urban and seven rural agreed to participate as stated above. The reasons given for refusal were inability to create time in the curriculum for a survey and not being "interested" in this research.

Chinese middle schools generally cover the three-year age range of 12–15. We aimed to achieve a sample size of around 500 in each year group in each province. Before conducting the survey, we learned about the average class size in each school in order to determine how many classes would need to be included. The average class size was 40 in Zhejiang, 80 in Henan, and 50 in Chongqing. We then calculated the number of classes we would need which came to 36 in Zhejiang, 18 in Henan and 28 in Chongqing. In the four schools in Zhejiang, three classes in each grade of each school were selected. In the three schools in Henan, two classes in each grade of each school were selected. In the four schools in Chongqing, three classes in grade 7 and two classes in each grade of 8–9 were selected. The classes were selected by simple random sampling from class lists. The survey took place from May to September 2018.

We distributed 4265 questionnaires in total; 3886 were returned, a response rate of 91%. Of these 112 were discarded for inadequate completion of key variables, so 3774 questionnaires were analyzed and the overall response rate was 88%. The mean age of the participants was 13.58 (SD = 0.87), with 1401 (37%) from urban areas and 2373 (63%) from rural areas.

2.2. Instruments

We designed a self-completion questionnaire which drew on questions from previous research in China (Chan & Wong, 2015; Wong, Chan, & Cheng, 2014; Zhou et al., 2013) and other countries (Fahy et al., 2016; Låftman, Modin, & Östberg, 2013; Wolke, Lee, & Guy, 2017). The draft questionnaire was then piloted among 32 children from the target age group, who were also asked to provide specific feedback about clarity, appropriateness, and any omissions. The questionnaire was then amended accordingly.

The final questionnaire comprised four sections.

1. Sociodemographic characteristics and background information. This included questions on gender, age, the place of household registration (urban or rural), school name, household composition, occupation of parents, perceived family economy status compared to other students (good, fair, poor), whether boarding at school, academic performance (top 20%, medium, bottom 20%), self-assessment of relationship with mother and father (good, fair, poor). The latter was specifically included because it was suggested by students in the pilot.
2. Questions about traditional bullying included: (1) physical bullying (hitting, kicking, beating) (2) verbal bullying (mocking, ridiculing) (3) spreading rumors (4) exclusion/isolation (5) threats (6) damage to possessions. These same six items were used to ask about perpetration and victimization in the past year with response options: yes, no, do not know.
3. Questions about cyberbullying included: (1) teasing/insulting (2) online spread of rumors (3) exposure of private information (4) exclusion from online groups (5) online threats, with the same questions for perpetration and victimization and a time period of the past year. The response options: yes, no, do not know.
4. Questions about psychosomatic symptoms, (frequent headaches,

recurring abdominal pain, problems with sleeping), referred to the past year, and answer categories were: never, occasionally, sometimes, often, always.

2.3. Procedure

Research assistants underwent initial training to ensure they were comfortable and competent to conduct the survey in the school setting. A self-completion questionnaire was completed by the students in the classroom setting. Research assistants introduced the purpose and content of the survey and stayed in the classroom to respond to any queries.

Informed consent was obtained from the child participants themselves through a signed declaration on the front page of the questionnaire. This was removed before the questionnaire was placed in a sealed box to guarantee anonymity. Students were told there was no compulsion to participate and they did not need to answer any question if they found it difficult or uncomfortable. Ethical approval was obtained from the Ethics Committee of Zhejiang University School of Public Health.

2.4. Analysis

First, we generated descriptive statistics on the sociodemographic information and bullying involvement. Next, we used Pearson's chi-square tests to examine the associations of bullying with sociodemographic characteristics, background information, and psychosomatic symptoms. For those variables which were significant in the univariate analysis we then constructed logistic regression models to evaluate the associations between involvement in bullying and potential risk factors, while adjusting for other confounders. Data analysis was performed using SPSS 24.0.

3. Results

3.1. Characteristics of the study population

The sociodemographic characteristics and background information of participants are in Table 1. There were some major differences between urban and rural children: 77% of rural children boarded at school at least on weekdays, compared with 13% of urban children. Only 51% of rural children lived with both of their biological parents, compared with 83% of urban children. This is because the parents of many rural children are rural-to-urban migrant workers who have left their children behind, usually in the care of grandparents.

3.2. Incidence of traditional bullying and cyberbullying

The incidence of traditional bullying and cyberbullying in the last year by gender, residence and household composition is shown in Table 2. In terms of traditional bullying, 1332 (35.6%) stated they had been victims. Most common were being mocked or ridiculed, 1034 (27.6%), and being victims of lies or false rumors, 540 (14.4%). Only 341 (9.5%) admitted traditional bullying of others. In terms of cyberbullying, 1170 (31.4%) stated they had been victims. Most common forms were being teased online, 703 (18.6%) and being excluded online, 690 (18.5%). Again fewer, 622 (16.6%), admitted online bullying of others. Males and children living in rural areas were more likely to be bullies and victims. There were no significant associations between bullying and residence with both parents.

Of note is the finding that 638 (46.2%) of urban students and 1763 (74.8%) of rural students thought bullying was a "serious problem" in their schools.

The incidence of traditional bullying and cyberbullying in each school is shown in Table 3. The four schools in Zhejiang had the lowest prevalence of traditional bullying and cyberbullying. A rural school in

Table 1

Sociodemographic characteristics and familial relation situation by residence N (%).

	Total (n = 3774)	Urban (n = 1401)	Rural (n = 2373)	P
Gender				0.77
Male	1973(52.6)	739(52.9)	1234(52.4)	
Female	1779(47.4)	658(47.1)	1121(47.6)	
Age				
11–13	1780(47.8)	752(54)	1028(44)	0.000
14–16	1941(52.2)	639(46)	1302(56)	
Province				0.000
Zhejiang	1340(35.5)	759(54.2)	581(24.5)	
Henan	1292(34.2)	437(31.2)	855(36)	
Chongqing	1142(30.3)	205(14.6)	937(39.5)	
Boarding				0.000
Yes	1973(53.2)	180(12.9)	1793(77.3)	
No	1739(46.8)	1212(87.1)	527(22.7)	
Household composition				0.000
Both parents	2376(63)	1166(83.2)	1210(51)	
One of parents	810(21.4)	184(13.2)	626(26.4)	
Neither parent	588(15.6)	51(3.6)	537(22.6)	
Family economic status				0.000
Poor	259(7.9)	55(4.1)	204(10.6)	
Ordinary	2492(76.3)	926(68.6)	1566(81.6)	
Rich	517(15.8)	368(27.3)	149(7.8)	
Academic performance				0.000
Top 20%	1007(27.8)	425(31.6)	582(25.6)	
Medium	1956(54)	698(51.9)	1258(55.2)	
Bottom 20%	660(18.2)	223(16.6)	437(19.2)	
Situation of Familial Relations by Residence				
Relationship with mother				0.001
Good	2308(70.8)	982(72.8)	1326(69.3)	
Fair	780(23.9)	318(23.6)	462(24.1)	
Poor	174(5.3)	48(3.6%)	126(6.6)	
Relationship with father				0.343
Good	2107(65)	884(65.8)	1223(64.4)	
Fair	905(27.9)	374(27.8)	531(28)	
Poor	230(7.1)	85(6.3)	145(7.6)	

Henan had the highest prevalence of traditional victims at 49%; A rural school in Chongqing had the highest prevalence of cyber victims at 52%; Another rural school in Chongqing had the highest prevalence of both traditional bullies, 16%, and cyber bullies, 29%.

3.3. Overlaps of (1) bullies and victims and (2) traditional and cyber bullying

Among the four main categories of bullying: traditional bullies and traditional victims, cyber bullies and cyber victims, some children belonged to more than one group, that is they were both bullies and victims, or they were involved in both traditional and cyber bullying. 645 (17%) were traditional and cyber victims, 169 (4.5%) were traditional and cyber bullies, 200 (5.3%) were traditional bullies and victims, 434 (11.5%) were cyber bullies and victims.

3.4. Risk factors associated with bullies and victims

Table 4 shows the crude and adjusted odds ratios for risk factors for the four main categories of bullying: traditional bullies and traditional victims, cyber bullies and cyber victims. After adjustment traditional victims were more likely to be male [OR = 1.3, 95% CI (1.1, 1.5), p = 0.003], in boarding schools [OR = 1.7, 95% CI (1.4, 2.1), p = 0.000], with poor academic performance [OR = 1.8, 95% CI (1.5, 2.3), p = 0.000], a poor paternal relationship [OR = 1.7, 95% CI (1.2, 2.3), p = 0.001], and a poor maternal relationship [OR = 1.5, 95% CI

Table 2
The prevalence of traditional bullying and cyberbullying of all participants N (%).

	Total, N (%)	Gender			Residence			Household composition			
		Male, n = 1973	Female, n = 1779	P	Urban, n = 1401	Rural, n = 2373	P	Both Parents, n = 2376	One Parent, n = 810	Neither Parent, n = 588	P
Traditional victimization											
Victims of											
Hitting/kicking	293(7.8)	233(11.9)	60(3.4)	0.000	79(5.7)	214(9.1)	0.000	165(7)	74(9.2)	54(9.2)	0.048
Mocking/ridiculing	1034(27.6)	571(29.1)	459(26)	0.036	289(20.8)	745(31.6)	0.000	650(27.6)	218(27.2)	166(28.4)	0.87
Lies/false rumours	540(14.4)	283(14.4)	256(14.5)	0.94	176(12.7)	364(15.5)	0.02	346(14.7)	118(14.7)	76(13)	0.57
Exclusion/isolation	350(9.3)	165(8.4)	184(10.4)	0.034	106(7.6)	244(10.4)	0.005	222(9.4)	78(9.7)	50(8.6)	0.75
Threats	242(6.5)	167(8.5)	74(4.2)	0.000	59(4.2)	183(7.8)	0.000	146(6.2)	55(6.9)	41(7)	0.67
Possessions destroyed	248(6.6)	154(7.9)	94(5.3)	0.002	71(5.1)	177(7.5)	0.004	163(6.9)	48(6)	37(6.3)	0.63
Victims of any one of the six items	1332(35.6)	747(38.1)	580(32.9)	0.001	388(27.9)	944(40.1)	0.000	819(34.7)	295(36.8)	218(37.3)	0.36
Traditional perpetration											
Bullied others in any of the six ways	341(9.5)	230(12.5)	107(6.2)	0.000	100(7.5)	241(10.7)	0.006	208(9.2)	79(10.4)	54(9.8)	0.31
Cyber victimization											
Victims of											
Teasing/insulting	703(18.6)	458(23.4)	240(13.6)	0.000	215(15.4)	489(20.8)	0.000	426(18.1)	147(18.3)	130(22.4)	0.016
Lies/false rumours	266(7.1)	149(7.6)	117(6.6)	0.4	93(6.7)	173(7.4)	0.67	168(7.2)	52(6.5)	46(7.9)	0.055
Revealing private messages	254(6.8)	140(7.2)	110(6.3)	0.5	80(5.7)	175(7.5)	0.000	153(6.5)	54(6.7)	47(8.1)	0.33
Exclusion in online groups	690(18.5)	393(20.2)	292(16.6)	0.002	201(14.4)	490(20.9)	0.000	407(17.3)	156(19.5)	127(21.9)	0.038
Threats	176(4.7)	109(5.6)	65(3.7)	0.002	61(4.4)	115(4.9)	0.23	96(4.1)	45(5.6)	35(6.1)	0.051
Vicitims of any one of the five items	1170(31.4)	676(34.6)	482(27.4)	0.000	372(26.7)	799(34.1)	0.000	712(30.3)	250(31.1)	208(35.8)	0.06
Cyber perpetration											
Cyberbullied others in any of the five ways	622(16.6)	409(20.9)	206(11.7)	0.000	210(15)	414(17.6)	0.001	381(16.2)	131(16.3)	110(19)	0.27

(1.1, 2.2), *p* = 0.02]. Traditional bullies were more likely to be male [OR = 2.1, 95% CI (1.6, 2.7), *p* = 0.000], with a poor paternal relationship [OR = 1.7, 95% CI (1.1, 2.6), *p* = 0.02], and a poor maternal relationship [OR = 2.1, 95% CI (1.3, 3.5), *p* = 0.002]. Cyber victims were more likely to be male [OR = 1.5, 95% CI (1.3, 1.7), *p* = 0.000], attending boarding schools [OR = 1.8, 95% CI (1.4, 2.1), *p* = 0.000], with a poor paternal relationship [OR = 1.8, 95% CI (1.3, 2.5), *p* = 0.000], and a fair maternal relationship [OR = 1.4, 95% CI (1.2, 1.7), *p* = 0.001]. Cyber bullies were more likely to be male [OR = 2.0, 95% CI (1.7, 2.5), *p* = 0.000], at boarding schools [OR = 1.8, 95% CI (1.4, 2.3), *p* = 0.000], with a poor paternal relationship [OR = 2.1, 95% CI (1.5, 3.0), *p* = 0.000] and a poor maternal relationship [OR = 1.6, 95% CI (1.1, 2.5), *p* = 0.018].

3.5. Association of victims with psychosomatic symptoms

Of all the students 491 (13.3%) reported they often or always had headache, 607 (16.5%) reported they often or always had abdominal pain, and 597 (16.1%) reported they often or always had sleep problems. Table 5 shows the association of bullying with psychosomatic

symptoms. Compared to non-victims, traditional victims were 1.5 times, and cyber victims were 1.7 times more likely to report frequent headache. Compared to non-victims, traditional victims were 1.3 times, and cyber victims were 1.4 times more likely to report frequent abdominal pain. Compared to non-victims, traditional victims were 1.5 times, and cyber victims were 1.8 times more likely to report frequent sleep problems.

4. Discussion

While there is a growing body of literature exploring traditional bullying and cyberbullying among adolescents in mainly western countries, this is, to our knowledge, the first research to explore the association of psychosomatic symptoms with traditional and cyber bullying among middle school students in Mainland China. Our findings highlight the high prevalence of both types of bullying in Chinese middle schools, the overlaps between traditional bullying and cyberbullying, some key risk factors, and associated psychosomatic symptoms.

Table 3
Incidence of bully and victim in each school N (%).

		Traditional victimN (%)	Traditional bullyN (%)	Cyber victimN (%)	Cyber bullyN (%)
Schools in Zhejiang	**Total (1331)**	339(26)	71(6)	275(21)	114(9)
	Urban1 (382)	84(22)	19(5)	82(21)	33(9)
	Urban2 (366)	78(21)	14(4)	68(18)	27(7)
	Rural1 (227)	63(28)	6(3)	61(27)	22(10)
	Rural2 (350)	114(33)	32(10)	64(18)	32(9)
Schools in Henan	**Total (1278)**	519(41)	138(11)	392(31)	240(19)
	Urban1 (437)	130(30)	45(11)	129(30)	90(21)
	Rural1 (478)	209(44)	58(13)	157(34)	96(20)
	Rural2 (367)	180(49)	35(10)	106(29)	54(15)
Schools in Chongqing	**Total (1132)**	474(42)	132(12)	503(45)	268(24)
	Urban1 (205)	96(47)	22(11)	92(45)	58(28)
	Rural1 (250)	107(43)	38(16)	118(47)	72(29)
	Rural2 (324)	134(41)	34(11)	108(34)	57(18)
	Rural3 (358)	137(38)	38(11)	185(52)	81(23)

Table 4
Associations of explanatory variables with perpetrators and victims.

	Traditional Victims, n = 1332					Cyber Victims, n = 1170					Traditional Perpetrators, n = 341					Cyber Perpetrators, n = 622				
	N (%)	Crude OR (95%CI)	P	Adjusted OR (95%CI)	P	N (%)	Crude OR (95%CI)	P	Adjusted OR (95%CI)	P	N (%)	Crude OR (95%CI)	P	Adjusted OR (95%CI)	P	N (%)	Crude OR (95%CI)	P	Adjusted OR (95%CI)	P
Gender																				
Male (1957)	747 (38)	1.26 (1.1–1.4)	0.001	1.3 (1.1–1.5)	0.003	676 (34.6)	1.5 (1.3–1.7)	0.000	1.5 (1.3–1.7)	0.000	230 (12.5)	2.2 (1.7–2.8)	0.000	2.1 (1.6–2.7)	0.000	409 (20.9)	2.05 (1.7–2.5)	0.000	2.0 (1.7–2.5)	0.000
Female (1763)	580 (33)	1.0		1.0		482 (27.4)	1.0		1.0		107 (6.2)	1.0		1.0		206 (11.7)	1.0		1.0	
Residence																				
Rural (2347)	944 (40)	1.7 (1.5–2.0)	0.000	1.2 (0.96–1.4)	0.125	799 (34.1)	1.5 (1.3–1.7)	0.000	1.1 (0.9–1.4)	0.223	241 (10.7)	1.5 (1.2–1.9)	0.001	1.3 (0.96–1.8)	0.086	414 (17.6)	1.3 (1.04–1.5)	0.015	0.9 (0.7–1.1)	0.320
Urban (1394)	388 (28)	1.0		1.0		371 (26.7)	1.0		1.0		100 (7.5)	1.0		1.0		208 (14.9)	1.0		1.0	
Boarding																				
Yes (1954)	829 (42)	1.9 (1.7–2.2)	0.000	1.7 (1.4–2.1)	0.000	704 (36.1)	1.7 (1.5–2.0)	0.000	1.8 (1.4–2.1)	0.000	196 (11)	1.3 (1.0–1.6)	0.000	1.2 (0.9–1.6)	0.020	375 (19.2)	1.5 (1.3–1.8)	0.000	1.8 (1.4–2.3)	0.000
No (1725)	477 (28)	1.0		1.0		445 (25.9)	1.0		1.0		138 (8)	1.0		1.0		236 (13.7)	1.0		1.0	
Academic performance																				
Bottom 20% (652)	304 (46.7)	2.1 (1.7–2.5)	0.000	1.8 (1.5–2.3)	0.000	230 (36)	1.3 (1.0–1.6)	0.070	1.0 (0.8–1.3)	0.980	85 (13.8)	1.9 (1.3–2.6)	0.000	1.4 (1.0–2.0)	0.000	136 (21)	1.5 (1.2–2.0)	0.002	1.0 (0.8–1.3)	0.980
Medium (1937)	690 (35.4)	1.3 (1.1–1.5)	0.003	1.3 (1.1–1.5)	0.003	585 (30)	1.0 (0.8–1.1)	0.980	0.9 (0.8–1.1)	0.350	158 (8.5)	1.0 (0.8–1.3)	0.010	1.0 (0.7–1.3)	0.951	302 (16)	1.0 (0.8–1.2)	0.900	0.9 (0.7–1.2)	0.500
Top 20% (1002)	299 (29.9)	1.0		1.0		315 (32)	1.0		1.0		82 (8.5)	1.0		1.0		159 (16)	1.0		1.0	
Relationship with father																				
Poor (227)	111 (48.9)	2.1 (1.6–2.8)	0.000	1.7 (1.2–2.3)	0.001	94 (41.6)	2.1 (1.6–2.8)	0.000	1.8 (1.3–2.5)	0.000	37 (17.5)	2.5 (1.7–3.7)	0.000	1.7 (1.1–2.6)	0.000	66 (29.1)	2.7 (1.9–3.7)	0.000	2.1 (1.5–3.0)	0.000
Fair (895)	345 (38.3)	1.4 (1.2–1.6)	0.000	1.2 (1.0–1.5)	0.037	352 (39.2)	1.8 (1.5–2.2)	0.000	1.6 (1.3–2.0)	0.000	82 (9.4)	1.2 (0.9–1.5)	0.037	0.9 (0.6–1.2)	0.310	174 (19.4)	1.5 (1.2–1.8)	0.000	1.2 (0.9–1.5)	0.120
Good (2088)	647 (30.9)	1.0		1.0		564 (27.1)	1.0		1.0		170 (8.5)	1.0		1.0		299 (14.3)	1.0		1.0	
Relationship with mother																				
Poor (171)	81 (47)	2 (1.5–2.7)	0.000	1.5 (1.1–2.2)	0.020	71 (41.5)	1.9 (1.4–2.6)	0.000	1.3 (0.9–1.9)	0.110	29 (18)	2.8 (1.8–4.3)	0.020	2.1 (1.3–3.5)	0.000	47 (27.5)	2.5 (1.7–3.5)	0.000	1.6 (1.1–2.5)	0.018
Fair (773)	321 (41)	1.6 (1.3–1.9)	0.000	1.3 (1.1–1.6)	0.005	308 (40)	1.8 (1.5–2.1)	0.000	1.4 (1.2–1.7)	0.001	94 (13)	1.8 (1.4–2.4)	0.005	1.9 (1.3–2.6)	0.000	181 (23.4)	2 (1.6–2.4)	0.001	1.8 (1.4–2.3)	0.000
Good (2286)	712 (31)	1.0		1.0		641 (28.1)	1.0		1.0		168 (7.6)	1.0		1.0		315 (13.8)	1.0		1.0	

Adjusted for gender, residence, boarding, academic performance, and relationship with parents.

Table 5
Associations of bullies/victims with psychosomatic Symptoms.

	Headache			Abdominal Pain			Sleep Problems		
	Often/Always	Crude OR (95% CI)	*P*	Often/Always	Crude OR (95% CI)	*P*	Often/Always	Crude OR (95% CI)	*P*
Traditional victim			0.000			0.000			0.000
Yes (1310)	219(17)	1.5(1.3–1.7)		254(20)	1.3(1.2–1.5)		259(20)	1.5(1.4–1.8)	
No (2365)	270(11)	1.0		349(15)	1.0		335(14)	1.0	
Traditional bully			0.005			0.013			0.000
Yes (332)	60 (18)	1.4(1.1–1.7)		69(21)	1.3(1.1–1.6)		87(26)	1.7(1.4–2.1)	
No (2996)	376(13)	1.0		468(16)	1.0		438(15)	1.0	
Cyber victim			0.000			0.000			0.000
Yes (1149)	209(18)	1.7(1.5–1.9)		231(20)	1.4(1.3–1.6)		253(22)	1.8(1.6–2.1)	
No (2261)	242(11)	1.0		332(15)	1.0		299(13)	1.0	
Cyber bully			0.001			0.000			0.000
Yes (613)	103(17)	1.3(1.1–1.6)		132(22)	1.4(1.2–1.6)		141(23)	1.6(1.3–1.8)	
No (2894)	364(13)	1.0		447(16)	1.0		424(15)	1.0	

4.1. Prevalence of bullying

The prevalence of bullying and cyberbullying in our study is higher than that in the few other studies among middle school students in Mainland China, which reported a maximum prevalence of traditional victims of 26%. With the conclusion drawn that bullying is less common in China than elsewhere (Chan & Wong, 2015; Cheng, Newman, & Qu, 2010). There were differences in prevalence of bullying across our three provinces: in Zhejiang province bullying was less common. In some schools in Henan and Chongqing we found that the atmosphere in the school lacked order and discipline. An American study observed that a disordered school environment tends to undermine teachers' ability to efficiently manage the classroom and student behavior, which is associated with an increased risk of school violence (Bradshaw, Sawyer, & O'Brennan, 2009). As mentioned above, the average class size in Henan was twice that in Zhejiang, with Chongqing in the middle. Such high student-teacher ratios make it difficult to effectively manage students, thus creating an atmosphere where bullying can take place with impunity.

4.2. Overlap between bullies and victims

The clear overlaps we found between bullies and victims in traditional bullying and cyberbullying showed that bullies and victims are not discrete groups and many children can take on the role of perpetrator as well as victim. This suggests that there is a core group of children who bully each other. But this overlap is more common in cyberbullying than traditional bullying, maybe because cyberbullying allows for easy retaliation at a distance. A study among South Korean adolescents produced similar findings, that role exchange was easier in cyberbullying than traditional bullying and that cyberbullying was an online version of other real-world antisocial behaviors, but easier to be involved with as perpetrator or in retaliation (Lee & Shin, 2017).

4.3. Overlap between traditional bullying and cyberbullying

The extent of the overlap between traditional and cyber bullying varied in different studies. One large-scale study from grades 3 to 12 in US, as well as from grades 4 to 10 in Norway suggested around 90% of those been exposed to cyberbullying, had also been bullied in traditional ways, indicating a large overlap between traditional bullying and cyberbullying (Olweus, 2012). In contrast, a study among children aged 10 to 15 in US suggested only 36% of the victims of cyberbullying reported being bullied at school (Ybarra, Diener-West, & Leaf, 2007). Our study showed there was some overlap between traditional bullying and cyberbullying. Yet the majority of cyber bullies are not traditional bullies. This is confirmed by a study arguing that many cyberbullies do

not dare to bully "in real life", but are more comfortable to do so electronically by its perceived anonymity (Mishna, Saini, & Solomon, 2009). While the overlap between bullies of traditional bullying and cyberbullying is limited, there is greater overlap between victims of traditional bullying and cyberbullying.

A new phenomenon has recently emerged which actually combines traditional bullying and cyberbullying. Our search for social media reports of bullying from 2015 to 2017 on China Youth Network and Sina Network showed an increasingly common practice involving the filming of traditional physical bullying, then uploading to social networking sites, as a form of cyberbullying. This may be especially distressing for victims who are exposed to the trauma twice. We did not ask about this practice in our research, so we cannot comment on whether this is common or not.

4.4. Risk factors of both kinds of bullying

In terms of risk factors, boys were more likely to be involved in bullying both as bullies and victims. This was also found in Hong Kong (Wong et al., 2014) and Turkey (Erdur-Baker, 2009). While elsewhere such as in US (Williams & Guerra, 2007) and Sweden (Slonje & Smith, 2008) no gender difference was found in cyberbullying. Both types of bullying were more common among boarding school students in our study. Most of the rural children were boarding at schools compared to urban children (77% vs. 13%). This is largely because of practicality that is many middle schools in rural areas are located too far from students' homes for daily attendance. The longer time spent with peers in a closed environment, probably contributes to bullying events (Yin, Wang, & Zhang, 2017). The victims cannot minimize their exposure and cannot easily access parental or non-school support. This may help to create a culture of acceptance of bullying in many boarding schools. And it is also known that bullying often follows the victims from the day school setting into the residential setting (Lester, Mander, & Cross, 2015). This means that it is impossible for many adolescents to escape from the distress of being bullied.

Poor academic performance was a risk factor only for traditional victims. Our findings suggested the students in the bottom 20% of academic performance were twice as likely to be traditional victims than those in the top 20%. A study in the middle school age group in Australia and the US, found that academic failure was associated with a 150% increase in traditional bullying (Hemphill, Kotevski, & Tollit, 2012). In China, academic achievement takes on particular importance, because it has been emphasized in Chinese society since ancient times, and education is still regarded as inextricably linked with financial success and higher social status (Hesketh & Ding, 2005). The great emphasis on academic achievement within this culture influences the attitudes held by the peer group, so children who do poorly in school

may be at high risk for discrimination, rejection and maltreatment by peers (Schwartz, Farver, Chang, & Lee-Shin, 2002). While a longitudinal study among middle school students in US revealed that students who were generally more bullied were likely to fall into the lower academic rank (Juvonen, Wang, & Espinoza, 2011). Whether being bullied leads to poorer academic achievement or poor academic achievement leads to being bullied cannot be determined from this cross-sectional study.

We found children with fair and poor parental relationships were more likely to engage in bullying or being bullied. This has been observed in other studies: a study among adolescents aged 10 to 17 in the US suggested that a poor caregiver-child emotional bond is associated with an increase in online harassment (Ybarra & Mitchell, 2004). A cross-sectional study of 8342 Chinese middle school students showed that poor communication or relationship with parents increased the chance of traditional bullying or being bullied (Wang, Zhou, & Lu, 2012). A study among US adolescents showed that positive parental support protected children from bullying others and being bullied in both traditional bullying and cyberbullying (Wang, Iannotti, & Nansel, 2009). Children with poorer parental relationships do not communicate well with parents and may get less positive parental support. Effective communication between children and parents, and positive support from parents are critical in fostering adolescents' healthy psychosocial functioning, which makes them less likely to engage in bullying behaviours (Chan & Wong, 2015). Prolonged separation from parents may disrupt parent-child relationships as has been suggested in other studies (Zhao, Wang, Zhou, Jiang, & Hesketh, 2018). Children who lack these good relationships may be more likely to engage in bullying. However, in our study nearly half of the rural students were not living with both parents. Despite this, no significant association was found between any form of bullying and whether the child was living with the parents. Part of the explanation may be that separation from parents in children in this age group should not be assumed to imply poor parental support. Many other factors may influence this relationship. In China many migrant workers leave their children behind in rural areas, so-called left behind children, but some are in frequent, even daily, contact by phone and message, and parents may visit frequently (Zhao, Wang, Li, Zhou, & Hesketh, 2017). Even when this is not the case, the physical separation may not have seriously adverse effects on the parent-child relationship. In our study we found only a weakly significant association between self-reported quality of relationship and residence with both parents. This clearly supports a more complex and nuanced relationship about which assumptions cannot be made. No previous literature has specifically explored the association between left-behind status and bullying involvement, so future research would be valuable to fill this gap.

4.5. Bullying and psychosomatic well-being

Our study shows an association between both kinds of bullying and higher frequency of psychosomatic symptoms. This phenomenon has been observed elsewhere. A study among 2215 Finnish adolescents aged 13–16-year-olds showed a significant association between cyberbullying and headache, abdominal pain, sleeping difficulties (Sourander & Ikonen, 2010). A study of Norwegian adolescents aged 13–15-year-olds found that youth who reported more bullying victimization reported increased physical (headache, abdominal pain) and psychological symptoms (Evans, Smokowski, & Cotter, 2014). Our findings suggest that psychosomatic symptoms may alert us about children who are victims of traditional bullying and cyberbullying. A mechanism for the association between bullying and psychosomatic symptoms has been proposed. It has been found that social rejection activates the same area of brain that registers physical pain, and stressful events increase stress hormones, which in turn suppress immune system functioning (Nishina, Juvonen, & Witkow, 2005). Thus, bullying victims are more likely to get headache, abdominal pain, and other illnesses. In addition, physical sickness may attract attention,

sympathy or support from adults and peers, and this may encourage the expression of physical symptoms (Nishina et al., 2005).

5. Limitations

Our study has limitations: first, we were unable to use random sampling of schools, and we had to rely on contacts and the co-operation of headteachers. This might have led to selection bias, with a possible underestimation of the prevalence of bullying because the headteachers who declined might have had more bullying problems in their schools and feared disclosure. Second, reliance on self-report may lead to under-reporting of admitting of perpetration of bullying. This may partly explain why perpetration was reported less than victimization for both types of bullying (Another reason for lower rates of reported bullying compared with victimization is that bullies may have several victims). Future studies should collect information from multiple sources, including teachers and parents. Third, our study was cross-sectional, and causal inferences regarding relational factors and involvement in bullying cannot be made. Longitudinal designs should be utilized to address this shortcoming.

6. Conclusion

A number of interventions to prevent bullying have succeeded in reducing bullying in a number of countries and China can learn from these. Zero-tolerance policies are regarded as a viable approach to school discipline to maintain safe classrooms. These rely on punishment including suspension and expulsion in severe cases (Teske, 2011). Other specific measures include firstly, the "whole-school" approach which has successfully reduced bullying in many countries like Norway, where it was first used. The approach includes school-wide conferences or assemblies, with strongly-messaged video materials to raise awareness of bullying (Chan & Wong, 2015). Secondly, the peer support approach involves school tribunals or "bully courts", where pupils hear evidence and decide on sanctions or punishments for those involved in bullying. This approach had an impressive impact in UK where bullying in eight participating schools dropped from 70% to 6% (Smith, Ananiadou, & Cowie, 2003). Thirdly, the restorative whole-school approach involves peace education, mediation of conflict, and reintegrative shaming of bullies. A 2-year study in Hong Kong showed that half of students who had bullied others had reduced their bullying behaviors in the schools involved in this intervention. This approach may be especially appropriate for the Chinese cultural context, since it emphasizes collective values and restoration of interpersonal harmony (Wong, Cheng, Ngan, & Ma, 2010).

Headteachers need to take the lead and decide which of the approaches available best suit their school environment. In particular, all teachers, and other staff in schools need to work with parents and the children, to raise awareness, to identify perpetrators and victims, and especially to protect the most vulnerable children.

But for cyberbullying, social media platforms also need to act, and delete bullying posts and video materials in a timely fashion. The major Chinese social media-Weibo, WeChat and QQ, should develop stricter rules on bullying and freeze the user accounts of those spreading bullying information.

Declaration of Competing Interest

The authors declared that there is no conflict of interest.

Human subjects approval statement

Ethical approval was obtained from the Ethics Committee of Zhejiang University School of Public Health.

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