



# Association between different stages of precollege school bullying and murder-related psychological behaviors among college students in Anhui Province, China



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## ARTICLE INFO

### Keywords:

School bullying  
Murder-related psychological behaviors  
College students

## ABSTRACT

Little is known about the relationship between precollege school bullying and murder-related psychological behaviors. The present study aims to examine that relationship in Chinese college students using a cross-sectional study. Self-report data were collected from 4034 college students in Anhui Province using a proportional stratified cluster sampling method. Four types of school bullying (i.e., physical, verbal, relational, and cyber) with bullies and victims and two periods (i.e., primary and secondary) were measured. The prevalence rates of murderous ideation, plans, preparation, and attempts were 6.9%, 2.5%, 1.8%, 1.4%, respectively. Different stages of precollege cyber bullying were associated with murder-related psychological behaviors for both bullies (primary: AORs = 2.78 to 15.67; secondary: AORs = 2.43 to 9.99; both periods: AORs = 2.26 to 14.04) and victims (primary: AORs = 2.87 to 16.57; secondary: AORs = 1.89 to 4.49; both periods: AORs = 3.68 to 21.48). A dose-response relationship was found, such that college students with a bullying perpetration index of two types and more were more likely to have murder-related psychological behaviors than those who were not bullied. Notably, both primary and secondary school bullying, especially cyber forms, were more likely to be associated with murder-related psychological behaviors. Therefore, it is necessary to develop school bullying preventive measures beginning in primary school.

## 1. Introduction

School bullying has become an important public health issue in the global adolescent health field due to its high prevalence. Craig et al. (2009) reported that over 26.0% of adolescents were involved in bullying in 40 European countries. For American adolescents, the prevalence rates of four forms of school bullying, including verbal, relational, physical and cyber, were 53.6%, 51.4%, 20.8% and 13.6%, respectively (Wang et al., 2009). In mainland China, the prevalence of self-reported bullying victimization and perpetration ranged from 2.0% to 66.0% and 2.0% to 34.0%, respectively, whereas the prevalence rate of self-reported cyberbullying victimization and perpetration ranged from 14.0% to 57.0% and 3.0% to 35.0%, respectively (Chan and Wong, 2015).

An increasing number of studies have indicated that involvement in school bullying has a negative impact on adolescents' physical and psychological health (Arseneault et al., 2006). For instance, children who were bullied at school are more likely to have physical injuries, poor appetites, and anxiety, especially depression (Takizawa et al., 2014). Furthermore, bullying in childhood has chronic adverse health effects in adolescent and adulthood, including poorer sleep quality, substance use, and suicidal ideation or attempts (Yeh et al., 2017; Gámez-Guadix et al., 2013; Arango et al., 2016; Winsper et al., 2012). A five-decade longitudinal British birth cohort study revealed that adults who were bullied in childhood had higher odds of depression, anxiety disorders, and suicidality than did nonvictimized peers at ages 23 and 50 years old (Takizawa et al., 2014).

Adolescent homicide, as a most extreme consequence of

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interpersonal violence, also draws attention from the public. According to the reports from the United Nations Office on Drugs and Crime (UNODC), 43.0% of homicide victims were aged 15–29 years from 192 countries and regions (United Nations Office on Drugs and Crime, 2014). In the United States, the prevalence rate of homicide among youths aged 15–24 years was 11.7 per 100,000 population (Parks et al., 2014). Previous studies on homicide have focused mostly on adults, but little is known about this problem in adolescence (Alisic et al., 2018). A study of the homicide of teenage intimate partners showed that 150 (6.9%) were murdered by intimate partners, and most victims (90.0%) were female (Adhia et al., 2019). However, studies examining adolescent homicide are rare in China. Further, adolescents with homicidal behavior were more likely to use alcohol and tobacco, carry weapons (Hohl et al., 2017; Dodson, 2016), and even suffer from mental health problems (Taylor and Kalebic, 2018; Yoshimasu, 2017). Jetelina et al. (2019) have found that compared with nonvictimized children, those who were bullied in childhood had an increased risk of violent injuries. A study conducted in nationally representative sample of US high school students revealed that compared with nonvictims (2.5%), victims (46.4%) were more likely to carry weapons to school (Pham et al., 2017), possibly to defense violence. In our previous studies, we have found that being a bully-victim was a risk factor for murderous ideation and behaviors in middle and high school students (Su et al., 2019). These findings suggest that involvement in bullying might increase the occurrence of homicidal behavior. However, few studies have detailed the relationship between school bullying and homicide among university students, especially in China.

A greater number of studies have explored the relationship between school bullying and suicide-related psychological behaviors (Arango et al., 2016; Hepburn et al., 2012; Duong and Bradshaw, 2014; Kuehn et al., 2018). Suicide is a form of extreme self-inflicted violence. The risk factors of adolescent suicide have been extensively studied, whereas the risk factors for adolescent murder have been poorly understood. A previous study defined homicide as thinking about physically harming another or intending and planning to physically harm another (Schwartz et al., 2005). Therefore, similar to suicide-related psychological behavior (Su et al., 2010, 2018), we defined murder-related psychological behaviors as a series of mental processes, including murderous ideation, murderous plans, murderous preparation, and murderous attempts.

Therefore, in this study, we aim to explore the association between various forms of precollege school bullying in different stages and murder-related psychological behaviors among Chinese college students. It was hoped that this study could help us identify the risk factors contributing to murder-related psychological behaviors and thus shed light on adolescent violence prevention.

## 2. Methods

### 2.1. Sample

A multistage stratification method was used to select participants. At the first stage, four universities were randomly selected based on the diversity of academic disciplines (colleges of medicine, agriculture, science, and engineering) in Hefei city. Hefei city is the capital of Anhui Province and is located in the middle of Anhui Province. A proportional stratified cluster sampling method was used to select the participants. Students aged 18 years and older in those four colleges were invited to participate in this study. Two to five classes in each grade in each of those four schools were randomly selected. A total of 4 287 students were invited to participate in the study. Of these students, 173 refused to take part in this survey, and 54 were absent. After removing 26 students who accidentally missed one or more tables of the questionnaire, we ultimately received 4 034 effective questionnaires, including 2 342 males (58.1%) and 1 692 females (41.9%). The students

ranged in age from 18 to 23 years (mean 20.38, SD 1.35).

### 2.2. Procedure

All students in the chosen classes, from freshmen to seniors, were invited to participate in this survey. They were asked to complete the questionnaires anonymously during class time (approximately 30 min). All data were collected in October 2018. To avoid any potential information bias, the teacher was asked to leave when the trained interviewers administered the anonymous questionnaires, and students were separated for each other. Written informed consent was obtained from the school, the students, and the students' parents. Ethical approval was reviewed and provided by the Biomedicine Ethical Committee of Anhui Medical University.

### 2.3. Measures

#### 2.3.1. School bullying

The items assessing school bullying were based on the Olweus Bully/Victim Questionnaire (Solberg and Olweus, 2003). First, a standard definition of bullying (qifu) was given in Chinese (Wang et al., 2019). Then, students were asked whether they had bullied others or had been bullied at school during primary school, secondary school or both periods (primary and secondary school). Considering the social background of China, students are often in the stage of childhood during primary school, and students begin to develop during adolescence in middle school. Therefore, this study aims to explore the effects of school bullying during childhood and adolescence on the murder behavior of college students. Four forms of school bullying (verbal, relational, physical, and cyber) were measured in this study. Verbal bullying was measured by two items: (a1) calling someone mean names or making fun of or teasing someone in a hurtful way; and (a2) and calling someone mean names regarding his or her accent. Relational bullying was assessed by two items: (b1) excluding others from their group of friends or leaving others out of things on purpose; and (b2) telling lies or spreading false rumors about others or sending mean notes and trying to make others unpopular. Physical bullying was examined with two items: (c1) hitting, kicking, pushing, shoving, or locking someone indoors; and (c2) blackmailing someone for money or damaging things. Cyber bullying was measured by two items: (d1) bullying using a computer, e-mail messages or pictures; and (d2) bullying using a cell phone (Wang et al., 2019). For each form of school bullying, the stages of bullying occurrence were as follows: never, primary school, secondary school (junior high school, senior high school), and both primary and secondary school. In addition, as in a previous study (Chen and Huang, 2015), a bullying perpetration index (BPI) and a bullying victimization index (BVI) were calculated to determine the total number of the 4 forms of bullies and victims, ranging from 0 (noninvolved) to 4. Two roles of bullying (bullying and victimization) were also considered in this survey. Before the survey began, this questionnaire was retested (1-week interval) with 202 college students to guarantee that the content was suitable for the study population. The kappa values ranged from 0.82 to 0.94. Moreover, a consistency test was examined, ranging from 0.76 to 0.83.

#### 2.3.2. Murder-related psychological behaviors questionnaire

Murderous behavior refers to taking certain actions in a planned and purposeful manner to achieve the illegal behavior of killing someone (Wang et al., 2016). In this study, we defined murder-related psychological behaviors with reference to suicide-related psychological behaviors (Su et al., 2010; Bruwer et al., 2014). Murder-related psychological behaviors were considered to be a series of mental processes, including murderous ideation, murderous plans, murderous preparation, and murderous attempts. The specific items are as follows: (a) "Have you ever thought about ending someone's life in the past six months (i.e., have thoughts about taking someone's life)?", (b) "Have

**Table 1**  
Prevalence of murder-related psychological behaviors by sample characteristics.

Variables	N(%)	Ideation (%)	Plans (%)	Preparation (%)	Attempts (%)
Gender					
Male	2342(58.1)	198 (8.5)	89(3.8)	64(2.7)	49(2.1)
Female	1692(41.9)	80 (4.7)	12(0.7)	10(0.6)	8(0.5)
Only child					
Yes	1803(44.7)	148(8.2)	62(3.4)	51(2.8)	41(2.3)
No	2231(55.3)	130(5.8)	39(1.7)	23(1.0)	16(0.7)
Relationship with mother					
Poor	75(1.9)	13(17.3)	9(12.0)	9(12.0)	8(10.7)
General	610(15.1)	54(8.9)	19(3.1)	17(2.8)	11(1.8)
Good	3349(83.0)	211(6.3)	73(2.2)	48(1.4)	38(1.1)
Relationship with father					
Poor	124(3.1)	18(14.5)	12(9.7)	11(8.9)	10(8.1)
General	1095(27.1)	101(9.2)	35(3.2)	28(2.6)	20(1.8)
Good	2815(69.8)	159(5.6)	54(1.9)	35(1.2)	27(1.0)
Appearance					
Good	755(18.7)	60(7.9)	22(2.9)	19(2.5)	15(2.0)
General	2817(69.8)	163(5.8)	57(2.0)	39(1.4)	31(1.1)
Poor	462(11.5)	55(11.9)	22(4.8)	16(3.5)	11(2.4)
No. of friends					
< 3	1235(30.6)	112(9.1)	48(3.9)	42(3.4)	34(2.8)
≥ 3	2799(69.4)	166(5.9)	53(1.9)	32(1.1)	23(0.8)
Depression					
Yes	2083(51.6)	205(9.8)	89(4.3)	68(3.3)	53(2.5)
No	1951(48.4)	73(3.7)	12(0.6)	6(0.3)	4(0.2)
Verbal: bullying victimization					
Yes	1681(41.7)	178(10.6)	66(3.9)	50(3.0)	43(2.6)
No	2353(58.3)	100(4.2)	35(1.5)	24(1.0)	14(0.6)
Relational: bullying victimization					
Yes	1332(33.0)	146(11.0)	57(4.3)	44(3.3)	39(2.9)
No	2702(67.0)	132(4.9)	44(1.6)	30(1.1)	18(0.7)
Physical: bullying victimization					
Yes	974(24.1)	119(12.2)	49(5.0)	40(4.1)	35(3.6)
No	3060(75.9)	159(5.2)	52(1.7)	34(1.1)	22(0.7)
Cyber: bullying victimization					
Yes	342(8.5)	78(22.8)	48(14.0)	43(12.6)	37(10.8)
No	3692(91.5)	200(5.4)	53(1.4)	31(0.8)	20(0.5)
Verbal: bullying perpetration					
Yes	849(21.0)	128(15.1)	61(7.2)	45(5.3)	38(4.5)
No	3185(79.0)	150(4.7)	40(1.3)	29(0.9)	19(0.6)
Relational: bullying perpetration					
Yes	575(14.3)	105(18.3)	55(9.6)	44(7.7)	41(7.1)
No	3459(85.7)	173(5.0)	46(1.3)	30(0.9)	16(0.5)
Physical: bullying perpetration					
Yes	513(12.7)	95(18.5)	52(10.1)	43(8.4)	35(6.8)
No	3521(87.3)	183(5.2)	49(1.4)	31(0.9)	22(0.6)
Cyber: bullying perpetration					
Yes	179(4.4)	60(33.5)	42(23.5)	40(22.3)	38(21.2)
No	3855(95.6)	218(5.7)	59(1.5)	34(0.9)	19(0.5)
Total	4034(100)	278(6.9)	101(2.5)	74(1.8)	57(1.4)

you ever planned to end someone's life in the past six months (i.e., carefully thought about some specific ways or steps to take someone's life)?", (c) "Have you ever prepared to end someone's life in the past six months (i.e., prepared some specific tool or equipment to end someone's life)?", and (d) "Have you ever attempted to end someone's life in the past six months (e.g., poisoning, stabbing with a sharp knife, strangling)?". The response options were 0 = never, 1 = once, 2 = 2 or 3 times and 3 = 4 or more times. However, the detection rates of involvement in murder-related psychological behaviors 2 times or above were relatively low. Therefore, the occurrence of the 4 types of murder-related psychological behaviors was dichotomized as involved (one or more times) and noninvolved (never). In our previous study, this questionnaire showed desired values for reliability and validity in middle- and high-school students (Su et al., 2018; Wang et al., 2016). In this study, the Cronbach's alpha values calculated for the sample of 202 college students ranged from 0.80 to 0.94, and the kappa values ranged from 0.82 to 0.89.

### 2.3.3. Self-Rating depression scale

The Self-Rating Depression Scale (SDS) was developed by

Zung (1965) and aims to assess depression. The validity and reliability have been examined (Gabrys and Peters, 1985; Han et al., 2018a, b). It consists of 20 items, and a 4-point Likert scale was used for each item to assess how the subjects felt in the past week. The scores for each item were added to obtain the total score, ranging from 20 to 80. A higher score demonstrated more serious depression. The Cronbach's alpha values ranged from 0.83 to 0.92, and the kappa values ranged from 0.78 to 0.89.

### 2.3.4. Covariates

Based on previous relevant studies (Wang et al., 2009, 2016; Han et al., 2018a, b), we controlled for differences in gender (male or female), grade, self-perceived family socioeconomic status (good, moderate, poor), self-perceived relationship with mother and father (good, moderate, poor), and other sociodemographic characteristics (i.e., appearance, number of friends, only-child status and character). Depression was also included as a covariate because depression was associated with both bullying and homicide (Takizawa et al., 2014; Rheingold et al., 2012).

## 2.4. Statistical analysis

All statistical analyses were performed using SPSS for Windows (version 23.0; SPSS Inc., Chicago, IL, USA). Descriptive statistics were conducted for this study (e.g., the prevalence of each form of bullying and the prevalence of murderous ideation and behaviors). Univariate logistic regression analysis was used to explore the relationships between covariates (e.g., gender, family socioeconomic status) and murderous ideation and behaviors. Multinomial logistic regression models were used to explore the relationship between each form of murder-related psychological behavior and different stages of school bullying experiences or bullying victimization by adjusting for socio-demographic variables and depression. The level of significance was set at  $P < .05$ . We also performed Poisson regression models to explore those relationships. The results were remained robust. We enclosed those results in the Supplement Materials (see S Table 1 and S Table 2).

## 3. Results

### 3.1. The prevalence rates of bullying, victimization and murder-related psychological behaviors

The prevalence rates of bullying victimization were 41.7% for verbal, 33.0% for relational, 24.1% for physical, and 8.5% for cyber, whereas the rates of bullying perpetration were 21.0% for verbal, 14.3% for relational, 12.7% for physical, and 4.4% for cyber. Additionally, the prevalence rates of murderous ideation, plans, preparation, and attempts were 6.9%, 2.5%, 1.8%, and 1.4%, respectively (see Table 1).

### 3.2. Univariate logistic regression analyses

The univariate logistic regressions showed that gender (odds ratios (ORs) ranging from 1.86 to 5.53), only-child status (ORs ranging from 0.31 to 0.69), relationship with both parents (ORs ranging from 0.10 to 0.46), and number of friends (ORs ranging from 0.29 to 0.63) were significantly associated with each murder-related psychological behavior. Family status, character, appearance, and grade were partly significantly associated with each murder-related psychological behavior (see Table 2).

### 3.3. Associations between precollege bullying experiences and murder-related psychological behaviors

After adjustments were made for covariates (variables that were significantly associated with each murder-related psychological behavior in Table 2 and depression), multivariable logistic regressions were performed to explore the association between various types of precollege bullying experiences in different stages and series of murder-related psychological behaviors (see Table 3 and Table 4).

#### 3.3.1. Murderous ideation

Precollege cyber bullying victimization (primary: adjusted odds ratio (AOR) = 2.87; secondary: AOR = 1.89; both periods: AOR = 3.64) and perpetration experiences (primary: AOR = 2.78; secondary: AOR = 2.43; both periods: AOR = 2.26) and relational bullying perpetration experiences (primary: AOR = 1.67; secondary: AOR = 2.18; both periods: AOR = 2.32) were associated with an increased risk of murderous ideation. Verbal bullying victimization experiences (primary school: AOR = 1.57 and both periods: AOR = 1.96), verbal bullying perpetration experiences (primary school: AOR = 1.69), and physical bullying perpetration experiences (secondary school: AOR = 2.15) were significantly correlated with murderous ideation. Furthermore, a BPI of two types and more (AORs ranging from 2.49 to 7.69) and a BVI of two and three types (AORs ranging from 1.68 to 2.81) were significantly associated with an

increased risk of murderous ideation.

#### 3.3.2. Murderous plans

Similarly, precollege cyber bullying victimization (primary: AOR = 9.99; secondary: AOR = 3.21; both periods: AOR = 9.76) and perpetration experiences (primary: AOR = 4.23; secondary: AOR = 3.11; both periods: AOR = 4.31) were significantly associated with murderous plans. Relational bullying perpetration experiences (both periods: AOR = 3.01) and physical bullying perpetration experiences (secondary school: AOR = 2.15 and both periods: AOR = 4.15) were significantly associated with murderous plans. For the BPI, two types and more (AORs ranging from 3.61 to 15.80) were significantly associated with murderous plans.

#### 3.3.3. Murderous preparation

Cyber bullying victimization (primary: AOR = 16.84; secondary: AOR = 4.49; both periods: AOR = 18.28) and perpetration experiences (primary: AOR = 12.58; secondary: AOR = 3.57; both periods: AOR = 7.86) and physical bullying perpetration experiences (secondary school: AOR = 3.62 and both periods: AOR = 6.34) were correlated with murderous preparation. Those with a BPI of two types and more (AORs ranging from 2.93 to 21.55) were more likely to report more murderous preparation.

#### 3.3.4. Murderous attempts

Physical bullying victimization experiences (secondary school: AOR = 2.66) and cyber bullying victimization (primary: AOR = 16.57 and both periods: AOR = 21.48) or perpetration experiences (primary: AOR = 15.67; secondary: AOR = 9.99; both periods: AOR = 14.04) were significantly associated with murderous attempts. Additionally, college students with physical (AOR = 3.57) and relational (AOR = 3.55) bullying perpetration experiences in both periods were more likely to report murderous attempts than were those students without such experiences. Those with a BPI of three types and more (AORs ranging from 19.16 to 26.23) were more likely to report murderous attempts.

## 4. Discussion

In this study, the prevalence rates of murderous ideation, murderous plans, murderous preparation, and murderous attempts were 6.9%, 2.5%, 1.8%, and 1.4%, respectively. One main finding is that cyber bullying was associated with higher odds of murder-related psychological behavior in various forms. Furthermore, a dose-response relationship was observed between college students with BPI and murder-related psychological behaviors.

In recent years, the prevalence rates of school bullying were still high, and it will continue to affect the physical and mental health of adolescents (Zhao and Wang, 2017; Hymel and Swearer, 2015). In this study, we found that the prevalence rates of bullying victimization were 41.7% for verbal, 33.0% for relational, 24.1% for physical, and 8.5% for cyber bullying victimization. Furthermore, the prevalence rates of bullying perpetration were 21.0% for verbal, 14.3% for relational, 12.7% for physical, and 4.4% for cyber bullying perpetration. In a sample of 3175 middle school students aged 15–17 years in Xi'an, China, 54.9% and 44.6% of Chinese children had been bullied in their lifetimes and in the preceding year, respectively (Zhu and Chan, 2015). The prevalence rates of cyber bullying were lower than those of other forms of bullying, which is consistent with the findings of previous studies (Wang et al., 2009; Thomas et al., 2017). It is possible that some students do not have the opportunity to use mobile phones and computers due to academic pressures.

In a previous study, the prevalence rates of murderous ideation, plans, preparation, and attempts were 9.9%, 2.8%, 1.3%, and 0.6%, respectively, in a sample of 5726 middle and high school (Wang et al., 2016). These prevalence rates of murderous ideation and plans are

**Table 2**  
Unadjusted OR (95% CI) for murder-related psychological behaviors by univariate analysis.

Variables	Ideation OR (95% CI)	Plans OR (95% CI)	Preparation OR (95% CI)	Attempts OR (95% CI)
Gender				
Female(ref)				
Male	1.86(1.42,2.43)***	5.53(3.02,10.14)***	4.73(2.42,9.23)***	4.50(2.13,9.52)***
Only child				
Yes(ref)				
No	0.69(0.54,0.88)**	0.50(0.33,0.75)**	0.36(0.22,0.59)***	0.31(0.17,0.56)***
Family economic status				
Poor(ref)				
General	0.90(0.69,1.19)	0.74(0.50,1.20)	0.57(0.35,0.93)*	0.58(0.33,1.01)
Good	1.18(0.73,1.91)	1.09(0.51,2.32)	1.11(0.50,2.48)	0.89(0.33,2.38)
Relationship with mother				
Poor(ref)				
General	0.46(0.24,0.90)*	0.24(0.10,0.54)**	0.21(0.09,0.49)***	0.15(0.06,0.40)***
Good	0.32(0.17,0.59)***	0.16(0.08,0.34)***	0.11(0.05,0.23)***	0.10(0.04,0.21)***
Relationship with father				
Poor(ref)				
General	0.60(0.35,1.03)	0.31(0.16,0.61)**	0.27(0.13,0.56)***	0.21(0.10,0.46)***
Good	0.35(0.21,0.60)***	0.18(0.10,0.35)***	0.13(0.06,0.26)***	0.11(0.05,0.23)***
Character				
Introvert(ref)				
Moderate	0.89(0.67,1.18)	0.73(0.47,1.14)	0.62(0.37,1.04)	0.55(0.30,1.01)
Outgoing	0.76(0.56,1.04)	0.55(0.33,0.93)*	0.43(0.23,0.81)**	0.52(0.27,1.02)
Appearance				
Good(ref)				
General	0.71(0.52,0.97)*	0.69(0.42,1.13)	0.54(0.31,0.95)*	0.55(0.30,1.02)
Poor	1.57(1.06,2.30)*	1.67(0.91,3.04)	1.39(0.71,2.73)	1.20(0.55,2.64)
No. of friends				
< 3(ref)				
≥ 3	0.63(0.49,0.81)***	0.48(0.32,0.71)***	0.33(0.21,0.52)***	0.29(0.17,0.50)***
Academic performance				
Poor(ref)				
General	0.79(0.60,1.04)	0.67(0.43,1.06)	0.74(0.44,1.23)	0.70(0.38,1.27)
Good	0.54(0.37,0.78)**	0.69(0.40,1.22)	0.57(0.29,1.15)	0.77(0.37,1.60)

OR - odds ratio; 95% CI - 95% confidence interval.

\*  $P < .05$ ;

\*\*  $P < .01$ ;

\*\*\*  $P < .001$ .

slightly higher than those found in our research, but the rates for murderous preparation and attempts are lower than those found in our research. It is possible that college students have more mature executive ability than middle school students do, as college students not only have ideas, but they also follow through with their ideas. However, our research is limited to Anhui Province, China. Future studies using a representative national sample are needed to confirm our findings.

Consistent with a previous study (Loeber and Ahonen, 2013), a good relationship with both parents and having more intimate friends showed a negative correlation with each form of murder-related psychological behaviors. It is possible that adolescents who have a good relationship with their parents and more friends could receive more family and social support, thus reducing the chance of murder-related psychological behaviors. Furthermore, being a male and being an only child are associated with increased odds of murder-related psychological behaviors; these findings were similar to those of previous studies (Wang et al., 2016; Peters et al., 2017). Heim et al. (2010) indicated that male androgen testosterone in adolescence can also increase the risk of male violence and that such violence could include later adolescent murder-related psychological behaviors. Previous studies have reported that only children might be more selfish (Veenhoven and Verkuyten, 1989). Compared with non-only children, only children exhibit differences in the development of behavior and brain structure (Yang et al., 2017). Therefore, more studies are needed to examine the relationship between these social demographic factors and murder-related psychological behaviors in the future.

After adjustment for covariates (e.g., sociodemographic variables that were significant in univariate analysis and depression), different

stages of precollege cyber bullying were associated with higher odds of murder-related psychological behavior in various forms, except for murderous attempts. On the one hand, the use of the Internet and cell phones has become more common among adolescents in recent years (Hamm et al., 2015). On the other hand, cyber bullying can affect a large number of adolescents within a short time period because it can spread quickly and is not limited by time and space (Sticca and Perren, 2013; Robert et al., 2013). With these ideas in mind, we believe that the Internet, with its novelty status, has had an invisible impact on the minds of teenagers (Tang and Koh, 2017). Moreover, adolescents who were involved in cyber bullying show more depression, self-harm and suicidality (Hamm et al., 2015), which may further evolve into murderous behavior.

Our results indicate that verbal bullying (both victimization and perpetration) were associated with murderous ideation in childhood but not with other types of murder-related psychological behaviors. These results further supported the idea that childhood bullying experiences have a long-lasting impact on adolescent mental health (Wang et al., 2018). Involvement in physical bullying as perpetrators in the adolescent period was associated with an increased risk of murderous ideation, plans, and preparation but not in childhood. However, we also found a positive association between physical bullies and murderous ideation, plans, and preparation in both periods, probably because of the continuation of the impact of secondary school. Nevertheless, this result might inform us that involvement in school bullying during the adolescent period has a greater impact on murder-related behaviors than do childhood bullying experiences. Espelage et al. (2018) found that those who were bullied in early

**Table 3**  
Multivariate logistic regression of adolescent murder in different periods of school bullying [AOR (95% CI)].

Variables	Ideation <sup>a</sup>	Plans <sup>b</sup>	Preparation <sup>c</sup>	Attempts <sup>b</sup>
Verbal: bullying victimization				
Never (ref)				
Primary	1.57(1.14,2.18)**	0.84(0.46,1.56)	0.49(0.21,1.12)	0.60(0.23,1.58)
Secondary	1.26(0.81,1.94)	0.92(0.44,1.93)	1.02(0.45,2.41)	1.21(0.44,3.28)
In both periods	1.96(1.21,3.18)**	1.91(0.91,4.01)	1.56(0.64,3.81)	1.75(0.61,4.97)
Relational: bullying victimization				
Never (ref)				
Primary	1.22(0.85,1.74)	0.96(0.49,1.88)	0.86(0.38,1.96)	1.24(0.50,3.11)
Secondary	1.46(0.96,2.20)	1.18(0.57,2.44)	0.65(0.25,1.64)	0.79(0.27,2.30)
In both periods	1.59(0.98,2.59)	1.28(0.60,2.75)	1.09(0.45,2.65)	1.54(0.57,4.13)
Physical: bullying victimization				
Never (ref)				
Primary	1.18(0.84,1.67)	0.740(0.389,1.407)	0.784(0.357,1.723)	0.991(0.415,2.367)
Secondary	1.12(0.67,1.88)	1.187(0.552,2.552)	1.679(0.707,3.984)	2.655(1.048,6.727)*
In both periods	1.59(0.94,2.69)	1.539(0.716,3.306)	2.002(0.827,4.847)	1.695(0.608,4.728)
Cyber: bullying victimization				
Never (ref)				
Primary	2.87(1.74,4.75)***	9.99(4.80,20.76)***	16.84(7.01,40.43)***	16.57(6.48,42.40)***
Secondary	1.89(1.15,3.13)*	3.21(1.49,6.89)**	4.49(1.84,10.98)***	2.89(1.16,8.73)*
In both periods	3.64(1.93,6.84)***	9.76(4.25,22.41)***	18.28(7.09,47.14)***	21.48(7.62,60.56)***
Verbal: bullying perpetration				
Never (ref)				
Primary	1.69(1.19,2.39)**	1.63(0.89,2.99)	1.22(0.57,2.63)	1.18(0.49,2.86)
Secondary	1.70(0.99,2.92)	1.49(0.65,3.40)	1.17(0.44,3.10)	1.50(0.51,4.41)
In both periods	1.11(0.56,2.23)	1.47(0.60,3.60)	0.81(0.26,2.46)	0.60(0.16,2.22)
Relational: bullying perpetration				
Never (ref)				
Primary	1.67(1.11,2.50)*	2.00(0.99,4.01)	1.21(0.48,3.09)	2.71(0.99,7.40)
Secondary	2.18(1.29,3.70)**	1.76(0.74,4.18)	1.77(0.63,4.92)	2.91(0.92,9.20)
In both periods	2.32(1.13,4.74)*	3.01(1.19,7.63)*	2.77(0.94,8.20)	3.55(1.02,12.41)*
Physical: bullying perpetration				
Never (ref)				
Primary	1.46(0.96,2.21)	1.05(0.49,2.25)	0.99(0.37,2.62)	1.09(0.39,3.03)
Secondary	2.15(1.23,3.76)**	3.10(1.46,6.56)**	3.62(1.46,8.76)**	1.61(0.57,4.56)
In both periods	1.54(0.79,2.97)	4.15(1.87,9.22)***	6.34(2.47,16.27)***	3.57(1.21,10.49)*
Cyber: bullying perpetration				
Never (ref)				
Primary	2.78(1.51,5.11)**	4.23(1.80,9.95)**	12.58(4.75,33.32)***	15.67(5.46,45.02)***
Secondary	2.43(1.23,4.80)*	3.11(1.28,7.59)*	3.57(1.23,10.38)*	9.99(3.33,30.01)***
In both periods	2.26(1.04,4.91)*	4.31(1.68,11.01)**	7.86(2.66,23.28)***	14.04(4.34,45.44)***
Severity of depression				
None (ref)				
Mild	1.79(1.29,2.48)***	3.37(1.69,6.70)**	4.36(1.72,11.04)**	4.55(1.46,14.10)**
Moderate to severe	3.39(2.47,4.65)***	9.46(4.98,17.96)***	13.25(5.55,31.61)***	16.09(5.63,46.01)***

**Notes:**  
<sup>a</sup> Model adjusted for gender, only child, relationship with mother, relationship with father, appearance and number of friends that were statistically significant in univariate analyses.

<sup>b</sup> Model adjusted for gender, only child, relationship with mother, relationship with father and number of friends.

<sup>c</sup> Model adjusted for gender, Character, relationship with mother, relationship with father and number of friends.

AOR - adjusted odds ratio; 95% CI - 95% confidence interval.

\*  $P < .05$ ;

\*\*  $P < .01$ ;

\*\*\*  $P < .001$ .

middle school had higher odds of sexual violence in high school. However, it is best to consider these findings to be preliminary results; more studies are needed to validate these findings.

In this study, we found a dose-response relationship in which college students with a BPI of two types and more were more likely to have murder-related psychological behaviors than those who were not bullied. However, this relationship did not exist for the BVI. This finding indicates that bullies may be more robustly associated with murder-related psychological behaviors. In contrast, [Olfie et al. \(2015\)](#) reported that men who had been bullied by coworkers or supervisors were more likely to commit murder. We also found an association between depression and murder-related psychological behaviors, which was also confirmed by another study ([Crump et al., 2013](#)). It is possible that the murder is accompanied by other mental disorders, including major depression and bipolar affective disorder, which are often

characterized by poor adaptability ([Minero et al., 2017](#)). Moreover, a previous study found that both bullies and victims scored higher in hostile aggression, retaliation, and ease of aggression ([Camodeca and Goossens, 2005](#)). Adolescent students with elevated levels of anger or aggression were more likely to be arrested for homicide/attempted homicide ([Baglivio and Wolff, 2017](#)). Furthermore, hostility mediated the relationship between prior bullying victimization and subsequent bullying perpetration, whereas hostility failed to mediate the victimization-perpetration association. Hostility and anger successfully predicted bullying perpetration ([Walters and Espelage, 2018](#)). These results suggested that hostility and anger might mediate the association between school bullying and murder ideation and behaviors. A previous study found that victims and bullies were more likely to carry weapons than were uninvolved peers ([Geel et al., 2014](#)). Furthermore, victims may carry weapons for self-protection, whereas bullies may carry

**Table 4**  
Multivariate logistic regression of adolescent murder on variety of school bullying [AOR (95% CI)].

Variables	% (N = 4034)	Ideation		Plans		Preparation		Attempts	
		%	AOR (95% CI) <sup>a</sup>	%	AOR (95% CI) <sup>b</sup>	%	AOR (95% CI) <sup>c</sup>	%	AOR (95% CI) <sup>b</sup>
<b>BPI</b>									
Non-involved(ref)	70.2	4.1	1.00	1.0	1.00	0.6	1.00	0.4	1.00
One type	15.7	6.6	1.24(0.84, 1.83)	1.7	1.77(0.83, 3.78)	1.1	2.06(0.79, 5.41)	0.2	0.41(0.05, 3.35)
Two types	8.0	14.3	2.49(1.66, 3.71)***	4.0	3.61(1.70, 7.64)**	1.9	2.93(1.03, 8.39)*	1.2	2.23(0.61, 8.14)
Three types	3.6	25.9	4.31(2.70, 6.90)***	18.4	13.85(6.97, 27.51)***	15.6	19.55(8.42, 45.42)***	14.3	19.16(7.25, 50.68)***
Four types	2.5	35.4	7.69(4.19, 14.12)***	23.2	15.80(6.93, 36.02)***	21.2	21.55(8.16, 56.90)***	20.2	26.23(8.86, 77.67)***
<b>BVI</b>									
Non-involved(ref)	42.9	3.6	1.00	1.3	1.00	0.9	1.00	0.6	1.00
One type	25.6	5.1	1.21(0.81, 1.79)	1.6	0.89(0.44, 1.79)	0.8	0.51(0.20, 1.30)	0.3	0.38(0.94, 1.50)
Two types	17.6	8.2	1.68(1.12, 2.52)**	1.1	0.46(0.19, 1.11)	0.6	0.31(0.09, 1.00)	0.1	0.15(0.02, 1.27)
Three types	9.3	18.2	2.81(1.84, 4.30)***	7.8	1.59(0.78, 3.23)	6.1	1.31(0.55, 3.08)	6.1	2.48(0.90, 6.79)
Four types	4.7	19.5	1.51(0.84, 2.74)	13.2	1.39(0.61, 3.16)	12.1	1.33(0.51, 3.42)	10.5	1.70(0.57, 5.10)
<b>Severity of depression</b>									
None (ref)	48.4	3.7	1.00	0.6	1.00	0.3	1.00	0.2	1.00
Mild	30.8	7.0	1.73(1.25, 2.40)**	2.3	3.24(1.62, 6.48)**	1.5	4.09(1.60, 10.43)**	1.0	3.93(1.24, 12.40)*
Moderate to severe	20.9	14.0	3.05(2.20, 4.23)***	7.2	7.45(3.86, 14.40)***	5.8	9.82(4.04, 23.90)***	4.8	9.54(3.23, 28.14)***

Notes: % refers to percent of four forms of murder-related psychological behaviors on variety school bullying experience.

<sup>a</sup> Model adjusted for gender, only child, relationship with mother, relationship with father, appearance and number of friends that were statistically significant in univariate analyses.

<sup>b</sup> Model adjusted for gender, only child, relationship with mother, relationship with father and number of friends.

<sup>c</sup> Model adjusted for gender, Character, relationship with mother, relationship with father and number of friends.

BPI-Bullying Perpetration Index; BVI-Bullying Victimization Index; AOR - adjusted odds ratio; 95% CI - 95% confidence interval.

\*  $P < .05$ ;

\*\*  $P < .01$ ;

\*\*\*  $P < .001$ .

weapons to intimidate others (Dijkstra et al., 2012). Using a sample of 3660 Korean secondary students, Choi and Park (2018) found that students with higher self-esteem were more likely to engage in future bullying perpetration when they were bullied. Future studies need to examine mediators and moderators of the relationship between school bullying and adolescent murderous ideation and behaviors, aiming to provide more clues for adolescent murder prevention.

To our knowledge, this is the first study to investigate the relationship between school bullying and murder-related psychological behavior among college students in China. Based on studies of suicide-related psychological behaviors, we defined murder as a series of mental processes, including murderous ideation, plans, preparation, and attempts. Notably, it is taken into account that school bullying has chronic adverse health effects from childhood to adolescence and even in later adulthood. School bullying in two periods (i.e., childhood and adolescence) were evaluated in detail in this study. We believe that our findings have provided insights for adolescent violence prevention.

#### 4.1. Limitations

The limitations of this study must be noted. First, because it is a cross-sectional study, causal conclusions could not be drawn. Future longitudinal studies are needed to verify the predictive effects of school bullying on murder-related psychological behavior. Second, all data were collected via self-report. In addition, information on school bullying was collected through recall; therefore, recall bias is inevitable. However, previous studies have shown that the retrospective recall of bullying experiences is reliable and advisable (Rivers, 2001), and this bias can be reduced by measuring two clear items for each form of school bullying. Third, this study was limited to Hefei city, Anhui Province. Therefore, future cohort studies based on a representative national sample are needed to confirm our findings. Lastly, the frequency of involvement in school bullying was not measured in this study. However, school bullying during two time periods was evaluated, and the BPI and BVI were used to determine the total number of bullies and victims, respectively. In this way, we can explore the association between various types of preadolescent and adolescent school bullying and each murder-related psychological behavior.

## 5. Conclusion

Our results have confirmed the association between various types of childhood and adolescent school bullying and each murder-related psychological behavior. Furthermore, this study extends previous findings that school bullying is associated not only with suicide-related psychological behaviors but also with murder-related psychological behaviors. However, future cohort studies are needed to verify these associations. This study is consistent with previous studies showing that school bullying has long-term health effects. Therefore, it is necessary to develop preventive measures beginning in primary school. Furthermore, to reduce the harmful effects of bullying on children and adolescents, society as a whole needs to work together, including parents, teachers, and child health workers.

### Declaration of Competing Interest

The authors declare that they have no conflict of interest.

### Acknowledgments

This work was supported by the grants from the National Nature Science Foundation of China (grant nos. 81874268, 81973064 and 81573163).

### Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.psychres.2019.112593](https://doi.org/10.1016/j.psychres.2019.112593).

### References

- Adhia, A., Kernic, M.A., Hemenway, D., Vavilala, M.S., Rivara, F.P., 2019. Intimate partner homicide of adolescents. *JAMA Pediatr* 173, 571–577.
- Alisic, E., Groot, A., Snetselaar, H., Stroeken, T., Hehenkamp, L., 2018. Children's perspectives on life and well-being after parental intimate partner homicide. *Eur. J. Psychotraumatol.* 8, 1463796.
- Arango, A., Opperman, K.J., Gipson, P.Y., King, C.A., 2016. Suicidal ideation and suicide attempts among youth who report bully victimization, bully perpetration and/or low

- social connectedness. *J. Adolesc.* 51, 19–29.
- Arseneault, L., Walsh, E., Trzesniewski, K., Newcombe, R., Caspi, A., Moffitt, T.E., 2006. Bullying victimization uniquely contributes to adjustment problems in young children: a nationally representative cohort study. *Pediatrics* 118, 130–138.
- Baglivio, M.T., Wolff, K.T., 2017. Prospective prediction of juvenile homicide/attempted homicide among early-onset juvenile offenders. *Int. J. Environ Res Public Health* 14, 197.
- Bruwer, B., Govender, R., Bishop, M., Williams, D.R., Stein, D.J., Seedat, S., 2014. Association between childhood adversities and long-term suicidality among South Africans from the results of the South African Stress and Health study: a cross-sectional study. *BMJ Open* 4, e004644.
- Camodeca, M., Goossens, F.A., 2005. Aggression, social cognitions, anger and sadness in bullies and victims. *J. Child Psychol Psychiatry* 46, 186–197.
- Chan, H.C., Wong, D.S., 2015. Traditional school bullying and cyberbullying in Chinese societies: prevalence and a review of the whole-school intervention approach. *Aggress Violent Beh.* 23, 98–108.
- Chen, Y.Y., Huang, J.H., 2015. Precollege and in-college bullying experiences and health-related quality of life among college students. *Pediatrics* 135, 18–25.
- Choi, B., Park, S., 2018. Who becomes a bullying perpetrator after the experience of bullying victimization? The moderating role of self-esteem. *J. Youth Adolesc.* 47, 2414–2423.
- Craig, W., Harelisch, Y., Fogelgrinvald, H., Dostaler, S., Hetland, J., Simons-Morton, B., Molcho, M., Overpeck, M., Due, P., Pickett, W., 2009. A cross-national profile of bullying and victimization among adolescents in 40 countries. *Int. J. Public Health* 54, 216–224.
- Crump, C., Sundquist, K., Winkleby, M.A., Sundquist, J., 2013. Mental disorders and vulnerability to homicidal death: Swedish nationwide cohort study. *BMJ* 346, f557.
- Dijkstra, J.K., Gest, S.D., Lindenberg, S., Veenstra, R., Cillessen, A.H., 2012. Testing three explanations of the emergence of weapon carrying in peer context: the roles of aggression, victimization, and the social network. *J. Adolesc Health* 50, 371–376.
- Dodson, N.A., 2016. Adolescent gun violence prevention: what we know, and what we can do to keep young people safe. *Curr Opin Pediatr* 28, 441–446.
- Duong, J., Bradshaw, C., 2014. Associations between bullying and engaging in aggressive and suicidal behaviors among sexual minority youth: the moderating role of connectedness. *J. Sch Health* 84, 636–645.
- Espelage, D.L., Basile, K.C., Leemis, R.W., Hipp, T.N., Davis, J.P., 2018. Longitudinal examination of the bullying-sexual violence pathway across early to late adolescence: implicating homophobic name-calling. *J. Youth Adolesc.* 47, 1880–1893.
- Gabrys, J.B., Peters, K., 1985. Reliability, discriminant and predictive validity of the Zung self-rating depression scale. *Psychol Rep* 57, 1091–1096.
- Gómez-Guadix, M., Orue, I., Smith, P.K., Calvete, E., 2013. Longitudinal and reciprocal relations of cyberbullying with depression, substance use, and problematic internet use among adolescents. *J. Adolesc Health* 53, 446–452.
- Geel, M.V., Vedder, P., Tanilon, J., 2014. Bullying and weapon carrying: a meta-analysis. *JAMA Pediatr* 168, 714–720.
- Hamm, M.P., Newton, A.S., Chisholm, A., Shulhan, J., Milne, A., Sundar, P., Ennis, H., Scott, S.D., Hartling, L., 2015. Prevalence and effect of cyberbullying on children and young people: a scoping review of social media studies. *JAMA Pediatr* 169, 770–777.
- Han, A., Wang, G., Xu, G., Su, P.Y., 2018a. A self-harm series and its relationship with childhood adversity among adolescents in mainland China: a cross-sectional study. *BMC Psychiatry* 18, 28.
- Han, L., Zhao, S.Y., Pan, X.Y., Liao, C.J., 2018b. The impact of students with left-behind experiences on childhood: the relationship between negative life events and depression among college students in China. *Int J Soc Psychiatry* 64, 56–62.
- Heim, C., Shugart, M., Craighead, W.E., Nemeroff, C.B., 2010. Neurobiological and psychiatric consequences of child abuse and neglect. *Dev. Psychobiol.* 52, 671–690.
- Hepburn, L., Azrael, D., Molnar, B., Miller, M., 2012. Bullying and suicidal behaviors among urban high school youth. *J. Adolesc Health* 51, 93–95.
- Hohl, B.C., Wiley, S., Wiebe, D.J., Culyba, A.J., Drake, R., Branas, C.C., 2017. Association of drug and alcohol use with adolescent firearm homicide at individual, family, and neighborhood levels. *JAMA Intern Med* 177, 317–324.
- Hymel, S., Swearer, S.M., 2015. Four decades of research on school bullying: an introduction. *Am. Psychol.* 70, 293–299.
- Jetelina, K.K., Reingle Gonzalez, J.M., Cuccaro, P.M., Peskin, M.F., Pompeii, L., Atem, F., Elliott, M.N., Earnshaw, V.A., Davies, S.L., Schuster, M.A., 2019. Mechanisms and frequency of violent injuries among victims and perpetrators of bullying. *J. Adolesc Health* 64, 664–670.
- Kuehn, K.S., Wagner, A., Vellozo, J., 2018. Estimating the magnitude of the relation between bullying, e-bullying, and suicidal behaviors among United States youth, 2015. *Crisis* 14, 1–9.
- Loeber, R., Ahonen, L., 2013. Invited address: street killings: prediction of homicide offenders and their victims. *J. Youth Adolesc.* 42, 1640–1650.
- Minero, V.A., Barker, E., Bedford, R., 2017. Method of homicide and severe mental illness: a systematic review. *Aggress Violent Behav.* 37, 52–62.
- Oliffe, J.L., Han, C.S., Drummond, M., Maria, E.S., Bottorff, J.L., Creighton, G., 2015. Men, masculinities, and murder-suicide. *Am. J. Mens Health* 9, 473–485.
- Parks, S.E., Johnson, L.L., McDaniel, D.D., Gladden, M., 2014. Surveillance for violent deaths—National violent death reporting system, 16 states, 2010. *MMWR Surveill Summ.* 63, 1–33.
- Peters, Z.J., Hatzenbuehler, M.L., Davidson, L.L., 2017. Examining the intersection of bullying and physical relationship violence among New York city high school students. *J. Interpers Violence* 32, 49–75.
- Pham, T.B., Schapiro, L.E., John, M., Adesman, A., 2017. Weapon carrying among victims of bullying. *Pediatrics* 140, e20170353.
- Rheingold, A.A., Zinzow, H., Hawkins, A., Saunders, B.E., Kilpatrick, D.G., 2012. Prevalence and mental health outcomes of homicide survivors in a representative US sample of adolescents: data from the 2005 national survey of adolescents. *J. Child Psychol Psychiatry* 53, 687–694.
- Rivers, I., 2001. Retrospective reports of school bullying: stability of recall and its implications for research. *Br. J. Dev. Psychol.* 19, 129–141.
- Robert, S., Peter, K.S., Ann, F., 2013. The nature of cyberbullying and strategies for prevention. *Comput. Human Behav* 29, 26–32.
- Schwartz, R.C., Wendling, H.M., Guthrie, H.K., 2005. Examining anxiety as a predictor of homicidality: a pilot study. *J. Interpers. Violence* 20, 848–854.
- Solberg, M.E., Olweus, D., 2003. Prevalence estimation of school bullying with the Olweus Bully/Victim Questionnaire. *Aggressive Behav.* 29, 239–268.
- Sticca, F., Perren, S., 2013. Is cyberbullying worse than traditional bullying? examining the differential roles of medium, publicity, and anonymity for the perceived severity of bullying. *J. Youth Adolesc.* 42, 739–750.
- Su, P.Y., Han, A.Z., Wang, G.F., Wang, L.H., Zhang, G.B., Xu, N., Xu, G., 2018. Is childhood maltreatment associated with murderous ideation and behaviors in adolescents in China? *Psychiatry Res.* 10, 467–473.
- Su, P.Y., Hao, J.H., Huang, Z.H., Tao, F.B., 2010. An investigation on self-harm episodes and their relationship with suicidal psychology and behaviors in 2713 college students. *Chin. J. Epidemiol.* 31, 1267–1271.
- Su, P.Y., Wang, G.F., He, H., Han, A.Z., Zhang, G.B., Xu, N., 2019. Is involvement in school bullying associated with increased risk of murderous ideation and behaviors among adolescent students in China? *BMC Psychiatry* 19, 121.
- Takizawa, R., Maughan, B., Arseneault, L., 2014. Adult health outcomes of childhood bullying victimization: evidence from a five-decade longitudinal British birth cohort. *Am. J. Psychiatry* 171, 777–784.
- Tang, C.S., Koh, Y.W., 2017. Addiction to internet use, online gaming, and online social networking among young adults in China, Singapore, and the United States. *Asia. Pac. J. Public Health* 29, 673–682.
- Taylor, P.J., Kalebic, N., 2018. Psychosis and homicide. *Curr. Opin. Psychiatry* 31, 223–230.
- Thomas, H.J., Connor, J.P., Lawrence, D.M., Hafekost, J.M., Zubrick, S.R., Scott, J.G., 2017. Prevalence and correlates of bullying victimisation and perpetration in a nationally representative sample of Australian youth. *Aust. N.Z. J. Psychiatry* 51, 909–920.
- United Nations Office on Drugs and Crime, Retrieved from**[http://www.unodc.org/documents/gsh/pdfs/2014\\_GLOBAL\\_HOMICIDE\\_BOOK\\_web.pdf](http://www.unodc.org/documents/gsh/pdfs/2014_GLOBAL_HOMICIDE_BOOK_web.pdf), 2014.
- Veenhoven, R., Verkuyten, M., 1989. The well-being of only children. *Adolescence* 24, 155–166.
- Walters, G.D., Espelage, D.L., 2018. From victim to victimizer: hostility, anger, and depression as mediators of the bullying victimization-bullying perpetration association. *J. Sch. Psychol.* 68, 73–83.
- Wang, C.C., Lin, H.C., Chen, M.H., Ko, N.Y., Chang, Y.P., Lin, I.M., Yen, C.F., 2018. Effects of traditional and cyber homophobic bullying in childhood on depression, anxiety, and physical pain in emerging adulthood and the moderating effects of social support among gay and bisexual men in Taiwan. *Neuropsychiatr. Dis. Treat.* 14, 1309–1317.
- Wang, G.F., Jiang, L., Wang, L.H., Hu, G.Y., Fang, Y., Yuan, S.S., Wang, X.X., Su, P.Y., 2019. Examining childhood maltreatment and school bullying among adolescents: a cross-sectional study from Anhui province in China. *J. Interpers Violence* 34, 980–999.
- Wang, J., Iannotti, R.J., Nansel, T.R., 2009. School bullying among adolescents in the United States: physical, verbal, relational, and cyber. *J. Adolesc Health* 45, 368–375.
- Wang, L.H., Hu, G.Y., Xu, G., Su, P.Y., 2016. Analysis on the epidemiological characteristics of adolescent murderous psychological behaviors in Anhui. *Chin. J. Sch. Health* 37, 1182–1186.
- Winsper, C., Lereya, T., Zanarini, M., Wolke, D., 2012. Involvement in bullying and suicide-related behavior at 11 years: a prospective birth cohort study. *J. Am. Acad. Child Adolesc. Psychiatry* 51, 271–282 e3.
- Yang, J., Hou, X., Wei, D., Wang, K., Li, Y., Qiu, J., 2017. Only-child and non-only-child exhibit differences in creativity and agreeableness: evidence from behavioral and anatomical structural studies. *Brain Imaging Behav* 11, 493–502.
- Yeh, Y.C., Huang, M.F., Wu, Y.Y., Hu, H.F., Yen, C.F., 2017. Pain, bullying involvement, and mental health problems among children and adolescents with ADHD in Taiwan. *J. Atten Disord* 1087054717724514.
- Yoshimasu, K., 2017. Substance-related and addictive disorders as a risk factor of suicide and homicide among patients with ADHD: a mini review. *Curr Drug Abuse Rev.* 9, 80–86.
- Zhao, Y.J., Wang, S.Y., 2017. Reduction and control of school bullying is urgently needed. *Chin. J. Epidemiol.* 38, 277–279.
- Zhu, Y., Chan, K.L., 2015. Prevalence and correlates of school bullying victimization in Xi'an, China. *Violence Vict.* 30, 714–732.
- Zung, W., 1965. A self-rating depression scale. *Arch. Gen. Psychiatry* 12, 63–70.