

Original Research Article

Analysis of School Bullying of Middle School Students based on Regression Analysis Method

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Abstract: **Background:** In recent years, the frequent occurrence of school bullying incidents has continuously attracted widespread attention from all walks of life. The phenomenon of bullying has become a school safety issue that cannot be ignored. Research on the main factors affecting school bullying will help prevent and control school bullying, establish a long-term prevention system, provide effective suggestions and countermeasures for building a harmonious campus and provide educators with a scientific basis. **Method:** Through questionnaire surveys, we conducted descriptive statistics on the phenomenon of campus bullying among students of different grades, used principal component analysis to reduce dimensionality to obtain new public factors, established multiple linear regression equations, and analyzed the influence of age, gender, identity, whether to join the computer to enter school, skip class, peers on four types of bullying: verbal bullying, cyber bullying, physical bullying, and relationship bullying. **Results:** The bullying method is mainly verbal bullying, followed by relational bullying and physical bullying, and cyber bullying is the lowest. Boys are more likely to be bullied than girls, and the difference in bullying between boys and girls is more reflected in physical bullying and verbal bullying. Peer relationship is one of the main factors leading to campus bullying, and the proportion of students without friends being bullied is as high as 75.76%. The comparison between day students and boarding students shows that boarding students are more victims of bullying than day students. **Conclusion:** Students with different academic performance types have different rates of bullying victimization, and students with poor academic performance are more likely to be bullied. Students with good academic performance are more likely to be popular in the class, so grades seem to be a favorable factor to protect themselves from bullying. If school bullying is not stopped, it may become a violent incident, so educators and parents should be aware of and monitor it as soon as possible.

Keywords: School bullying, questionnaire surveys, descriptive statistics, principal component analysis, multiple linear regression equations.

1. INTRODUCTION

The study of school bullying on a global scale began in the 1970s. The pioneer in the study of school bullying behavior, Professor Orvis, through an in-depth investigation of bullying behavior, defined school bullying as the victim being deliberately, repeatedly and continuously by one or more students to make negative behaviors, causing physical and psychological harm or discomfort to the victim. He believes that bullying has three core characteristics: intentional aggressive behavior, repeated harms and inequality of power for both parties. The frequent occurrence of school bullying around the world has attracted the attention of national education policy makers, and many countries have taken relevant prevention measures. Norway has established a zero tolerance program and issued the "Anti-bullying Declaration". The United States and Japan have also successively promulgated anti-bullying bills and implemented comprehensive anti-bullying policies. The Chinese government also attaches great importance to the issue of school bullying: In April 2016, the Office of the Education Supervision Committee of the State Council issued the "Notice on Carrying out Special Management of School Bullying", requiring primary and secondary schools across the country to strengthen the prevention and special management of school bullying incidents.

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At present, there is no unified concept for campus bullying, but bullying methods can be divided into four types: verbal bullying, relationship bullying, cyber bullying and physical bullying (Wang *et al.*, 2009). "Verbal bullying" is the most difficult to spot bullying behavior. It refers to the behavior of bullying the other party with rough language, which is mainly manifested as repeated insults, threats, and rude comments on other people's characteristics (Azeredo *et al.*, 2015; Naidoo *et al.*, 2016; Antiri, 2016; Menesini and Salmivalli, 2017; Dardiri *et al.*, 2020; Rigby, 2020). "Relational bullying" refers to creating rumors and gossip, transforming the meaning of the words themselves and deliberately disseminating them, deliberately squeezing certain types of classmates into social circles, making them ignored and disrespected by everyone (Woods and Wolke, 2003; Woods and Wolke, 2004; Bauman and Rio, 2006; Hampel *et al.*, 2009; Dukes *et al.*, 2009; Chester *et al.*, 2017). "Physical bullying" is the earliest and most traditional form of bullying. It mostly occurs between boys and boys. It is mainly manifested in repeated beatings, tripping, touching, kicking, shoving, blocking or robbing other people (Tharp-Taylor, 2009; Litwiller and Brausch, 2013; Piquart, 2017; Cho, 2018; Choi, 2019; Mendez, 2019). "Cyber bullying" refers to the use of interactive digital technologies such as the Internet and telephone to make malicious rumors or repetitive or hostile behaviors directed at minors, resulting in certain material or mental harm to the victim (Williams and Guerra, 2007; Kwan and Skoric, 2013; Cross *et al.*, 2015; Baldry *et al.*, 2017; Tanrikulu, 2018; Cilliers and Chinyamurindi, 2020). School bullying has had a great negative impact on the healthy growth of young people and undermined the harmony of society (Horton, 2011; Rigby and Smith, 2011; Espelage and Rue, 2012; Olweus, 2013; Cornell and Limber, 2015; Hymel and Swearer, 2015). Therefore, the top priority is to pay attention to school bullying and solve the problem of school bullying.

In the past few decades, the problem of school bullying has been investigated by some authors (Albayrak *et al.*, 2016; Hall, 2017; Rigby, 2017; Raqqad, 2017; Maunder and Crafter, 2018; Hicks *et al.*, 2018; Thornberg, 2018; Gaffney *et al.*, 2019; Thornberg and Delby, 2019; Huang and Cornell, 2019). For instance, Gaffney *et al.*, (Gaffney *et al.*, 2019) studied the effectiveness of school-bullying intervention programs globally. Ba *et al.*, (Ba *et al.*, 2019) investigated the ethnic differences of being traditionally bullied and cyberbullied in China. Tekel and Karadag (Tekel and Karadag, 2019) discussed the effects of school bullying on school mindfulness and school academic performance through a structural equation model. Strindberg *et al.* (Strindberg *et al.*, 2020) examined Swedish school pupils' perspectives on why some pupils engage in bullying, support bullying or avoid standing up for the one(s) being bullied. Smith and Berkkun (Smith and Berkkun, 2020) reported an analysis of contextual information on a sample of 201 articles from 1976 to 2015 on school bullying. Arslan *et al.*, (Arslan *et al.*, 2020) explored the effects of victimization and perpetration experiences on positive psychological orientations, mental health problems, and subjective wellbeing in high school students. Healy (Healy, 2020) proposed three theoretically derived hypotheses that describe mechanisms through which encouraging peers to actively defend victims may produce adverse outcomes for victims. Olweus *et al.*, (Olweus *et al.*, 2020) provided that schools with continued use had changed their "school culture" for the better with regard to awareness, preparedness and competence in handling and preventing bullying. Walters (Walters, 2020) indicated that bullying victimization and perpetration correlate strongly and that their cross-lagged longitudinal relationship runs in both directions, such that perpetration is just as likely to lead to future victimization as victimization is to lead to future perpetration. Mischel and Kitsantas (Mischel and Kitsantas, 2020) examined middle school students' perceptions of bullying, school climate and social support and coping. Khanolainen and Semenova (Khanolainen and Semenova, 2020) developed a new arts-based measure assessing school bullying and to test it within a pilot study involving 19 schoolchildren. Divecha and Brackett (Divecha and Brackett, 2020) revealed that social and emotional learning is a promising approach for reducing a range of disruptive behaviors in schools. Although the problem of school bullying has been studied by some authors, the existing research results only use some simple qualitative analysis methods to study school bullying and the methods are relatively monotonous.

2. QUESTIONNAIRE PROCESSING

Data source

In response to the problem of campus bullying, we designed a questionnaire on the bad behaviors of teenagers on campus. A total of 4 schools were selected from all middle schools in Anyang by stratified cluster random sampling, and the questionnaire was filled out in units of classes. The survey process required in accordance with the unified guidance and self-filling, it was finally retrieved by the class teacher, which provided rich and reliable data for investigating the problem of campus bullying. This questionnaire is for junior and senior high school students. It collects some information about youth campus life and bullying incidents, and uses the results of the survey. By sorting out the questionnaire data, a total of 4 schools, 1500 students participated in the questionnaire, 1218 valid questionnaires, the effective rate is 84.2%, including 616 girls (50.6%) , 602 boys (46.4%); 812 (66.7%) students under 16 years old, 406 (33.3%) students over 16 years old; 718 high school students (58.9%), 500 junior high school students (41.1%).

Selection of variables

This article focuses on the fields related to the main factors of campus bullying. Therefore, bullying is taken as a dependent variable and divided into four types of bullying: "verbal bullying", "relational bullying", "physical bullying",

and “cyber bullying”. "Age", "identity", "whether to join the machine to enter school", "time from home to school", "skip class", "partner" are taken as independent variables.

Reliability and validity test of questionnaire

Table 1: Reliability Checklist

Cronbach α	Standardized Cronbach α	Number of Items
0.862	0.853	32

In Table 1, Cronbach $\alpha=0.862>0.7$. It means that the reliability of the questionnaire is good, and this survey has high reliability.

3. RESULTS

Univariate analysis

Table 2: Single Factor Analysis of School Bullying of High School Students

Factor		Total People	Number of People Bullied	Percentage of People Bullied	χ^2	Sig.
Age	>16	406	135	33.25%	39.904	0.047
	<=16	812	288	35.47%		
Gender	Boy	602	232	38.54%	23.449	0.000
	Girl	616	191	31.01%		
Identity	High school student	718	249	34.68%	5.710	0.022
	Junior school student	500	174	34.80%		
Have phone	Yes	923	328	35.54%	9.587	0.088
	No	295	95	32.20%		
Have computer	No	222	91	40.99%	13.441	0.568
	Yes	996	332	74.34%		
Boarding method	Not live in school	422	149	35.31%	10.062	0.043
	Sometimes in school	562	188	33.45%		
	live in school	234	86	36.75%		
Home to school time	1-10 minute	251	96	38.25%	28.115	0.031
	10-20 minute	298	92	30.87%		
	20-30 minute	185	58	31.35%		
	30-40 minute	148	57	38.51%		
	>40 minute	336	120	35.71%		
Skip class	No	1146	382	33.33%	9.738	0.045
	Yes	72	41	56.94%		
Friend	>5	751	217	28.89%	37.147	0.002
	3-5	289	115	39.79%		
	1-2	139	59	42.45%		
	No	33	25	75.76%		
Time to complete homework	<0.5h	36	15	41.67%	12.755	0.061
	0.5h-1h	216	73	33.80%		
	1h-2h	372	106	28.49%		
	>2h	594	208	35.02%		

From Table 2, we observe that school bullying is not statistically significant with whether there is a mobile phone, whether there is a computer, and the time to complete homework ($P>0.05$). It is related to age, gender, grade, whether to join the school by telephone, boarding method, time from home to school and the difference between classes and peers ($P <0.05$).

Moreover, among the number of people bullied, the proportion of boys is 38.54% and the proportion of girls is 31.01%, indicating that boys are more prone to bullying. Those with more than five friends in the class is 28.89%, and the proportion of students who have no friends in the class is 75.76%, indicating that in peer relationships, the better the peer relationship, the less likely to be bullied. Students who have never skipped class accounted for 33.33%, and students who skipped class accounted for 56.94%, indicating that students with different academic performance types have different rates of bullying victimization. In general, students with poor academic performance are easier to be bullied.

Principal component analysis

Table 3: KMO and Bartlett Test

Kaiser-Meyer-Olkin's metric		0.790
Bartlett's sphericity test	Approximate chi-square	3247.275
	df	55
	Sig.	.000

In Table 3, the KMO value is 0.790>0.7, indicating that the correlation between variables is strong. The approximate chi-square value is 3247.27, the corresponding significance level is 0.000<0.1. So, the research data is suitable for principal components analysis.

Table 4: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loading		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.188	28.983	28.983	3.188	28.983	28.983
2	1.240	11.274	40.257	1.240	11.274	40.257
3	1.081	9.823	50.080	1.081	9.823	50.080
4	1.052	9.560	59.640	1.052	9.560	59.640
5	0.929	8.444	68.083	0.929	8.444	68.083
6	0.877	7.976	76.059	0.877	7.976	76.059
7	0.846	7.693	83.752			
8	0.794	7.217	90.970			
9	0.436	3.964	94.934			
10	0.395	3.593	98.527			
11	0.162	1.473	100.000			

In Table 4, a total of 6 principal components can be extracted through the 11 questions of the reliability test, and the cumulative variance contribution rate of these 6 principal components has reached nearly 76.059%.

Table 5: Component Matrix

	Component					
	F_1	F_2	F_3	F_4	F_5	F_6
Age	0.836	-0.095	-0.095	-0.067	0.013	-0.008
Gender	0.084	-0.435	0.42	0.58	-0.067	0.204
Identity	0.926	-0.094	-0.074	-0.04	-0.023	-0.013
Have phone	0.313	0.227	-0.042	0.634	0.062	0.33
Have phone in school	0.196	0.523	0.104	-0.07	0.717	0.132
Have computer	0.003	0.563	-0.278	0.449	-0.132	-0.319
Boarding method	0.815	-0.164	-0.094	-0.07	-0.031	-0.028
Home to school time	0.796	-0.081	-0.163	-0.021	0.074	-0.061
Skip class	0.216	0.425	0.323	-0.308	-0.354	0.592
Friend	0.202	-0.006	0.763	-0.006	0.222	-0.375
Time to complete homework	-0.32	-0.421	-0.278	0.002	0.455	0.334

In Table 5, The original variable can be expressed as a linear combination of 6 common factors:

$$F = 0.290F_1 + 0.113F_2 + 0.098F_3 + 0.096F_4 + 0.084F_5 + 0.080F_6.$$

Regression analysis

Let Y_1, Y_2, Y_3, Y_4 be verbal bullying, relational bullying, physical bullying and cyber bullying respectively, $X_1, X_2, X_3, X_4, X_5, X_6$ be age, gender, grade, whether to join the school by telephone, boarding method, time from home to school and friend respectively.

Table 6: Verbal Bullying

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.098	0.542		3.874	0.000
Age	-0.047	0.041	-0.051	-1.141	0.254
Gender	-0.271	0.065	-0.118	-4.173	0.000
Identity	-0.140	0.106	-0.060	-1.323	0.186
Have phone in school	0.187	0.080	0.067	2.346	0.019
Skip class	0.259	0.138	0.053	1.868	0.062
Friend	0.225	0.041	0.157	5.527	0.000

According to the value of P in Table 6, we obtain the multiple linear regression equation as follows:

$$y_1 = 2.098 - 0.271x_2 + 0.187x_4 + 0.225x_6$$

Table 7: Relationa Bullying

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.394	0.283		4.933	0.000
Age	-0.031	0.022	-0.064	-1.44	0.150
Gender	-0.024	0.034	-0.020	-0.722	0.470
Identity	-0.082	0.055	-0.066	-1.479	0.139
Have phone in school	0.110	0.042	0.075	2.659	0.008
Skip class	0.143	0.072	0.056	1.977	0.048
Friend	0.177	0.021	0.234	8.324	0.000

According to the value of P in Table 7, we obtain the multiple linear regression equation as follows:

$$y_2 = 1.394 + 0.110x_4 + 0.143x_5 + 0.177x_6$$

Table 8: Physical Bullying

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.188	0.334		3.563	0.000
Age	-0.005	0.026	-0.009	-0.193	0.847
Gender	-0.099	0.040	-0.070	-2.477	0.013
Identity	-0.155	0.065	-0.108	-2.381	0.017
Have phone in school	0.123	0.049	0.071	2.504	0.012
Skip class	0.165	0.085	0.055	1.933	0.053
Friend	0.149	0.025	0.169	5.955	0.000

According to the value of P in Table 8, we obtain the multiple linear regression equation as follows:

$$y_3 = 1.188 - 0.099x_2 - 0.155x_3 + 0.123x_4 + 0.149x_6$$

Table 9: Cyber Bullying

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.080	0.271		3.992	0.000
Age	-0.004	0.021	-0.008	-0.179	0.858
Gender	-0.080	0.032	-0.070	-2.477	0.013
Identity	-0.057	0.053	-0.049	-1.082	0.279
Have phone in school	0.052	0.040	0.037	1.296	0.195
Skip class	0.357	0.069	0.147	5.159	0.000
Friend	0.105	0.020	0.146	5.142	0.000

According to the value of P in Table 8, we obtain the multiple linear regression equation as follows:

$$y_4 = 1.080 - 0.080x_2 + 0.357x_5 + 0.105x_6$$

4. CONCLUSIONS

This paper has collected data through questionnaires, used univariate analysis, principal component analysis and regression analysis to study the school bullying of middle school students. The bullying method is mainly verbal bullying, followed by relational bullying and physical bullying, and cyber bullying is the lowest. Boys are more likely to be bullied than girls, and the difference in bullying between boys and girls is more reflected in physical bullying and verbal bullying.

5. SUGGESTIONS

School can conduct real-time monitoring by installing "electronic eyes" in public areas of campus. Teachers should pay attention to daily communication with students, and use the information reported by students to understand whether anyone in the class has been bullied by relationship or verbal bullying, so as to find out the facts as soon as possible and take necessary preventive measures. For example, conduct bullying behaviors on students who have already committed bullying. Psychological and behavioral intervention, stop bullying in a timely manner, avoid causing more harm to the bullied and affecting the future development of the bully's personality, psychology, and pro-social behavior. At the same time, it is necessary to protect the bullied and take measures against it. Necessary psychological counseling to prevent the bullied person from having a psychological shadow due to the bullying.

Parents should pay more attention to their children's daily life performance and whether there are abnormal behaviors, such as feeling low after going home from school, nightmares at night and reluctance to attend class reunions. If children have such behaviors, parents should communicate with them in time to find out whether they are being bullied at school. Teachers should also strengthen the quality education of students. At the same time, they should pay attention to cultivating students to form harmonious peer-to-peer interactions to prevent students from playing and playing or small conflicts from developing into bullying incidents.

School and teachers should give more care and help to students who are relatively weak in social communication. Parents should strengthen communication with their children, promptly inquire about their children's interpersonal relations in school, listen to some of the information revealed by the children in the process of telling, communicate with teachers in time, understand whether the children are bullied at school and find out the bullying behavior as soon as possible. In addition, parents can guide their children to learn to protect themselves and take appropriate self-defense measures. Teachers should give every student support and care fairly and guide middle school students to establish a peer support system to form an anti-bullying class atmosphere, encourage them to actively participate in group activities, take the initiative to participate in interpersonal communication and boldly show themselves.

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Conflict of Interest

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

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