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Ecological Factors of Being Bullied Among Adolescents: a Classification and Regression Tree Approach

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Abstract

Being bullied is a well-recognized trauma for adolescents. Bullying can best be understood through an ecological framework since bullying or being bullied involves risk factors at multiple contextual levels. The purpose of the study was to identify the risk and protective factors that best differentiate groups along with the outcome variable of interest (being bullied) using Classification and Regression Tree (CART) analysis. The study used the Health Behavior in School-Aged Children (HBSC) data collected from a nationally representative sample of students in grades six through ten during the 2005–2006 school years. This study identified that for adolescents 12 and younger, lower parental support is a critical risk factor associated with bullying and among those 13 to 14 with lower parent support, adolescent with higher academic pressure reported experiencing more bullying. For the older group of adolescents (aged 15 and older), school related factors were identified to increase the risk level of being bullied. There was a critical age (15 years old) for implementing victimization interventions to reduce the damage from being bullied. Service providers working with adolescents aged 14 and less should focus more on family-oriented intervention and those working with adolescents aged 15 and more should offer peer- or school-related interventions.

Keywords

Being bullied; Bullying; Ecological risk factors; CART; Adolescents

1 Introduction

Being bullied is a well-recognized trauma for adolescents. According to the School Crime Supplement to the National Crime Victimization Survey (Robers et al. 2012), 28% of students aged 12 through 18 were victims of bullying at school one or more times in 2009. Sansone and Sansone (2008) reported one out of ten students report being bullied frequently by their peers. Experiencing bullying as an adolescent can influence a child's perception of his or her safety as well as the overall quality of his or her school experience (Batsche and

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Knoff 1994; Borg 1998). Bullying has led to serious psychological and social impacts for its victims, even to the point of suicide (Bhutani et al. 2014; Ivarsson, Broberg, and Arvidsson 2005; McCabe et al. 2003; Owusu, Hart, Oliver, and Kang 2011; Schneider et al. 2012; Storch et al. 2003).

Studies on trends in risk and protective factors associated with bullying indicate there is a number of persistent risk factors that increase the probability of being bullied. Individual factors include child emotional, developmental, and behavioral problems (Shetgiri et al. 2012). Family factors include poor parental communication, lack of parental involvement, and parental anger with the child (Espelage, Bosworth, and Simon 2000; Flouri & Buchanan 2003; Shetgiri et al. 2012; Spriggs, Iannotti, Nansel, and Haynie 2001). Finally, poor relationships with classmates and negative peer groups are considered peer or school risk factors (Espelage et al. 2000; Spriggs et al. 2001). In the past few years, scholars have studied factors associated with bullying at multiple contextual levels: individual, family or peer, school, and community (Lee 2011; Lee and Song 2012). Although literature on the perpetration of bullying is increasing, less is known about the multilevel factors associated with who is a victim of bullying. The current study responds to this shortcoming in the previous research. Thus, this study aims to identify the risk and protective factors using Classification and Regression Tree (CART) analysis.

2 Literature Review

According to the ecological risk-factor approach, adolescents can be exposed to risks organized into four levels of their ecology: (1) the individual, (2) the family, (3) extrafamilial contexts, such as schools and peer groups, and (4) the macro system, such as media and public policies (Perkins 2002; Small and Luster 1994). The central idea of this approach suggests that as exposure to risk factors at multiple levels increases, the probability of being bullied increases.

2.1 Age and Being Bullied

At the individual level, age is a crucial variable to explore as a risk and protective factor associated with being bullied. There are distinct differences in how being bullied is experienced by age (Macklem 2003). Some research studies indicate that the percentage of students who are targeted by bullies decreases as age increases (Khoury-Kassabri et al. 2004; Smith, Madsen, and Moody 1999). Kaltiala-Heino et al. (2000) found that high school students (grades 11–12) experienced less victimization than students in junior high schools (grades 7–8). The 2009 School Crime Supplement showed that as the grade level of students increased from 6th through 12th grades, the total percentage of bullied students decreased from 39.4 to 20.4 %. Younger children may be at an increased risk for being bullied because they have not yet acquired the social and assertiveness skills to handle bullying incidents effectively in order to deter further bullying (Smith et al. 1999). The transition from elementary school to middle school or junior high school is a period in which students are more likely to be bullied than other time periods (Orpinas & Horne 2006).

2.2 Family Factors and Being Bullied

Influential factors for being bullied among adolescents are obviously related to their negative family experiences (Orpinas & Morne 2006). Some studies reported that poor parent-children relationships and communications increased the probability of victimization by bullying (Bowers et al. 1994; Moon et al. 2010; Stevens et al. 2002). Jaynes (2008) found that parental involvement was a predictor of being bullied by investigating the relationship between parental involvement and being bullied among 7th to 12th grade students. In the study of family factors associated with children's resilience to being bullied, scholars found that maternal warmth, sibling warmth, and a positive atmosphere at home reduced the risk of being bullied (Bowes et al. 2010). They reported that warm and supportive family relationships helped to prevent children from the negative outcomes associated with bullying victimization (Bowes et al. 2010).

2.3 Peer Factors and Being Bullied

As students move into adolescence, they spend more time with friends and less time with their families (Larson & Richards 1991). In light of these changes among adolescents, peer factors and an increasing use of technology play significant roles in bullying today. Several studies indicate that the more adolescents use mobile phones, the more susceptible they are to cyberbullying (Cantone et al. 2015; D'Antona et al. 2010; National Children's Home [NCH] 2005; Raskauskas and Stoltz 2007; Smith et al. 2008). Slonje and Smith (2008) asserted that cyberbullying is much dangerous than most traditional bullying because of the following three reasons: (1) the difficulty of getting away from it; (2) the breadth of potential audience; and (3) the invisibility of those doing the bullying.

2.4 School Factors and Being Bullied

In order to decrease school violence, developing a positive school climate is necessary (Colvin et al. 1998; Khoury-Kassabri et al. 2004; Moon, Karlson, and Kim 2015; Stephens 1994). To the extent that students do not attend school because they perceive themselves to be at high risk of being bullied, school climate, as measured by student and staff experiences with victimization (National School Climate Center 2015), could be a predictor of bullying. Astor, Benbenishty, Zeira, and Vinokur (2002) found that high school students' decision not to attend school was related to their experiences of victimization by other students and school staff. Nansel et al. (2001) reported that poor relationships with classmates in classrooms pertained to increase the risk of bullying as well as being bullied. Moreover, low academic competence was associated with an increased risk of being bullied as well (Ma et al. 2009; Nansel et al. 2001).

Building upon the previous studies, we hypothesized that family, peer, and school factors would be significant predictors of being bullied among adolescents. Also, we tested another hypothesis that predictors of being bullied would vary by age.

3 Methods

3.1 Data and Participants

Data were collected from a nationally representative sample of students in grades six through ten participating in the Health Behavior in School-Aged Children (HBSC) study during the 2005–2006 school year (Wang et al. 2010). Health Behavior in School-aged Children (HBSC) is a cross-national survey, which is conducted every four years to examine health-related behavior among children and adolescents. The sample was selected through a three-stage stratified design, with census divisions and grades as strata and school districts as primary sampling units. African-American and Hispanic students were oversampled. Students completed an anonymous self-report questionnaire distributed in the classrooms. A total of 9,227 students completed the survey, but 8888 students were included for the study. Students were excluded from the final sample if they failed to respond to multiple items on the questionnaire, particularly if those items indicated whether the student experienced bullying or not.

3.2 Measures

From the larger HBSC study, 22 items were selected based on the ecological theoretical framework and the previous research. The questions for this study addressed: 1) individual factors (1 item; see Table 1); 2) family factors (16 items; see Table 1); 3) peer factors (1 item; see Table 1); and 4) school factors (4 items; see Table 1). Age was selected as the individual factor and calling and texting as the peer factor. Parental support and parental monitoring were used as the family factors. School performance, feelings about school, enjoy with classmate, and academic pressure were selected as the school factors.

Family factors are parental support and parental monitoring. Six items were combined to create a measure of parental support: 1) parent/guardian helps me as much as I need; 2) parent/guardian lets me do things I like doing; 3) parent/guardian is loving; 4) parent/guardian understands my problems; 5) parent/guardian likes me to make my own decisions; and 6) parent/guardian makes me feel better when upset. Responses were measured on a 5-point Likert scale (about every day, about every week, more than once a week, about every month, and rarely or never). We used reverse scores. This means that higher scores would indicate higher support. The Cronbach Alpha for the measure of parental support was .84.

Ten items were combined to create a measure of parental monitoring. Five items asked about mothers and five asked about fathers. These five questions inquiring about parental monitoring were: 1) mother/father knows who your friends are; 2) mother/father knows how you spend money; 3) mother/father knows where you are after school; 4) mother/father knows where you go at night; 5) mother/father knows what you do with free time. Responses were measured on a 4-point Likert scale (she/he knows a lot, she/he knows a little, she/he doesn't know anything, and I don't have/see mother/father/guardian). We used reverse scores. This means that higher scores would indicate higher monitoring. The Cronbach Alpha for the measuring of parental monitoring was .88.

School factors are school performance, feelings about school, enjoy with classmate, and academic pressure. Each school factor was measured by a single item, so we did not report the Cronbach Alpha of them.

The variable, being bullied, was based on respondents' self-report of how often they got bullied. Nine items inquired about the frequency of being bullied: 1) called names and teased; 2) left out of things; 3) hit, kicked, and pushed; 4) others lied about me; 5) for my race/color; 6) for my religion; 7) made sexual jokes to me; 8) using a computer/e-mail; and 9) using a cell phone. Responses for these items were measured on a 5-point Likert scale (I haven't been bullied, only once or twice, two or three times a month, about once a week, and several times a week). The responses were recoded into two categories, *not being bullied* and *bullied*. Nine items were combined into a single score ranged from 0 to 9. The Cronbach Alpha of 'being bullied' was .90.

3.3 Analytic Method

We used descriptive statistics to examine the distribution of risk factors among the sample of adolescents and employed *t*-test and chi-square tests to evaluate bivariate relationships between bullying status and risk/protective factors. Also, Classification and Regression Trees (CART) were used to identify population (audience) segments of adolescents based on risk and protective factors for being bullied. CART analyses were conducted in CART 6.0 software (Salford Systems 2008). CART is one of the data mining algorithms for classification and regression (Breiman, et al. 1984). CART can efficiently handle both continuous and categorical variables in the data set. From an algorithmic point of view, CART has a forward stepwise procedure that adds model terms and a backward procedure for pruning, and it conducts variable selection by only including significant variables in the model. The output of CART models is a hierarchical structure that consists of a series of if-then rules to predict the dependent variable (Moon et al. 2011).

We selected CART to examine complex interactions among multiple risk factors that may not be apparent or may be difficult to interpret in a traditional regression analysis and for its ability to identify and segment homogeneous and possibly high risk subgroups of the population. Based on similar characteristics, these subgroups may benefit from different or tailored intervention strategies. CART generates a multi-dimensional examination of individuals who are members of a subgroup, whereas regression is based on the identification of variables as they relate to the outcome, averaged over all individuals (Swan et al. 2004). Specifically, CART was used to develop a classification and regression tree to stratify the study sample into meaningful homogenous subgroups in relation to a particular target variable. In our case, the dependent variable is bullying status (bullied or not bullied). Predictors include individual, family, peer, and school factors described in the measurement section.

4 Results

4.1 Sample Description

Table 2 shows the percentage of adolescents identified as being bullied by age and compares the students who were identified as ‘being bullied’ to those identified as ‘not being bullied’ with respect to individual, family, peer, and school risk factors.

4.2 Differences Between Bullied and not Bullied Adolescents

The results of the analyses revealed a significant relationship between being bullied and age. The percentage of students who were not bullied increased gradually until age 16 (60 %–80 %) and decreased at age 17 (76.0 %). Students who were bullied peaked at age 11 or younger then gradually decreased until age 17. The results of the analyses revealed that there was a significant difference between students who were bullied and those who were not bullied by age. The analyses show that students who were bullied have significantly lower levels of parental support and parental monitoring compared to students who were not bullied ($t=-9.89$, $t=-3.53$, $p<0.001$). As for peer factors, bullied students reported making fewer calls and texts to friends ($t=5.07$, $p<0.001$). As with school factors, students who were bullied had more negative opinions about school performance ($t=-5.18$, $p<0.001$), negative feelings about school ($t=-7.42$, $p<0.001$), and enjoyed being with classmates less comparing to students who were not bullied ($t=-9.63$, $p<0.001$).

4.3 CART Analysis

The final model contained 15 nodes and had an overall classification accuracy of 59.8 %. The target class was set as ‘being bullied.’ After pruning the tree, 8 variables remained in the model, including age, enjoying being with classmates, parental support, academic pressure, frequency of calling and texting friends, present feelings about school, and teacher’s opinion of school performance. Terminal nodes ranged in size from $N=52$ to $N=2,137$. The most important variable for determining ‘being bullied’ was age, which split from the root node (see Table 2). Age split between a value of 14 and 15. Adolescents aged 14 and less were more likely to be bullied (32.6 %) than adolescents aged 15 and more (22.4 %). Figure 1 represents the overall tree structure and the size and position of each node.

4.3.1 Adolescents Aged 15 and More—In adolescents age 15 and older, enjoying spending time with classmates less and poorer feelings about school contributed to higher level of being bullied. Specifically, adolescents age 15 and older who enjoyed being with classmates less were more likely to be bullied (34.3 %) than their counterparts (20.5 %). The risk level of being bullied among adolescents age 15 and older increased much more when they had negative feeling about school (37.1 %: terminal node). No other predictor variables explained ‘being bullied’ in adolescents age 15 and older.

4.3.2 Adolescents age 14 and Younger—For adolescents age 14 and younger, (1) parental support, (2) enjoying being with classmates, and (3) amount of academic pressure were found to be important contributors to being bullied. Adolescents with higher parental support were less likely to be bullied (27.3 %) than adolescents with lower parental support (37.1 %). Parental support had a stronger association with bullying among adolescents age

12 and younger than adolescents over age 12. For adolescents between ages 13 and 14, amount of academic pressure was a significant predictor of being bullied. Adolescents reporting higher academic pressure in this age group were more likely to report being bullied (35.3 %) than their counterparts (24.3 %).

5 Discussion

Over the past few years, experts have suggested that bullying can best be understood through an ecological framework because bullying or being bullied involves risk factors at multiple contextual levels (Lee 2011; Lee and Song 2012). This study confirms existing research findings that there are indeed group differences between those students being bullied and those who are not bullied. From the results of this study it is clear that there were significant correlates at multiple levels distinguishing adolescents who experienced bullying from those who did not. At the bivariate level, adolescents who were bullied had lower levels of parental support and monitoring. The results of the CART model indicate that adolescents who are bullied have less parental support than adolescents who are not bullied. This result supports the finding that family patterns are strongly related to children experiencing bullying and violence (Bowes et al. 2010; Yan et al. 2010). Research shows that poor parental relationships and lower involvement increase the probability of victimization by bullying (Bowers et al. 1994; Stevens et al. 2002; Jaynes 2008). With the close connections in the literature between parental warmth and parental supervision, the results of the CART model provide some indication that parental support is a stronger protective factor against bullying among Korean adolescents than parental monitoring. Although statistically significant at the bivariate level, it should be noted that the practical difference in levels of parental monitoring between students who experienced bullying and those that did not was small, $M=1.71$ ($SD=0.60$) not bullied compared to $M=1.76$ ($SD=0.59$) bullied. The similarity in levels of parental monitoring between groups may be one reason parental monitoring was not a significant correlate in the CART model.

Concerning peer factors, the study supports prior research suggesting that having poorer quality friendships or no friendships increases the risk of peer victimization. Prior research has found that victims report having fewer friends, having poorer peer relationship quality (Smith, Shu, and Madsen 2001), and experiencing greater peer rejection (Parkhurst and Hopmeyer 1998). Additionally, peer relationships and peer sociability have been found to be important protective factors against victimization for girls (Paul and Cillessen 2003). In our study, victimized adolescents reported calling and texting friends less frequently. Potentially, it raises the possibility that bullying leads adolescents to call and text less frequently. In our study, teacher perception of school performance, negative feelings about school, and disconnectedness with classmates appeared as risk factors for victimization.

The results of this study suggest that individual, family, peer, and school factors are important to consider when thinking about ways to prevent peer victimization. Therefore, multilevel prevention efforts that include strategies to increase parental support, to enhance friendship quality, and to decrease academic pressure while still improving school performance may have the greatest impact on reducing peer victimization.

Classification and regression trees were used to identify bullying-related risk profiles for subgroups of adolescents. Our results demonstrate that complex combinations of bullying-related risk factors differ among subgroups of adolescents. Similar to other studies, we found that age was a significant variable for bullying involvement (Khoury-Kassabri et al. 2004; Smith et al. 1999). Adolescents aged 14 and younger were more likely to be bullied than adolescent aged 15 and older. This result of our study substantiates previous research findings that bullying and victimization decrease with age and grade level (Khoury-Kassabri et al. 2004). In addition, our study found that different risk constellations emerged for adolescents aged 14 and younger compared to adolescents age 15 and older. For the younger group of adolescents (age 14 and younger), lack of parental support, lack of enjoyment being with classmates, and academic pressure were identified as important risk factors. In Orpinas and Horne's (2006) study, the transition period from elementary school to middle or junior high school was a more vulnerable time for children to experience bullying than any other period. Interestingly, the results of our study identified two distinct risk factor groups for adolescents transitioning to early middle school (typically age 12 and younger) compared to adolescents transitioning to late middle school (typically between 13 and 14 years of age). For adolescents 12 and younger, less parental support is a critical risk factor associated with bullying. Among children 13 to 14 with less parent support, adolescent with higher academic pressure reported experiencing more bullying. For the older group of adolescents (age 15 and older), school related factors that were identified to increase the risk level of being bullied are enjoying being with classmates less and poorer feelings about school.

5.1 Implications for Practice and Research

To reduce the harm from being bullied, focusing and implementing age-modified interventions is necessary. Service providers working with adolescents age 15 and under should focus more on family-oriented interventions and those working with adolescents age 15 and older should offer peer- or school-related interventions to prevent them from being bullied. Furthermore, it is important to note that CART can be a compelling data analysis method for social work researchers to examine complex interactions among multiple risk factors. This data analysis method can be useful to identify and segment homogeneous and possibly high-risk subgroups of the population, based on similar characteristics that may benefit from different or tailored intervention strategies.

5.2 Limitations and Suggestions for Future Studies

As a secondary data analysis, this study is limited to the variables available in the HBSC study. Future research should examine the influence of adolescents' exposure to media on bullying behavior. Furthermore, this analysis utilizes a cross-sectional data sample. The analysis can effectively identify subgroups of adolescents who experience higher rates of bullying. However, longitudinal data would allow for a stronger understanding of how earlier risk and protective factors influence experiencing bullying for these subgroups. Despite these limitations, this study used a large national probability sample of adolescents to obtain these subgroups. Moreover, as the first CART analysis examining risk factors for being bullied, this study provides important information that can be used to tailor bullying intervention strategies for adolescents.

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Fig. 1.
CART model of predicting 'being bullied'

Table 1

Summary of construct items

Variables	Individual Factor	Age	How old are you?	Response Categories	Reliability (Cronbach's Alpha)	Excluded items
Family factors	Parental support		Q50A-Q50E & Q50H	Parent/Guardian: ① Helps me as much as I need, ② Lets me do things I like doing, ③ Is loving, ④ Understands my problems, ⑤ Likes me to make own decisions, ⑥ Makes me feel better when upset	11=age 11 or younger, 12=age 12, 13=age 13, 14=age 14, 15=age 15, 16=age 16, 17=age 17	⑥ Tries to control things I do, ⑦ Treats me like a baby
	Parental monitoring		Q48A-Q48E & Q49A-Q49E	Mother knows: ① Who your friends are, ② How you spend money, ③ Where you are after school, ④ Where you go at night, ⑤ What you do with free time & Father knows: ① Who your friends are, ② How you spend money, ③ Where you are after school, ④ Where you go at night, ⑤ What you do with free time	0.82	
Peer factor	Calling & texting		Q56	How often call/text friends	0.88	
School factors	Teacher's opinion		Q58	Teacher's opinion of your school performance	1=rarely or never, 2=1 or 2 days a week, 3=3 or 4 days a week, 4=5 or 6 days a week, 5=every day	
	Feelings about school		Q59	Present feelings about school	1=very good, 2=good, 3=average, 4=below average	
Bullied	Enjoy classmates		Q60A	Student in my class: Enjoy being together	1=I like it a lot, 2=I like it a bit, 3=I don't like it very much, 4=I don't like it all	
	Academic pressure		Q61	Amount of pressure from school work	1=Strongly agree, 2=Agree, 3=Neither agree nor disagree, 4=Disagree, 5=Strongly disagree	
			Q 63A-Q63I	How often got bullied: ① Called names, teased, ② Left out of things, ③ Hit, kicked, pushed, ④ Others lied about me ⑤ For my race/color, ⑥ For my religion, ⑦ Made sexual jokes to me ⑧ Using a computer/e-mail, ⑨ Using a cell phone	1=Not at all, 2=A little, 3=Some, 4=A lot	
					1=I haven't been bullied, 2=only once or twice, 3=2 or 3 times a month, 4=about once a week, 5=Several times a week → 1=not bullied (NO), 2-5=bullied (YES)	

Table 2

Comparing age, individual, family, peer and school risk factors between 'being bullied group' and 'not being bullied group'

<i>N</i> =8888	Not Bullied (<i>n</i> =6241)	Bullied (<i>n</i> =2647)	<i>t</i>	Chi-square
	70.2 %	29.8 %		
Individual factor				
Age (%)				
11 or younger (10.7)	62.3 %	37.7 %		133.02 ***
12 (21.7)	64.1 %	35.9 %		
13 (20.6)	70.2 %	29.8 %		
14 (18.0)	70.7 %	29.3 %		
15 (16.7)	76.1 %	23.9 %		
16 (10.3)	80.3 %	19.7 %		
17 (0.6)	76.0 %	24.0 %		
Family factors				
Parental support	1.53 (0.44)	1.64 (0.47)	-9.89 ***	
Parental monitoring	1.71 (0.60)	1.76 (0.59)	-3.53 ***	
Peer factor				
Calling and texting	3.34 (1.53)	3.16 (1.53)	5.07 ***	
School factors				
Teacher's opinion	2.11 (0.87)	2.22 (0.89)	-5.18 ***	
Feeling about school	2.12 (0.90)	2.28 (0.92)	-7.42 ***	
Enjoy classmates	2.43 (0.99)	2.66 (1.09)	-9.63 ***	
Academic pressure	2.47 (1.02)	2.66 (1.00)	-8.33	

 $p < 0.001$