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**Peer victimization in childhood and internalizing problems in adolescence: A prospective longitudinal study.**

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## Abstract

Traumatic childhood experiences have been found to predict later internalizing problems. This prospective longitudinal study investigated whether repeated and intentional harm doing by peers (peer victimization) in childhood predicts internalizing symptoms in early adolescence. 3692 children from the Avon Longitudinal Study of Parents and Children (ALSPAC), as well as their mothers and teachers, reported on bullying in childhood (7-10 years) and internalizing problems in early adolescence (11-14 years). Controlling for prior psychopathology, family adversity, gender and IQ, being a victim of bullying was associated with higher overall scores, as well as increased odds of scoring in the severe range (>90<sup>th</sup> percentile) for emotional and depression symptoms. Victims were also more likely to show persistent depression symptoms over a 2-year period. These associations were found independent of whether mothers, teachers or the children reported on bullying. It is concluded that peer victimization in childhood is a precursor of both short-lived and persistent internalizing symptoms, underlining the importance of environmental factors such as peer relationships in the etiology of internalizing problems.

Keywords: bullying, depression, non-clinical, internalizing problems, ALSPAC

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Bullying is the act of intentional and repeated aggressive behavior towards one or more weaker individuals (Olweus 2002). The aggressive behavior may be direct – verbal (e.g., calling names), physical (e.g., hitting) – or indirect (e.g., spreading rumors) or by using electronic means, i.e., cyber bullying (Wang et al. 2011). Those who are the targets of bullying are classified as victims (Haynie et al. 2001; Wolke et al. 2000). Bullying is a universal problem, occurring worldwide, with prevalence ranging from approximately 10-25% across countries (Analitis et al. 2009; Nansel et al. 2001).

Peer victimization has been associated with acute short-term distress such as chronic worrying, nightmares and decreased well-being (Arseneault et al. 2010). Victims are more likely to suffer from long-lasting social isolation, loneliness, anxiety and poor social competence (Egan and Perry 1998; Forero et al. 1999; Veenstra et al. 2005; Kochenderfer-Ladd and Wardrop 2001), and to have an increased risk of self-harm, suicidal ideation, attempting and completing suicides (Barker et al. 2008; Klomek et al. 2009; Winsper et al. 2012). They are also more prone to developing symptoms of psychosis, such as auditory hallucinations and paranoid ideation (Lataster et al. 2006; Schreier et al. 2009).

Research focusing on the relationship between peer victimization and depression shows moderately strong results across cross-sectional studies (Hawker and Boulton 2000). Victims of both traditional and cyber-bullying scored higher than uninvolved children on measures of depressive symptoms (Fekkes et al. 2004; Undheim and Sund 2010; Wang et al. 2011). Particularly, indirect victimization may be relevant to the development of internalizing problems (Benjet et al. 2010). Van der Wal and colleagues (2003) found that in girls, the risk of depressive symptoms increased to 3-fold among those who were victims of direct bullying, but rose to 9-fold in victims of indirect bullying. Similarly, cross-sectional (Baldry and Winkel 2004; Prinstein et al. 2001) and retrospective (Dempsey and Storch 2008) studies

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show that indirect victimization is a strong risk factor for internalizing symptoms.

Furthermore, retrospective studies indicate that a history of victimization is common in populations with an existing diagnosis of a depressive disorder. Severe or traumatic childhood victimization was reported by a significant minority of depression outpatients (Gladstone et al. 2006) and individuals who recalled being victimized at school were more likely to have a depression diagnosis in adulthood (Lund et al. 2009).

While cross-sectional and retrospective studies give an indication that victimization is associated with depressive symptoms, the direction of influence is not clear; i.e., whether victimization precedes depression or vice versa. Furthermore, these designs tend to suffer from confounds of current mental health problems, and other factors related to both victimization and mental health, such as family adversity, social deprivation or parent mental health (Kraemer et al. 2001). In order to develop strategies for prevention of depression, it is crucial to identify factors that make children more likely to be depressed. To determine whether childhood victimization is a likely causal factor temporal precedence before onset needs to be established. Furthermore potential confounders, as well as mental health symptoms occurring prior to being victimized, should be controlled for – objectives typically enabled by longitudinal designs.

Several longitudinal studies to date have provided evidence for an association between victimization and depression. Victimization in adolescence significantly predicts depression symptoms in both the short term (1-4 years later) (Bond et al. 2001; Kaltiala-Heino et al. 2010; Sweeting et al. 2006) and long term (Klomek et al. 2008). For example, Klomek and colleagues (2008) showed that those who were bully-victims (children who were both bullies and victims) at the age of 8 years had 4 times increased odds of severe depression scores 10 years later. Furthermore, there appears to be a dose-response relationship, where frequent victimization confers greater risk for emotional symptoms,

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psychiatric diagnosis and pharmacological treatment than occasional victimization (Sourander et al. 2009; Sugden et al. 2010). Overall, peer victimization appears to be a moderate predictor of internalizing problems over time ( $r = .18$ ) (Reijntjes et al. 2010). Conversely, internalizing problems may not just be the consequences but also, although weak, the antecedents of victimization ( $r = .08$ ) – a reciprocal influence, which may lead to a vicious circle (Kaltiala-Heino et al. 2010; Sweeting et al. 2006). This further illustrates the importance of controlling for internalizing symptoms which predate the onset of victimization in study designs.

Although the existence of a relationship between exposure to victimization and internalizing problems has been demonstrated in previous longitudinal studies, a number of features of that relationship remain unknown. Firstly, the use of multiple informants (e.g., mother and self-report) on measures of peer victimization and internalizing symptoms is infrequent. Agreement between different informants on emotional and behavioral problems or victimization is typically low (Shakoor et al. 2011; Sourander et al. 1999). However, if victimization reports from different informants show a consistent relationship to later internalizing problems this substantially adds to the validity of a causal relationship between both (Rønning et al. 2009). Secondly, a dose-response relationship between severity or chronicity of exposure to trauma in childhood and serious mental health problems has been suggested (Arseneault et al. 2011; Schreier et al. 2009) but is rarely investigated between victimization and internalizing problems. Thirdly, there is a lack of studies that have examined depressive symptomatology of varying levels of severity, which would allow a direct comparison of peer victimization as a *general* risk for depressive symptoms (shifting the distribution) versus a *specific* risk for depressive psychopathology. If the former is found general prevention efforts would be required to reduce depression (Rose 1981). Fourthly, only a handful of studies (Kaltiala-Heino et al. 2010; Sweeting et al. 2006) have re-examined

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the same depression outcome over time, a method which would allow the investigation of the impact of peer victimization on symptom persistence. Finally, most existing studies were school based rather than general population based; hence were not able to control for mental health problems prior to school age.

The aim of this prospective study was to investigate the association between exposure to peer victimization in childhood and internalizing problems in early adolescence. The study aimed to answer the following specific questions: 1) Does victimization in childhood, independent of whether reported by child, mother or teacher, predict internalizing problems in adolescence? 2) Is there a dose-response relationship with more severe or chronic victimization related to more severe or persistent internalizing problems? 3) Does victimization result in a general shift of internalizing problems scores or specifically increase those in the clinically relevant range? 4) Are these effects maintained when controlling for factors which increase the risk of mental health problems independently of exposure to bullying, i.e., family adversity, pre-existing internalizing problems and child IQ?

## **Method**

### **Participants**

Data were sampled from the Avon Longitudinal Study of Parents and Children (ALSPAC) birth cohort, which recruited 14,541 pregnant women resident in Avon, UK with expected dates of delivery 1st April 1991 to 31st December 1992 (Golding et al. 2001). Out of the initial 14,541 pregnancies, 14,062 were live births and 13,978 were alive at 1 year. From the first trimester of pregnancy, parents have completed postal questionnaires about the study child's health and development; while the child has attended annual assessment clinics, including face-to face interviews, psychological and physical tests. As the aim of the study

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was not to investigate prevalence of victimization or internalizing problems but to study peer victimization as a long-term risk factor for internalizing problems, a restricted sample was selected for analysis: the children had to have participated and have valid data for all of the following assessments: (a) self-reported *peer victimization* at either 8 or 10 years; (b) internalizing symptoms, comprising *depression symptoms* on the Short Mood and Feelings Questionnaire (Angold et al. 1995) at ages 11, 12, 13 and 14 years, and *negative emotionality symptoms* on the Strengths and Difficulties Questionnaire (R. Goodman, 1997) at 12 and 13 years; (c) DSM-IV *diagnosis of internalizing disorders*, i.e. depressive disorder and anxiety disorder at 13 years measured by the Development and Well-Being Assessment (R. Goodman et al. 2000). A total of 3692 children (25.4% of the total cohort) satisfied these criteria (see Table 1 for a comparison between included and excluded participants). The aim was to study prospective relationships rather than prevalence estimations that require complete populations. Thus no missing value imputations were conducted (Wolke et al. 2009a). Characteristics of the specific sample can be seen in supplementary table 1. Ethical approval for the study was obtained from the ALSPAC Law and Ethics Committee and the Local Research Ethics Committees.

### **Measures and Design**

#### *Differences between participants and those excluded*

Table 1 shows the comparisons between participants (n=3692, 25.4% of the total cohort of 13,978) and those who were excluded (n=10286, 73.6% of the total cohort of 13,978). Children who were excluded from the final sample were more often boys, of non-white ethnicity, of low birth weight, with one or more psychiatric diagnoses at age 7, born to single mothers without O-levels (secondary school exams taken in the UK prior to 1998), living in rented accommodation, with at least one form of adversity present within the family environment. However, no differences were found in the frequency of peer victimization.

## \* TABLE 1 \*

*Peer victimization.*

Victimization variables were constructed from mother, teacher and child reports. Child reports (collected at 8 and 10 years) were derived from a modified version of the Bullying and Friendship Interview Schedule (Wolke et al. 2001b). The structured interview on bullying behavior and peer relations has been previously used in Germany (Wolke et al. 2001c) and in the UK (Wolke et al. 2000, 2001a), has high inter-rater (interviewers') reliability and has been shown to predict academic, health, mental health and suicide outcomes (e.g. Winsper et al. 2012; Wolke et al. 2001a; Woods and Wolke 2004) and to be sensitive to detect peer related effects of medical interventions such as eye patching (Williams et al. 2006). The interview has predictive validity during elementary school (Wolke et al. 2009b; Sapouna et al. 2011) and even from elementary to secondary school (Schäfer et al. 2005). Five items referred to direct victimization: 1) personal belongings taken; 2) threatened or blackmailed; 3) hit or beaten up; 4) tricked in nasty way; 5) called bad/nasty names and four items referred to indirect victimization: 1) exclusion to upset the child; 2) coercive pressure to do things s/he didn't want to do; 3) lies or nasty things said about others; 4) spoilt activities for other pupils (for example, sports games or class activities) on purpose to make them upset. Cronbach's alpha for children's response to direct and indirect victimization at age 8 was 0.62 and 0.64 respectively; and at age 10 was 0.68 and 0.71. The correlation between indirect and direct victimization for 8 years was  $r=0.38$ ,  $p<0.0001$  and for 10 years was  $r=0.32$ ,  $p<0.0001$  indicating that direct and indirect victimization are partly distinct constructs. Due to the skewed distribution, direct victimization was coded as present if the child confirmed that at least one of the five behaviors occurred repeatedly (4 or more times in the past six months) or very frequently (at

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least once per week in the past six months). Similarly, indirect victimization was coded as present if the child confirmed that at least one of the four behaviors occurred repeatedly or frequently. The derived variables of interest were: (a) overall victim status at either 8 or 10 (either direct or indirect) (b) stability of victimization: no victimization; unstable (direct or indirect victimization at 8 or 10 years) and stable (direct or indirect victimization at both 8 and 10 years), and (c) victimization severity at 10 years: neutral, victim of indirect bullying only, victim of direct bullying only, and severe (victim of both indirect and direct bullying).

Mother and teacher reports were derived from a single item “*child is picked on or bullied by other children*” administered multiple times in childhood: at 7, 8 and 9 years to the mothers, and at 7 and 10 years to the teachers. The child was classed as a mother- or teacher-reported victim if the item was rated as “somewhat applies” or “certainly applies” by a parent or teacher at any of the assessment points (Schreier et al. 2009). The overall agreements between the different informants were as follows: mothers and teachers ( $\kappa_{\text{Kappa K}} = 0.18, p < 0.001$ ); mothers and children ( $\kappa = 0.19, p < 0.001$ ); teachers and children ( $\kappa = 0.09, p < 0.001$ ) which are consistent with previously reported inter-informant agreement (Rønning et al. 2009).

*Internalizing problems.*

Depression typically shows an increase in mid to late adolescence and the study of 11-14 year olds allows for the detection of possible vulnerability to the later development of clinical problems (Angold & Rutter 1992). Three measures of internalizing problems were administered:

(a) Short Mood and Feelings Questionnaire (SMFQ) (Angold et al. 1995): The SMFQ is a 13-item scale measuring non-clinical depression symptoms, with high reported validity and reliability (Cronbach’s alpha = 0.85) (Angold et al. 1995; Thapar et al. 2010). Each item

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is rated on a 3-point scale with respect to the events of the past two weeks. The SMFQ is available in both child and parent report forms. In the ALSPAC cohort, self-reported depression symptoms were assessed in annual assessment clinics at 11 and 14 years, with parent report at 12 and 13 years, in the form of postal questionnaires.

(b) Assessment of negative emotionality was taken from Strengths and Difficulties Questionnaire (SDQ) reported by parents at ages 12 and 13. The emotionality subscale consisted five items reflecting negative emotionality (e.g. “child has many worries”, “child is often unhappy”). Each item is rated on 3-point scale (not true, somewhat true and certainly true). The scores range from 0 (no emotional problems) to 10 (answered ‘certainly true’ on all symptoms). The emotional subscale has reported good internal consistency (Cronbach’s alpha = 0.75) (R. Goodman et al. 1998).

(c) Development and Well-Being Assessment (DAWBA) (R. Goodman et al. 2000): The DAWBA is a semi-structured psychiatric diagnostic interview designed for 4-16 year olds, which can be administered to parents, teachers or children themselves. A mixture of closed and open-ended questions assesses symptoms of common child mental health disorders and responses are matched against Axis I DSM-IV psychiatric diagnoses. In the present study, parent reports were used to derive diagnoses of internalizing disorders, i.e. depressive disorder and anxiety disorder at age 13 years, using a computer algorithm which has been shown to be comparable in accuracy with a clinical rating method (A. Goodman et al. 2011). The emotional subscale has reported good internal consistency (Cronbach’s alpha = 0.75).

For the SDQ and SMFQ outcomes, scores were treated as continuous outcomes (broad internalizing problems) and additionally, severe SMFQ and SDQ outcomes (severe internalizing problems) were derived by considering those scoring > 90<sup>th</sup> percentile (within a clinical range; (R. Goodman 2001)) and those whose scores fell below that range.

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Mean scores on the continuous SDQ and SMFQ measures are shown in Appendix 1. As there was no difference between SDQ scores at 12 and 13 years,  $t(3691)=1.06$ ,  $p>.05$ , the average score across the two assessments was considered in analysis (mean combined SDQ score = 1.48). Post-hoc comparisons of the SMFQ scores showed that parental reports yielded lower depression scores than self-reports,  $t(3691)=38.14$ ,  $p=.00$ , and earlier assessments (11-12 years) yielded lower scores than those conducted later (13-14 years),  $t(3691)=9.50$ ,  $p=.00$ . To account for these mean score differences between parent and child report we standardized the SMFQ scores using the z-score transformation and derived two variables, Early Depression and Late Depression, by computing the average of the standardized SMFQ scores at 11-12 years and 13-14 years, respectively.

In terms of severe scores, a total of 332 children scored  $> 90^{\text{th}}$  percentile for Early Depression (9.0% of the sample), 327 for Late Depression (8.9% of the sample) and 196 for emotional problems in the SDQ (5.3% of the sample).

Depression symptom persistence over time was determined from SMFQ scores between 11 and 14 years. As the content of the SMFQ remained unchanged between early (11-12 years) and late (13-14 years) assessments, the scores are directly comparable. Children were classed as having (a) No persistent symptoms: when their scores were  $< 90\%$  of the distribution at *both* the early and late assessments ( $N=3139$ , 85% of the sample); or (b) Low persistence: scores  $> 90\%$  at *either* the early *or* the late assessments ( $N=447$ , 12.1% of the sample); or (c) High persistence: scores  $> 90\%$  in *both* the early and late assessments ( $N=106$ , 2.9% of the sample).

DSM-IV diagnoses of depression, anxiety and any emotional disorder at 13 years were categorical outcomes from the DAWBA, with presence versus absence of a diagnosis being considered. A total of 0.7% ( $N=24$ ) of the children in the sample had a DSM-IV diagnosis of depression at 13 years; 1% ( $N=37$ ) satisfied the criteria for anxiety disorder.

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In summary the final measures of internalizing problems were: Broad Internalizing Problems (continuous Early Depression, Late Depression and negative emotionality SDQ scores); Severe Internalizing Problems (scoring in the >90% percentile of Early Depression, Late Depression, and negative emotionality SDQ scores); DSM IV diagnosis of major depression diagnosis (DAWBA); DSM IV diagnosis of anxiety disorder diagnosis; Low depression persistence (> 90% percentile at either the early or the late depression assessments) and High depression persistence (scoring >90% percentile at both early and late depression assessments).

*Potential confounders.*

Anxiety (Rapee et al., 2009) and externalizing problems (Wolff and Ollendick 2006) in childhood are potential precursors of depression. Presence of any Axis I DSM-IV diagnosis (i.e.  $\geq 1$  ADHD disorder, conduct disorder, oppositional defiant disorder, depression or any anxiety disorder), predating the earliest assessment of peer victimization, was recorded based on parent and teacher report in the DAWBA at age 7 years (4.3%). Presence or absence of emotional problems reported by parents was assessed on the SDQ at 7-8 years (R. Goodman 1997).

Family Adversity Index (FAI) (Bowen et al. 2005) was assessed during pregnancy of the study children and included 18 different measures of adversity including young maternal age, poor partner relationship, housing and financial problems, maternal mental health, substance abuse or criminality. Family adversity was coded as present when mothers reported at least two adversities (23.0%).

Child IQ was assessed using an abbreviated form of the Wechsler Intelligence Scale for Children–III (Wechsler et al. 1992) during a clinic assessment at 8 years (see Horwood et al. 2008).

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*Statistical analyses*

Multiple linear regression models were used, with the SMFQ and SDQ scores entered as continuous outcome variables, and self-, mother- and teacher-reported victim status as predictors. Victimization stability (unstable and stable victimization) and severity (direct only, indirect only, severe) were entered into the linear regression models as dummy variables. For example the dummy variable referring to severe victimization was coded as 1 when severe victimization was present and 0 otherwise. All analyses controlled for sex, IQ, FAI, any DSM-IV diagnosis (7 years) and emotional problems on the SDQ (7-8 years). For the remaining outcomes, binary or multinomial logistic regression models were used to estimate crude ORs with 95% CIs. Victimization stability and severity were entered into the models as categorical predictors, with 'not victimized' used as a reference category.

## Results

### Frequency of Peer Victimization

A total of 46.2% of children included in the sample reported being victims at either 8 or 10 years, and 53.8% were never victimized. Stable victimization was reported by 12.8% of children and 4.7% were severely victimized at 10 years. Mother reports of victimization were available for all children in the sample, and 37.7% were classed as victims. Teacher reports were available for 2708 children (73.3%), of which 13.1% were classed as victims.

Girls were victimized less frequently than boys, according to both child (42.6% girls vs. 50.1% boys; OR = 0.74; 95% CI, 0.65-0.84) and teacher reports (9.6% girls vs. 16.6% boys; OR = 0.54, 95% CI, 0.43-0.67), but not according to mother reports, (61.5% girls vs. 60.2% of boys; OR = 1.06, 95% CI, 0.88-1.26). Girls were less likely to experience direct victimization (12.7% girls vs. 18.9% of boys; OR = 0.53, 95% CI, 0.63-0.76), but there were

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no sex differences in the prevalence of indirect only victimization (3.5% girls vs. 2.3% boys; OR=1.41, 95% CI, 0.95-2.11).

**Confounders**

Any DSM-IV diagnosis at 7 years, emotional problems on the SDQ at 7 years, and family adversity were positively associated with some or all measures of internalizing problems in adolescence, whereas there was a negative association with IQ, confirming their status as potential confounders (results not shown). Given the higher prevalence of depression in females, sex was also examined as a potential confounder. On the SMFQ, females scored higher than males in Late Depression,  $\beta=.15$ ,  $p=.00$ , but there was no sex difference in Early Depression,  $\beta=-.01$ ,  $p=.44$ . Females also had more emotional symptoms on the SDQ,  $\beta=.12$ ,  $p=.00$ ; however no sex differences were observed in the prevalence of depression diagnosis on the DAWBA at 13 years, (0.8% of males vs. 0.5% of females), OR=0.56, 95% CI, 0.24-1.27. Consequently all the above confounders were entered into the regression models as covariates.

**Differences between sources of report**

The only differences in the predictive power of the various sources of victimization report emerged when considering those scoring above the 90<sup>th</sup> percentile on the SMFQ and SDQ. Specifically, self-report was the only source which significantly increased risk for scoring above the 90<sup>th</sup> percentile in all three assessments of internalizing problems for which disparate sources of report were available (i.e. Early Depression, Late Depression, emotional problems on the SDQ). Self-reported victimization was more strongly related to Early Depression than the other two outcomes. For instance, self-reported peer victimization was associated with more than a 3-fold increase in odds of being in the severe Early Depression range (OR = 3.30, 95% CI, 2.45-4.45), but a 2-fold increase for severe Late Depression

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scores (OR = 1.89, 95% CI, 1.44-2.47). On the other hand, mother and teacher reports only predicted a single outcome; 2-fold increased odds of the severe Early Depression scores (OR = 2.48, 95% CI, 1.64-3.77), and near 4-fold increased odds of severe SDQ scores (OR = 3.89, 95% CI, 2.40-6.31), respectively.

**Dose-response relationship**

There was a dose-response relationship between victimization and depression (SMFQ) scores. Stable victimization (being a victim at both 8 and 10 years) was more strongly associated with both Early and Late Depression outcomes than when victimization was unstable (Table 2). For example, children who were victimized at one time point had nearly 3-times increased odds of being above the 90<sup>th</sup> percentile of Early Depression scores (OR = 2.65, 95% CI, 1.89-3.72), whereas children who were victimized at both time points had 5-times increased odds of being above the 90<sup>th</sup> percentile of Early Depression scores (OR = 5.59, 95% CI, 3.84-8.15). Similarly, children who were severely victimized (a victim of both direct and indirect victimization) were more likely to have high Early and Late Depression scores than if the child was subjected to only indirect or only direct victimization. For example, both only direct victimization (OR = 4.12, 95% CI, 2.98-5.69) and only indirect victimization (OR = 4.06, 95% CI, 2.18-7.54) conferred increased odds of scoring above the 90<sup>th</sup> percentile of Early Depression scores but with severe victimization the same odds were increased over 6 times (OR = 6.01, 95% CI, 3.79-9.53).

By contrast, stable and severe victimization exerted largely reduced or no effects above that of victimization alone on emotional symptoms, for both continuous and severe SDQ scores (Table 2). There was no evidence of a dose-response relationship between victimization stability and severity and any of the DSM-IV diagnoses.

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There was also a dose-response relationship between victimization and depression symptom persistence. For both the High and Low Persistence outcomes, stable victimization was more strongly associated with depression symptoms than when victimization was unstable. For example, being a stable victim increased the odds for highly persistent depression symptoms over six-fold (OR = 6.00, 95% CI, 3.28-10.98), whereas for unstable victims the odds were increased two-fold (2.26, 95% CI, 1.28-4.01). Similarly, severe victimization was more strongly associated with depression symptoms than when the child was subjected to only one type of victimization. For example, being severely victimized increased the odds for highly persistent depression symptoms over seven-fold (OR = 7.27, 95% CI, 3.37-15.67), whereas for only direct and only indirect victimization the corresponding odds were 5 and 4 times increased, respectively (OR = 4.99, 95% CI, 2.93-8.47 and OR = 4.03, 95% CI, 1.36-15.67).

### **Associations between Peer Victimization and Broad Internalizing Problems**

Tables 2 and 3 show associations between peer victimization and the SMFQ and SDQ measures of internalizing problems (Table 2) and DSM-IV diagnoses (Table 3), controlling for confounding variables. Peer victimization status was positively associated with internalizing problem scores on the SMFQ and SDQ (Table 2). For example, being a self-reported victim was associated with approximately a tenth of a standard deviation increase in Late Depression scores ( $\beta = .13, p < .01$ ) and emotional symptom scores on the SDQ ( $\beta = .07, p < .01$ ). Similar associations between continuous SMFQ and SDQ scores were observed for the mother, teacher and self-report report (Table 2).

### **Associations between Peer Victimization and Severe Internalizing Problems**

Victimization was also associated with a greater risk of scoring above the 90<sup>th</sup> percentile on the SMFQ and SDQ. For instance, self-reported victimization carried 3-fold and

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2-fold increased odds of scoring above the 90<sup>th</sup> percentile in the Early Depression (OR = 3.30, 95% CI, 2.45-4.45) and SDQ assessments (OR = 1.71, 95% CI, 1.20-2.43), respectively.

Where victim status predicted *both* higher scores in general *and* scoring above the 90<sup>th</sup> percentile, the risk was greater when severe scores were considered as an outcome. For example, being a self-reported victim was associated with just over a fifth of a standard deviation increase in continuous Early Depression scores ( $\beta = .22, p < .01$ ) but 3-fold increased odds of scoring above the 90<sup>th</sup> percentile (OR = 3.30, 95% CI, 2.45-4.45). Peer victimization status was not significantly associated with either of the DSM-IV diagnoses (depressive or anxiety disorder) (Table 3).

\* TABLE 2 \*

\* TABLE 3 \*

#### **Associations between Peer Victimization and Depression Symptom Persistence**

Table 4 shows associations between peer victimization and Low and High Persistence, controlling for sex, IQ, pre-existing mental health symptoms and family adversity.

Positive peer victimization status as reported by the children, mother and teachers was positively associated with both Low and High Persistence of depression symptoms measured by the SMFQ (Table 4). The associations were stronger for the High Persistence outcome; for example, teacher-reported victims had two-fold increased odds of being in the Low Persistence group (OR = 2.53, 95% CI, 1.99-3.21), but 4 fold increased odds of Highly Persistent depression symptoms (OR = 4.19, 95% CI, 2.50-7.04).

\* TABLE 4 \*

## Discussion

The current study found that victimization predicts the development of internalizing symptoms in early adolescence. Firstly, we observed that victimization increased the risk of depression (SMFQ) and emotional problems (SDQ), and an even greater increase in odds of scoring on the extreme end of the distribution (>90th percentile). These findings suggest that although victimization acts as a risk factor for internalizing problems across the spectrum, a disproportional shift occurs towards the top end of the range. In addition, peer victimization predicted depression symptom persistence: the odds for persistently scoring in the top 10<sup>th</sup> percentile of depression scores were higher for victims than non-victims. Thus victimization affects not just incidence but also chronicity of depression problems. This underlines the role of victimization as a serious public health risk, given that victims appear likely to develop severe and persistent vulnerability to depression.

Secondly, mother, teacher and child reports of victimization predicted broad internalizing problems on the SMFQ (depression) and SDQ (negative emotionality). This is consistent with the findings of Shakoor and colleagues (2011) who reported that both mother and child reports of victimization yielded similar effect sizes when predicting non-clinical emotional and behavior problems. However, our study also found informant discrepancies in the prediction of *severe* internalizing problem scores (> 90<sup>th</sup> percentile). This may suggest that different sources of victimization report do have equal validity (Shakoor et al. 2011) when predicting shifts of internalizing scores across the broad spectrum but not in the severe range. Alternatively, the more comprehensive instrument used for establishing victim status was the self-report, as contrasted with a single item question for mother and teacher reports, and this may explain the fact that self-report consistently predicted all outcomes in the severe score range, offering the most comprehensive range of predictions. This finding cannot be attributed to shared method variance (Nakamoto and Schwartz 2010) as the outcome

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measures were both self and mother report measures. Nonetheless, self-report did not provide exhaustive information about the risk for more severe internalizing problems. For instance, with teacher-reported victims the risk for scoring in the top range for emotional problems (SDQ) was about two times higher than the same outcome predicted by self-reports. This underlines the importance of using multiple sources of report to prevent loss of valuable information.

Thirdly, in line with previous research on depression (Sourander et al. 2009; Sugden et al. 2010) and other mental health outcomes (Schreier et al. 2009), a dose-response relationship was observed between victimization and depression symptoms (SMFQ). Stability of victimization and experiencing both direct and indirect victimization conferred a higher risk for depression problems than lower stability or experiencing only one type of victimization. A similar dose-response relationship was also present for depressive symptom persistence – with severe victimization (victims of both indirect and direct bullying) conferring more than 7-fold increased odds for high persistence. However, a dose-response relationship was not found for emotional problems measured by the SDQ. This suggests victimization is a more specific predictor of depression in particular, rather than emotional problems in general.

Finally, a surprising finding was the lack of association between victimization and DSM-IV diagnoses of internalizing problems (depressive or anxiety disorder) in the DAWBA assessment. The lack of effect is most likely explained by a lack of statistical power caused by our stringent selection criteria. The number of positive cases in our sample was limited - only 0.7% of children had a DSM-IV diagnosis of depression and 1% satisfied the criteria for anxiety. Although the prevalence of depressive disorder is low in early adolescence (Costello et al. 2006; Shanahan et al. 2011), the prevalence of DAWBA-assessed depression and anxiety diagnoses in 13-15 year olds has been shown to be respectively 2.5% and 5%, in a

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nationally representative UK sample (Ford et al. 2003). These figures are higher than in this study, which could be explained by selective drop out: the ALSPAC participants who consistently participated were less likely to have a psychiatric diagnosis (Wolke et al. 2009a). Nevertheless, the trends were in the expected direction of victimization being associated with more frequent diagnosis of depression but the confidence intervals were too wide due to insufficient statistical power.

Victimization in childhood was more likely to increase odds for an immediate, less impairing depression outcome (e.g., non-clinical depression symptoms within 2 years of being bullied), than a delayed, more impairing depression outcome (e.g., DSM-IV diagnosis of depression several years later). In this sample, self-reported victims had a greater risk of developing depression symptoms at 11-12 years, than at ages 13 or older. This is consistent with findings that measures assessed closer in time are (usually) more highly related than measures taken between more distant time points (Bornstein et al. 2006; Conley 1984). Furthermore, the effect of victimization may fade over time as individuals cease to be victims of current bullying. However, those who developed early depressive symptoms that persisted over time were also more likely to be victims of bullying. Thus risk factors occurring in childhood (such as childhood peer victimization), in particular if chronic or severe, may be more closely related to childhood-onset, persistent depression, than adult- or adolescent-onset depression (Shanahan et al. 2011).

Nevertheless, not all children who were victimized had highly increased depression scores. Additional factors may have to be present for an individual to move along the depression continuum from distressing yet non-clinical symptoms, to severe scores or even a diagnosable psychiatric disorder. One contributing factor is early childhood psychopathology. For example, Rønning and colleagues (2009) failed to find an association between peer victimization and later psychiatric caseness, after controlling for prior psychopathology.

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Similarly, Sourander and colleagues (2007; 2009) found that although frequent victims and bully-victims had increased odds of psychiatric hospitalization or depression 5-15 years later, these associations were considerably curtailed after controlling for prior psychopathology. However, in the present study, taking into account DSM-IV diagnoses and emotional problems occurring prior to peer victimization hardly reduced the association between victimization and internalizing problems. This is consistent across most previous studies that found unique associations between victimization and *non-clinical* outcomes after adjusting for prior adjustment problems (Arseneault et al. 2006; Kaltiala-Heino et al. 2010; Schreier et al. 2009; Sugden et al. 2010).

But how does victimization lead to depression symptoms? It appears that victimization is a trauma that works itself “under the skin” by either altering the physiological response to stress (Ouellet-Morin et al. 2011), by gene-environment interaction whereby victimized children who later develop depression symptoms differ in genotype (Benjet et al. 2010; Sugden et al. 2010) and finally, repeated experience of victimization may equip an individual with a range of cognitive biases characteristic of depression (Mezulis et al. 2004). There is evidence for all three routes in the development of depression. Firstly, altered HPA-axis activity and altered cortisol response has been found to be associated with increased risk for developing depression (Burke et al. 2005; Cowen 2010; Harkness et al. 2011; Luby et al. 2004) and altering cognitive processes (El Hage et al. 2009; Erickson et al. 2003; Huffziger and Kuehner 2009). Furthermore, an interaction between a serotonin transporter promoter polymorphism (5-HTTLPR) and stress in the development of depression has been repeatedly reported with a recent meta-analysis of 54 studies showing strong evidence that 5-HTTLPR moderates the relationship between stress and depression, with the 5-HTTLPR s allele associated with an increased risk of developing depression under stress ( $P = .00002$ ) (Karg et al. 2011). Indeed, victimized children who later develop clinically

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significant symptoms show systematic differences in the expression of depression-linked genes (e.g. *5-HTTLPR*) compared to those who remain symptom-free or exhibit only transient symptoms (Sugden et al. 2010). Finally, repeated experience of victimization may equip an individual with a range of cognitive biases rendering him/her susceptible to the self-defeating ideations characteristic of depression (Mezulis et al. 2004). Victims (Woods et al. 2009) and those exhibiting symptoms of depression (Beck 2008; Evans et al. 2005) have been shown to have numerous biases in cognitive processing, e.g., deeper encoding of negative information in memory or interpretation of ambiguous material as negative (Dearing and Gotlib 2009; Hertel and Brozovich 2010). Thus being victimized, in particular if chronic or severe, may work itself into the brain altering neuro-circuitry and social cognition (Gini 2006; Sutton et al. 1999; Teicher et al. 2010) and stress response (Ouellet-Morin et al. 2011).

Furthermore, as children get older, they start to spend less time at home and more time among their peers (Steinberg and Morris 2001) and peer interactions take on a heightened importance, supplanting previous reliance on parents (Connell and Dishion 2006). Often, as the importance of peers increases, peer groups shift and peer-related stress increases (Sontag et al. 2008). It has been suggested that low-status positions in peer groups may cause children to have a diminished sense of belonging and relatedness to others (Baumeister and Leary 1995), which may increase the risk of depression. Indeed, it was found that children who are victimized tend to have increased levels of loneliness (Troop-Gordon and Ladd 2005), and decreased social satisfaction (Kochenderfer-Ladd and Wardrop 2001) compared to others. Moreover, children who are victimized may attribute victimization to their own deficiencies, potentially compromising their self-worth and precipitating depressive symptoms (Ladd and Troop-Gordon 2003; Troop-Gordon and Ladd 2005). Additionally, it has been shown that children who are depressed are more likely to be victimized (Kochel et al. 2012). Chronic victimization increases internalizing problem scores and the persistence of

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internalizing problems (Leadbeater and Hoglund 2009). Hence, frequent and stable peer victimization may interfere with important developmental processes, and cause emotional adjustment problems (Prinstein et al. 2001) and may foster depressive behavior symptoms even in children who do not have a genetic propensity for emotional problems.

There are several strengths of the present study: (1) the direct and detailed assessment of peer victimization and internalizing problems in children; (2) the use of multiple informants of peer victimization and internalizing problems which is shown to be a better predictor of adjustment than mono-informant assessments (Ladd and Kochenderfer-Ladd 2002); (3) the finding of prevalence rates of peer victimization that are similar to those reported in other studies in the UK (Whitney and Smith 1993; Wolke et al. 2001c) (4) the prospective study design with victimization assessments during childhood and internalizing problems at the age 11 to 14 years; (5) children were drawn from the general population, thus confounding effects of treatment seeking can be ruled out; (6) the use of well validated instruments with high reliability; and (7) availability of information on a variety of possible confounding factors.

There are also limitations. The mother-, teacher- and self-reports couldn't be formally compared as they were fundamentally different measures. Moreover, as mother and teacher reported victimization was assessed with a single item and this may have limited reliability compared to the more comprehensive child interview. Nevertheless expected associations were found. Furthermore, longitudinal information on all instruments was only available on a subsample, although substantial in size (N: 3692). Missing data, especially for teachers as informants, meant that sample sizes were further reduced in the analyses controlling for possible confounders. However, peer victimization itself was not related to selective dropout. Those who participated across all time points were socially advantaged and had less risk of

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psychopathology (i.e., reduced prevalence), a pattern of selective dropout found in most longitudinal investigations (Hille et al. 2005; Wolke et al. 1995). This may work against stated hypotheses due to reduced statistical power, in particular, where disorders are infrequent such as depression in early adolescence. Indeed power was limited for DSM-IV diagnoses. In contrast, the relationship between predictors and depression symptoms is unlikely to have been substantially altered by selective dropout processes as has been shown in simulations (Wolke et al. 2009a), nevertheless it cannot be ruled out.

In conclusion, the present study has demonstrated that victimization in childhood increases the risk for internalizing problems, in particular depression symptoms, in adolescence. By using a range of different outcomes in a prospective longitudinal design we were able to show that victimization predicts both broad but particular severe depression symptoms, as well as persistent depression symptoms, across different informants, with severe and chronic victimization emerging as particularly strong risk factors. These results support the contribution of psychosocial factors to the etiological underpinnings of internalizing problems, though the precise mechanisms through which victimization leads to increased depression and emotional symptoms need to be determined. Most importantly, our study adds to a growing body of research showing that peer victimization in childhood can have serious mental health consequences over the longer term. It should be considered an important public health risk, rather than an acceptable feature of child development (Hamburger et al. 2011; Scrabstein 2009) and interventions aimed at reducing victimization may be able to reduce depression prevalence in children and early adolescence (Farrington and Ttofi 2009).

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Table 1. Differences between included participants (full dataset) and those excluded due to missing data.

	Not included in sample	Included in sample	Not included in sample vs included in sample
	<i>N</i> (%)	<i>N</i> (%)	<i>OR</i> (95% <i>CI</i> )
<b>Sex</b>			
<i>Male</i>	5443 (75.4)	1777 (24.6)	1.21 (1.12-1.31)**
<i>Female</i>	4841 (71.7)	1915 (28.3)	Ref
<b>Ethnicity</b>			
<i>Non-white</i>	500 (82.1)	109 (17.9)	2.01 (1.63-2.48)**
<i>White</i>	7980 (69.5)	3494 (30.5)	Ref
<b>Birthweight</b>			
< 2500g	587 (78.6)	160 (21.4)	1.43 (1.20-1.71)**
≥ 2500g	9560 (73.3)	3491 (26.7)	Ref
<b>Mother's marital status</b>			
<i>Single</i>	2678 (81.6)	603 (18.4)	2.00 (1.82-2.21)**
<i>Married</i>	6758 (68.9)	3048 (31.1)	Ref
<b>Mother's home ownership</b>			
<i>Rented</i>			
<i>Mortgaged/owned</i>	2984 (86.0)	484 (14.0)	3.02 (2.72-3.35)**
	6420 (67.2)	3139 (32.8)	Ref
<b>Mother's education</b>			
< <i>O-level</i>	3123 (83.8)	605 (16.2)	2.78 (2.52-3.07)**
≥ <i>O-level</i>	5646 (65.0)	3044 (35.0)	Ref
<b>Social class</b>			
<i>Manual</i>	3737 (63.7)	2129 (36.3)	1.73 (1.60-1.88)**
<i>Non-manual</i>	4229 (75.3)	1390 (24.7)	Ref
<b>Family adversity</b>			
<i>Yes</i>	5972 (87.6)	844 (12.4)	1.98 (1.81-2.16)**
<i>No</i>	3524 (55.5)	2826 (45.5)	Ref
<b>Peer victimization</b>			
<i>Yes</i>	1117 (39.6)	1706 (60.4)	1.00 (0.91-1.11)
<i>No</i>	1306 (39.7)	1986 (60.3)	Ref
<b>Any common DSM-IV diagnosis at 7 years (DAWBA)</b>			
<i>Yes</i>	320 (67.8)	152 (32.2)	1.62 (1.33-1.98)**
<i>No</i>	4386 (56.6)	3367 (43.4)	Ref

\*\*  $p < .01$

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Table 2. Associations between peer victimization and internalizing problems in (SMFQ and SDQ) controlling for sex, IQ, family adversity and pre-existing emotional and behavior problems

	Broad Internalizing Problems						Severe Internalizing Problems									
	Depression SMFQ Early 11-12 years <sup>c</sup>		Depression SMFQ Late 12-13 years <sup>c</sup>		Negative Emotionality SDQ <sup>c</sup>		Depression SMFQ Early >90% <sup>d</sup> (n=332)			Depression SMFQ Late >90% <sup>d</sup> (n=327)			Negative Emotionality SDQ >90% <sup>d</sup> (n=196)			
	Beta	P-value	Beta	P-value	Beta	P-value	OR	CI (95%)	P-value	OR	CI (95%)	P-value	OR	CI (95%)	P-value	
<i>Child report</i> <sup>a</sup> <b>Any victim</b>	.22	0.000	.13	0.000	.07	0.000	<i>Child report</i> <sup>a</sup> <b>Any victim</b> (n=1706)	3.30	2.45-4.45	0.000	1.89	1.44-2.47	0.000	1.71	1.20-2.43	0.003
<i>Mother report</i> <sup>a</sup> <b>Any victim</b>	.11	0.000	.10	0.000	.09	0.000	<i>Mother report</i> <sup>a</sup> <b>Any victim</b> (n=1230)	2.48	1.64-3.77	0.000	1.35	0.94-1.93	0.103	1.53	0.94-2.48	0.090
<i>Teacher report</i> <b>Any victim</b> <sup>a</sup>	.15	0.000	.11	0.000	.12	0.000	<i>Teacher report</i> <sup>a</sup> <b>Any victim</b> (n=354)	1.22	0.81-1.84	0.341	1.51	0.99-2.31	0.057	3.89	2.40-6.31	0.000
<b>Unstable victim</b> <sup>b</sup>	.16	0.000	.10	0.000	.06	0.001	<b>Stability</b> <i>Unstable</i> (n=1180) <sup>a</sup>	2.65	1.89-3.72	0.000	1.66	1.22-2.25	0.001	1.71	1.15-2.54	0.008
<b>Stable victim</b> <sup>b</sup>	.25	0.000	.15	0.000	.06	0.000	<i>Stable</i> (n=428) <sup>a</sup>	5.59	3.84-8.15	0.000	2.81	1.94-4.07	0.000	1.62	0.96-2.73	0.072
<b>Direct only victim</b> <sup>b</sup>	.19	0.000	.10	0.000	.03	0.078	<b>Severity</b> <i>Direct only</i> (n=561) <sup>a</sup>	4.12	2.98-5.69	0.000	1.87	1.33-2.63	0.000	1.62	1.03-2.53	0.035
<b>Indirect only victim</b> <sup>b</sup>	.10	0.000	.06	0.000	.04	0.034	<i>Indirect only</i> (n=105) <sup>a</sup>	4.06	2.18-7.54	0.000	2.19	1.15-4.18	0.017	1.67	0.68-4.07	0.262
<b>Severe victim</b> <sup>b</sup>	.20	0.000	.10	0.000	.04	0.017	<i>Severe</i> (n=167) <sup>a</sup>	6.01	3.79-9.53	0.000	3.43	2.13-5.52	0.000	1.92	0.96-3.85	0.068

<sup>a</sup> Reference category: Not bullied.<sup>b</sup> Dummy coded variable.<sup>c</sup> Linear regression analysis.<sup>d</sup> Binary or multinomial logistic regression analysis.

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Table 3. Associations between peer victimization and DSM-IV diagnoses of internalizing disorders, adjusted for sex, IQ, family adversity and pre-existing emotional and behavioral problems.

	DSM-IV Major Depression Diagnosis (DAWBA) <sup>b</sup> (n=24)			DSM_IV Any Anxiety Disorder diagnosis (DAWBA) <sup>b</sup> (n=37)		
	OR	CI (95%)	P value	OR	CI (95%)	P value
<i>Child report</i> <sup>a</sup>						
<b>Any victim</b> (n=1706)	1.74	0.64-4.75	0.282	1.27	0.61-2.66	0.520
<i>Mother report</i> <sup>a</sup>						
<b>Any victim</b> (n=1230)	0.84	0.26-2.71	0.764	1.01	0.39-2.61	0.992
<i>Teacher report</i> <sup>a</sup>						
<b>Any victim</b> (n=354)	3.23	1.04-10.30	0.048	1.59	0.48-5.24	0.446
<b>Stability</b>						
<i>Unstable</i> (n=1180) <sup>a</sup>	2.19	0.71-6.76	0.809	1.09	0.46-2.57	0.849
<i>Stable</i> (n=428) <sup>a</sup>	1.23	0.23-6.49	0.173	1.37	0.49-3.80	0.552
<b>Severity</b>						
<i>Direct only</i> (n=561) <sup>a</sup>	1.68	0.52-5.46	0.385	1.61	0.66-3.93	0.300
<i>Indirect only</i> (n=105) <sup>a</sup>	.00	.00	0.997	.00	.00	0.997
<i>Severe</i> (n=167) <sup>a</sup>	1.40	0.18-11.13	0.098	2.23	0.63-7.87	0.215

<sup>a</sup> Reference category: Not bullied.<sup>b</sup> Binary or multinomial logistic regression.

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Table 4. Associations between peer victimization and >90<sup>th</sup> percentile depression (SMFQ) symptom persistence (adjusted for sex, IQ, family adversity and pre-existing emotional and behavioral problems).

	Low Depression Persistence (n=447) vs. No Symptoms <sup>b</sup>			High Depression Persistence (n=106) vs. No Symptoms <sup>b</sup>		
	OR	CI (95%)	P-value	OR	CI (95%)	P-value
<i>Child report</i> <sup>a</sup>						
<b>Any victim</b> (n=1706)	2.40	1.89-3.05	0.000	3.20	1.93-5.31	0.000
<i>Mother report</i> <sup>a</sup>						
<b>Any victim</b> (n=1230)	1.58	1.14-2.19	0.006	2.59	1.28-5.26	0.008
<i>Teacher report</i> <sup>a</sup>						
<b>Any victim</b> (n=354)	2.53	1.99-3.21	0.000	4.19	2.50-7.04	0.000
<b>Stability</b>						
<i>Unstable</i> (n=1180) <sup>a</sup>	2.11	1.60-2.77	0.000	2.26	1.28-4.01	0.005
<i>Stable</i> (n=428) <sup>a</sup>	3.73	2.67-5.20	0.000	6.00	3.28-10.98	0.000
<b>Severity</b>						
<i>Direct only</i> (n=561) <sup>a</sup>	2.30	1.71-3.09	0.000	4.99	2.93-8.47	0.000
<i>Indirect only</i> (n=105) <sup>a</sup>	2.98	1.71-5.19	0.000	4.03	1.36-11.94	0.012
<i>Severe</i> (n=167) <sup>a</sup>	4.76	3.12-7.26	0.000	7.27	3.37-15.67	0.000

<sup>a</sup> Reference category: Not bullied.<sup>b</sup> Binary or multinomial logistic regression.

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