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## **Bullied Children and Psychosomatic Problems: A Meta-analysis**

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# Bullied Children and Psychosomatic Problems: A Meta-analysis

## abstract

**BACKGROUND AND OBJECTIVE:** A previous meta-analysis showed that being bullied during childhood is related to psychosomatic problems, but many other studies have been published since then, including some longitudinal studies. We performed a new meta-analysis to quantify the association between peer victimization and psychosomatic complaints in the school-aged population.

**METHODS:** We searched online databases up to April 2012, and bibliographies of retrieved studies and of narrative reviews, for studies that examined the association between being bullied and psychosomatic complaints in children and adolescents. The original search identified 119 nonduplicated studies, of which 30 satisfied the prestated inclusion criteria.

**RESULTS:** Two separate random effects meta-analyses were performed on 6 longitudinal studies (odds ratio = 2.39, 95% confidence interval, 1.76 to 3.24) and 24 cross-sectional studies (odds ratio = 2.17, 95% confidence interval, 1.91 to 2.46), respectively. Results showed that bullied children and adolescents have a significantly higher risk for psychosomatic problems than non-bullied agemates. In the cross-sectional studies, the magnitude of effect size significantly decreased with the increase of the proportion of female participants in the study sample. No other moderators were statistically significant.

**CONCLUSIONS:** The association between being bullied and psychosomatic problems was confirmed. Given that school bullying is a widespread phenomenon in many countries around the world, the present results indicate that bullying should be considered a significant international public health problem. *Pediatrics* 2013;132:720–729

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### KEY WORDS

bullying, peer victimization, psychosomatic problems, health, meta-analysis

### ABBREVIATIONS

CI—confidence interval

$N_{fs}$ —fail-safe  $N$

OR—odds ratio

SES—socioeconomic status

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Being bullied during childhood or adolescence is a risk factor for a person's well-being and adjustment. Studies have shown that peer victimization is related mainly to internalizing problems, including low self-esteem, high anxiety, and depression,<sup>1-4</sup> and it also is linked to suicidal ideation and attempt.<sup>5,6</sup> Moreover, it is increasingly recognized that bullied students can also be affected by poor physical health and show a variety of symptoms, such as headache, backache, abdominal pain, skin problems, sleeping problems, bed-wetting, or dizziness.<sup>7-11</sup> Given that in such circumstances psychosocial processes seem to act as a key factor negatively affecting children's health, these symptoms are often called psychosomatic problems.<sup>7-10</sup>

To date, the only meta-analysis<sup>12</sup> specifically conducted on this issue was published in 2009. That meta-analysis synthesized the results of 11 studies that have analyzed the association between being victimized by peers at school and the prevalence of symptoms among children and adolescents between 7 years and 16 years of age. Bullied students were found to have a significantly higher risk for psychosomatic problems than were the controls, that is, the age-mates who were not involved in bullying (pooled odds ratio [OR] = 2.00, 95% confidence interval [CI], 1.70 to 2.35). Although important, those results were limited by the small number of studies included in the meta-analysis (which also precluded the possibility of testing for possible moderators), and the results were also limited by the fact that only 2 of them used a longitudinal design.

Subsequently, another meta-analysis<sup>3</sup> has analyzed data from longitudinal studies that measured a variety of internalizing problems, including psychosomatic symptoms. Overall, this meta-analysis has confirmed that peer victimization is positively associated

with poor well-being. However, Reijntjes and colleagues' review included only 2 studies that measured psychosomatic symptoms; unfortunately, these symptoms were not distinguished from other types of internalizing problems (eg, depression, anxiety, or loneliness), but a pooled correlation for each study was computed, with no comparison between bullied and nonbullied children.

Since the publication of the first meta-analysis in 2009, several other studies that assessed the risk for psychosomatic problems in bullied children have been added to the literature, including some studies that used a longitudinal design. This new meta-analysis seeks to update and expand both Gini and Pozzoli's and Reijntjes and colleagues' meta-analyses<sup>3,12</sup> by (1) including the subsequently published studies that allowed to estimate the risk for psychosomatic problems in children and adolescents who are bullied by peers (ie, cases) compared with nonbullied peers (ie, controls), (2) performing separate meta-analyses of longitudinal and cross-sectional studies, and (3) testing for potential moderators of variation in the magnitude of effect sizes.

## METHODS

### Literature Search

Four methods were used to identify relevant studies. First, electronic searches in PsycINFO, PubMed, the Cochrane Library database, the Campbell Collaboration database, and Scopus were conducted in April 2012 with the following keywords: "bullying," "peer victimization" AND "somatic," "psychosomatic," and "physical health." Second, the "cited by" function in Scopus was used to retrieve empirical articles that have cited the previous meta-analysis.<sup>12</sup> Third, review articles about consequences of bullying were reviewed for possible relevant citations. Finally, the reference sections of the collected articles were searched for relevant earlier references.

This meta-analysis was planned, conducted, and reported in adherence to the Meta-analysis of Observational Studies in Epidemiology guidelines.<sup>13</sup>

### Inclusion Criteria

A study had to meet the following a priori criteria to be included. The most basic requirement was the inclusion of measures of peer victimization at school in childhood or adolescence and of psychosomatic symptoms. These measures could include self-report questionnaires; peer, parent, or teacher reports; or an interview that resulted in a quantitative rating of peer victimization and health problems. Second, studies were required to have reported effect sizes and related confidence intervals or enough information to calculate these data, for example, by reporting comparisons between bullied children and a control group (defined as children from the same population of victims who were classified as not bullied). We excluded the following types of studies: studies that did not include a control group; studies that measured psychosomatic symptoms with items included in a larger scale, because these symptoms could not be clearly distinguished from other problems; studies with duplicated data; studies that did not report analyses on the variables of interest; and studies with adults or psychiatric patients. The authors independently assessed whether articles met the inclusion criteria. In the case of disagreement, a consensus was reached through discussion.

### Coding of Studies

Studies were coded on design (cross-sectional versus longitudinal), length of follow-up for longitudinal studies, type of bullying measure (self-report questionnaire versus peer or adult reports versus interview), type of psychosomatic symptoms measured, type of sampling procedure, sample composition and characteristics, and geographic location of

study. Quantitative data were extracted from text and tables; for the sake of comparability with the results of the former meta-analysis,<sup>12</sup> the data that were adjusted for important confounders (eg, gender, age, ethnicity, or parental education) were preferred.

## Statistical Analyses

Eleven studies reported an effect based on a single composite score for psychosomatic complaints, whereas the remaining studies reported data for a number of different symptoms distinctly (eg, headache, stomachache, backache, abdominal pain, dizziness, sleeping problems, poor appetite, bedwetting, skin problems, vomiting; see Table 1). Because the number and the type of symptoms varied systematically across studies, following Gini and Pozzoli's original procedure,<sup>12</sup> the OR for each symptom was extracted, and then a pooled OR was computed from each study. (Items that referred to psychological problems, such as anxiety or depression, were not included in this computation.) This procedure allowed a direct comparison with the results of the former meta-analysis. The case group included victims, that is, children who are bullied by peers. The control group featured children who have not been bullied. With very few exceptions, studies did not report results for boys and girls separately; therefore, we were not able to compare effect sizes for these two groups of children. Because most of the studies reported the proportion of girls in the sample, we used this information to test for possible moderation by gender.

Analyses were done using Comprehensive Meta-Analysis.<sup>14</sup> We extracted the OR and 95% CI from each study. Data from individual studies were pooled by using a random effects model. Each study was weighted by the inverse of its variance, which, under the random effects model, includes the within-study

variance plus the between-studies variance  $\tau$ -squared ( $T^2$ ). The  $z$  statistic was calculated, and a two-tailed  $P$  value of  $<.05$  was considered to indicate statistical significance. Statistical heterogeneity was assessed by using the  $Q$  statistic to evaluate whether the pooled studies represent a homogeneous distribution of effect sizes. Also reported is the  $I^2$  statistic, indicating the proportion of observed variance that reflects real differences in effect size.<sup>15</sup>

To address the possible publication bias (ie, the fact that studies with non-significant results are less likely to be published), we computed the fail-safe  $N$  ( $N_{fs}$ ) according to the method Orwin<sup>16</sup> proposed, which is more conservative than the traditional Rosenthal  $N_{fs}$ .<sup>17,18</sup> Orwin's  $N_{fs}$  determines the number of additional studies in a meta-analysis yielding null effect sizes that would be needed to yield a "trivial" OR of 1.05. Researchers suggest that meta-analysts calculate a tolerance level around a fail-safe  $N$  that is equal to 5 times the number of effects included in the meta-analysis plus 10 (the "5k + 10" benchmark).<sup>18,19</sup> Moreover, the association between the standardized effect sizes and the variances of these effects was analyzed by rank correlation with use of the Kendall  $\tau$  method. If small studies with negative results were less likely to be published, the correlation between variance and effect size would be high. Conversely, a lack of a significant correlation can be interpreted as the absence of publication bias.<sup>20</sup>

## RESULTS

After the removal of duplicates, a list of 119 potentially eligible studies was generated (Fig 1). Based on titles and abstracts, 55 articles were excluded at the first screening because they were qualitative studies, reviews or commentaries, or studies that did not measure school bullying. Full-text copies of the

remaining 64 potentially relevant studies were obtained. Fourteen studies were excluded because they did not meet the inclusion criteria (eg, they did not have a control group). Fifteen studies did not report enough data to compute effect sizes or confidence intervals. Five studies were not available in full text. The remaining 30 studies were included for this meta-analysis. Six studies were longitudinal studies, and 24 used a cross-sectional design.

Table 1 summarizes the characteristics of the studies included in this meta-analysis, including sample size and response rate, age and gender composition of the sample, type of measures, symptoms measured, study design, and type of sampling. A total of 219 560 children and adolescents participated in the 30 studies. Across the 26 studies that provided information about the sample's gender composition, 50.2% (range, 32.8% to 62.4%) of the participants were girls.

Five studies were from Norway, 2 of which were from the same publication<sup>28,34,35,38</sup>; 4 from the United States<sup>22,23,27,43</sup>; 3 from Australia<sup>8,11,37</sup>; 2 from the United Kingdom<sup>44,45</sup>; 2 from the Netherlands<sup>7,25</sup>; 2 from Finland<sup>51,56</sup>; 2 from India<sup>33,40</sup>; and 1, respectively, from Austria,<sup>26</sup> China,<sup>29</sup> France,<sup>30</sup> Germany,<sup>41</sup> Greenland,<sup>42</sup> Italy,<sup>10</sup> Mexico,<sup>21</sup> and Turkey.<sup>32</sup> Two articles reported data from multiple countries.<sup>24,39</sup> Information about race or ethnicity and socioeconomic status (SES) of the participants was not systematically reported in all studies. Overall, the heterogeneity of racial and SES classification within and across the studies was such that it precluded analysis by race and ethnicity or SES.

## Meta-analysis of Longitudinal Studies

Six studies used a longitudinal design. The follow-up duration ranged from 9 months to 11 years. Across the 6 samples, bullied children were found to

**TABLE 1** Characteristics of Studies Included in the Meta-analysis

Source	Sample Size (response rate)	Age Range, y (%girls)	Bullying Measure	Symptom Measure	Symptoms Reported	Adjustment for Confounders	Study Design	Type of Sampling
Alboreo-Gallo et al (2011) <sup>21</sup>	340 (n/a)	7–11 (n/a)	Peer nomination questionnaire	Self-report questionnaire	Single score	None	Cross-sectional	Convenience sample
Blebl et al (2011) <sup>22</sup>	65 (n/a)	12–20 at time 3 (62.9)	Time 1: play session; time 3: self-report questionnaire	Self-report questionnaire	Single score	Gender	Longitudinal	Convenience sample
Burk et al (2011) <sup>23</sup>	344 (60%)	7–15 (52.3)	Multi-informant (self, teacher, parent report) questionnaire	Multi-informant (self, teacher, parent report) questionnaire	Single score	None	Longitudinal	Convenience sample
Due et al (2005) <sup>24</sup>	123 227 (>90%)	11–15 (51)	Self-report questionnaire	Self-report questionnaire	Headache, stomachache, backache, sleeping difficulties, tired in the morning, dizziness, irritable, feeling nervous	Age, family affluence, country	Cross-sectional	Cluster random sampling
Fekkes et al (2004) <sup>7</sup>	2766 (100%)	9–12 (50)	Self-report questionnaire	Self-report questionnaire	Headache, skin problems, abdominal pain, tense muscles, feeling tired, bad appetite	Gender	Cross-sectional	Unknown
Fekkes et al (2006) <sup>25</sup>	1118 (70%)	9–11 (50.3)	Self-report questionnaire	Self-report questionnaire	Abdominal pain, sleeping problems, headache, feeling tense, feeling tired, poor appetite, bedwetting	Gender, age, having friends	Longitudinal	Unknown
Forero et al (1999) <sup>8</sup>	3918 (86%)	11–15 (54.3)	Self-report questionnaire	Self-report questionnaire	Single score	Clusters within schools	Cross-sectional	Cluster random sampling
Gini (2008) <sup>10</sup>	565 (94%)	8–11 (52.9)	Self-report questionnaire	Self-report questionnaire	Headache, abdominal pain, feeling tired, feeling tense, sleeping problems, dizziness	Gender, age	Cross-sectional	Simple random sampling
Gradinger et al (2009) <sup>26</sup>	761 (95%)	14–19 (51.5)	Self-report questionnaire	Self-report questionnaire	Single score	None	Cross-sectional	Convenience sample
Gruber and Fineran (2008) <sup>27</sup>	522 (51%)	12–17 (42.9)	Self-report questionnaire	Self-report questionnaire	Single score	None	Cross-sectional	Convenience sample
Haavet et al (2004) <sup>28</sup>	8316 (88%)	15 (54.4)	Self-report questionnaire	Self-report questionnaire	Headache, pain from neck or shoulder	None	Cross-sectional	Population study
Hesketh et al (2010) <sup>29</sup>	2191 (80%)	9–12 (44)	Self-report questionnaire	Self-report questionnaire	Headache, abdominal pain	Gender, age, residence, parental education	Cross-sectional	Simple random sampling
Houbre et al (2006) <sup>30</sup>	291 (95%)	9–12 (n/a)	Self-report questionnaire	Self-report questionnaire	Skin conditions, sleeping disorders, digestive disorders, somatic pain, vegetative symptoms, diarrhea, and constipation	None	Cross-sectional	Convenience sample
Kaltiala-Heimo et al (2000) <sup>31</sup>	17 643 (87%)	14–16 (49.3)	Self-report questionnaire	Self-report questionnaire	Single score	Age, gender, family structure, parental education	Cross-sectional	Convenience sample

**TABLE 1** Continued

Source	Sample Size (response rate)	Age Range, y (%girls)	Bullying Measure	Symptom Measure	Symptoms Reported	Adjustment for Confounders	Study Design	Type of Sampling
Karatas and Ozturk (2011) <sup>32</sup>	92 (82%)	10–12 (51.1)	Self-report questionnaire	Parent report questionnaire	Headache, abdominal pain, stomachache, backache, skin problems, restlessness, nervousness, sleeping problems, dizziness, respiratory problems, poor appetite	None	Cross-sectional	Simple random sampling
Kshirsagar et al (2007) <sup>33</sup>	500 (100%)	8–12 (62.4)	Semistructured interview	Semistructured interview	Headache, tummy aches, body ache, has failed, bites nails, sleep problems, vomiting, bedwetting	Not specified	Longitudinal	Simple random sampling
Lien et al (2009) (sample 1) <sup>34</sup>	3790 (88%)	15–16 (49.3)	Self-report questionnaire	Self-report questionnaire	Headache; pain in neck or shoulder; pain in arm, leg, or knee; abdominal pain; back pain	SES, family structure, ethnicity, exposure to violence, having close friends	Cross-sectional	Population study
Lien et al (2009) (sample 2) <sup>34</sup>	3790 (80%)	18–19 (55.9)	Self-report questionnaire	Self-report questionnaire	Headache; pain in neck or shoulder; pain in arm, leg, or knee; abdominal pain; back pain	SES, family structure, ethnicity, exposure to violence, having close friends	Cross-sectional	Population study
Løhre et al (2011) <sup>35</sup>	419 (100%)	7–16 (n/a)	Multi-informant (self, teacher, parent report)	Self-report questionnaire	Stomachache, headache	Gender, grade	Cross-sectional	Convenience sample
Luntamo et al (2012) <sup>36</sup>	2215 (91%)	13–18 (50)	Self-report questionnaire	Self-report questionnaire	Headache, abdominal pain, sleep problems	None	Cross-sectional	Population study
McGee et al (2011) <sup>37</sup>	1806 (n/a)	14–21 (51.8)	Self-report questionnaire	Self-report questionnaire	Single score	Childhood aggression, social or thought problem behaviors, poverty, physical punishment	Longitudinal	Population study
Natvig et al (2001) <sup>38</sup>	856 (83.7%)	13–15 (50.6)	Self-report questionnaire	Self-report questionnaire	Headache, stomachache, backache, feeling dizzy, irritability, feeling nervous, sleeplessness	Gender, age, school	Cross-sectional	Unknown
Nordhagen et al (2005) <sup>39</sup>	17 114 (68%)	2–17 (49.1)	Parent report questionnaire	Parent report questionnaire	Single score	Gender, age, country, living area, family situation, education	Cross-sectional	Stratified random sampling
Ramya and Kulkarni (2011) <sup>40</sup>	500 (n/a)	8–14 (52.8)	Interview	Interview	Headache, tummy ache, bedwetting, fever	None	Cross-sectional	Simple random sampling
Richter et al (2007) <sup>41</sup>	5650 (70%–80%)	11–15 (49.8)	Self-report questionnaire	Self-report questionnaire	Single score	None	Cross-sectional	Cluster random sampling
Rigby (1999) <sup>11</sup>	78 (28.3%)	Time 1: 13.8, Time 2: 16.7 (44.9)	Self-report questionnaire	Self-report questionnaire	Single score	None	Longitudinal	Convenience sample
Schnohr and Niclason (2006) <sup>42</sup>	891 (n/a)	11–15 (n/a)	Self-report questionnaire	Self-report questionnaire	Headache, stomachache, sleeping difficulties	Gender, age	Cross-sectional	Cluster random sampling

TABLE 1 Continued

Source	Age Range, y (%girls)	Bullying Measure	Symptom Measure	Symptoms Reported	Adjustment for Confounders	Study Design	Type of Sampling
Srabstein et al (2006) <sup>43</sup>	11–15 (53.5)	Self-report questionnaire	Self-report questionnaire	Headache, stomachache, dizziness, backache, irritability, feeling nervous, sleeping problems	Gender, age, race, overweight, maternal education	Cross-sectional	Cluster random sampling
Williams et al (1996) <sup>44</sup>	7–10 (n/a)	Semistructured interview	Semistructured interview	Sleeping problems, bed wetting, headache, tummy ache	Not specified	Cross-sectional	Population study
Wolke et al (2001) <sup>45</sup>	6–9 (49.6)	Interview	Parent report questionnaire	Sore throat, cold or coughs, breathing problems, nausea, poor appetite	Gender, school year, ethnic minority	Cross-sectional	Convenience sample

n/a, not available.

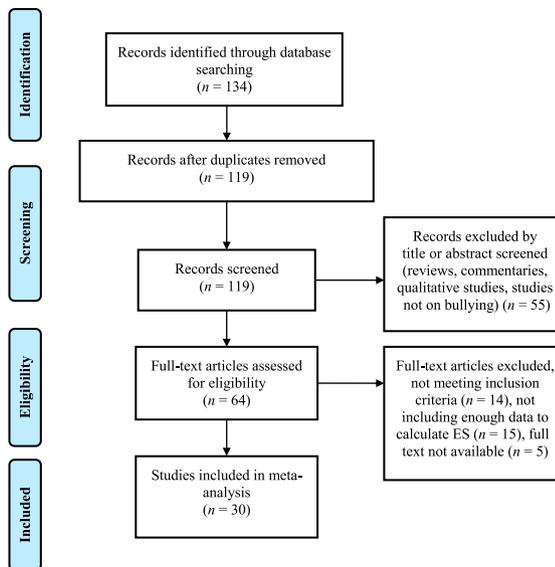


FIGURE 1 Flow diagram of study inclusion.

have a significantly higher risk for psychosomatic problems than non-bullied agemates were (OR = 2.39, 95% CI, 1.76 to 3.24,  $Z = 5.62$ ,  $P < .0001$ ). Figure 2 shows the forest plot for this meta-analysis. Studies were highly homogeneous ( $Q = 4.94$ ,  $P = .42$ ,  $I^2 = 0\%$ ). Furthermore, no evidence of publication bias was present. Kendall's  $\tau = .53$  with two-tailed  $P = .13$ . An additional 102 studies with null effect sizes would be needed to attenuate this omnibus

effect size to a trivial effect ( $5k + 10$  benchmark = 40).

**Meta-analysis of Cross-Sectional Studies**

Across the 24 samples that were included in the cross-sectional studies, bullied children were found to have a significantly higher risk for psychosomatic problems than were non-bullied peers (OR = 2.17, 95% CI, 1.91 to 2.46,  $Z = 12.09$ ,  $P < .0001$ ). Figure 3

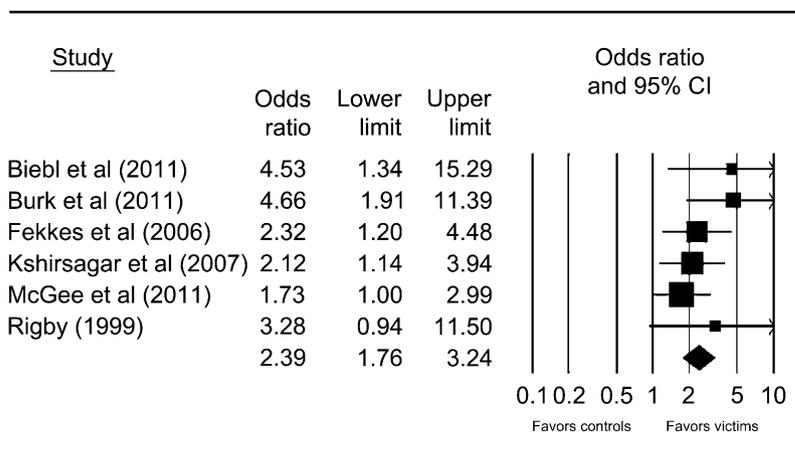


FIGURE 2 Forest plot for random effects meta-analysis of the association between being bullied and psychosomatic problems: longitudinal studies. Note: Effect sizes are expressed as odds ratios. Studies are represented by symbols whose area is proportional to the study's weight in the analysis.

shows the forest plot for this meta-analysis. Effect sizes within this group of studies were not homogeneous ( $Q = 103.06, P < .001, I^2 = 77.7\%$ ). Again, no evidence of publication bias was present. Kendall's  $\tau$  was .05 with two-tailed  $P = .75$ . An additional 325 studies with null effect sizes would be needed to attenuate this omnibus effect size to a negligible value ( $5k + 10$  benchmark = 130).

Moderator analyses with gender composition of the sample, geographic location, and type of informant were performed to explore possible explanations for heterogeneity in the effect sizes across cross-sectional studies. The proportion of girls in the sample was available for 20 of the 24 cross-sectional studies, and it was used as a continuous predictor in a weighted mixed-effects metaregression. The magnitude of the effect size significantly decreased with an increase in the number of female participants in the study sample ( $B = -0.04, 95\% \text{ CI}, -0.07$  to  $-0.02, P < .002$ ). The study's geographic location (coded as Europe versus other countries) was not a significant moderator ( $k = 15, \text{OR} = 2.19, 95\% \text{ CI}, 1.82$  to  $2.62$ , and  $k = 8, \text{OR} = 2.16,$

$95\% \text{ CI}, 1.61$  to  $2.90$ , respectively;  $Q = 0.004, P = .95$ ).

Moreover, the potential moderating role of a methodological feature, namely the type of informant, was tested. Twenty studies used the participant as an informant for involvement in bullying (ie, used self-report questionnaires or interviews with the child), and only 4 studies collected data through other informants (ie, peers or parents). Effect sizes did not vary as a function of the type of informant associated with bullying experiences ( $\text{OR} = 2.17, 95\% \text{ CI}, 1.86$  to  $2.53$  for self-reports,  $\text{OR} = 2.18, 95\% \text{ CI}, 1.55$  to  $3.06$  for other informants;  $Q = 0.00, P = .98$ ). Similarly, 19 studies collected information about symptoms from the participants themselves ( $\text{OR} = 2.21, 95\% \text{ CI}, 1.90$  to  $2.58$ ), whereas 5 studies asked other informants ( $\text{OR} = 2.00, 95\% \text{ CI}, 1.47$  to  $2.72$ ). Also, the effect of this moderator was not statistically significant:  $Q = 0.37, P = .57$ .

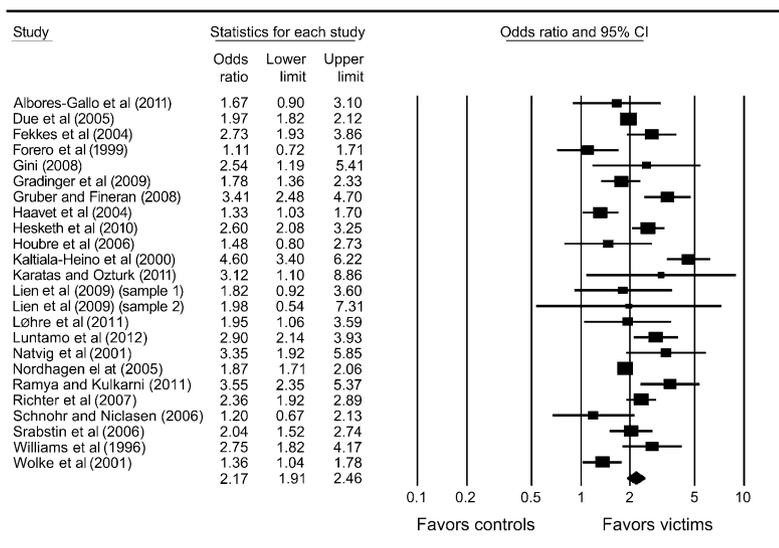
Finally, as in the former meta-analysis,<sup>12</sup> a sensitivity analysis was performed based on the quality of the studies. Quality was assessed through 2 criteria (beyond those required as inclusion criteria): the use of a randomized

sampling design or a whole population of students and a good response rate ( $>80\%$ ). Twelve studies satisfied both criteria. We then performed a separate meta-analysis of this subgroup of studies, and the results were  $\text{OR} = 2.10, 95\% \text{ CI}, 1.87$  to  $2.46$ .

## DISCUSSION

Our meta-analysis showed that bullied pupils are at least two times more likely than nonbullied agetates to have psychosomatic problems. Thus, this updated meta-analysis confirmed the findings of the former meta-analytic synthesis<sup>12</sup> with a much larger sample of studies. Importantly, the same result was found not only with cross-sectional studies but also in a meta-analysis of 6 studies that used a longitudinal design. Finally, the meta-regression analysis showed that the strength of the relationship between being bullied and having health problems is higher when samples contain proportionally more boys. Given the explorative nature of this analysis, a significant finding is not to be considered definitive, but it does suggest a direction for additional research. A possible explanation might deal with the fact that a school or classroom environment with a higher proportion of male students is a context in which bullying behavior is more likely to happen and where supportive and helping behaviors in favor of the bullied pupils are less frequent.<sup>46</sup> This could increase the negative impact of being bullied on children's health. The influence of the school environment's gender composition on peer victimization and its consequences for children's well-being is a topic that warrants additional research.

Since the former meta-analysis, the number of studies testing the association between bullying experiences and psychosomatic problems has tripled. We can reasonably conclude that this association is established, and we call



**FIGURE 3** Forest plot for random effects meta-analysis of the association between being bullied and psychosomatic problems: cross-sectional studies. Note: Effect sizes are expressed as odds ratios. Studies are represented by symbols whose area is proportional to the study's weight in the analysis.

for new research efforts aimed at elucidating the mechanisms through which bullying affects children's health. We also call for research that investigates how other environmental factors interact with peer victimization experiences to determine health risk. However, not all children are at the same risk for developing health problems: Some children may be more resilient than others against a high-risk environment. To explain this adaptive success, protective factors must be considered. For example, supportive parent-child relationships, characterized by parental warmth, supervision, support, and involvement, may protect children from adverse life experiences at school, such as being bullied by peers, and thus reduce negative consequences. Similarly, attachment to school, sense of belonging, and school support may be related to better student health. Longitudinal studies that address the mediating role of these and other environmental factors on the peer victimization-health problems link are much needed.

### Strengths and Limitations

The strengths of this meta-analysis include the much larger number of studies that were available this time compared with the former meta-analysis. Another strength is the wide geographic distribution of the samples, which were derived from several different countries around the world. Furthermore, we were able to perform separate meta-analyses of longitudinal and cross-sectional studies, which yielded the same results. Finally, we did not find evidence of publication bias that may have led to overestimating the association between bullying and psychosomatic problems.

Meta-analysis is an invaluable tool for integrating prior research, illuminating research gaps, and defining priorities for future research. However, the fact

that the major limitations of the literature that were highlighted in the first meta-analysis are still present is startling to see. For example, much variability exists in the methods and instruments used to assess the prevalence of symptoms and peer victimization experiences. The majority of studies used a variety of self-report questionnaires, both for peer victimization and for children's health complaints. In some cases, these measures were reduced to a single-item questionnaire. Self-report measures are very common in bullying research and are usually considered to be valid and reliable.<sup>47</sup> However, possible problems with these instruments are that they require a good level of respondents' self-consciousness and that some bullied children may deny their condition. Finally, associations between data derived from the same source (ie, when children self-report both bullying experiences and health problems) might be inflated by the common method variance. For these reasons, we stress the need for future studies to collect information through multiple independent informants, such as children themselves, their peers within the class, and their teachers or parents. Moreover, it is important that researchers choose validated and widely used instruments rather than ad hoc or newly developed scales with no evidence of reliability or validity. Also, the assessment of children's physical health must be improved. For example, none of the available studies included independent objective information, such as children's school absenteeism extracted from school attendance records or their visits to the school nurse office.

Furthermore, the studies included in this meta-analysis, and in the former meta-analysis, did not measure different forms of victimization separately (ie, physical and relational victimization) or did not report separate analyses for different forms of victimization. Despite

their overlapping, research has demonstrated the importance of distinguishing the 2 forms of victimization because they may be differentially related to personal adjustment.<sup>48</sup> Future studies should analyze the negative health consequences of physical and relational victimization experiences.

Finally, our meta-analysis shares the same limitations of all meta-analyses of observational studies. Because individuals cannot be randomly allocated to groups, the influence of confounding variables cannot be fully evaluated. Although many studies controlled for important confounding variables, such as parental education and socioeconomic status or exposure to violence outside of school, other unknown confounders could be partially responsible for the effect observed.

### Implications for Practitioners

The studies reviewed supported the fact that bullied children have more frequent psychosomatic problems than nonbullied pupils. Moreover, this meta-analysis significantly complements the growing body of research that documents the poor personal adjustment of bullied children and adolescents, in terms of both internalizing and externalizing problems, which other recent meta-analyses on the psychosocial consequences of peer victimization<sup>3,4,49</sup> summarize. Altogether, these results have significant implications for pediatricians, child psychologists, and other health care professionals. It is very important that these professionals be ready to identify children who are at risk for being bullied because the potential negative health, psychological, and educational consequences of bullying experiences are far-reaching.

Pediatricians can play an important role in detecting potential victims of bullying if they consider bullying as a possible risk factor in any patient with recurrent headaches, breathing problems, poor

appetite, sleeping problems, and so on. Any recurrent and unexplained somatic symptom can be a warning sign of bullying victimization. Because children do not easily talk about their bullying experiences, pediatricians could approach the issue of bullying through general questions, for example, by inquiring about the child's experience and friends in school. If the child seems to be withdrawn from peers, the pediatrician should ask for the reason and determine whether teasing, name calling, or deliberate exclusion may be involved.

Asking whether the child feels safe at school can also allow the pediatrician to gain insight into the level of concern the child is experiencing.

Moreover, pediatricians could routinely review the warning signs of bullying with parents to help them identify problems with bullying their child may be experiencing. Preventive measures can also include counseling parents about bullying experiences as a risk factor for children's well-being and the importance of promoting

development of social skills and assertiveness in their children. Pediatricians' suggestions are likely to be particularly effective given the high confidence that parents usually put in these professionals. Furthermore, parents should be encouraged to ask for school support when a case of bullying emerges. Breaking the cycle of victimization through early identification and prompt intervention may prevent persistent physical and mental health problems in children who experience bullying.

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**A Message From the Editor of Pediatrics:** *In its January 2013 issue, Pediatrics published a case report entitled “Lethal Effect of a Single Dose of Rasburicase in a Preterm Newborn Infant.” The authors included two physicians (Patrizia Zaramelia, MD, and Alessandra DeSalvia, PhD, MD), who disclosed that they served as paid expert witnesses in the case reported in this article. Although the authors of the case report refer to the infant as “our patient,” Pediatrics has since learned that none of the authors of the case report treated the infant who is the subject of the case report. Pediatrics has also learned that this case is the subject of pending criminal and civil proceedings in Italy, that Drs. Zaramelia and DeSalvia were appointed as expert witnesses for the prosecution in the criminal proceedings and that the medical conclusions in the article are being contested by the opposing parties and their experts.*

## Bullied Children and Psychosomatic Problems: A Meta-analysis

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