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Chapter 6
The Relation Between Students' Perceptions of Instructional Quality and Bullying Victimization

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Abstract Instructional quality may serve as a protective factor against school bullying victimization internationally. This study investigated this using the data provided by TIMSS 2011 fourth grade students. Given the highly-skewed distribution of the bullying scale and the clustered structure of the TIMSS data, a multilevel (students nested in classes) zero-inflated Poisson regression was used and responses to the bullying items were treated as rough counts. Covariates identified as predicting bullying at the international level were controlled for. Findings from the international model indicate that better instructional quality is associated with lower rates of student self-reported bullying victimization. At the educational-system level findings are mixed. The analysis suggests that bullying begins at an early age and that, at the fourth grade level, bullying victimization is an international phenomenon. Although instructional quality is associated with lower reported bullying victimization rates internationally, cross-system differences point to the important fact that instructional quality will not, in and of itself, globally lower rates of bullying in schools.

Keywords Instructional quality · Bullying victimization · Student characteristics · Zero-inflated poisson regression · Trends in Mathematics and Science Study (TIMSS) 2011

6.1 Introduction

Over the past two decades, there has been rapid growth in understanding of bullying in schools and its many negative effects on victims (Dill et al. 2004; Jimerson et al. 2010; Olweus 1994). Bullying is a global phenomenon affecting students at all levels of achievement and socioeconomic status (Harel-Fisch et al. 2011;

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Rutkowski et al. 2013a, b), and that immigrant students are at greater risk of deleterious effects (Rutkowski et al. 2013a, b). Based on the results of a cross-national review, Jimerson et al. (2010, p. 1) contended that "studies in all countries in which bullying has been investigated, have revealed the presence of bullying." An increased awareness of the prevalence and impacts of bullying have accompanied a growth in prevention and related initiatives. For example, at the international nongovernmental level, nonprofit organizations, such as the International Bullying Prevention Association and No Bully, have been established to share information and work with teachers and parents from around the world to prevent and combat bullying in schools. In addition, the United Nations envoy on violence against children recently stated that bullying in schools is a "serious concern" that threatens victims' fundamental rights to education (UN News 2015).

Related to international attention on bullying, there have also been a number of nationally-focused studies on bullying in schools and associated correlates (Bosworth et al. 1999; Haynie et al. 2001; Nansel et al. 2003; Wang et al. 2009); however, at the international level, there remain a dearth of studies examining factors associated with bullying across a large group of countries. In this study, we aim to add to international conversation and to pursue one possible correlate of bullying that does not receive a great deal of focus: teacher instructional quality.

In its most general form, bullying is understood as a behavior intended to inflict injury or discomfort upon another individual (Olweus 1994). Within the context of schools, Olweus (2010) noted that an important aspect of school bullying victimization is the exposure to "negative or aggressive acts that are carried out repeatedly and over time" (p. 11). Indeed, in much of the bullying literature, the repeated nature of the aggressive acts is a key component defining bullying (see also Cook et al. 2010). Furthermore, Olweus (2010, p. 10) recognized bullying as "a subset of aggression or aggressive behavior," as did the US Centers for Disease Control (CDC), which included bullying as an example of violent behavior (CDC n.d.).

As prominent figures in the classroom and in children's day-to-day lives, teachers play an important role in students' well-being and development around the world (OECD 2005). Evidence suggests that positive student teacher relationships are associated with students' self-esteem, academic motivation, and achievement (Frymier and Houser 2000; Skinner and Belmont 1993). Further, support from teachers has been shown to reduce student aggression (Reinke and Herman 2002) and to decrease the risk of bullying (Natvig et al. 2001). Unsurprisingly then, teachers are key players in reducing bullying prevalence within schools (Allen 2010; Crothers and Kolbert 2010). And research clearly shows that teachers are important actors in both the intervention process when bullying occurs and in preventing bullying victimization from occurring in the first place (Nicolaides et al. 2002; Yoon and Kerber 2003).

To date, much research on the relationship between teachers and classroom bullying has largely centered on teachers' classroom management, with a specific

emphasis on discipline practices within the classroom (Bullock 2002; Smokowski and Kopasz 2005). Advocates of a classroom management approach to ameliorating bullying argue that "teachers who are adept at managing student behavior in the classroom work to prevent student bullying through creating a classroom climate incompatible with peer victimization… work to improve children's social skills and conflict management skills so that future bullying is less likely" (Crothers and Kolbert 2010, p. 537). Notable here is that these and other bullying studies typically place instructional quality under the umbrella of classroom management. This is in contrast to the operational definition of instructional quality used here, where instructional quality is partly comprised of classroom management (see Chap. 1). Nonetheless, these studies show the importance of teachers, with respect to school bullying victimization.

Although such studies clearly place the teacher in a central role with respect to bullying prevention and prevalence, simply viewing the teacher as a "disciplinary manager" ignores other important dimensions. In other words, teachers do more than manage disciplinary issues. This is in line with Barbetta et al. (2005, p. 17), who posited that "the first line of defence in managing student behaviors is effective instruction." In a recent study, Kyriakides et al. (2014) found support for this argument by employing the dynamic model of educational effectiveness to design strategies and actions to counter bullying, and found that schools who support their teachers in developing an optimal and safe classroom learning environment via high quality teaching (amongst other things) may reduce bullying. To that end, they wrote: "Provision of learning opportunities for students is one of the most important aspects of school policy on teaching when dealing with bullying" (Kyriakides et al. 2014, p. 457). Hence, teachers and their instruction play an important role, not just for achievement, but also for preventing bullying. As such, our objective here was to determine the degree to which instructional quality (as defined and described in Chap. 1) is associated with less school bullying victimization internationally. The sample includes fourth grade students and their teachers who participated in TIMSS 2011. We selected fourth grade students as this is a relatively understudied age group in the international literature and because interventions are more effective at earlier ages (Smith 2010). Given the highly-skewed distribution of the bullying scale (described subsequently) and the clustered nature of the TIMSS data, we used a multilevel (students nested in classes) zero-inflated Poisson regression and treated responses to the bullying items as rough counts. We controlled for several covariates that have been found in previous research (Rutkowski et al. 2013a, b) to predict bullying at the international level. These covariates included sex of the student, student attachment to the school, student sociocultural capital, and student immigrant background.

6.2 Methods

6.2.1 Data

In this study, we consider only 48 of the 49 TIMSS participating fourth grade systems (excluding special administrative units such as the Flanders region of Belgium, the Basque Country, and Northern Ireland). We omitted Australia from our analysis because there was variance in the class-level sampling weights due to a design feature involving the indigenous population. As such, it was not possible to fit a multilevel model to these data while also properly incorporating the design features of the study.

For the models fit to the data (discussed subsequently), we treated the data as students nested within classes, recognizing that we confounded the class- and school-level variance in those countries that sample more than one class per school.

6.2.2 Measures

We used TIMSS 2011 grade four student background questionnaire responses for the entire international sample, excepting omissions.

Student measures

The TIMSS student questionnaire (Foy et al. 2013) features a six-item scale that aligns with our research question on bullying victimization. This scale is a modification of the Olweus (2007) bullying scale, with all relevant items under a single stem that asks "During this year, how often have any of the following things happened to you at school?" The individual items include (1) "I was made fun of or called names;" (2) "I was left out of games or activities by other students;" (3) "Someone spread lies about me;" (4) "I was hit or hurt by other students(s) (e.g. shoving, hitting, kicking);" (5) "I was made to do things I didn't want to do by other students;" and (6) "Someone spread lies about me." Students responded to one of four options: "at least once a week"; "once or twice a month"; "a few times a year"; and "never." We found reasonable evidence that the bullying scale can be regarded as scalar invariant across all considered countries (see Appendix D, Table D.1). As such, these items were summed to create a scale from zero (when all items were ticked "never") to 18 (when all items were ticked "at least once a week"). The reliability of this scale in the TIMSS international sample, as measured by Guttman's λ_2 was 0.76. Although TIMSS produces a bullying scale, we opted to create our own measures because the TIMSS-produced scale is the result of an item response theory model that assumes the underlying latent variable (bullying experiences) is normally distributed. Given the frequency scale of these indicators and our interest in understanding frequency of

bullying experiences, we created our own scale that approximates count data that is best fit by a Poisson regression (Agresti 2002). The weighted average counts and standard deviations of bullying experiences in the TIMSS 2011 grade four sample (Table 6.1) show that there are meaningful differences in terms of the average levels of reported bullying victimization, from countries with relatively low average counts of bullying ($\bar{x}_{\text{Azerbaijan}} = 2.23, SD = 3.33$; $\bar{x}_{\text{Armenia}} = 2.16, SD = 3.44$) to countries with relatively high average counts ($\bar{x}_{\text{Thailand}} = 8.01, SD = 4.30$; $\bar{x}_{\text{Botswana}} = 6.56, SD = 4.79$). For reference, the pooled international average is 4.91 (SD = 4.35). (We further discuss the distribution of this scale in Sect. 6.2.3.)

As the primary focus of our research question, we used students' perception of instructional quality (InQua) as a predictor in our model. The variables included asked about the degree to which students agreed that, in their math lessons: (a) they know what their teacher expects them to do; (b) their teacher is easy to understand; (c) they are interested in what their teacher is saying; and (d) their teacher gives

Table 6.1 Descriptive statistics of bullying scale, by country

Country	n	Mean	SD	Country	n	Mean	SD
Azerbaijan	4882	2.23	3.33	Malta	3607	5.21	4.18
Austria	4668	4.29	4.20	Morocco	7841	5.81	4.52
Bahrain	4083	6.56	4.79	Oman	10,411	6.17	4.34
Armenia	5146	2.16	3.44	Netherlands	3229	4.73	3.85
Botswana	4198	7.95	3.68	New Zealand	5572	6.34	4.57
Chile	5585	6.03	4.87	Norway	3121	4.10	3.74
Taiwan	4284	4.31	4.09	Poland	5027	3.58	3.95
Croatia	4584	3.46	3.57	Portugal	4042	4.50	3.88
Czech Republic	4578	4.80	4.08	Qatar	4117	6.67	4.82
Denmark	3987	3.45	3.42	Romania	4673	4.76	4.19
Finland	4638	3.46	3.39	Russia	4467	4.74	3.94
Georgia	4799	3.03	3.64	Saudi Arabia	4515	5.55	4.56
Germany	3995	4.41	3.89	Serbia	4379	3.69	3.80
Honduras	3919	5.83	4.75	Singapore	6368	5.37	4.15
Hong Kong	3957	4.49	3.94	Slovakia	5616	4.81	4.21
Hungary	5204	5.40	4.27	Slovenia	4492	4.60	4.18
Iran	5760	5.14	4.21	Spain	4183	5.16	4.39
Ireland	4560	3.40	3.82	Sweden	4663	2.81	3.14
Italy	4200	4.34	3.93	Thailand	4448	8.01	4.30
Japan	4411	4.46	4.07	UAE	14,720	6.03	4.53
Kazakhstan	4382	3.34	3.97	Tunisia	4912	5.16	4.05
Korea	4334	4.13	3.84	Turkey	7479	5.96	4.65
Kuwait	4142	5.52	4.71	USA	12,569	4.55	4.43
Lithuania	4688	4.53	3.93	Yemen	8058	5.06	4.63

Note Weighted average counts (n), mean and standard deviation (SD) of bullying experiences in school. *UAE* United Arab Emirates

them interesting things to do. Items (a) and (b) tap into clarity of instruction as described in Chap. 1, while items (c) and (d) tap into the aspect of instructional quality referred to as supportive climate. A supportive climate refers among other things to teachers who support students by engaging them. This scale hence misses the aspects of instructional quality referring to cognitive activation and classroom management.

Although TIMSS also measures teachers with respect to instructional quality, we opted for the student report, as students are less prone to answering in socially desirable ways (Wagner et al. 2015).

As a proxy for sociocultural capital, we used the books in the home variable, scaled from 0 to 4, which is coded such that 0 corresponds to few books and 4 corresponds to more than 200 books. As a measure of the students' attachment to school, we used the average of two variables that asked students how much they agree that: (1) they like being in school; and (2) they feel like they belong at this school. These are Likert scaled variables, where 0 = strongly disagree and 3 = strongly agree. This short scale had an estimated international reliability of 0.77. Although the TIMSS data set has no direct measure of immigrant status, we used the frequency of speaking the language of the test at home as a rough proxy, with 0 = never; 1 = sometimes; and 2 = always or almost always. Finally, we included the student's sex such that 0 = male and 1 = female.

6.2.3 Analytic Methods

Given the inherent multilevel structure of the data (students nested in classes, classes nested in schools, schools nested in countries), we pursued a multilevel approach. Although intraclass correlations (ICCs) were relatively low, ranging from 0.01 to 0.03, the standard errors around each system's intercept variance estimate are quite small relative to the variance estimate, providing some evidence that there are meaningful between-group differences in average log-counts of bullying. Although these values are not included in the interest of space, they are available upon request from L. Rutkowski. Further, the nature of the bullying victimization scale (frequency of occurrence) resulted in a non-normal distribution. Rather, the data more closely followed a Poisson distribution, which is sensible if the scale roughly represents counts of bullying victimization experiences. Finally, the occurrence of bullying victimization in schools is, fortunately, a relatively rare occurrence, leading to more zeros than is normally expected in a Poisson distribution (Fig. 6.1). Assuming a Poisson distribution with an overall empirical mean (λ) of 4.91 (SD = 4.35) and n = 247,338, the number of zeros is normally expected to be $ne^{-\lambda} = 247{,}338\ e^{-4.91} = 1824$ (Lambert 1992). Instead, we found 45,653 zeros. This confirmed our suspicion that there were too many zeros and that a typical multilevel Poisson model will not suffice. We thus chose a multilevel

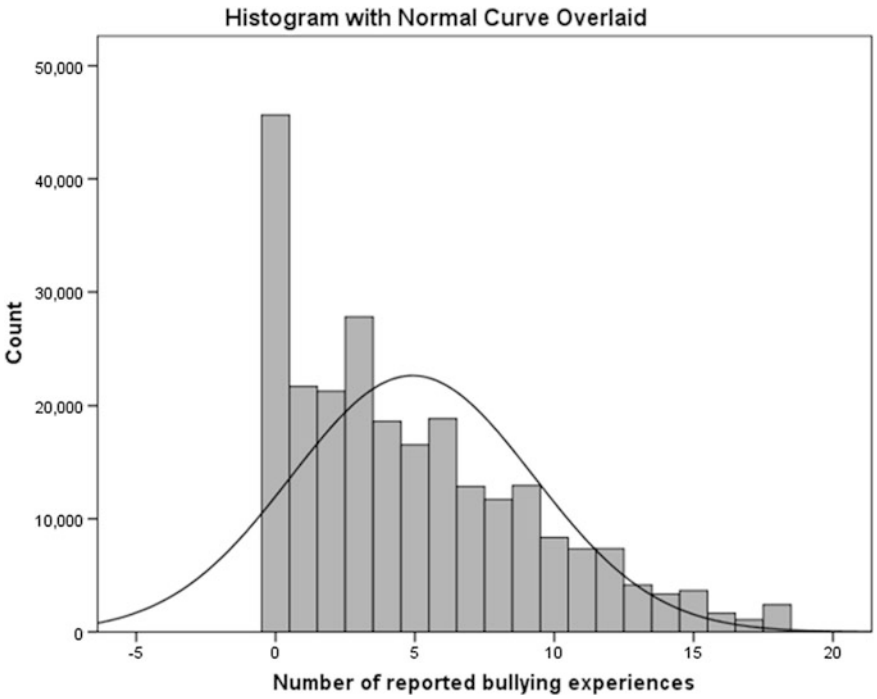

Fig. 6.1 Normal density curve overlying histogram of bullying scale distribution

zero-inflated Poisson (M-ZIP) model for our analysis, given the distribution of the outcomes and the structure of the data. In a single-level ZIP model, it is assumed that there are two separate processes at work: a latent binomial regression that predicts whether someone is in the zero category (no occurrence) and a standard count or Poisson regression (frequency of occurrence; Lambert 1992). A convenient feature of a ZIP model is that the variables that explain the zero part and count part of the model do not have to be the same. Given that our interest was in the count part of the model, we did not build a model for the zero part; however, we did estimate the coefficient associated with the odds of having no bullying victimization experiences. The model is a mixture of a Poisson distribution with parameter λ and a degenerate distribution with point mass at 0 and probability p. When excess zeros are present, a ZIP model is a better fit to the data and better predicts both zeros and counts (Hall 2000; Lambert 1992).

Although two-level M-ZIP models are theoretically well established and relatively easy to implement in commercially available software, there is little practical capacity for higher-level M-ZIP models; we thus chose to fit two sets of two-level M-ZIP models. In the first case, we fitted one pooled international model where students were nested within classrooms, and educational system was used as a clustering variable. Secondly, we produced individual models for each country

where students were nested within classes. In all cases, we assumed that InQua was metric invariant across countries and the loadings were fixed according to the results of the invariance analysis (see Appendix D, Box D.1). Further, we fitted all two-level M-ZIP models in M*plus* 7 (Muthén and Muthén 1998–2012) and we followed recommendations (Rutkowski et al. 2010) to apply sampling weights at the student and class level. The models fitted to the TIMSS 2011 data were specified as follows, with all level-one predictor variables centered about their grand-means:

$$\begin{aligned}
\text{The logistic part: } & \operatorname{logit}(p_i) = \alpha_0 \\
\text{The Poisson part: } & \log\left(\lambda_{ij}\right) = \beta_{0j} + \sum_{h=1}^{5} \beta_{hj} x_{hij} \\
& \beta_{oj} = \gamma_{00} + \gamma_{01} z_{1j} + U_{0j} \\
& \beta_{hj} = \gamma_{h0} \text{ for all } h.
\end{aligned}$$

Here, α_0 is the log odds of no bullying experiences. Then $(\exp(\alpha_0)/(1+\exp(\alpha_0))$ expresses the probability of being in the zero category. In the Poisson part of the model, β_{0j} expresses the log counts of bullying victimization for classroom j when all h student-level covariates (x_{hij}) for student i in class j are zero. And the effect of each of the student-level predictors is expressed by β_{hj}, where $h = 1, \ldots, 5$. We modelled the classroom average log bullying count (β_{0j}) as a function of an overall system-level expected log bullying count (γ_{00}) when the class-average of InQua (z_{1j}) is zero, an effect for class-average InQua (γ_{01}), plus a random classroom effect (U_{0j}). Between-classroom variance in β_{0j} is expressed as $\operatorname{var}\left(U_{0j}\right) = \tau_0^2$. Because we treat all level-one effects as fixed across classrooms, the slopes (β_{hj}) are regarded as fixed and so $\beta_{hj} = \gamma_{h0}$ for all h. It is important to note that, although it is not represented in the above model specification, InQua is a latent variable measured by its relevant indicators at the within- and between-levels. In the pooled model, the international average estimate of log counts of bullying victimization was given as γ_{00}, whereas in the country-specific models, this parameter corresponded to the country-average bullying estimate. After controlling for other covariates, we examined whether instructional quality, as reported by students, was associated with bullying victimization experiences at either the student or classroom level.

Coefficients are interpreted similar to those in standard multilevel regression: statistically significant positive coefficients imply a positive association with counts of violence and statistically significant negative coefficients imply a negative association with counts of violence. To put the Poisson regression coefficients in a more intuitive metric, we can exponentiate them (i.e., $e^{\gamma_{h0} \cdot x_{hij}}$) and directly interpret the multiplicative effect of a one unit change in the predictor on the outcome in terms of count ratios.

6.3 Results

We were primarily interested in instructional quality; however, structural parameters for all predictors are also presented (Table 6.2). We do not report the measurement model parameters (factor loadings, intercepts, residual variance, and latent variable variance); however, they are available on request. In terms of the logistic or zero-part of the model, our analysis indicates that, internationally, 21 % of fourth grade students reported no bullying victimization experiences ($\frac{\exp(-1.56)}{[1+\exp(-1.56)]} = 0.21$ 95 %CI [0.183, 0.241]).

With respect to the count or Poisson part of the model, we note the following findings associated with instructional quality at the international level. There is a statistically and practically significant negative effect for instructional quality at the student level. That is, better perceived instructional quality is associated with lower rates of student self-reported bullying victimization. In particular, for a one unit increase in instructional quality, bullying rates are expected to be 30 % lower ($e^{-0.36} = 0.698$ (95 %CI [0.541, 0.900]). In other words, for a student who reports instructional quality that is one unit higher, we expect that their reported bullying victimization will be just 70 % that of a student who reported instructional quality one unit lower. In contrast, at the classroom level, we found no relationship between instructional quality and bullying.

Our findings for the pooled international model also indicate a negative sex effect ($\exp(-0.11) = 0.895$; 95 %CI [0.861, 0.932]), with girls reporting bullying rates that are about 10 % lower than their boy peers. Students who reported higher levels of attachment to school reported bullying rates about 6 % lower than their less attached peers ($\exp(-0.06) = 0.942$; 95 %CI [0.906, 0.979]). There was a small negative association between frequency of speaking the language of the test and bullying rates ($\exp(-0.05) = 0.951$; 95 %CI [0.933, 0.970]). Given that students from an immigrant background tend to exhibit stronger associations between bullying and achievement compared to their native born peers (see for example, Rutkowski et al. 2013a, b), this finding is especially germane. Finally, at the international level, we observed a small positive association between our SES proxy and student reports of bullying victimization ($\exp(0.02) = 1.020$; 95 %CI [1.000, 1.040]), where students reporting one unit more books also reported slightly higher (2 %) bullying victimization.

Before discussing the individual educational system results, it must be noted that the language item was not administered in Slovenia, and there is thus no parameter estimate for this variable. Within the individual country analyses (Table 6.2), we generally see a highly heterogeneous pattern for the relationship between instructional quality and self-reported bullying victimization rates after controlling for other covariates in the model. For example, in several educational systems, there was a statistically significant negative association. The strongest negative associations at the within-class level were observed in Turkey ($\exp(-25.98) = 0.000$; 95 %CI [0.000, 0.000]), Tunisia ($\exp(-6.53) = 0.000$; 95 %CI [0.000, 0.046]), Honduras ($\exp(-6.45) = 0.002$; 95 %CI [0.000, 0.088]), Chile ($\exp(-5.20) = 0.006$; 95 %

Table 6.2 M-ZIP results (statistically significant effects for instructional quality are indicated in bold)

Country	Within										Between					
	InQua_w (*SE*)	t	Girl (*SE*)	t	Attach (*SE*)	t	Lang (*SE*)	t	Books (*SE*)	t	InQua_b (*SE*)	t	Int (*SE*)	t	Zero (*SE*)	t
International	**−0.36 (0.13)**	**−2.87**	−0.11 (0.02)	−7.23	−0.06 (0.02)	−3.36	−0.05 (0.01)	−5.86	0.02 (0.01)	3.13	0.03 (0.08)	0.44	1.71 (0.02)	109.32	−1.56 (0.07)	−23.36
Armenia	0.06 (0.14)	0.41	−0.12 (0.05)	−2.42	−0.02 (0.04)	−0.55	−0.06 (0.05)	−1.20	−0.02 (0.02)	−1.00	−0.45 (0.27)	−1.66	1.41 (0.05)	30.09	0.04 (0.05)	0.78
Austria	0.14 (0.16)	0.86	−0.09 (0.03)	−3.10	−0.25 (0.04)	−7.00	−0.07 (0.03)	−2.88	0.02 (0.01)	1.71	−0.14 (0.21)	−0.68	1.58 (0.03)	63.16	−1.43 (0.06)	−26.07
Azerbaijan	**−1.13 (0.40)**	**−2.83**	−0.25 (0.05)	−4.96	−0.08 (0.08)	−1.00	0.03 (0.07)	0.47	−0.02 (0.03)	−0.58	−1.32 (0.94)	−1.40	1.10 (0.08)	13.75	−0.06 (0.09)	−0.64
Bahrain	**−3.34 (0.81)**	**−4.13**	−0.22 (0.04)	−5.29	0.12 (0.03)	4.00	0.01 (0.03)	0.33	0.01 (0.01)	0.93	0.09 (0.23)	0.40	1.88 (0.03)	72.35	−2.20 (0.09)	−25.86
Botswana	−0.06 (0.05)	−1.33	−0.03 (0.02)	−1.94	0.00 (0.01)	0.00	0.04 (0.01)	3.00	0.01 (0.01)	0.71	−0.22 (0.17)	−1.35	2.10 (0.01)	149.93	−3.95 (0.17)	−23.66
Chile	**−5.20 (1.27)**	**−4.11**	−0.07 (0.03)	−2.41	0.05 (0.05)	1.00	−0.09 (0.03)	−3.40	0.01 (0.01)	0.83	0.28 (0.22)	1.27	1.73 (0.03)	69.04	−2.09 (0.07)	−30.33
Croatia	−0.39 (0.21)	−1.80	−0.14 (0.03)	−4.89	−0.02 (0.03)	−0.70	−0.12 (0.04)	−3.19	−0.02 (0.02)	−1.07	−0.03 (0.18)	−0.16	1.43 (0.07)	20.74	−1.25 (0.06)	−22.36
Czech Republic	−0.04 (0.13)	−0.32	−0.12 (0.04)	−3.54	−0.15 (0.03)	−5.58	−0.12 (0.03)	−3.56	−0.03 (0.01)	−2.00	**−0.45 (0.21)**	**−2.09**	1.71 (0.02)	85.55	−1.64 (0.07)	−25.28
Denmark	**−0.68 (0.27)**	**−2.55**	−0.07 (0.04)	−1.78	−0.16 (0.04)	−3.95	−0.13 (0.05)	−2.63	0.03 (0.02)	1.87	0.22 (0.19)	1.15	1.34 (0.04)	37.31	−1.49 (0.07)	−21.54
Finland	0.14 (0.09)	1.59	−0.11 (0.03)	−3.38	−0.27 (0.03)	−10.07	−0.17 (0.05)	−3.54	0.01 (0.02)	0.47	0.03 (0.17)	0.14	1.40 (0.02)	63.41	−1.51 (0.06)	−24.70
Georgia	**−5.69 (1.30)**	**−4.38**	−0.12 (0.04)	−2.64	0.03 (0.04)	0.97	−0.23 (0.05)	−4.78	−0.03 (0.02)	−1.47	0.84 (1.14)	0.74	1.33 (0.03)	39.21	−0.61 (0.06)	−9.45
Germany	−0.05 (0.11)	−0.47	−0.07 (0.03)	−2.34	−0.19 (0.03)	−7.42	−0.13 (0.03)	−3.74	0.01 (0.01)	0.69	0.02 (0.31)	0.05	1.63 (0.02)	77.52	−1.70 (0.06)	−28.32
Honduras	**−6.45 (2.05)**	**−3.14**	−0.15 (0.03)	−4.53	0.05 (0.06)	0.93	0.00 (0.04)	−0.09	0.02 (0.02)	1.35	0.12 (0.44)	0.26	1.76 (0.03)	58.63	−1.82 (0.09)	−19.74

(continued)

Table 6.2 (continued)

Country	Within										Between					
	InQua_w (*SE*)	t	Girl (*SE*)	t	Attach (*SE*)	t	Lang (*SE*)	t	Books (*SE*)	t	InQua_b (*SE*)	t	Int (*SE*)	t	Zero (*SE*)	t
Hong Kong	**−0.14 (0.05)**	**−2.58**	−0.14 (0.03)	−5.07	−0.06 (0.02)	−3.33	−0.05 (0.03)	−1.80	0.03 (0.01)	2.00	−0.36 (0.23)	−1.53	1.63 (0.02)	85.74	−1.75 (0.06)	−30.22
Hungary	**−0.16 (0.07)**	**−2.35**	−0.08 (0.02)	−3.65	−0.10 (0.02)	−4.85	0.01 (0.05)	0.25	−0.03 (0.01)	−2.90	−0.18 (0.23)	−0.79	1.79 (0.02)	99.56	−1.96 (0.06)	−31.66
Iran	**−0.28 (0.09)**	**−2.94**	−0.06 (0.08)	−0.79	−0.07 (0.02)	−2.87	0.01 (0.02)	0.33	−0.01 (0.01)	−1.10	**−2.58 (0.77)**	**−3.35**	1.66 (0.05)	36.93	−1.72 (0.09)	−18.26
Ireland	**−0.30 (0.15)**	**−2.00**	−0.10 (0.04)	−2.18	−0.09 (0.03)	−2.82	−0.16 (0.04)	−3.86	0.02 (0.02)	1.31	0.27 (0.29)	0.91	1.43 (0.04)	32.39	−1.02 (0.06)	−16.98
Italy	−0.12 (0.10)	−1.17	−0.06 (0.03)	−2.06	−0.07 (0.03)	−2.56	−0.12 (0.02)	−5.00	0.03 (0.01)	2.50	**−1.14 (0.31)**	**−3.69**	1.61 (0.02)	73.14	−1.56 (0.06)	−25.98
Japan	0.07 (0.12)	0.53	−0.25 (0.03)	−9.26	−0.16 (0.03)	−5.52	−0.10 (0.03)	−3.41	0.02 (0.01)	1.42	−0.14 (0.14)	−1.05	1.66 (0.02)	79.00	−1.49 (0.06)	−24.10
Kazakhstan	**2.44 (0.39)**	**6.32**	−0.07 (0.04)	−1.76	−0.36 (0.05)	−7.48	−0.04 (0.04)	−0.97	−0.05 (0.02)	−2.42	**−3.39 (0.79)**	**−4.31**	1.44 (0.06)	23.61	−0.65 (0.10)	−6.26
Korea	**−0.30 (0.11)**	**−2.74**	−0.22 (0.03)	−8.35	−0.09 (0.03)	−3.37	−0.17 (0.03)	−5.16	0.01 (0.01)	0.50	**−0.44 (0.15)**	**−2.84**	1.60 (0.02)	88.94	−1.47 (0.05)	−30.00
Kuwait	**−1.53 (0.54)**	**−2.82**	−0.23 (0.06)	−3.80	0.08 (0.03)	2.83	0.02 (0.03)	0.74	0.02 (0.01)	1.50	−0.70 (0.41)	−1.69	1.87 (0.08)	24.58	−1.52 (0.09)	−16.19
Lithuania	0.29 (0.37)	0.79	−0.06 (0.03)	−1.91	−0.28 (0.07)	−4.15	−0.15 (0.04)	−3.40	0.01 (0.02)	0.53	−0.19 (0.53)	−0.36	1.62 (0.02)	73.82	−1.75 (0.06)	−27.78
Malta	−0.11 (0.09)	−1.16	−0.12 (0.03)	−4.17	−0.07 (0.02)	−3.61	0.06 (0.02)	2.64	0.01 (0.01)	0.38	−0.38 (0.22)	−1.76	1.75 (0.02)	91.89	−1.92 (0.07)	−27.87
Morocco	**−3.55 (0.91)**	**−3.92**	−0.21 (0.03)	−7.24	0.04 (0.04)	1.03	0.05 (0.02)	2.09	0.06 (0.01)	5.00	0.07 (0.54)	0.14	1.72 (0.04)	41.88	−2.18 (0.14)	−15.83
Netherlands	−0.02 (0.37)	−0.04	−0.07 (0.04)	−2.03	−0.17 (0.06)	−2.84	−0.11 (0.04)	−3.09	0.03 (0.01)	2.43	−0.23 (0.44)	−0.52	1.61 (0.02)	80.70	−2.18 (0.08)	−28.64
New Zealand	−0.05 (0.15)	−0.31	−0.04 (0.02)	−2.00	−0.10 (0.03)	−3.38	−0.07 (0.02)	−3.00	0.01 (0.01)	1.30	0.39 (0.28)	1.37	1.90 (0.02)	112.00	−2.36 (0.07)	−34.71

(continued)

Table 6.2 (continued)

Country	Within										Between					
	InQua_w (*SE*)	t	Girl (*SE*)	t	Attach (*SE*)	t	Lang (*SE*)	t	Books (*SE*)	t	InQua_b (*SE*)	t	Int (*SE*)	t	Zero (*SE*)	t
Norway	0.04 (0.21)	0.17	−0.11 (0.04)	−3.00	−0.22 (0.04)	−5.24	−0.12 (0.04)	−2.75	0.01 (0.02)	0.59	−0.22 (0.26)	−0.85	1.53 (0.03)	58.81	−1.77 (0.09)	−20.84
Oman	**−0.21 (0.08)**	**−2.81**	**−0.10 (0.02)**	−5.30	−0.02 (0.02)	−1.10	−0.01 (0.01)	−0.73	0.02 (0.01)	3.52	**−1.03 (0.25)**	**−4.08**	1.90 (0.02)	109.59	−2.11 (0.08)	−25.89
Poland	**−0.33 (0.16)**	**−2.13**	**−0.24 (0.03)**	−7.03	−0.01 (0.03)	−0.26	−0.20 (0.05)	−4.28	0.01 (0.02)	0.63	0.00 (0.49)	0.00	1.53 (0.02)	63.71	−0.99 (0.04)	−23.57
Portugal	−0.38 (0.20)	−1.88	−0.17 (0.04)	−4.25	−0.08 (0.05)	−1.50	−0.05 (0.05)	−1.07	−0.01 (0.02)	−0.63	−0.76 (0.54)	−1.42	1.59 (0.03)	54.86	−1.81 (0.08)	−22.90
Qatar	−0.07 (0.10)	−0.70	−0.20 (0.04)	−4.70	−0.03 (0.02)	−1.39	−0.01 (0.02)	−0.67	0.02 (0.01)	1.25	**−0.94 (0.43)**	**−2.17**	1.98 (0.02)	82.50	−2.10 (0.09)	−23.57
Romania	**−0.28 (0.13)**	**−2.10**	−0.23 (0.03)	−7.70	0.01 (0.03)	0.15	−0.05 (0.05)	−1.00	−0.02 (0.01)	−1.21	−1.28 (0.69)	−1.86	1.59 (0.05)	33.08	−1.73 (0.09)	−18.96
Russia	**−0.32 (0.09)**	**−3.64**	−0.06 (0.02)	−2.38	−0.07 (0.03)	−2.68	−0.07 (0.03)	−2.46	0.00 (0.01)	0.08	−0.59 (0.33)	−1.79	1.70 (0.02)	73.87	−1.61 (0.07)	−22.72
Saudi Arabia	**−3.80 (1.07)**	**−3.56**	−0.38 (0.09)	−4.42	0.06 (0.03)	2.13	0.02 (0.04)	0.51	0.00 (0.01)	0.15	−0.38 (0.47)	−0.83	1.70 (0.04)	47.11	−2.14 (0.13)	−16.24
Serbia	−0.32 (0.24)	−1.34	−0.23 (0.04)	−6.60	−0.01 (0.05)	−0.20	−0.17 (0.04)	−4.10	0.02 (0.02)	1.11	−0.21 (0.30)	−0.70	1.54 (0.03)	46.55	−1.05 (0.07)	−15.49
Singapore	**−0.11 (0.04)**	**−2.59**	−0.21 (0.02)	−10.19	−0.08 (0.02)	−5.33	−0.03 (0.02)	−1.39	0.03 (0.01)	3.00	−0.16 (0.14)	−1.15	1.75 (0.01)	125.14	−2.16 (0.06)	−38.59
Slovakia	−0.02 (0.16)	−0.14	−0.11 (0.03)	−4.24	−0.13 (0.03)	−4.64	−0.10 (0.03)	−3.57	−0.01 (0.01)	−0.92	0.16 (0.29)	0.56	1.66 (0.03)	55.33	−1.69 (0.06)	−27.26
Slovenia	−0.38 (0.69)	−0.55	−0.19 (0.07)	−2.86	−0.05 (0.10)	−0.51	.	.	−0.01 (0.02)	−0.69	−0.55 (0.45)	−1.22	1.62 (0.03)	52.86	−1.76 (0.08)	−21.96
Spain	−0.13 (0.13)	−0.76	−0.07 (0.03)	−2.16	−0.06 (0.03)	−1.97	−0.07 (0.02)	−3.36	0.02 (0.01)	1.33	−0.05 (0.15)	−0.34	1.80 (0.02)	85.67	−1.56 (0.06)	−25.49
Sweden	**–0.33 (0.13)**	**−2.46**	−0.04 (0.04)	−1.06	−0.21 (0.03)	−6.90	−0.19 (0.04)	−5.40	0.04 (0.02)	2.50	0.19 (0.26)	0.71	1.26 (0.03)	46.63	−1.05 (0.06)	−17.75

(continued)

Table 6.2 (continued)

Country	Within										Between					
	InQua_w (*SE*)	t	Girl (*SE*)	t	Attach (*SE*)	t	Lang (*SE*)	t	Books (*SE*)	t	InQua_b (*SE*)	t	Int (*SE*)	t	Zero (*SE*)	t
Taiwan	−0.10 (0.06)	−1.70	−0.11 (0.03)	−3.93	−0.07 (0.02)	−3.04	−0.07 (0.03)	−2.46	0.00 (0.01)	−0.17	−0.26 (0.19)	−1.36	1.66 (0.02)	83.20	−1.29 (0.06)	−22.24
Thailand	−0.01 (0.10)	−0.12	−0.06 (0.02)	−3.37	−0.04 (0.02)	−2.21	−0.01 (0.02)	−0.44	0.02 (0.01)	2.20	−0.13 (0.25)	−0.50	2.09 (0.02)	87.25	−3.17 (0.14)	−23.29
Tunisia	**−6.53 (1.71)**	**−3.82**	−0.21 (0.04)	−5.58	−0.10 (0.04)	−2.49	0.03 (0.02)	1.41	0.01 (0.02)	0.71	−0.53 (0.36)	−1.46	1.62 (0.03)	62.35	−2.22 (0.11)	−20.14
Turkey	**25.98 (11.46)**	**2.27**	−0.15 (0.02)	−7.00	−0.09 (0.02)	−4.89	−0.07 (0.02)	−3.22	0.00 (0.01)	0.00	**−1.18 (0.25)**	**−4.80**	1.79 (0.02)	99.56	−1.84 (0.06)	−28.80
UAE	−0.06 (0.06)	−1.02	−0.17 (0.02)	−7.13	−0.03 (0.01)	−2.29	−0.01 (0.01)	−0.65	0.01 (0.01)	1.09	**−0.51 (0.18)**	**−2.85**	1.89 (0.02)	128.31	−1.99 (0.05)	−38.39
USA	−0.38 (0.35)	−1.10	−0.06 (0.02)	−2.77	−0.08 (0.06)	−1.34	−0.03 (0.02)	−1.42	0.03 (0.01)	2.70	−0.08 (0.24)	−0.31	1.71 (0.02)	100.35	−1.35 (0.04)	−37.42
Yemen	−0.15 (0.39)	−0.38	−0.17 (0.06)	−2.81	−0.02 (0.06)	−0.36	−0.07 (0.03)	−2.15	0.04 (0.02)	2.53	**−0.97 (0.42)**	**−2.30**	1.73 (0.07)	24.34	−1.36 (0.14)	−10.03

Note: *SE* standard error; t t-value (statistically significant when t > 1.96 or t < −1.96), *InQua_w* within-class instructional quality; *Attach* student attachment to the school; *Lang* frequency of speaking the language of the test at home; *Books* number of books in the home; *InQua_b* between-class instructional quality; *Int* intercept; *Zero* intercept for no bullying. *UAE* United Arab Emirates

CI [0.000, 0.066]), and Georgia ($\exp(-5.69) = 0.003$; 95 %CI [0.000, 0.043]). In contrast, Kazakhstan exhibited a positive association between perceived instructional quality and bullying victimization at the student level ($\exp(2.44) = 11.47$; 95 % CI [5.34, 24.64]). These findings indicate that, as students report better instructional quality practices, they also tend to report much higher incidences of bullying. The remainder of the educational systems, 25 of the 48, showed no association at the student level between instructional quality and bullying rates.

At the class level, findings were also highly varied across educational systems. Whereas Yemen showed no association at the student-level, there was a strong negative association at the class-level; we found that class-average bullying reports markedly reduced with improved instructional quality ($\exp(-0.97) = 0.379$; 95 % CI [0.17, 0.86]). Findings were similar in several countries, including the Czech Republic, Qatar, and the United Arab Emirates, who exhibited no relationship at the student level, but a negative association at the classroom-level. A small group of educational systems demonstrated both a negative student- and class-level association between instructional quality and bullying victimization. At the between-classroom level, these systems include Iran ($\exp(-2.58) = 0.076$; 95 % CI [0.017, 0.342]), Korea ($\exp(-0.44) = 0.644$; 95 %CI [0.480, 0.864]), and Oman ($\exp(-1.03) = 0.357$; 95 %CI [0.219, 0.582]). The remaining 39 educational systems demonstrated no association at the classroom-level between instructional quality and bullying victimization. In summary, at the country level, we observed significant negative relations at both the student and class level; however more educational systems (23) exhibited significant negative relations at the student level than at the classroom level (10).

6.4 Discussion

In this study, we aimed to determine the degree to which instructional quality is associated with bullying victimization at both the international level and within TIMSS-participating educational systems. Although bullying levels vary substantially in each participating system, unfortunately, in all systems, there is a prevalence of self-reported bullying victimization at the fourth grade. This is in line with previous similar research at the eighth grade (Rutkowski et al. 2013a, b). Fortunately, in many countries, the rates of self-reported bullying victimization are relatively low, leading to many students reporting no bullying victimization. We accounted for this skewed distribution in our analysis via a zero-inflated Poisson modeling approach. Further, to help isolate the relationship between instructional quality and bullying, we controlled for several covariates that have been demonstrated to predict bullying at the international level including: sex of the student, student attachment to the school, sociocultural capital of the student, and immigrant background of the student, as measured by language spoken at home. Finally, given the wide variety of cultural differences among TIMSS countries, our analysis allowed for a unique cross-national examination. We believe that these findings have important implications for future research

and point to a need for a better understanding of the teacher's role in bullying prevention, both within and between countries.

Internationally, there is a negative association between student reported instructional quality and bullying rates. This association, however, is limited to the student level. In other words, better perceived instructional quality is related to fewer reports of bullying victimization within classes. These results suggest that, after accounting for other covariates, the sampled students' perceptions of teachers and their teaching quality play a role in explaining differences at the student level in bullying victimization internationally. These results are particularly interesting when we consider the economic, geographic, cultural, and linguistic diversity of TIMSS participant systems. Stated simply, we have some evidence that, at the international level, students' perceptions of instructional quality correlate with outcomes beyond achievement. In contrast, at the classroom level, we found that better instructional quality (as reported by the students, aggregated to the classroom level) was not associated with bullying rates internationally.

At the country level, we found a highly heterogeneous pattern of instructional quality results, with a mix of primarily negative or null associations at both analyzed levels. This is in contrast to other covariates in the model. For example, student sex explained differences in bullying experiences in most analyzed educational systems. Specifically, bullying rates were generally lower for girls in all but six countries (Lithuania, Kazakhstan, Denmark, Botswana, Sweden, and Iran). In addition, student attachment to the school was predictive of lower bullying rates in 28 out of 48 educational systems. These findings are consistent with previous research that analyzed similar outcomes at the eighth grade (Rutkowski et al. 2013a, b) and found that girls and more attached students tended to report fewer incidences of bullying victimization. When we consider previous research that has pointed to clear differences in the kind of bullying victimization experienced by boys and girls (Hong and Espelage 2012; Smith et al. 1999), interventions that are sex-specific might be reasonable in many of the countries considered. Specific to the findings around attachment, the causal direction of this relationship cannot be established through our results, unfortunately. Some studies suggest that students who are frequently victimized feel a lower sense of belonging (Eisenberg et al. 2009), while other studies reported less bullying at schools where students report higher school attachment (Hong and Espelage 2012; Richard et al. 2012), suggesting that decreases in victimization are associated with better school attachment. Nonetheless, the consistency of this finding indicates that school attachment is important and that further research in this area is justified. Policies for fostering school attachment should approach the issue holistically, considering both the academic and social aspects of a student's sense of belonging (Akiba 2010).

Teachers should be integral to any policy, as students spend most of their days in the presence of teachers, placing teachers in the most obvious position to directly foster a safe environment for students, with the support of school leadership. Our findings suggest that student perceptions of instructional quality have the potential to reduce bullying victimization; however, given the mixed findings at the educational

system level and at the classroom level, it is unclear whether an emphasis on improving instructional quality would translate into better outcomes. Rather, it is likely that other interventions and policies would be important in this regard.

6.5 Limitations

We note several limitations to our study. First, our bullying measure includes both physical and verbal victimization and social exclusion, and does not identify the perpetrator. Our data do not indicate whether bullying victimization took place within or outside of the classroom. The stem of the question only situates the occurrence at school. Furthermore, the data available for measuring instructional quality did not include items measuring classroom management or cognitive activation. Our construct is hence not as broad as that commonly used in the literature (see for example Klieme et al. 2009). Had the TIMSS data included such items, we may have obtained different significant findings. TIMSS data is cross-sectional and observational, making any conclusions correlational only. To that end, further research in each of the identified areas is important for establishing the causal direction of the relationships. In particular, it might be that bullied students hold generally negative feelings toward schooling and their teachers, thus explaining the pattern of negative associations at the student level between perceptions of teaching quality and bullying. Finally, we note that given the state-of-the-art in commercially available software, we made a trade-off between fully capturing the nested structure of the data (students in classes in schools in countries) and most appropriately modeling the distribution of bullying victimization. Despite these limitations, we found meaningful associations between instructional quality and bullying victimization internationally, pointing to a need for country- and school-level policies and interventions to foster safe and productive learning environments for all students.

6.6 Conclusions

Our analysis shows that bullying begins at an early age and that, at the fourth grade level, bullying victimization is an international phenomenon. Although we found that positive student perceptions of instructional quality were associated with lower reported bullying victimization rates internationally, cross-system differences indicate that instructional quality is unlikely to be a universal solution. The lack of a homogeneous solution that can be applied internationally speaks to the complexity of bullying victimization and how, in spite of a global prevalence and near-universal consequences (Akiba 2010; Engel et al. 2009; Rutkowski et al. 2013a, b), the problem of bullying in schools necessitates local solutions. Hence, educational system-level policy makers must address the issue by carefully examining their own context and by using tools that are proven to work best in a given setting. To that

end, it is important to recognize that this study is one piece of evidence in the international bullying literature, and further research, especially at the system-level, is clearly needed in terms of identifying interventions and policies that foster a safe secure learning environment for the youngest students. Nevertheless, the power of such an analysis, with many countries and representative samples, demonstrates that bullying victimization is happening across a wide range of heterogeneous countries, regardless of geography, dominant race/ethnicity, language, culture, and economic development.

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