Associations between Student–Teacher Relationship Quality, Class Climate, and Bullying Roles: A Bayesian Multilevel Multinomial Logit Analysis

Robert Thornberg, Bertil Wegmann, Linda Wänström, Ylva Bjereld, and Jun Sung Hong

ABSTRACT
This study examined whether student–teacher relationship quality at the individual level and student–teacher relationship quality and peer climate at the class level were associated with being a bully, a victim, a bully/victim, or uninvolved in school bullying, controlling for gender, age, socioeconomic status and immigrant background at the individual level and socioeconomic status at the class level. Data from the Swedish Health Behavior in School-Aged Children (HBSC) survey from 2017/2018 were analyzed. In the current study, a sample of 3,578 students from 213 school classes was included. The findings showed that student–teacher relationship quality at the individual level was associated with a lower probability of being a bully, a bully/victim, or a victim compared to being uninvolved. In addition, class climate at the class level was associated with a lower probability of being a bully/victim or a victim compared to being uninvolved. Supportive class climate and student–teacher relationship is thus important dimensions to focus on in the everyday bullying prevention in school.

Bullying is defined as repeated aggressive, offensive, or inhumane behavior directed toward individuals who are disadvantaged or less powerful in relation to the perpetrator(s) (Hellström et al., 2021). Being bullied at school is associated with a greater risk of mental health problems (Chouhy et al., 2017; Holt et al., 2015; Klomek et al., 2015; Moore et al., 2017; Schoeler et al., 2018), psychosomatic and physical health problems (Chouhy et al., 2017; Deryol & Wilcox, 2020; Gini & Pozzoli, 2013; Moore et al., 2017), school absenteeism (Fry et al., 2018), poor academic performance (Chouhy et al., 2017; Fry et al., 2018; Moore et al., 2017), and delinquency (Cullen et al., 2008; Lo et al., 2020; Ttofi et al., 2012), although the risk of developing delinquency later in life is much stronger for bullies and bully/victims than it is for victims (Klomek et al., 2015). Because research has consistently revealed both concurrent and longitudinal associations between bullying perpetration and victimization (for a meta-analysis, see, Walters, 2021), it is crucial to understand that students could be either bullies (i.e., those who are bullying others without being bullied themselves), victims (i.e., those who are bullied without bullying others), or bully/victims (i.e., those who are both...
bullying others and being bullied by others at the same time). While all three bullying roles are linked to adverse outcomes, bully/victims are at the highest risk of internalizing and externalizing problems (Georgiou & Stavrinides, 2008; Haynie et al., 2001; Kelly et al., 2015; Wolke et al., 2013).

According to the social-ecological framework (Bronfenbrenner, 1979), bullying needs to be understood as a social phenomenon that is established and perpetuated over time, and influenced by both individual and contextual factors (Hong & Espelage, 2012; Swearer et al., 2012; Swearer & Hymel, 2015). Peers in their classrooms, and the teachers they meet and interact with during their everyday school life, represent students’ most proximal microsystems in the school context. Thus, in the current study, we examined whether student–teacher relationship quality at the individual level and student–teacher relationship quality and class climate at the school class level were associated with being a bully, a victim, a bully/victim, or uninvolved in school bullying when controlling for gender, age, socio-economic status, and immigrant background.

**Student–teacher relationship quality**

With reference to the social-ecological framework, Bouchard and Smith (2017) argue that teachers are uniquely situated to influence students’ peer relationships at school, and that a large part of this influence is through student–teacher relationships. Such relationships can be defined as “meaningful emotional and relational connections which develop between students and their teachers as a consequence of prolonged interactions” (Marengo et al., 2018, p. 1202). Relationship quality varies across student–teacher dyads, from positive and close to negative and conflictual (Pianta, 2006; Roorda et al., 2017, 2011). Positive student–teacher relationships involve a high level of warmth, open communication, and support provided by teachers to students, and are therefore caring, emotionally supportive, and trust-building (Sulkowski & Simmons, 2018). They are vital for students’ positive development and school adjustment. Positive student–teacher relationships have been linked to a greater sense of school belonging (Allen et al., 2018), academic motivation (Maulana et al., 2014; Scales et al., 2020), engagement (Quin, 2017; Roorda et al., 2017, 2011), and achievement (Cornelius-White, 2007; Roorda et al., 2017, 2011), and also to fewer externalizing behavior problems (Lei et al., 2016).

Positive student–teacher relationships have long been seen as protective for students at risk (Baker et al., 2008; Hamre & Pianta, 2005, 2006; Hughes, 2011; Meehan et al., 2003), including the risk of becoming involved in bullying. Previous research has found that better student–teacher relationship quality at the individual level is associated with less bullying perpetration (Bae et al., 2019; Berchiatti et al., 2021; Ertesvåg, 2016; Espelage et al., 2015; Hamel et al., 2021; Košir et al., 2020; Longobardi et al., 2018; Marengo et al., 2018) and less bullying victimization (Aldridge et al., 2018; Bae et al., 2019; Berchiatti et al., 2021; Chen et al., 2021; Demol et al., 2020; Marengo et al., 2018; Serdiouk et al., 2016; Sulkowski & Simmons, 2018; Zhao et al., 2021; for exceptions, see, Hamel et al., 2021; Košir et al., 2020). While most studies of student–teacher relationship quality and involvement in bullying have included perpetration and victimization as quantitative variables, studies examining whether student–teacher relationship quality might be linked to distinct bullying roles are scarce. In their study, Wang et al. (2015) found that bullies and bully/victims had significantly poorer student–teacher relationships than victims, bystanders, or uninvolved students.
Surprisingly few studies have examined whether student–teacher relationship quality at the classroom or class level is linked to bullying victimization and/or perpetration, but among these studies, positive student–teacher relationships at the class level have been shown to be associated with less bullying victimization (Di Stasio et al., 2016; Thornberg, Wänström, Pozzoli et al., 2018). However, Košir et al. (2020) did not find the student–teacher relationship quality at the class level to be significantly linked to bullying victimization among elementary students in Slovenian schools. Furthermore, in their class-level analysis, Thornberg, Wänström, Pozzoli et al. (2018) found that student–teacher relationship quality was not directly linked to peer victimization, but did show an indirect link through its association with the class climate. In addition, Waasdorp et al. (2019) reported that high levels of student–teacher closeness at the class level were related to high levels of student sympathy for victims of bullying.

To the best of our knowledge, only three studies have examined the link between student–teacher relationship quality at the class level and bullying perpetration. While Dietrich and Cohen (2021) found that student–teacher relationship quality was significantly and negatively linked to bullying perpetration, this association was not found to be significant in the other two studies (Košir et al., 2020; Di Stasio et al., 2016). However, in Di Stasio et al.’s (2016) regression models, characteristics of the school class were also included (e.g., social comparison and competition), and social comparison at the class level was linked to bullying perpetration. In addition, in Košir et al.’s (2020) multilevel regression models, peer relationship quality, pro-bully attitudes, and pro-victim attitudes at the class level were included. They found that, in classes with less pro-bully attitudes, there was less bullying perpetration (and at class level, pro-bully attitudes correlated negatively with both peer relationship quality and student–teacher relationship quality, while the two latter class variables intercorrelated positively). Considering that student–teacher relationship quality seems to be indirectly associated with bullying victimization through class climate at the class level (Thornberg, Wänström, Pozzoli et al., 2018), this possible indirect effect might explain why student–teacher relationship quality at the class level has not been significantly related to bullying perpetration when the group characteristics of the school class have been included in the models. In addition, in Dietrich and Cohen’s (2021) study, the indirect link between student–teacher relationship quality and bullying perpetration through student–student relationship quality at the class level was much stronger than the direct link between the first two of these variables. However, research on the link between student–teacher relationships at the class level and bullying remains limited.

**Class climate**

In Sweden (where this study was conducted), students in elementary and lower secondary school usually remain in a single formal group of 20–30 peers in the same grade (school year), organized by the school for the full school day or most of their lessons, and for more than one year. This unit or formal group of students is termed a *school class* or simply a *class* in the literature (e.g., Alm & Låftman, 2016; Coelho & Sousa, 2018; Låftman et al., 2021; Parsons, 1959; Pozzoli et al., 2012). Alm and Låftman (2016) argue that, while students belong to various groups and contexts affecting their lives, their peer group, and school class, along with their family, tend to be the most important contexts. Students’ social interactions and relationships within a given class are usually more significant and frequent
than those with students from other classes in the wider school context. Thus, from an analytical point of view, the class level is much more proximal than the school level. Accordingly, Masci et al. (2016) found that class effects on achievement tend to be larger than school effects. Therefore, we focus on students nested into classes, because we consider this microsystem to be the most significant source of influence with which students have direct contact during everyday school life.

Bullying is a group phenomenon among students (Hymel et al., 2015; Salmivalli, 2010), and the peer ecology of the school class represents an important social context for both understanding and dealing with this phenomenon (e.g., Doll et al., 2004; Saarento et al., 2015). As Dietrich and Cohen (2021) put it: “levels of bullying behavior differ not only between individuals but also between contexts” (p. 35). Research has shown that bullying perpetration and victimization vary significantly across classes (Atria et al., 2007; Coelho & Sousa, 2018; Salmivalli et al., 2011; Stefanek et al., 2011), underlining the importance of examining class characteristics. Thus, bullying is not solely about individual bullies and victims. It is a social process to which other peers are usually witnesses when it takes place in school (Craig et al., 2000).

Studies have demonstrated that the between-class variability in bullying can be explained in part by how classmates typically respond as bystanders. They may behave as defenders, meaning that they try to help or support the victim, but they may also respond as outsiders or passive bystanders, thus remaining neutral and keeping out of the bullying process. They may even take the bullies’ side as reinforcers, who support the bullies by cheering and laughing, or as assistants, who help the bullies and join them in their bullying (Salmivalli, 2010). The more classmates reinforce bullying by laughing and cheering and failing to defend the victims, the more often bullying is likely to occur (Kärnä et al., 2010; Nocentini et al., 2013; Salmivalli et al., 2011; Thornberg & Wänström, 2018). A warmer, more supportive and orderly social climate in the classroom and among the class has, in turn, been associated with more defending and less reinforcing when classmates witness bullying (Thornberg, Wänström, Jungert et al., 2018). It has been suggested that a poor social climate in the class increases the risk of a range of negative outcomes (e.g., Alm & Låftman, 2016), including bullying and victimization (Stefanek et al., 2011).

Class climate can be defined as “the quality of collective interpersonal relationships among students” (Shim et al., 2013, p. 592) belonging to the same school class. So far, surprisingly few studies have investigated whether class climate is linked to bullying. However, there are some exceptions. In their study involving 11–15-year-old students in Austria, Stefanek et al. (2011) demonstrated that a positive, cohesive, and supportive class climate was related to less bullying perpetration and victimization. Thornberg, Wänström, Pozzoli et al. (2018) examined Swedish school classes of 9–13-year-old students and found that a positive, caring, and supportive class climate was associated with a lower prevalence of bullying victimization.

In another Swedish study involving 10–13-year-old students, Thornberg, Wänström, Jungert et al. (2018) revealed that bullying victimization was less prevalent in classes with more authoritative classroom climates. Such a climate refers to the degree of teacher support, warmth, and responsiveness, the degree of teacher structure and demandingness, and the degree of student support, warmth, and responsiveness. It is therefore unclear in their findings whether, or to what extent, each of these three components of authoritative classroom climate was associated with bullying.
victimization. Recently, Dietrich and Cohen (2021) showed that a positive student–student relationship quality at the class level was associated with less bullying perpetration among American students. Finally, Košir et al. (2020) examined Slovenian students with a mean age of 12.8 years and found that a supportive class climate was associated with bullying victimization but not with bullying perpetration. To sum up, the role of class climate in school bullying is understudied and, across these few studies, there are some inconsistencies. None of the studies have examined whether class climate is related to the roles of bully, victim, bully/victim, or uninvolved. Thus, research is needed to examine and test whether the class climate is related to being a bully, a victim, a bully/victim, or uninvolved in school bullying.

**Demographic control variables**

Gender, age, socioeconomic status, and immigrant background were used as control variables in the current study. While prior studies have found that boys, in general, are more engaged in bullying perpetration than girls (Cook et al., 2010; Mitsopoulou & Giovazolias, 2015), meta-analyses have reported no gender differences in bullying victimization (Cook et al., 2010; Kljakovic & Hunt, 2016). In terms of age, there are inconsistent findings regarding the link between age and bullying, and meta-analyses have reported a non-significant association between age and bullying victimization (Cook et al., 2010; Kljakovic & Hunt, 2016). Research findings on socioeconomic status (SES) and bullying roles are also inconsistent (e.g., Due et al., 2019; Elgar et al., 2019; Garner & Hinton, 2010; Jansen et al., 2011; Knaappila et al., 2018; Låftman et al., 2017; Malecki et al., 2020; Östberg et al., 2018; Shetgiri et al., 2012). Even though Tippett and Wolke (2014) found that bullying victimization and perpetration were significantly and negatively associated with SES in their meta-analysis, the evidence was very weak. In addition to examining associations at the individual level, SES has also been examined at contextual (neighborhood and school) levels, but the findings are inconsistent (e.g., Choi et al., 2021; Due et al., 2009; Lemstra et al., 2012; Malecki et al., 2020; Modin et al., 2018; Schumann et al., 2014). Finally, research findings on whether bullying perpetration and victimization are linked to ethnicity and immigrant backgrounds are also mixed (e.g., Almeida et al., 2011; Annerbäck et al., 2014; Bjøreld et al., 2015; Caravita et al., 2020; Espelage et al., 2018; Feinstein et al., 2019; Kahle & Peguero, 2017; Låftman et al., 2017; Llorent et al., 2016; Plenty & Jonsson, 2017; Tippett et al., 2013; Vitoroulis & Georgiades, 2017; for a review, see Xu et al., 2020). In their meta-analysis of ethnicity and bullying perpetration, Vitoroulis and Vaillancourt (2018) found that the effects were non-significant. Considering that the effects of these demographic variables on bullying perpetration and victimization vary across studies and across cultural and local contexts, including them as control variables should be adequate.

**The present study**

The present study aimed to examine whether student–teacher relationship quality at the individual level and student–teacher relationship quality and class climate at the class level were associated with being a bully, a victim, a bully/victim, or uninvolved in
school bullying, controlling for gender, age, socioeconomic status, and immigrant background at the individual level and socioeconomic status at the class level. We expected positive, warm, and supportive student–teacher relationship qualities at the individual level to be associated with fewer bullies, victims, and bully/victims. We further expected a positive, caring, and supportive class climate at the class level to be associated with fewer bullies, victims, and bully/victims. Considering the few studies and their inconsistent findings in the literature, student–teacher relationship quality at the class level and its associations with being a bully, victim, or bully/victim were examined in an exploratory way. Among the control variables, we expected that being a boy would increase the risk of being a bully. In relation to the non-significant associations in previous meta-analyses, gender and age were not expected to be associated with being a victim, and, due to the mixed findings in previous research, other control variables were examined in an exploratory manner.

**Methods**

**Participants and procedure**

Data from the Swedish Health Behavior in School-Aged Children (HBSC) survey were used in this study. HBSC is a World Health Organization collaborative cross-sectional survey, which was carried out during the winter of 2017–2018 among students in school grades 5, 7, and 9 (aged approximately 11, 13, and 15). The sampling was based on a two-step cluster design. In the first step, a random sample of schools in Sweden was drawn. Overall, 450 schools were invited to take part. Of these, 213 agreed to participate. In the second step, one class was randomly drawn from each school, thus resulting in 213 school classes.

The questionnaire was answered anonymously by all the students who wanted to participate and were present in class on the survey day. The attrition rate of students in the participating classes was 11%. In total, 4,294 students completed the paper questionnaires in classrooms and returned them to the class teacher in sealed envelopes. However, all the study variables had some missing data. Students with missing data on one or more items from the bullying or victimization scales (305 students), were still included in our study and categorized into the bullying roles in accordance with their available data on these scales. Ages of students who failed to report their age (88 students) were imputed by the mean age of each student’s grade. Following this, there was less than 6% missing data for each of our study variables (immigrant background had 5.7% missing, class climate 5.1%, teacher–student relationships 4.8%, socioeconomic status [SES] 4.3%, the bullying/victimization categories 3.7%, and gender 1.8%). The missing data pattern was not random, according to Little’s test, but because the percentages of missing data were fairly low for each of the variables, and were not likely to affect our results, we omitted students who had missing data on any of the variables, resulting in a sample of 3,623 students (49.0% boys, 26.6% in grade 5, 33.5% in grade 7, and 39.9% in grade 9). In the sample, 21.6% had an immigrant background. No approval from an ethical review board was required because the students’ answers were anonymous (Public Health Agency of Sweden, 2019).
Measures
In the current study, we used the part of the 2017–2018 HBSC dataset that was elicited from the following scales included in the HBSC survey.

Bullying
The behavioral-based scales on bullying perpetration and victimization (seven items each, including physical, verbal, and relational forms, e.g., “I have been called mean names, made fun of and teased in a hurtful way,” “I have been hit, kicked, shoved around or locked indoors,” and “other students have told lies or spread false rumors about me and tried to make others dislike me”) that followed an age-appropriate definition of bullying in the HBSC survey elicited data to categorize the participants into different bullying roles. They rated each item on a five-point scale (no bullying/victimization during the last couple of months, once or twice, 2–3 times per month, about once per week, several times per week; bullying perpetration: \( \alpha = 0.84 \); victimization: \( \alpha = 0.81 \)). Students were categorized into “bullies” if they had answered “2–3 times per month” or more often on at least one of the bullying items, “victims” if they had answered “2–3 times per month” or more often on at least one of the victimization items, “bully/victims” if they had answered “2–3 times per month” or more often on at least one of the bullying items and one of the victimization items, and “uninvolved” if none of the above applied.

Demographic data
Age: Students reported their birth year and birth month. Gender: Students answered the question “Are you a girl or a boy?” Immigrant background: Foreign-born students, as well as Swedish-born students with two foreign-born parents, were categorized as students with an immigrant background. SES: SES was measured by using the Family Affluence Scale (FAS; Hartley et al., 2016).

Student–teacher relationship quality
Student–teacher relationship quality was assessed with three items: “I feel that my teachers accept me as I am,” “I feel that my teachers care about me as a person,” and “I feel trust in my teachers.” Students rated each item on a five-point scale (5 = strongly agree, 4 = agree, 3 = neither agree nor disagree, 2 = disagree, 1 = strongly disagree). A sum-score was generated from the three items (\( \alpha = 0.87 \)).

Class climate
The class climate was measured with three items: “The students in my class(es) enjoy being together,” “Most of the students in my class(es) are kind and helpful,” and “Other students accept me as I am.” Students rated each item on a five-point scale (5 = strongly agree, 4 = agree, 3 = neither agree nor disagree, 2 = disagree, 1 = strongly disagree). A sum-score was composed of the three items (\( \alpha = 0.80 \)).
Analytical techniques

We estimated a fully Bayesian varying-intercept multinomial logit model using the 213 different school classes at the group level. Each quantitative explanatory variable was standardized to mean 0 and variance 1. In this type of multilevel multinomial logit model, unique regression coefficients of the explanatory variables were estimated for each of the categories: 1 (bullies/victims), 2 (victims), and 3 (uninvolved). The regression coefficients for the reference category 0 (bullies) were all set to 0 such that all model parameters became identified.

To estimate a multilevel multinomial logit model is not straightforward. We developed our own implementation of this model using a Bayesian approach within STAN’s probabilistic programming language. The implemented model is not part of the current documentation of models in STAN, see Supplementary materials for our modeling code in STAN. In the Bayesian multilevel setting the class level implicates natural prior information in estimating the coefficients at the individual level. This is especially useful for classes with no or few students in a category, where estimation for the intercept of this class can use the pooled information across classes at the population level.

Our Bayesian varying-intercept multinomial model can be defined for student $i$ in school class $j$ and bullying category $k$ as:

$$P(Y_{ij} = k) = \frac{\exp[\alpha_k + \beta_k x_{ij}]}{1 + \sum_{k=1}^{3} \exp[\alpha_k + \beta_k x_{ij}]}$$

where $i = 1, \ldots, n$, $j = 1, \ldots, J$, $k = 1, 2, 3$, $Y_{ij}$ is the response category for the $i$th student in the $j$th class, $\alpha_k$ is the intercept for the $j$th class in category $k$, $\beta_k$ is the parameter vector for the explanatory variables $x_{ij}$ in category $k$, and the trivariate normal distribution for $\alpha_j$ can be viewed as a prior distribution for the intercepts. The model is identified by setting all model parameters of the reference category, $k = 0$, to 0. Thus, $P(Y_{ij} = 0) = \frac{1}{1 + \sum_{k=1}^{3} \exp[\alpha_k + \beta_k x_{ij}]}$. Following Grilli and Rampichini (2007), the Intraclass Correlation Coefficient (ICC) for each category $k = 1, 2, 3$, of the multilevel multinomial logit model, as a percentage measure of how strongly students in the same school class resemble each other, can be defined as:

$$\rho^{(k)}_{ICC} = \frac{\sigma^2}{\sigma^2 + \sigma^2_{ij}}$$

which is an analogous formulation to the multilevel logit model with only two categories. In our Bayesian modeling, the distribution of the intraclass correlations is easily evaluated from the sampled posterior draws of $\sigma^2_j$. To interpret the intraclass correlations and further estimation results for other models, we noted the following ratio of probabilities as the odds ($O_{lm}$) for category $l$ versus $m$:

$$O_{lm} = \frac{P(Y_{ij} = l)}{P(Y_{ij} = m)} = \exp[\alpha_l - \alpha_m + \beta_l - \beta_m x_{ij}]$$

and for the special case of $m = 0$, i.e.:
\[ O_{0l} = \frac{p(y_{ij}=l)}{p(y_{ij}=0)} = \exp[\alpha_{jl} + \beta_{j}x_{ij}] \]

For the empty model with \( x_{ij} = 0 \) it follows that:

\[ O_{0l} = \log\left(\frac{p(y_{ij}=l)}{p(y_{ij}=0)}\right) = \alpha_{jl}. \]

Hence, higher values of \( \sigma^2 \) (the variance of \( \alpha_{jl} \)) implies higher values of \( \rho_{lCC}^{(l)} \) and more variation between classes in the log-ratio of probabilities (the log-odds). We also noted that a one-unit increase of any (standardized) explanatory variable \( x_v \), given that all other variables are held constant, changes the odds \( O_{lm} \) to the following new odds:

\[ NO_{inv} = \exp[\beta_{lv} - \beta_{mv}] O_{lm}. \]

The effect size (ES) of the one-unit increase of \( x_v \) can be defined as a multiplicative factor of the odds \( O_{lm} \), given by

\[ ES_{inv} = \frac{NO_{inv}}{O_{lm}} = \exp[\beta_{lv} - \beta_{mv}]. \]

Finally, taking the posterior mean of \( ES_{inv} \) gives the mean effect size \( MES_{inv} \) for any explanatory variable \( x_v \) and categories \( l \) and \( m \).

**Prior distributions**

In our Bayesian framework, we needed to assign prior distributions to all unknown parameters: \((\beta_1, \beta_2, \beta_3), (\mu_1, \mu_2, \mu_3), (\sigma_1, \sigma_2, \sigma_3), (\rho_{12}, \rho_{13}, \rho_{23})\). We assumed weakly informative prior distributions for all the parameters in order to obtain a stable inference. In practice, however, changing the prior distributions in the non-informative direction changed the results very little, which suggests that the prior distributions were essentially non-informative. The prior distribution for the regression coefficients was \((\beta_1, \beta_2, \beta_3) \sim N(0, 5^2 I)\), where \( I \) is the identity matrix, the prior for the mean intercepts was \((\mu_1, \mu_2, \mu_3) \sim N(0, 10^2 I)\), the prior distributions for \((\sigma_1, \sigma_2, \sigma_3) > 0\) were independently standard, normally distributed truncated at 0 from below, and the LKJ(2) distribution (Lewandowski et al., 2009) was used as a weakly informative prior for each of the correlations \((\rho_{12}, \rho_{13}, \rho_{23})\) on \([-1, 1]\).

**Estimation routines**

We used the Hamiltonian Monte Carlo (HMC) algorithm (a Markov chain Monte Carlo (MCMC) method) in STAN’s probabilistic programming language to estimate the unknown model parameters. We used three MCMC chains and ran them until the distribution of the parameter draws converged to the underlying posterior distribution. The convergency measure \( \hat{R} \) in Gelman and Hill (2007) was used to check for convergence.

The convergency measure \( \hat{R} \) is approximately equal to the square root of the variance of the mixture of all the chains divided by the average within-chain variance. We estimated all models such that \( \hat{R} < 1.1 \). This suggested good convergence to the posterior with well-mixed
chains. We allocated the first 1,000 MCMC draws to the warm-up phase and used the latter 20,000 MCMC draws of the HMC algorithm as posterior draws from each of the three MCMC chains for our results.

**Results**

**Descriptive statistics and correlations**

Eighty students reported that they had bullied others (“bullies”), 122 reported that they had both bullied others and been victimized (“bully/victims”), 571 reported that they had been victimized (“victims”), and 2,850 reported neither having bullied others nor having been victimized (“uninvolved”). Table 1 shows descriptive results for the individual ($n = 3,623$) and class-level ($J = 213$) variables, and Tables 2 and 3 show correlations between individual and class variables. For descriptive purposes, the means of the seven original questions on each of the bullying and victimization scales (with responses from 1 to 5) are shown as individual variables and as class variables (class means). Observations from students who had answered at least six of the seven items were included ($n = 3,533$).

At the individual level, student–teacher relationship quality was negatively and weakly correlated with both victimization and bullying (see, Table 2). At the class level, there was a positive and moderate correlation between student–teacher relationship quality and class climate. Class climate, in turn, was negatively correlated with both victimization

| Table 1. Means, standard deviations, min- and max values for the quantitative variables. |
|---|
| **Variable** | **M** | **SD** | **Min** | **Max** |
| **Individual variables** |  |  |  |  |
| Age | 13.67 | 1.64 | 10.42 | 17.33 |
| SES | 15.39 | 1.94 | 7 | 19 |
| STRQ | 12.31 | 2.57 | 3 | 15 |
| Victimization | 1.27 | 0.49 | 1 | 5 |
| Bullying | 1.09 | 0.30 | 1 | 5 |
| **Class variables** |  |  |  |  |
| SES | 15.28 | 0.82 | 12.22 | 17.28 |
| STRQ | 12.35 | 1.10 | 8.88 | 14.67 |
| Class climate | 11.77 | 1.04 | 8.24 | 14.00 |
| Victimization | 1.28 | 0.17 | 1 | 22.7 |
| Bullying | 1.09 | 0.09 | 1 | 16.6 |

**Note:** STRQ = student–teacher relationship quality; bullying and victimization are here presented as quantitative variables.

| Table 2. Correlations for the Quantitative individual variables. |
|---|
| **Variable** | **Age** | **SES** | **STRQ** | **Vict.** | **Bul.** |
| Age | 1 |  |  |  |  |
| SES | .02 | 1 |  |  |  |
| STRQ | -.24 | .02 | 1 |  |  |
| Victimization | -.01 | -.02 | -.21 | 1 |  |
| Bullying | .04 | -.01 |-.12 | .38 | 1 |

**Note:** STRQ = student–teacher relationship quality; bullying and victimization are here presented as quantitative variables.
Table 3. Correlations for the quantitative class variables.

| Variable   | SES  | STRQ | Class cl. | Vict. | Bul. |
|------------|------|------|-----------|-------|------|
| SES        | 1    |      |           |       |      |
| STRQ       | -.07 | 1    |           |       |      |
| Class climate | .15  | .48  | 1         |       |      |
| Victimization | -.11 | -.14 | -.39      | 1     | .52  |
| Bullying   | -.12 | -.13 | -.12      | .52   | 1    |

Note: STRQ = student–teacher relationship quality; bullying and victimization are here presented as quantitative variables.

(moderately) and bullying (weakly). In addition, student–teacher relationship quality was negatively and weakly correlated with both victimization and bullying at the class level. (see, Table 3).

Bayesian multilevel multinomial logit model

First, we estimated an empty Bayesian varying-intercept multinomial logit model (Model 0) to estimate the intraclass correlations, defined for each category \( k \), as formulated in the statistical models, with bully/victims as category 1, victims as category 2, uninvolved as category 3, and bullies as the reference category 0. The posterior means and 95% credibility intervals for \( \rho_{jcc}^{(k)} \) were 0.050 and [0.001, 0.168] for bully/victims, 0.027 and [0.001, 0.100] for victims, and 0.073 and [0.023, 0.142] for uninvolved, indicating variability between classes for the log-odds of uninvolved to bullies.

We then estimated Model 1, including only the individual variables (gender, foreign background, age, SES, and student–teacher relationship quality). As for the previous model, the categories were bully/victims, victims, uninvolved, and bullies (reference category). Table 4 shows the results from this model, with the first row for each variable showing results for bully/victims versus bullies, the second row for victims versus bullies, the third row for uninvolved versus bullies, the fourth row for victims versus bully/victims, the fifth row for uninvolved versus bully/victims, and the sixth row showing results for uninvolved versus victims. In this table, 95% credibility intervals that do not cover zero are highlighted. A 95% credibility interval (which is common in the literature) that does not include 0 implies that a positive/negative slope is at least 39 times more likely than a negative/positive slope (i.e., very likely), and we therefore choose to interpret results from those intervals.

As shown in Table 4, gender has an effect on being a bully. Boys are less likely to be either a victim or uninvolved in relation to being either a bully or a bully/victim, compared to girls. Boys are also less likely to be a victim in relation to being uninvolved, compared to girls. To illustrate these effects, the posterior mean probability (from now on referred to only as “probability”) of being a bully for a girl with a Swedish background, and with average values for the quantitative variables, is 1.1%, compared to 2.2% for a boy. The corresponding probabilities of being a bully/victim are 1.8% for girls and 3.5% for boys; of being a victim are 16.6% for girls and 12.4% for boys; and of being uninvolved are 80.5% for girls and 81.8% for boys. Further illustrations of these effects are given by the mean effect size (MES). For example, the odds of boys being uninvolved in relation to being a bully are expected to be 51.1% (0.511) of the corresponding odds for girls, whereas the odds of boys being uninvolved in relation to being a victim are expected to be 36.4% (1.364) higher than the corresponding odds for girls (from now on the words “expected to be” are omitted in this regard).
Table 4. Estimation results for model 1.

| Variable/parameter | Posterior Mean coefficient | sd | Posterior 2.5 | Posterior 97.5 | Percentiles | Posterior Mean eff. size |
|--------------------|----------------------------|----|---------------|---------------|-------------|-------------------------|
| Gender (BulVic vs Bul) | −0.025 | 0.304 | −0.627 | 0.567 | 0.377 | 1.022 |
| Gender (Vic vs Bul) | −1.006 | 0.250 | −1.505 | −0.524 | 0.377 | 0.377 |
| Gender (Un vs Bul) | −0.700 | 0.240 | −1.179 | −0.233 | 0.511 | 0.511 |
| Gender (Vic vs BulVic) | −0.982 | 0.210 | −1.396 | −0.573 | 0.383 | 0.383 |
| Gender (Un vs BulVic) | −0.676 | 0.198 | −1.070 | −0.293 | 0.519 | 0.519 |
| Gender (Un vs Vic) | 0.306 | 0.097 | 0.117 | 0.495 | 1.364 | 1.364 |
| Foreign backgr (BulVic vs Bul) | −0.291 | 0.338 | −0.952 | 0.373 | 0.792 | 0.792 |
| Foreign backgr (Vic vs Bul) | −0.361 | 0.277 | −0.895 | 0.190 | 0.725 | 0.725 |
| Foreign backgr (Un vs Bul) | −0.419 | 0.265 | −0.929 | 0.111 | 0.682 | 0.682 |
| Foreign backgr (Vic vs BulVic) | −0.070 | 0.247 | −0.543 | 0.425 | 0.961 | 0.961 |
| Foreign backgr (Un vs BulVic) | −0.128 | 0.233 | −0.573 | 0.339 | 0.904 | 0.904 |
| Foreign backgr (Un vs Vic) | −0.058 | 0.121 | −0.293 | 0.181 | 0.951 | 0.951 |
| Age (BulVic vs Bul) | −0.244 | 0.165 | −0.570 | 0.079 | 0.794 | 0.794 |
| Age (Vic vs Bul) | −0.461 | 0.137 | −0.736 | −0.198 | 0.636 | 0.636 |
| Age (Un vs Bul) | −0.319 | 0.135 | −0.588 | −0.058 | 0.734 | 0.734 |
| Age (Vic vs BulVic) | −0.217 | 0.114 | −0.440 | 0.004 | 0.810 | 0.810 |
| Age (Un vs BulVic) | −0.075 | 0.112 | −0.295 | 0.145 | 0.934 | 0.934 |
| Age (Vic vs Un) | 0.142 | 0.059 | 0.026 | 0.258 | 1.155 | 1.155 |
| SES (BulVic vs Bul) | −0.127 | 0.148 | −0.419 | 0.164 | 0.890 | 0.890 |
| SES (Vic vs Bul) | −0.126 | 0.124 | −0.371 | 0.114 | 0.889 | 0.889 |
| SES (Un vs Bul) | −0.154 | 0.119 | −0.389 | 0.074 | 0.863 | 0.863 |
| SES (Vic vs BulVic) | 0.001 | 0.104 | −0.205 | 0.202 | 1.007 | 1.007 |
| SES (Un vs BulVic) | −0.027 | 0.098 | −0.221 | 0.162 | 0.978 | 0.978 |
| SES (Un vs Vic) | −0.028 | 0.050 | −0.126 | 0.070 | 0.973 | 0.973 |
| STRQ (BulVic vs Bul) | −0.063 | 0.123 | −0.305 | 0.174 | 0.946 | 0.946 |
| STRQ (Vic vs Bul) | 0.064 | 0.103 | −0.142 | 0.263 | 1.071 | 1.071 |
| STRQ (Un vs Bul) | 0.479 | 0.099 | 0.282 | 0.671 | 1.623 | 1.623 |
| STRQ (Vic vs BulVic) | 0.127 | 0.088 | −0.048 | 0.299 | 1.140 | 1.140 |
| STRQ (Un vs BulVic) | 0.543 | 0.083 | 0.377 | 0.705 | 1.727 | 1.727 |
| STRQ (Un vs Vic) | 0.416 | 0.047 | 0.324 | 0.508 | 1.517 | 1.517 |
| μ (BulVic) | 0.484 | 0.286 | −0.074 | 1.041 | 1.041 | 1.041 |
| μ (Vic) | 2.732 | 0.227 | 2.299 | 3.187 | 3.187 | 3.187 |
| μ (Un) | 4.315 | 0.224 | 3.896 | 4.763 | 4.763 | 4.763 |
| σ (BulVic) | 0.381 | 0.206 | 0.059 | 0.821 | 0.821 | 0.821 |
| σ (Vic) | 0.220 | 0.132 | 0.040 | 0.521 | 0.521 | 0.521 |
| σ (Un) | 0.465 | 0.110 | 0.236 | 0.685 | 0.685 | 0.685 |
| ρ (BulVic vs Vic) | 0.047 | 0.393 | −0.704 | 0.751 | 0.751 | 0.751 |
| ρ (BulVic vs Un) | −0.128 | 0.347 | −0.766 | 0.548 | 0.548 | 0.548 |
| ρ (Vic vs Un) | 0.147 | 0.385 | −0.640 | 0.779 | 0.779 | 0.779 |

Note: Posterior mean, standard deviation (sd), and percentiles of the parameters \( \beta_{\mu} - \beta_{\mu v} \) and the mean effective size (MES), defined in Section Analytical Techniques, are shown for each explanatory variable \( x \), and categories \( i \) and \( m \). Corresponding posterior measures are also shown for the parameters \( \mu, \sigma, \rho \). Values in bold mean that the current variable regarding categories \( i \) versus \( m \) has a very likely effect on the outcome. A very likely effect corresponds to a 95% credibility interval that does not include 0, which is equivalent to a positive/negative slope being at least 39 times more likely than a negative/positive slope.

In addition, age has an effect on being a bully. The probability of being a bully increases for older students in relation to being a victim or uninvolved; in other words, older students have a higher probability of being a bully in relation to being a victim or uninvolved compared to younger students. The probability of being uninvolved also increases for older students in relation to being a victim. To illustrate these effects, the probability of being a bully for an 11-year-old girl with a Swedish background, and with average values for the quantitative variables, is 0.7%, compared to 1.4% for a 15-year-old. The corresponding probabilities of being a bully/victim are 1.5% for 11-year-olds and 1.9% for 15-year-olds; of being a victim are 20.2% for 11-year-olds and 15.0% for 15-year-olds; and of being uninvolved are 77.6% for 11-year-olds and 81.7% for 15-year-olds. The odds of being
uninvolved in relation to being a bully after one standard deviation increase in age (everything else being equal) are 73.4% of the odds before this increase, whereas the odds of being uninvolved in relation to being a victim are 15.5% higher after an increase in age of one standard deviation.

Student–teacher relationship quality also has an effect on bullying roles. The probability of being uninvolved increases in relation to being a victim, a bully/victim, or a bully for higher values of student–teacher relationship quality (STRQ). For example, the probability of being a bully for students with low values on STRQ (one standard deviation below the mean), with a Swedish background, and of average values for the other quantitative variables, is 1.6%, compared to 0.7% for those with high values on STRQ (one standard deviation above the mean). The corresponding probabilities of being a bully/victim are 2.8% for low values on STRQ, and 1.1% for high values on STRQ; or being a victim are 22.7% for low values, and 11.7% for high values; and of being uninvolved are 72.9% for low values, and 86.4% for high values on STRQ. The odds of being uninvolved in relation to being a bully after a one standard deviation increase in STRQ (everything else being equal) are 62.3% higher than the odds before this increase, whereas the odds of being uninvolved in relation to being a victim are 51.7% higher after an increase.

Finally, we included SES, STRQ, and class climate as class variables in Model 2. To separate within-class and between-class effects, we subtracted the class means from the individual variables: SES, and STRQ.

As shown in Table 5, gender still has an effect on being a bully, when class variables are added. Boys are less likely to be either a victim or uninvolved in relation to being either a bully or a bully/victim, compared to girls. Boys are also less likely to be a victim in relation to being uninvolved, compared to girls. For example, the probability of being a bully for a girl with a Swedish background, and with average values for the quantitative variables, is 1.1%, compared to 2.2% for a boy. The corresponding probabilities of being a bully/victim are 1.7% for girls and 3.4% for boys; of being a victim are 16.6% for girls and 12.3% for boys; and of being uninvolved are 80.6% for girls and 82.0% for boys. The odds of boys being uninvolved in relation to being a bully are 52.5% of the corresponding odds for girls, whereas the odds of boys being uninvolved in relation to being a victim are 37.6% higher than the corresponding odds for girls.

Age also still has an effect on being a bully when class variables are added. The probability of being a bully increases for older students in relation to being a victim or uninvolved; older students have a higher probability of being a bully in relation to being a victim or uninvolved compared to younger students. For example, the probability of being a bully for an 11-year-old girl with a Swedish background, and of average values for the quantitative variables, is 0.6%, compared to 1.5% for a 15-year-old. The corresponding probabilities of being a bully/victim are 1.5% for 11-year-olds and 1.9% for 15-year-olds; of being a victim are 19.3% for 11-year-olds and 15.3% for 15-year-olds; and of being uninvolved are 78.6% for 11-year-olds and 81.3% for 15-year-olds. In addition, the odds of being uninvolved in relation to being a bully after a one standard deviation increase in age (everything else being equal) are 71.2% of the odds before this increase.
Table 5. Estimation results for model 2.

| Variable/parameter | Posterior Mean coefficient | sd | Posterior 2.5 | Posterior 97.5 | Percentiles 2.5 | Percentiles 97.5 | Posterior Mean eff. size |
|--------------------|----------------------------|----|---------------|---------------|----------------|----------------|------------------------|
| Individual variables |                            |    |               |               |                |                |                        |
| Gender (BulVic vs Bul) | −0.007                     | 0.305 | −0.614       | 0.581         | 0.040          |                 |                        |
| Gender (Vic vs Bul) | −0.988                     | 0.256 | −1.510       | −0.518        | 0.384          |                 |                        |
| Gender (Un vs Bul) | −0.674                     | 0.240 | −1.166       | −0.214        | 0.525          |                 |                        |
| Gender (Vic vs BulVic) | −0.981                     | 0.212 | −1.405       | −0.581        | 0.383          |                 |                        |
| Gender (Un vs BulVic) | −0.667                     | 0.196 | −1.059       | −0.291        | 0.523          |                 |                        |
| Gender (Un vs Vic) | 0.315                      | 0.099 | 0.124        | 0.508         | 1.376          |                 |                        |
| Gender (Vic vs Bul) | 0.108                      | 0.073 | 0.033        | 0.254         | 1.117          |                 |                        |
| Gender (Un vs Vic) | 0.140                      | 0.143 | −0.422       | 0.143         | 0.878          |                 |                        |
| SES (BulVic vs Bul) | 0.168                      | 0.119 | −0.407       | 0.068         | 0.851          |                 |                        |
| SES (Un vs Bul) | −0.200                     | 0.114 | −0.430       | 0.024         | 0.824          |                 |                        |
| SES (Vic vs BulVic) | −0.029                     | 0.100 | −0.227       | 0.169         | 0.977          |                 |                        |
| SES (Un vs BulVic) | −0.060                     | 0.093 | −0.245       | 0.124         | 0.946          |                 |                        |
| SES (Un vs Vic) | −0.032                     | 0.047 | −0.125       | 0.062         | 0.970          |                 |                        |
| STRQ (BulVic vs Bul) | −0.043                     | 0.118 | −0.276       | 0.186         | 0.964          |                 |                        |
| STRQ (Vic vs Bul) | 0.056                      | 0.101 | −0.136       | 0.252         | 1.063          |                 |                        |
| STRQ (Un vs Bul) | 0.432                      | 0.096 | 0.248        | 0.623         | 1.547          |                 |                        |
| STRQ (Vic vs BulVic) | 0.099                      | 0.088 | −0.076       | 0.271         | 1.108          |                 |                        |
| STRQ (Un vs BulVic) | 0.475                      | 0.082 | 0.317        | 0.635         | 1.614          |                 |                        |
| STRQ (Un vs Vic) | 0.376                      | 0.045 | 0.289        | 0.464         | 1.458          |                 |                        |
| Class variables |                            |    |               |               |                |                |                        |
| Class climate (BulVic vs Bul) | −0.107                     | 0.166 | −0.429       | 0.227         | 0.9110         |                 |                        |
| Class climate (Vic vs Bul) | −0.092                     | 0.134 | −0.363       | 0.169         | 0.920          |                 |                        |
| Class climate (Un vs Bul) | 0.172                      | 0.131 | −0.090       | 0.431         | 1.198          |                 |                        |
| Class climate (Vic vs BulVic) | 0.015                      | 0.126 | −0.239       | 0.253         | 1.023          |                 |                        |
| Class climate (Un vs BulVic) | 0.279                      | 0.121 | 0.038        | 0.512         | 1.331          |                 |                        |
| Class climate (Un vs Vic) | 0.264                      | 0.066 | 0.139        | 0.396         | 1.305          |                 |                        |
| SES (BulVic vs Bul) | 0.018                      | 0.157 | −0.292       | 0.310         | 1.031          |                 |                        |
| SES (Vic vs Bul) | 0.104                      | 0.126 | −0.153       | 0.344         | 1.118          |                 |                        |
| SES (Un vs Bul) | 0.088                      | 0.123 | −0.160       | 0.322         | 1.101          |                 |                        |
| SES (Vic vs BulVic) | 0.086                      | 0.115 | −0.133       | 0.312         | 1.097          |                 |                        |
| SES (Un vs BulVic) | 0.070                      | 0.112 | −0.147       | 0.289         | 1.080          |                 |                        |
| SES (Un vs Vic) | −0.016                     | 0.058 | −0.131       | 0.098         | 0.986          |                 |                        |
| STRQ (BulVic vs Bul) | −0.037                     | 0.196 | −0.435       | 0.340         | 0.982          |                 |                        |
| STRQ (Vic vs Bul) | 0.068                      | 0.161 | −0.241       | 0.387         | 1.084          |                 |                        |
| STRQ (Un vs Bul) | 0.118                      | 0.154 | −0.191       | 0.419         | 1.139          |                 |                        |
| STRQ (Vic vs BulVic) | 0.105                      | 0.158 | −0.204       | 0.408         | 1.125          |                 |                        |
| STRQ (Un vs BulVic) | 0.155                      | 0.145 | −0.125       | 0.446         | 1.180          |                 |                        |
| STRQ (Un vs Vic) | 0.050                      | 0.085 | −0.111       | 0.230         | 1.055          |                 |                        |
| μ (BulVic vs Bul) | 0.445                      | 0.283 | −0.127       | 1.005         |                 |                 |                        |
| μ (Vic vs Bul) | 2.719                      | 0.230 | 2.317        | 3.207         |                 |                 |                        |
| μ (Un vs Bul) | 4.303                      | 0.221 | 3.907        | 4.777         |                 |                 |                        |
| σ (BulVic) | 0.439                      | 0.217 | 0.081        | 0.879         |                 |                 |                        |
| σ (Vic) | 0.217                      | 0.124 | 0.047        | 0.493         |                 |                 |                        |
| σ (Un) | 0.416                      | 0.117 | 0.163        | 0.638         |                 |                 |                        |
| β_{BulVic} | 0.065                      | 0.399 | −0.688       | 0.769         |                 |                 |                        |
| β_{Vic} | −0.104                     | 0.351 | −0.741       | 0.531         |                 |                 |                        |
| β_{Un} | 0.122                      | 0.290 | −0.653       | 0.785         |                 |                 |                        |

Note: Posterior mean, standard deviation (sd), and percentiles of the parameters $\beta_x = \beta_{\text{un}}$, $\sigma$, and the Mean Effective Size (MES), as defined in Section Analytical Techniques, are shown for each explanatory variable $x$, and categories $l$ and $m$. Corresponding posterior measures are also shown for the parameters $\mu$, $\sigma$, $\beta_{\text{lm}}$. Values in bold indicate that the current variable regarding categories $l$ versus $m$ has a very likely effect on the outcome. A very likely effect corresponds to a 95% credibility interval that does not include 0, which is equivalent to a positive/negative slope being at least 39 times more likely than a negative/positive slope. $x_{\text{diff}} = x - \bar{x}$ is the deviation for the individual variable $x$ to its class mean.
In addition, STRQ_d (as a students’ deviation from the class mean) has an effect on bullying roles. The probability of being uninvolved increases in relation to being a victim, a bully/victim, or a bully for higher values of STRQ_d. The probability of being a bully for a student with low values on STRQ_d (one standard deviation below the mean), with a Swedish background, and of average values for the continuous variables, is 1.6%, compared to 0.8% for high values (one standard deviation above the mean). The corresponding probabilities of being a bully/victim are 2.6% for low values of STRQ_d, and 1.2% for high values; of being a victim are 22.1% for low values, and 12.1% for high values; and of being uninvolved are 73.8% for low values, and 85.9% for high values. The odds of being uninvolved in relation to being a bully after a one standard deviation increase in STRQ_d (everything else being equal) are 54.7% higher than the odds before this increase, whereas the odds of being uninvolved in relation to being a victim are 45.8% higher after an increase in STRQ_d.

Finally, class climate has an effect on bullying roles. The probability of being uninvolved increases in relation to being a victim or a bully/victim for students belonging to a class with a more cohesive, caring, and supportive class climate. The probability of being a bully for a student with low values on class climate (one standard deviation below the mean), with a Swedish background, and with average values for the quantitative variables, is 1.3%, compared to 1.0% for high values on class climate (one standard deviation above the mean). The corresponding probabilities of being a bully/victim are 2.2% for low values on class climate, and 1.4% for high values; of being a victim are 20.4% for low values, and 13.3% for high values; and of being uninvolved are 76.2% for low values, and 84.3% for high values. The odds of being uninvolved in relation to being a victim after a one standard deviation increase in class climate (everything else being equal) are 30.5% higher than the odds before this increase.

**Discussion**

To the best of our knowledge, the present study is the first to examine whether student–teacher relationship quality at the individual level and student–teacher relationship quality and class climate at the class level are related to being a bully, a victim, a bully/victim, or uninvolved in school bullying. The study controlled for gender, age, socioeconomic status, and immigrant background at the individual level, and socioeconomic status at the class level.

**Student–teacher relationship quality**

As expected, we found that students involved in more positive, supportive, and caring student–teacher relationships were less likely to be bullies, victims, or bully/victims and more likely to be uninvolved in bullying. This supports previous findings showing that better student–teacher relationship quality at the individual level is associated with less bullying perpetration (e.g., Bae et al., 2019; Berchiatti et al., 2021; Ertesvåg, 2016; Hamel et al., 2021; Köşir et al., 2020; Longobardi et al., 2018) and less bullying victimization (e.g., Bae et al., 2019; Berchiatti et al., 2021; Demol et al., 2020; Sulkowski & Simmons, 2018). Thus, having good relationships with teachers seems to function as a protective factor, even
when controlling for gender, age, socioeconomic status, and immigrant background at the individual level, and socioeconomic status, student–teacher relationship quality, and class climate at the class level.

In the initial bivariate correlation analyses at the class level, student–teacher relationship quality had a moderate positive correlation with class climate and a weak negative correlation with both bullying and victimization, which indicates that school classes characterized by greater positive, caring, and trustful student–teacher relationships tended to be more cohesive, caring, and supportive and have a lower prevalence of bullying and victimization. A better student–teacher relationship quality at the class level has previously been associated with less bullying victimization (Di Stasio et al., 2016; Thornberg, Wänström, Pozzoli et al., 2018; for an exception, see, Košir et al., 2020) and high levels of sympathy for victimized peers (Waasdorp et al., 2019). In the full Bayesian model, when all individual and class variables were included, student–teacher relationship quality at the class level was negligibly linked to bullying roles (i.e., the 95% credibility interval covered zero). These findings can be compared to two previous studies (Košir et al., 2020; Di Stasio et al., 2016). Their findings showed that the class-level student–teacher relationship quality was not significantly associated with bullying perpetration when various characteristics of the class climate were included in the models, even though its association with bullying victimization was significant in Di Stasio et al.’s (2016) study, but not in Košir et al.’s (2020). Our findings can also be compared with Dietrich and Cohen’s (2021) study, in which the indirect link between student–teacher relationship quality and bullying perpetration through student–student relationship quality at the class level was much stronger, while the direct link between the first two variables was weak.

Our findings show that student–teacher relationship quality has an effect on bullying roles at the individual level but not at the class level. In the context of a student–teacher relationship dyad, the teacher might influence the individual student by acting as a relational model, scaffolding the development of the student’s social competencies, and influencing the student’s social information processes, relational expectations, and behaviors with peers (Bouchard & Smith, 2017). Student–teacher relationship quality may also affect peers’ social perceptions of, and relationships with, a student through teachers’ social referrals. While a good student–teacher relationship might increase the likelihood of peer acceptance, poor student–teacher relationship quality may be associated with stigma, which could increase the risk of being rejected and victimized (Bouchard & Smith, 2017).

An additional possible explanation is that student–teacher relationship quality at the class level is indirectly associated with bullying roles through the class climate (cf., Dietrich & Cohen, 2021; Thornberg, Wänström, Pozzoli et al., 2018). In terms of the social-ecological framework, Hughes et al. (2014) argue that “as chief architects and managers of classroom contexts, teachers exert considerable influence on the classroom peer ecology” (p. 309). Accordingly, studies have found that positive, warm, caring, and supportive student–teacher relationships at the class level correlate with a more friendly, caring, and supportive class climate (Dietrich & Cohen, 2021; Košir et al., 2020; Thornberg, Wänström, Pozzoli et al., 2018). Based on their review, Jennings and Greenberg (2009) stated that supportive and healthy student–teacher relationships constitute a keystone for effective classroom management and
a prosocial classroom climate. It might therefore be plausible to suggest that teachers who display caring and respect toward their students may create a class environment in which students behave appropriately because they care about each other, rather than because they fear the consequences of rule-breaking (Orpinas & Horne, 2010).

**Class climate**

Only a few studies have included class climate to examine bullying perpetration and victimization. They have shown that a more positive, caring, and supportive class climate is associated with less bullying victimization (Košir et al., 2020; Stefanek et al., 2011; Thornberg, Wänström, Pozzoli et al., 2018). Moreover, while a few studies have found class climate to be negatively associated with bullying perpetration (Dietrich & Cohen, 2021; Stefanek et al., 2011), Košir et al. (2020) did not demonstrate a significant link. Nevertheless, both good student–teacher relationship quality and a positive class climate in Košir et al.’s (2020) study correlated negatively with pro-bully attitudes at the class level, which in the multilevel regression model, and as a class variable, was associated with both bullying perpetration and victimization. From a social-ecological perspective (Bronfenbrenner, 1979), the school class is one of the most proximal, everyday micro-systems that socialize and shape students’ social development. As an immediate setting in school, it has one of the most direct influences on bullying behavior among students (Hong & Espelage, 2012). In agreement with this, the current findings show that students are less likely to be victims or bully/victims, compared to being uninvolved, if they belong to a school class with a more positive, caring, and supportive class climate. Thus, the class climate seems to be an important protective factor against the bullying roles of victims and bully/victims.

**Gender and age**

Similar to prior studies (Cook et al., 2010; Mitsopoulou & Giovazolias, 2015), we found that it was more likely for boys to engage in bullying behavior than girls. Gender socialization into societal gender norms might be a possible explanation, which in turn emphasizes the importance of the macrosystem (Bronfenbrenner, 1979) for understanding school bullying (Hong & Espelage, 2012). Girls are generally socialized into more compliant, subordinate, and gentle roles, whereas boys are socialized to be more dominant, competitive, and aggressive (Eisner & Malti, 2015). Masculinity norms in peer groups make boys more prone to engage in aggressive behaviors, such as bullying (Singh & Ritu, 2015; Steinfeldt et al., 2012).

In contrast to the non-significant association between age and bullying victimization in previous meta-analyses (Cook et al., 2010; Kljakovic & Hunt, 2016), we found that the probability of being a victim compared to being uninvolved decreased with age. A possible explanation for the inconsistency between our study and previous meta-analyses might be that the link between age and bullying victimization is moderated by cross-national variations in cultural characteristics, highlighting the importance of considering differences between macrosystems (Bronfenbrenner, 1979) within a cross-cultural context. Older students report a lower frequency of being bullied than younger students in Swedish national surveys (Friends, 2020; Swedish National Agency for Education,
different procedures, differences, examining bullied, however, was not related to age in our study, which can be added to the mixed findings in the literature (Alvarez-García et al., 2015; Cook et al., 2010; Kljakovic & Hunt, 2016). Further research is needed to compare age trends in bullying perpetration and victimization between countries and to attend more closely to the cultural characteristics of global regions and countries, but also to further study possible moderators at the individual and different system levels (cf., Bronfenbrenner, 1979).

**SES and immigrant background**

In the present study, immigrant vs. non-immigrant background at the individual level, and socioeconomic status (SES) at both the individual and class level, demonstrated negligible relations to the bullying roles. This can be compared with the inconsistent findings in the literature (Elgar et al., 2019; Garner & Hinton, 2010; Jansen et al., 2011; Knaappila et al., 2018; Malecki et al., 2020; Östberg et al., 2018; Shetgiri et al., 2012; Vitoroulis & Vaillancourt, 2018; Xu et al., 2020). In addition, some studies suggest that lower SES at neighborhood and school levels is linked with a higher risk of being bullied (Choi et al., 2021; Lemstra et al., 2012; Malecki et al., 2020; cf., Modin et al., 2018). In agreement with these studies, we found that SES was negatively correlated with victimization (weakly) and bullying (weakly) at the class level. However, in the Bayesian models, the association between SES at the class level and being bullied was negligible in the current study. This is in line with some other multilevel studies examining SES at both individual and school levels (Due et al., 2009; Schumann et al., 2014). Possible explanations for the mixed findings might be cross-national and other contextual differences, the effects of the chosen combination of individual and contextual variables included in the statistical models, and methodological differences in terms of measurements, procedures, and statistical methods. Further studies should examine how several variables at different levels might interact with and moderate the association between SES and immigrant background and bullying roles.

**Limitations**

Despite the many strengths of this study, some limitations should be noted. Firstly, since the variables have been assessed through self-reporting, the findings are prone to social desirability, recall, and perception biases, and there might be a risk of careless marking and intentionally exaggerated responses. In addition, the self-reported data procedure might have inflated variable associations due to shared method variance. Combining self-reporting with peer nomination techniques to measure bullying perpetration and victimization, in order to accomplish methodological triangulation, would have improved the validity of these variables (cf., Bovaird, 2010; Cornell & Bandyopadhyay, 2010; Furlong et al., 2010; Hunter et al., 2021; Olweus, 2010; Vivolo-Kantor et al., 2014; Volk et al., 2017). Peer nomination data, however, was not available in the HBSC dataset. Thus, future studies should collect both peer and self-reports to measure bullying perpetration and victimization, to identify bullies, victims and bully/victims, while using both student reports and other data (e.g., observational data or teacher reports) to measure student–teacher relationship quality and class climate.
Secondly, the study has a cross-sectional design, and therefore we are not able to pinpoint the direction of any effects. For example, it is not clear whether student–teacher relationship quality is a predictor of bullying roles or if various bullying roles predict student–teacher relationship quality. It is also possible that the relations found in the study are reciprocal. Considering that the social-ecological framework proposes that bullying and bystander behavior patterns are established, sustained, and changed over time as a result of reciprocal associations between individual and contextual factors, future research with a longitudinal design should investigate the directionality of the variables and test reciprocal associations over time. In addition, intervention studies designed to increase the quality of student–teacher relationships and the class climate to test causal mechanisms are recommended to test hypotheses about causal processes.

Thirdly, because we conducted a secondary data analysis, we had no control over the wording, item construction, or potential items/questions in the questionnaire, which limited our ability to complete comprehensive measures to fully assess student–teacher relationship quality and class climate. Although the Cronbach’s alpha values were high, and thus supported the internal reliability of the two variables, more items might have been preferable to improve the validity. However, these were not available in the HBSC dataset. Future studies should therefore adopt more established and validated instruments to measure student–teacher relationship quality and class climate to examine their multilevel associations with bullying perpetration and victimization. Moreover, students who were not self-reported as bullies, victims, or bully/victims have been categorized in this study as “uninvolved.” Nevertheless, considering that bullying is a group phenomenon that includes other participant roles such as reinforcers (witnesses who are laughing and cheering on) and defenders (Salmivalli, 2010), further research should include these other roles or behaviors in data gathering and analyses.

When it comes to measuring bullying and various group phenomena in schools, we agree with Hunter et al. (2021) that “there exists no consensus on which questionnaire is the gold standard . . . and measurement has been described as the ‘Achilles heel’ of the field” (p. 179). Thus, and in accordance with post-positivist (e.g., Phillips & Burbules, 2000; Popper, 1959) and pragmatist (e.g., Biesta & Burbules, 2003; Dewey, 1929; Peirce, 1960) approaches to epistemology and methodology in the social sciences, we argue that the data and findings in the current study are partial, provisional, and fallible approximations and estimations. We do not claim that they are exact representations of reality because we reject such a naive, realist approach to science (see, Chalmers, 1999; Hanson, 1965).

**Practical implications**

These limitations aside, the current study has important practical implications. Our findings suggest that teachers need to consciously build positive, warm, caring, and supportive relationships with their students as a part of their bullying prevention practice. Close and positive student–teacher relationships may help teachers to better influence and monitor students’ behaviors, teach them moral values such as humanity, caring, justice, respect, and compassion, and be a more efficient role model themselves in front of the students. Teachers who build positive and caring relationships with their students enhance the probability of prosocial and caring relationships and interactions among the students, which in turn lower the risk of having students involved in school bullying (Thornberg, Wänström, Pozzoli et al., 2018). Therefore, teachers who are successful in establishing and maintaining positive
student–teacher relationships seem to be more able to develop a prosocial classroom climate together with their students and, hence, a more supportive, respectful, and caring social climate in school classes they teach (Jennings & Greenberg, 2009).

The current findings propose the importance of classroom management (cf., Roland & Galloway, 2002) by proposing that teachers who are successful in creating and maintaining a positive, caring, and supportive class climate together with their students (both in the classroom and beyond) are a vital component of bullying prevention. Working hard at getting to know their students as individuals, building positive student–teacher relationships, and establishing classroom rules and routines to create a positive, warm, supportive, and respectful classroom climate conducive to learning have been identified as effective components in teachers’ classroom management in the literature (Levin & Nolan, 2014). In addition to developing warm, caring, and supportive relationships with students (Aldridge et al., 2018; Bae et al., 2019; Berchiatti et al., 2021; Chen et al., 2021; Ertesvåg, 2016; Espelage et al., 2015; Longobardi et al., 2018; Marengo et al., 2018; Zhao et al., 2021), research has found that teachers who implement and maintain clearly defined classroom rules against bullying and use classroom management techniques are among the effective components in anti-bullying programs (Gaffney et al., 2021). With reference to previous studies, our findings suggest that anti-bullying programs must instruct and support teachers in developing their classroom management and leadership roles. They must do so in terms of how they establish and maintain relationships with their students and consciously influence the group development, norm-setting, and peer climate in their classrooms. The current findings contribute to a growing body of research that underscores the significance of addressing both contextual and individual factors in efforts to reduce school bullying, with caring, trustful, and supportive student–teacher relationships and group processes manifested as a positive, cohesive, and supportive class climate being shown to be crucial dimensions of everyday bullying prevention in schools.

Acknowledgments

We are grateful for the assistance given by Petra Löfstedt and Maria Corell in granting us access to the Swedish HBSC database.

Disclosure statement

This study utilized a publicly available dataset with no identifiers and was exempted from Institutional Review Board oversights. The authors declare that there is no conflict of interest, and there were no ethical issues concerning human participants/animals in the study.

ORCID

Robert Thornberg http://orcid.org/0000-0001-9233-3862
Bertil Wegmann http://orcid.org/0000-0003-2193-6003
Linda Wänström http://orcid.org/0000-0002-6590-3847
Ylva Bjereld http://orcid.org/0000-0001-8755-6922
Jun Sung Hong http://orcid.org/0000-0003-2816-9900
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