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A Multilevel Study of Predictors of Student Perceptions of School Climate: The Effect of Classroom-Level Factors

Christine W. Koth, Catherine P. Bradshaw, and Philip J. Leaf
Johns Hopkins Bloomberg School of Public Health and the Johns Hopkins Center for the Prevention of Youth Violence

A positive school climate is an important component of successful and effective schools and thus is often an aim of schoolwide initiatives. Climate has traditionally been conceptualized as a school-level factor and is often assumed to be related to other school-level factors (e.g., school size). The current study examines variation in perceptions of climate based on individual-, classroom-, and school-level factors to determine the influence of predictors at multiple levels. Data come from 2,468 5th graders from 37 public elementary schools. Two aspects of students' perception of school climate, order and discipline, and achievement motivation are examined. Multilevel analyses in hierarchical linear modeling indicate that individual-level factors (race and sex) accounted for the largest proportion of variance in perceptions of school climate. School-level factors (e.g., school size and faculty turnover) and several classroom-level factors (e.g., characteristics of the teacher, class size, and the concentration of students with behavior problems) were also significant predictors of perceptions of climate. These findings suggest that characteristics of the classroom environment are important to consider when aiming to improve school climate.

Keywords: school climate, multilevel analysis, classroom environment, behavioral problems

Positive school climate is recognized as an important component of successful and effective schools (Brand, Felner, Shim, Seitsinger, & Dumas, 2003; Kreft, 1993; Miller & Fredericks, 1990). It is defined as shared beliefs, values, and attitudes that shape interactions between students, teachers, and administrators and set the parameters of acceptable behavior and norms for the school (Emmons, Comer, & Haynes, 1996; Kuperminc, Leadbeater, Emmons, & Blatt, 1997). School climate is a product of social interactions among students and with teachers, is influenced by educational and social values, and has been shown to relate to social situations within classrooms and to the school as a whole. It has been linked to academic achievement and performance (Battistich, Solomon, Kim, Watson, & Schaps, 1995; Griffith, 1999); student misconduct, aggression, and behavioral problems (Battistich & Hom, 1997; Battistich, Solomon, Kim, Watson, & Schaps, 1995; Kuperminc, Leadbeater, & Blatt, 2001; Kuperminc et al., 1997; Loukas & Robinson, 2004; Shochet, Dadds, Ham, & Montague, 2006; Welsh, 2000; Wilson, 2004); adjustment problems (Kuperminc et al., 1997); and social and personal attitudes (Battistich et al., 1995).

This multidimensional construct has been examined from different theoretical and methodological perspectives. Prior research has typically assessed teachers and school staff to investigate their perceptions of school organization and identify specific attributes that distinguish effective from ineffective schools (Stockard & Mayberry, 1992). Recently, there has been increased interest in students' perceptions of the school environment among educators, researchers, and policymakers (Brand et al., 2003; Griffith, 1995, 1999, 2000; Kuperminc et al., 2001, 1997; Van Horn, 2003; Verkuyten & Thijs, 2002; Vieno, Perkins, Smith, & Santinello, 2005; Welsh, 2000).

From a social cognitive perspective (Bandura, 2001; Rogers, 1951), people tend to react to experiences as they subjectively perceive them, not necessarily to how the experiences are objectively. Consequently, students' perceptions of the school environment likely have a significant impact on their behavior at school and thus are important potential targets for school improvement initiatives that aim to enhance achievement and reduce discipline problems (Haynes, Emmons, & Ben-Avie, 1997). Since the No Child Left Behind Act of 2001, two aspects of school climate—achievement and safety—have become central in schools' improvements. A wide range of interventions have been proposed to address climate, some of which are aimed at individuals and others of which are more focused on classrooms or the school level. However, the impact of interventions on achievement and safety may depend on the target of the intervention. Therefore, it is important to identify specific factors at different ecological levels (student, classroom, and school) that may influence students' perceptions of these two aspects of school climate.

Measuring School Climate

School climate is multidimensional in nature, and an important issue is determining the appropriate unit of analysis: individual students or groups of students. Most previous research has con-

Christine W. Koth, Catherine P. Bradshaw, and Philip J. Leaf, Department of Mental Health, Johns Hopkins Bloomberg School of Public Health, and Johns Hopkins Center for the Prevention of Youth Violence.

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Correspondence concerning this article should be addressed to Christine W. Koth, 624 North Broadway, 8th Floor, Baltimore, MD 21205; E-mail: ckoth@jhsph.edu

ceptualized climate as a property of the school and analyzed it at the school level (see Anderson, 1982, for a review). Typically, an indicator of the climate is assessed and correlated with indicators of students' average performance, school characteristics, or student body composition (e.g., Brookover, Schweitzer, Schneider, Beady, Flood, & Weisenbaker, 1978; Halpin & Croft, 1963; Walberg, 1968; Walberg & Anderson, 1968). However, aggregating individual ratings data to form a single group-level indicator assumes little variation in the perception of different groups within the school (i.e., students, teachers, and administrators) and precludes investigation of diversity in perceptions of the climate.

Not all researchers view climate as an organizational indicator. Several studies have emerged documenting significant variation both within schools (likely attributable to individual-level factors) and between schools (likely attributable to school-level factors), thereby illustrating the importance of a multilevel approach (Battistich et al., 1995; Bevans, Bradshaw, Miech, & Leaf, 2007; Brand et al., 2003; Griffith, 1999, 2000; Philips, 1997; Rowan, Raudenbush, & Kang, 1991; Van Horn, 2003; Vieno et al., 2005). Specifically, student-level factors such as race (Battistich et al., 1995; Griffith, 2000; Kuperminc et al., 2001, 1997) and sex (Battistich et al., 1995; Griffith, 1999, 2000; Kuperminc et al., 2001, 1997; Verkuyten & Thijs, 2002; Welsh, 2000) have been shown to be significantly related to perceptions of school climate, with male and minority students tending to perceive the environment less favorably.

Commonly examined school-level predictors of school climate include structural aspects of the school, such as school size (Griffith, 2000; McNeely, Nonnemaker, & Blum, 2002; Welsh, 2000), student–teacher ratio (Griffith, 1995), and student mobility (Griffith, 2000). Aggregated indicators of student characteristics (e.g., socioeconomic status and ethnicity; Battistich et al., 1995; McNeely et al.; Vieno et al., 2005) and school type (public vs. private or urban vs. rural; Vieno et al., 2005) have also been linked with perceptions of school climate. However, relatively few studies have investigated factors at the classroom level in relation to perceptions of the overall school climate.

Classroom-Level Predictors of School Climate

Classroom dynamics are complex and similar to school climate in that they involve the relationships and interactions between teachers and students, among students, and the perceptions, attitudes, and behaviors of students and teachers within the classroom (Montague & Rinaldi, 2001). It is likely that the climate of specific classrooms varies within a single school and that classroom management, class composition, and teacher characteristics may influence students' experiences. Research has suggested that teacher management style is related to the social structure of the class (Roland & Galloway, 2002). Teachers with practices that include emphasis on prosocial values and cooperation and teachers who were supportive have experienced improvements in positive student behavior and an increase in students' perception of connectedness (Solomon, Battistich, Kim, & Watson, 1996). Classroom variables that are more descriptive such as gender and ethnic composition and class size have also been investigated. Two studies of Dutch students incorporated these descriptive variables into their analyses but found no significant effects in relation to school satisfaction (Verkuyten & Thijs, 2002) and school adjustment (van der Oord & Van Rossem, 2002). Similarly, teacher characteristics such as full- versus part-time status and work experience have also been investigated (van der Oord & Van Rossem, 2002) and linked with students' perceptions of climate.

Another potential classroom-level predictor of perceptions of school climate is the students' proximal exposure to deviant or aggressive behavior in the classroom. A study of 134 first-grade classrooms found considerable variability in the level of aggressive behavior across classrooms within schools and that the children's social behaviors varied as a function of the group norm (Stormshak et al., 1999). Furthermore, a growing number of studies have shown that groups of children with a high concentration of aggressive members affect both the behavior of the members and the dynamics of the group itself. In a study of first-grade classroom environments, classes with a higher proportion of students with past behavior problems also had significantly higher teacher ratings of shy behavior (Werthamer-Larsson, Kellem, & Wheeler, 1991). Research has also demonstrated that aggressive or deviant children shift the social norms, such that deviant behavior becomes socially acceptable among the members (Wright, Giammarino, & Parad, 1986). In addition to increasing the risk for behavior problems among classmates (Dishion, McCord, & Poulin, 1999; Dishion, Spracklen, Andrews, & Patterson, 1996; Patterson, Dishion, & Yoerger, 2000; Thornberry & Krohn, 1997), aggregating or clustering deviant youths within classrooms may have a proximal (Bronfenbrenner & Ceci, 1994) negative influence on the classroom environment and affect the students' overall perception of the school climate. Taken together, these findings suggest that the concentration of children with behavior problems may be an important classroom-level factor to consider when examining variation in children's perception of the school environment.

Although the notion that classroom characteristics influence students' overall perception of school climate seems reasonable, few studies have actually examined the various individual and classroom characteristics simultaneously (Malin & Linnakylae, 2001). The vast majority of multilevel research on school climate has used two-level models. For example, Verkuyten and Thijs (2002) found that factors at both the individual level (sex and minority status) and the class level (average motivation for academics and incidence of peer victimization) were related to students' overall perceptions of the school climate. Research using three-level multilevel modeling (individual, class, and school) is even rarer (e.g., Vieno et al., 2005). In a study of Italian school children, Vieno et al. (2005) found that 84% of the effect on climate was accounted for by individual-level factors (e.g., student's sex, age, socioeconomic status, parental monitoring, and control), whereas 11% was accounted for by class-level factors (e.g., democratic classroom culture) and 4% by school-level factors (e.g., school size, private vs. public, extent of extracurricular activities, and school resources). These findings suggest that attempts to identify the causes and consequences of school climate could benefit from examining potential predictors at multiple levels of the child's ecology (Griffith, 1999, 2000).

Overview of the Current Study

The present study examined two distinct aspects of school climate (school safety and willingness to learn) to determine the

potential influence and relative contribution of factors at various levels (individual, classroom, and school). We investigated previously established associations between school climate and individual-level (e.g., race and sex) and school-level factors (e.g., school enrollment and students' average income level) as well classroom-level factors. Specifically, we predicted that classroom indicators (e.g., class size and concentration of students with behavior problems) and teacher characteristics (e.g., advanced education and number of years teaching at the school) would have a proximal influence on students' perceptions of the school climate, above and beyond the influence of individual- and school-level factors. Using a multilevel framework, we were able to isolate the amount of variance associated with factors at the individual, classroom, and school levels.

Method

Data for this study were collected as part of a large-scale study of a schoolwide behavior support program called Positive Behavioral Interventions and Supports. Thirty-seven Maryland public elementary schools from five school districts (rural and suburban) volunteered to participate in the study. Of the schools, 21 were randomized to the intervention condition and 16 were assigned to the comparison condition. The current study includes data from the first year of the trial only, and no significant intervention effects were observed on student reports of the school climate at this time point.

Participants

The sample included 2,468 students in 120 non–special education fifth-grade classrooms within 37 elementary schools. The student sample was 48.8% female, and the racial and ethnic breakdown of students was 45.1% Caucasian, 34.5% African American, 3.2% American Indian, 2.2% Asian, and 15% "other" or "multiethnic." Of the 120 fifth-grade teachers included in the current analyses, 81.7% were female, 85.0% were Caucasian, 61.3% had been teaching at the school for 4 or fewer years, and 55.8% had education equivalent to or above a master's degree. The fifth-grade class sizes ranged from 11 to 31 students ($M = 23.1$, $SD = 3.7$). Total school enrollment ranged from 239 to 881 students ($M = 488.4$, $SD = 146.7$). The percentage of school-level (teaching) faculty turnover ranged from 0% to 40.0% ($M = 13.1$, $SD = 8.9$), and student mobility ranged from 5.7% to 47.9% ($M = 24.5$, $SD = 10.2$). The percentage of students receiving free or reduced-price meals ranged from 7.3% to 80.5% ($M = 40.8$, $SD = 20.0$).

Measures

Student (Level 1). In the spring, all fifth-grade students at participating schools were asked to complete the elementary school version of the School Development Program School Climate Survey (Haynes, Emmons, & Ben-Avie, 2001). The School Climate Survey is a widely used (e.g., Kuperminc et al., 2001) and well-validated measure of students' perception of climate. Prior research by Haynes et al. (2001) has indicated that the measure has strong psychometric properties, including internal consistency and interrater reliability. The School Climate Survey assesses student demographic information (e.g., sex and race) and consists of 53 statements regarding current school conditions, which are coded as "agree" or "disagree." Two subscales, Order and Discipline and Academic Motivation, were analyzed in the current study. Because of the study design, only fifth-grade students were asked to complete the School Climate Survey subscales; no data were collected from students in other grades. The survey subscales were group administered by trained project staff members, who provided a brief overview of the purpose of the survey and read each question aloud as the students completed the survey. The individual surveys were anonymous but were linked to the student's homeroom teacher.

The Order and Discipline subscale consists of 11 items (e.g., "My school is a safe place," "Children in my school fight a lot," and "At my school children disobey the rules") and assesses school safety and the appropriateness of student behavior at school. The Achievement Motivation subscale consists of six items (e.g., "My teachers believe I can do well in my school," "I feel I can do well in this school," and "I enjoy learning at this school") and assesses the extent to which the students believe they can and are willing to learn. Negatively stated items were reverse scored such that a higher score indicates a more positive school climate. The subscale scores were calculated by computing the percentage of items students agreed with on a scale ranging from 0 to 100. Analyses of the internal reliabilities of these two subscales indicated that the Order and Discipline subscale had a Cronbach's alpha of .74, and the Achievement Motivation subscale had an alpha of .63. Preliminary analysis using ordinary least squares (OLS) regression on individual student school climate scores and clustering on school (with robust standard errors) revealed no significant differences between intervention and comparison schools on either the Order and Discipline subscale ($p = .39$) or the Achievement Motivation subscale ($p = .85$).

Teacher and classroom (Level 2). Teachers completed a brief demographic questionnaire in the fall including questions regarding their gender, education, and number of years teaching at this school (with 4 years or less indicating newer teachers and 5 years or more indicating established teachers). Teacher ratings of individual students' disruptive or aggressive behaviors were obtained in the spring using the Teacher Observation of Classroom Adaptation—Checklist (Leaf, Schultz, Keys, & Ialongo, 2002). This checklist contains 25 items on a 6-point scale ranging from 1 (*never*) to 6 (*almost always*). The Aggressive/Disruptive subscale was used to calculate the percentage of students exhibiting behavior problems within each classroom and includes nine items (e.g., "breaks rules," "fights," "harms property," and "teases classmates"). The subscale scores were calculated by first averaging the nine items (Cronbach's $\alpha = .93$) and then applying a cutoff to categorize students as displaying either adaptive behavior or problematic behavior. The cutoff was approximately 1 standard deviation above the total sample mean, such that 25.7% of the students across the full sample of participants were classified as exhibiting problematic behavior. Similar methods have been used to classify students in previous studies using versions of the Teacher Observation of Classroom Adaptation—Revised (August, Bloomquist, Lee, Realmuto, & Hektner, 2006; Petras, Chilcoat, Leaf, Ialongo, & Kellam, 2004; Schaeffer, Petras, Ialongo, Poduska, & Kellam, 2003; Lavallee, Bierman, & Nix, 2005; Stormshak et al., 1999). We then created a single concentration of students with behavior

problems score for each classroom by dividing the number of students classified with problematic behaviors in each class by the total number of students in the class. This procedure resulted in a mean of 26.0% ($SD = 19.7$) of students per class being designated as exhibiting disruptive behavior.

School characteristics (Level 3). School enrollment, faculty turnover (percentage of faculty new to the school that year), student mobility (number of students migrating in plus the number migrating out, divided by total enrollment), and average student household income (percentage of students receiving free or reduced-price meals) were obtained from the Maryland State Department of Education for the school year. The receipt of free or subsidized lunches has been shown to be a good marker for low household income (Ensminger et al., 2000).

Analyses

Preliminary descriptive analyses were conducted in STATA 9.2 (StataCorp, 2005) and indicated that the means for the Order and Discipline and Achievement Motivation subscales were 48.86 ($SD = 22.94$) and 60.10 ($SD = 27.24$), respectively. In addition, the two climate outcomes were correlated at .42. We used a multilevel approach to examine our main hypothesis that the clustering of students within classrooms accounts for a substantial portion of the variance in perceptions of school climate, above and beyond variation between students and the amount of variance accounted for clustering students within schools. Furthermore, we hypothesized that specific classroom-level factors, such as teacher characteristics and indicators of classroom disorder (e.g., large class size, high concentration of students with behavior problems) would be associated with student perceptions of school climate, even after controlling for individual- and school-level factors. We also explored possible within-level interactions separately for each level. A multilevel modeling technique was selected for the present study because both the data (students nested within classrooms nested within schools) and the hypotheses (the impact of school- and classroom-level factors on students' perceptions) are multilevel in nature (Raudenbush & Bryk, 2002). Single-level models are inappropriate for the current analyses because they assume that regression coefficients apply equally to all contexts (Duncan, Jones, & Moon, 1998; Luke, 2004). In addition, because individuals from the same school contexts will likely have correlated errors, a basic assumption of multivariate regression is violated (Luke, 2004). Multilevel modeling procedures account for nonindependence of observations (students within classrooms, within schools) and allow for correlated error structures.

To examine the impact of students' perceptions within classrooms clustered within schools, we estimated three-level hierarchical linear models using HLM 6.02 software (Raudenbush, Bryk, & Congdon, 2005). All outcomes of school climate were measured at the student level (Level 1). Additional Level 1 indicators included individual student characteristics, Level 2 indicators included teacher and classroom variables, and Level 3 indicators included school characteristics. For each school climate outcome, an unconditional model with no covariates was estimated to partition the variance across the three levels. Two additional multilevel models were estimated for each outcome. First, Level 1 and Level 3 covariates were introduced to the model, then, to examine the influence of classroom-level factors above and beyond the influence of other-level factors, the Level 2 covariates were added to the model with the Level 1 and Level 3 covariates. At each step of the model building, each parameter was inspected individually to assess the significance of the residual variance. Any covariates with nonsignificant variances were fixed (Hox, 1995; Raudenbush & Bryk, 2002). Model assumptions were carefully checked for each outcome. The assumption of homogeneity of residuals was tested by examining the normal probability plot of residual dispersion and the scatter plot of the Level 2 expected versus fitted scores (Luke, 2004; Raudenbush & Bryk, 2002). There was no evidence to suggest heteroscedasticity of the residuals. In addition, the possibility that the predicted values fell outside of the 0–100 range was examined. The data revealed that all values fell within that range. Maximum likelihood estimation with robust standard errors was used to estimate the parameters, and the overall fit of the models was evaluated on the basis of examination of the Akaike information criterion (Akaike, 1974) and the likelihood ratio test (Luke, 2004; Raudenbush & Bryk, 2002).

Results

Unconditional Model

Using HLM, we calculated the amount of variance for each of the three levels (student, classroom, and school) by fitting an unconditional model (without any covariates) for each school climate outcome (Raudenbush & Bryk, 2002). The partitioning of variance for each outcome is displayed in Table 1. The majority of the variance (65% for order and discipline and 86% for achievement motivation) was explained by between-student variation, and the clustering of students within schools accounted for an additional 5% to 27% of the variance in perceptions of achievement motivation and order and discipline, respectively. Whereas the majority of previous studies did not examine the clustering of students within classrooms, these analyses indicated that clustering at this level accounted for an additional 8%–9% of the total variance in student perceptions of order and discipline and achievement motivation, respectively. These findings illustrate the potential importance of considering variation on a classroom level.

Multivariate Results

Within-level interactions. Using STATA, we conducted a series of single-level OLS regression analyses for each of the three levels of the hypothesized models to explore the possibility of within-level interactions to be included in the subsequent HLM multilevel models. Each OLS regression was clustered on schools

Table 1
Partitioning of Variance Across Levels From the Unconditional Multilevel Models for Students' Perceptions of Order and Discipline and Achievement Motivation

Level	Order and discipline variance (%)	Achievement motivation variance (%)
1: Student	65	86
2: Classroom	8	9
3: School	27	5

to better estimate the standard errors. No significant interactions were found between the covariates within the Level 1 (student) or Level 3 (school) variables. Using the Level 2 data, an interaction between class size and number of years a teacher has been teaching at the school (newer teachers = 4 years or less and established teachers = 5 years or more) was detected. For ease of interpretation, the class size variable was centered at the grand mean (M = 23.1). A single-level OLS regression indicated that this interaction was statistically significant for order and discipline (p = .04) and achievement motivation (p = .03). The calculated interaction term was entered as a separate Level 2 variable in the multilevel models to examine the association of the interaction within the multilevel framework.

HLM. Multilevel model estimates for order and discipline and achievement motivation are displayed separately in Table 2. Model 1 contains student-level (Level 1) and school-level (Level 3) covariates, and Model 2 contains estimates when the classroom (Level 2) covariates are added together with student- and school-level covariates. In Model 1, students' race and sex were significant for both of the school climate subscales. These associations remained in Model 2 when classroom-level covariates were added. These findings indicate that male and minority students perceived the school climate less favorably than did female and Caucasian students. Regarding the school-level factors in Model 1, the percentage of students from lower income households was statistically significant for order and discipline; however, when classroom factors were added to the model, this relation did not remain statistically significant.

We then included the classroom-level factors in the models to determine whether the individual- and school-level influences re-

Table 2
Multilevel Results for Order and Discipline and Achievement Motivation

	Model 1			Model 2		
Level	Coefficient	*SE*	*t*	Coefficient	*SE*	*t*
			Order and discipline			
1: Student						
Sex	−2.50**	0.87	−2.88	−2.43**	0.87	−2.79
Race	−3.93**	0.83	−4.74	−4.05**	0.80	−5.06
2: Classroom						
Class size				0.60†	0.32	1.86
Teaching years				3.64*	1.64	2.21
Class Size × Years				−0.98**	0.33	−3.00
Teacher education				−0.24	1.10	−0.22
% behavior problem				−0.27**	0.08	−3.40
3: School						
Enrollment	−0.02	0.01	−1.57	0.0	0.01	−0.61
Faculty turnover	−0.20	0.17	−1.20	−0.25**	0.08	−2.98
Student mobility	−0.05	0.16	−0.34	−0.08	0.10	−0.85
FARMs	−0.25**	0.08	−2.99	−0.08	0.05	−1.59
AIC	21,667.0			21,639.3		
Δ parameters	7					
Δ -2LL	41.63**					
			Achievement motivation			
1: Student						
Sex	−6.66**	1.04	−6.41	−6.62**	1.04	−6.37
Race	−2.80*	1.29	−2.17	−2.74*	1.24	−2.20
2: Classroom						
Class size				0.92**	0.36	2.56
Teaching years				2.01	2.17	0.92
Class Size × Years				−1.08*	0.47	−2.32
Teacher education				−1.36	2.22	−0.62
% behavior problem				−0.12*	0.05	−2.19
3: School						
Enrollment	−0.02†	0.01	−1.94	−0.02**	0.01	−2.64
Faculty turnover	0.05	0.11	0.45	0.14	0.10	1.45
Student mobility	0.03	0.14	0.23	−0.06	0.09	−0.61
FARMs	−0.05	0.06	−0.86	0.01	0.05	0.22
AIC	23,067.7			23,063.3		
Δ parameters	7					
Δ -2LL	18.41**					

Note. For sex, 1 = male, 0 = female; for race, 1 = minority, 0 = Caucasian; class size = number of students in the class; teaching years = number of years teacher has taught at this school; for teacher education, 1 = master's level or higher, 0 = bachelor's degree; % behavior problem = percentage of students in the class with behavior problems; enrollment = number of students enrolled at the school; FARMs = free or reduced price meals; AIC = Akaike information criterion.
** $p \leq .01$. * $p \leq .05$. † $p \leq .10$.

mained significant (see Model 2 in Table 2). There were no significant changes in individual-level factors when compared with Model 1. Regarding the school-level factors, faculty turnover was related to order and discipline, such that students from schools with higher turnover described the school as less orderly. With regard to school enrollment, we found that larger schools tended to be associated with lower scores on achievement motivation in Model 1, and this association became statistically significant in Model 2 when accounting for classroom-level factors.

Focusing on the classroom-level factors (see Model 2 of Table 2), we found the percentage of disruptive students in a class to be negatively associated with both indicators of school climate. Students in classrooms with a greater number of disruptive students rated the school climate less favorably than did students in classrooms with fewer disruptive peers. The within–Level 2 interaction (class size and number of years teaching at the school) remained significant for order and discipline and achievement motivation in the multilevel analyses. This interaction term represents the difference in school climate as class size increases among students of more established teachers compared with students of newer teachers. For both order and discipline and achievement motivation, the interaction coefficient was negative, indicating that in larger size classes, the students of more established teachers perceived the school climate less favorably than did students of newer teachers. The coefficient for class size was positive and statistically significant for achievement motivation and represents the change in school climate scores of students of newer teachers in larger versus smaller classes; therefore, for students with newer teachers, a larger class size was associated with a more positive academic setting than was a smaller class size. Because class size was mean-centered, the coefficient for years teaching represents the difference in school climate scores between established and newer teachers with an average class size of 23 students and was statistically significant for order and discipline. In other words, students of more established teachers in average-sized classrooms reported a more orderly climate than students of newer teachers in average-sized classrooms.

Model fit. A series of fit indices were calculated to evaluate the fit of the data to the final models. As shown in Table 2 for the two school climate variables, the models with student-, classroom-, and school-level covariates had lower Akaike information criteria (indicating better fit) and a significant difference in the likelihood ratio test ($p < .01$) as compared with the models with only student- and school-level covariates.

Discussion

The present study used a multilevel framework to examine the influence of individual-, classroom-, and school-level factors on students' perceptions of school climate. When we unpack these influences across levels in the unconditional model, we see that the largest proportion of variance comes from individual-level factors (65%–86%; Table 1). Further inspection of proportion of variance across the three levels for each of the climate outcomes indicates that achievement motivation had the lowest amount of school-level variance (5%) and the highest amount of individual-level variance (86%). The proportion of variance suggests there is greater variability in students' willingness to learn within schools and that this aspect of school climate may be more indicative of individuals' own motivation than is overall aggregated perception. In contrast, the amount of school-level variance for order and discipline was much higher (27%), suggesting that perceptions of school safety may be more relevant to school characteristics than achievement motivation; however, the individual level still accounted for the majority of the variance. Last, 8% to 9% of the variance across the two climate outcomes was attributable to clustering at the classroom level. This partitioning of variance is relatively consistent with previous research by Vieno et al. (2005), who found that 84% of the variation in climate was accounted for at the individual level, whereas 11% was accounted for at the class level, and just 4% at the school level.

From a methodological perspective, these findings suggest that researchers should pay careful attention to the clustering of students, both within schools and within classes, when examining school climate in intervention trials or cross-sectional epidemiological studies (Luke, 2004). Overlooking the nesting of students would likely increase the Type I error rate; therefore, researchers should adjust the standard errors to obtain accurate estimates (Murray, 1998).

Individual-Level Factors

Consistent with previous research (Battistich et al., 1995; Griffith, 1999, 2000; Kuperminc et al., 2001, 1997; Verkuyten & Thijs, 2002; Welsh, 2000), individual-level factors such as race and sex were associated with perceptions of the school environment, with male and minority students tending to perceive the school less favorably. Male students reported less order and discipline and lower levels of achievement motivation even after controlling for school- and classroom-level factors in Model 2. Prior research has indicated that boys are more likely than girls to display disruptive behavior at school (Lahey et al., 2000; McDermott, 1996; Putallaz & Bierman, 2004; Roberts & Baird, 1972; Tremblay et al., 1996) and therefore may perceive the environment as less safe and orderly. With regard to achievement motivation, boys tend to receive lower grades in elementary school than girls, which may contribute to this difference in their willingness to learn. With regard to race, minority students perceived the environment as less safe and reported lower levels of achievement motivation than did Caucasian youths, even after controlling for classroom- and school-level factors. These findings may reflect cultural differences in the expectations in the school setting (Zimmerman, Khoury, Vega, Gil, & Warheit, 1995) or in the construct validity of school climate (Kuperminc et al., 1997). Interventions that aim to increase a sense of positive climate should raise mutual understanding and awareness of culturally linked expectations in schools.

School-Level Factors

A series of school-level factors, including school size, faculty turnover, student mobility, and student free or reduced-price meals rate, were also examined as predictors of student perceptions of the school environment. These effects were smaller than we had anticipated. Specifically, larger enrollment was significantly negatively associated with achievement motivation, and high faculty turnover was related to lower perceptions of order and discipline, after controlling for influences at the other two levels. Although

prior research suggests that elementary school students can begin to feel lost or disconnected in large schools (Hellman & Beaton, 1986), Griffith (2000) did not find school size to be a significant factor in students' perceptions of school climate. These discrepant findings suggest that school size may be related to some aspects of school climate but not to others, and additional research with a larger sample of more diverse schools may further clarify the potential association between variables typically considered to be school-level indicators of school disorder (Birnbaum et al., 2003) and students' perceptions of school climate.

Classroom-Level Factors

As hypothesized, some of the classroom-level variables were associated with students' perceptions of the school environment. Of particular interest is the impact of clusters of students with behavior problems. As expected, the greater the proportion of students with behavior problems in a classroom, the less favorably the students perceived the school environment. This effect was strongest for perceptions of order and discipline. These findings suggest that children are particularly sensitive to their classmates' behavior problems and that students perceive the school's safety and their willingness to learn in relation to the number of disruptive classmates.

We detected a significant interaction effect between class size and number of years teaching for both outcomes. Regarding order and discipline, in an average class size of 23, students with more established teachers perceived school climate as safer than did students with newer teachers. Given just this information, one might theorize that teachers who have been working at the school for several years are better integrated into the school, able to provide a more stable and predictable environment for the students, and more familiar with the students. However, the significant interaction term indicates this is not true for all students and teachers. Specifically, students in larger classes with more established teachers tended to view the school environment as less safe than did students in smaller classes with more established teachers. In addition, students in larger classes with newer teachers perceived the school environment as safer than those in smaller classes with newer teachers. Regarding achievement motivation, there was no statistical difference in students' willingness to learn between newer and more established teachers of average class size. However, students in larger classes of newer teachers were more willing to learn than students in smaller classes of newer teachers. In addition, students' reports of their willingness to learn in larger classrooms of more established teachers were less favorable than those in smaller classrooms.

This interaction is an intriguing finding. It is important to remember that the students' perceptions are in regards to overall school climate and not classroom climate, and the factors that contribute to the dynamics of the classroom may affect school climate differently. Students are not randomly assigned to classrooms or teachers; therefore, it is possible that this interaction is indirectly measuring some other construct. Perhaps our measurement of the number of years teaching (i.e., newer vs. more experienced teachers) is a proxy measure for teaching styles or teacher–student interactions that were not measured directly. It is also possible that newer teachers in our study were exposed to different teaching methods while receiving their education than were their more experienced colleagues.

Other factors could explain why students of different classroom compositions perceive school climate differently. Studies suggest that teachers' perceptions and attitudes toward students affect their own behavior as well as students' behavior within the classroom (Ladd, Birch, & Buhs, 1999; Weinstein, Madison, & Kuklinski, 1995). Osterman (2000) contended that students with a sense of belonging and positive involvement in the classroom are more likely to demonstrate acceptance of authority and regulate their own behavior in the classroom. In addition, teacher interactions with students seem to influence students' perceptions of one another (Birch & Ladd, 1997). Prior research has indicated that teachers who display favoritism or are perceived as not being fair to all students can negatively influence the sense of community (Altenbaugh, Engel, & Martin, 1995). Students' attitudes about their teacher also tend to influence their sense of school satisfaction, such that school satisfaction is higher for students who like their teacher and have a more supportive relationship with the teacher (Baker, 1999; Verkuyten & Thijs, 2002). The current study was not designed to examine process-oriented variables, such as teaching style and teacher–student interaction; therefore, additional research on these types of variables within a multilevel framework is needed. It should also be noted that examining within-level interactions within the multilevel framework is rare. Methodologically, further exploration into these interactions is needed to investigate the validity of the relationship we uncovered.

General Discussion

The results of the current study indicate that student- and classroom-level factors tend to have greater influence on students' perceptions of the school environment than do school-level factors. Interventions aiming to enhance students' perceptions may be most effective if they target those with the most negative attitudes, such as male and minority students. There are several individual-level factors that were not examined in the current study that might also influence students' perceptions, such as their academic abilities, social relationships, socioeconomic status, and own problem behavior. Future research should examine these factors more specifically as possible predictors of school climate that may help target individual interventions more effectively. With regard to school-level factors, there are several initiatives focused on creating smaller schools and learning environments, and our findings suggest that school size was only marginally inversely related to climate. Efforts to increase the connectedness of within-school groupings, such as improving relations between teachers and students and those between peers within classrooms, may have a more favorable impact on students' perceptions of school climate than focusing on efforts to affect school-level factors (e.g., reducing school size). Reducing class size has often been cited as a possible strategy for increasing academic performance; however, our findings, along with those of other climate studies, suggest that class size alone may not greatly influence perceptions of school climate (Griffith, 1995; van der Oord & Van Rossem, 2002; Verkuyten & Thijs, 2002). Taken together, these findings suggest that factors at several levels should be assessed when examining different aspects of school climate and developing initiatives to enhance school climate.

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