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Exploring associations between school environment and bullying in Iran: Multilevel contextual effects modeling

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ABSTRACT

School bullying is a major global public health problem that may associate with school factors. Few studies have been conducted in Middle East countries and in Iran about the association between the environmental characteristics of school and bullying victimization and perpetration. The Persian-OBQ and school environment scale of MDS3 Climate Survey was completed by 1540 Iranian students from 42 schools. This study examined the association of student perceptions about school environment both at the collective and individual level (including 4 dimensions: rules, physical comfort, support, and disorder) and the experience of involvement in bullying victimization, perpetration, and both of verbal, relational, physical, and cyber forms, using a contextual effect model in a two-level multinomial modeling. Results showed that higher individual-perception of physical comfort and support were related to lower levels of involvement in verbal, relational or cyber forms; and higher individual-perception of disorder was related to a greater level of involvement in verbal and relational forms. Whereas a higher collective-perception of rules, physical comfort, support, and disorder were related to a greater level of involvement in all forms, except the relational only-victim form. The implications of these results for building a supportive school environment are discussed.

1. Introduction

School bullying are phenomena that affect the health (Hong et al., 2014; Hong, Kral, & Sterzing, 2015; Hong, Voisin, Cho, & Espelage, 2016; Rezapour, Khanjani, & Soori, 2019) and academic achievement of school-aged children (Jonathan & David, 2010). According to contextually-oriented theories, such as the Bronfenbrenner's Ecological Systems Theory (Bronfenbrenner, 1979), the social, physical, organizational and community contexts (macrosystems) as well as the individual characteristics (microsystem) of students play important roles in students involvement in bullying victimization and perpetration (Espelage & De La Rue, 2012; Espelage, Low, & Jimerson, 2014; Hong & Eamon, 2009). School is as a community of students that its environment may alter bullying behaviors via discipline/fairness/clarity of rules, peer- and teacher-support and social development (Gage, Prykanowski, & Larson, 2014; Hong & Espelage, 2012; Konishi, Miyazaki, Hymel, & Waterhouse, 2017; Wei, Williams, Chen, & Chang, 2010). In addition, evidence shows a supportive and caring environment in schools is one of main components of school-based anti-bullying interventions (Albayrak, Yıldız, & Erol, 2016; Jiménez-Barbero, Ruiz-Hernández, Llor-Zaragoza, Pérez-García, & Llor-Esteban, 2016). However, there are several gaps in extant research, which addressing these can enhance our understanding of the association between school environment and bullying.

The first gap is that most previous studies have been conducted in the western countries and some in East Asian countries (Chan & Wong, 2016; Han, Zhang, & Zhang, 2017; Lee & Song, 2012; Wei et al., 2010). But, there are few studies from Middle East countries (Yuksek & Solakoglu, 2016) and no study about this topic from Iran. But, there are few studies about the descriptive epidemiology of bullying behaviors in Iran. For example, a nationwide study conducted in 2011–2012 on 13,486 children and adolescents, that used a single item for self-reporting perpetration and victimization of bullying, showed that boys had a higher prevalence of perpetration and victimization then girls (10.4% boy bullies, 6.4% girls bullies, 21.5% boy victims, and 12.2% girls victims) (Kelishadi et al., 2015). Or another study in northern Iran among students of grades 8th and 9th, showed that the prevalence of only-bully, only-victim, and bully-victims were 5.4%, 22.1%, and 11%, respectively, and the verbal form was more prevalent than other forms (Soori, Rezapour, & Khodakarim, 2014).

The Middle East is a region that includes the Persian Gulf states, northern Africa, and the nations of Turkey, Pakistan and Afghanistan.

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Religious beliefs and cultural structures are almost similar; most of the Middle Eastern countries are Muslims and are affected by the educational and political context of Islam (Rabiei, 2013). But, there is linguistic diversity in this region. In addition, political and religious conflicts have created social and cultural differences between Middle East countries (Rabiei, 2013). Iran is a country located in this region with a special context.

1.1. Iran's education system

After Iran's revolution in 1979, the secular education system in Iran was replaced by an Islamic system (Cheng & Beigi, 2012). All primary and secondary schools were segregated based on gender (Fatima & Fatima, 2017). Students had to adhere to Islamic customs such wearing Islamic Hijab for girls; and boys had limitations in how they dress or how they cut their hair (Mahmoudi, Brown, Saribagloo, & Dadashzadeh, 2018). Iran's current education system, known as the 6–3-3 system, includes an initial six years in primary school (primary school starts at the age of 6), and six years in secondary school (3 years in middle school and 3 years in high school). Overall, there are 47 types of schools in Iran's current education system, which public (governmental), private (non-governmental), and gifted schools are the most common types (Minister of Education, 2016). Public (governmental) schools are equipped by the government (Minister of Education, 2016). Students can study at these schools, if they have the required age condition and live in the range of the school (Minister of Education, 2016). Private (Non-governmental) schools run under the supervision of the Ministry of Education and are funded by fees received from students (Minister of Education, 2016). Gifted schools are educational units which select talented students through entrance exams. These schools use more experienced teachers and provide more facilities (Minister of Education, 2016). All students, in most public and private schools, wear school uniforms. Students whitin Iranian schools have limited access to the internet or mobile phones (Mahmoudi et al., 2018). Thus, Iran, with its special socio-cultural structure is an interesting example, for investigating the association between school environment and bullying.

The second gap refer to that most previous studies have focused on the association between total bullying victimization and perpetration with school environment (Flaspohler, Elfstrom, Vanderzee, Sink, & Birchmeier, 2009; Låftman, Östberg, & Modin, 2017; Shukla, Konold, & Cornell, 2016), and were less concerned about the student involvement in various forms of victimization and perpetration (Konishi et al., 2017), separately. Individuals involved in this behavior are often divided into three categories; only-victim, only-bully, and bully-victim, in which each of them broadly include various forms such as physical (e.g., hitting, pushing, and kicking), verbal (e.g., name-calling and teasing in a hurtful way), relational (or social) (e.g. social exclusion and spreading rumors), and cyber (e.g. mobile phones, internet, email, online social networking or creating nasty websites) (Gladden, Vivolo-Kantor, Hamburger, & Lumpkin, 2014; Olweus, 2010; Smith, 2011; Wang, Iannotti, & Nansel, 2009). Unlike other forms, the cyber form as a new form of bullying is not limit to schools, thus views and theories about this new type are growing (Dooley, Pyżalski, & Cross, 2009). The cyber form has features that make it distinctive from the traditional forms (Smith et al., 2008). In this form the perpetrator can remain anonymous (Olweus, 2013). Therefore although, there is overlapping between these forms (Chan & Wong, 2015a; Marsh et al., 2011), different forms of bullying victimization and perpetration are different from each other in occurrence circumstances, nature, and even in the health problems (Cornell, Sheras, & Cole, 2006). Studying these various forms (verbal, relational, physical, and cyber) in different categories (only-victim, only-bully, bully-victim), can increase our understanding about their occurrence circumstances.

The third gap is that most previous studies have focused on individual perceptions or school-level perceptions alone, and there are few studies that have considered the collective-perceptions of all students at the school-level, along with the individual perceptions of environment (Konishi et al., 2017). Indeed, simultaneous consideration of both the individual-perception and collective-perception of school environments can help avoid ecological fallacies (Shinn & Rapkin, 2000). Ecological fallacy is generalizing the results of the group level to the individual level (Porta, 2014). On other hand, school environment factors are considered part of the macro system based on the socio-ecological theory, which is a contextual concept. Thus contextual studies can evaluate the contribution of school characteristics on student bullying beyond what can be explained by the characteristics of individual students (Marsh et al., 2012).

The finally challenge is related to the variability of terms and subdomains about school environment (Carney, Liu, & Hazler, 2018; Cohen, McCabe, Michelli, & Pickeral, 2009; Jeong, Kwak, Moon, & San Miguel, 2013; Johnson, 2009). “A school environment is broadly characterized by its facilities, classrooms, school-based health supports, and disciplinary policies and practices” (US Department of Education, 2018) that previous studies have shown an authoritative school environment (i.e., high discipline structure and support) are related to lower levels of bullying (Cornell & Huang, 2016; Gerlinger & Wo, 2016). Although school environment and school climate are used interchangeably, school environment is embedded in school climate (Bradshaw, Waasdorp, Debnam, & Johnson, 2014). The US Department of Education (USDOE) has introduced 4-sub-domains of school environment that include rules, physical comfort, support, and disorder (Bradshaw et al., 2014).

1.2. School environment and bullying

Rules and strategies that promote discipline and manage student behavior were associated with less student victimization and perpetration of bullying in previous studies (Cornell, Shukla, & Konold, 2015; Gregory et al., 2010; Hung, Luebbe, & Flaspohler, 2015). Jeong et al. (2013) showed that positive students´ perceptions about the fairness of school rules and their enforcement and perceptions about the clarity of rules (fairness of school rules, awareness of school rules, and awareness of school punishment) is associated with less victimization in the relational and physical forms of bullying. Låftman et al. (2017) studied 16,418, 9thgrade students in Stockholm and showed the prevalence of bullying was less in classes which students had a better perception of school rules. In addition, a study on 76 secondary schools in Western Canada showed a positive perception of Discipline/Fairness/Rules at student-level and school-level (collective-perception) was associated with less traditional and cyber victimization (Konishi et al., 2017).

Although the physical comfort and cleanliness of the school building are important parts of the school environment (Cohen et al., 2009), there are few studies about the association between this domain and bullying (Richard, Schneider, & Mallet, 2012). Physical appearance and cleanliness has been shown to promote school climate and feeling safe at school in previous studies (Voight & Nation, 2016; Williams, Schneider, Wornell, & Langhinrichsen-Rohling, 2018). Richard et al. (2012) in a study on 18,222 middle school students in France showed that although school cleanliness was not associated with involvement in verbal and relational bullying victimization, it was related to less involvement in physical bullying victimization.

Students perceptions about support has two aspects including social or emotional support (supporting and helping peers, teachers, and other staff in school in case of a problem) and support services that refer to the availability of services like counsellors for mental health (Bradshaw et al., 2014). The perceived support of peers, teachers, and other adults in schools was a significant predictor of bullying victimization and perpetration in previous studies (Cornell et al., 2015; Flaspohler et al., 2009; Gregory et al., 2010; Turner, Reynolds, Lee, Subasic, & Bromhead, 2014). Shukla et al. (2016) showed students' perception of willingness to seek help in schools with a positive environment (low

bullying prevalence) was lower than schools with a negative environment (high bullying prevalence).

There is evidence about a relation between physical disorder (e.g., broken windows and poor building conditions) and bullying behaviors in some studies (Bradshaw, Waasdorp, & Johnson, 2015; Plank, Bradshaw, & Young, 2009). Student's perception of disorder in school (i.e., threatening situations, violence, or disruptive interactions among people within a school) may relate to increased violence in schools (Plank et al., 2009). Bradshaw, Sawyer, and O'brennan (2009) showed school-level indicators of disorder (e.g., student–teacher ratio, concentration of student poverty, suspension rate, and student mobility) were significant predictors for bullying victimization and perpetration among both elementary and middle school students.

In addition, by considering student-demographic variables such as gender (boy and girl), grade (8th, 9th, and 10th) and school types in student-level as well as school organizational characteristics in school-level, the validity of potential association between the 4 sub-domains of school environment and students' involvement in bullying increases, because previous studies have shown they are related to both bullying and school environment (Bradshaw et al. (2009, Bradshaw et al., 2015). School organizational characteristics including the number of students, classes, teachers, and school area, alone are not very informative. However, the ratio of the number of students in school to school space, teachers, and the number of classes can reflect school organizational characteristics, properly (Khoury-Kassabri, Benbenishty, Avi Astor, & Zeira, 2004). Bradshaw et al. (2009) in Maryland showed that opportunities for bullying behaviors to occur were more in schools with high Student–Teacher ratio; because in these schools it is more difficult to manage student behaviors. Wei et al. (2010) in a study on 1172, 7th –9th grade students from 12 public middle schools in Taiwan showed school size and student–teacher ratio were not significantly associated with perpetration of verbal and physical bullying.

1.3. The current study

This study examined the associations between the sub-domains of students´ perception of school environment, including; rules, physical comfort, support, and disorder (both individual-perception and collective-perception) with student's experiences in only-victim, only-bully, and bully-victim of verbal, relational, physical and cyber forms, separately.

2. Methods

2.1. Participants

Data used in this study come from a survey about school bullying in Mazandran province, in north Iran. 1558 pupils aged 14 to 16 years (Mean = 14.7 ± 0.73) were selected by three-stage stratified sampling design. The schools of all cities of Mazandran Province (22 cities) were stratified by gender and school type (132 mutually-exclusive strata). We randomly selected 7 cities that included forty-two of these strata. Then, one school was selected from each stratum. In each of the selected schools, one or two classes (based on school size) were sampled randomly and all the students in the classes were included in the study. The total population of the 8th, 9th and 10th grade students in the seven cities of Mazandaran Province was 188,956, in the whole province it was 332,988. Eighteen cases were excluded for analysis because of incomplete and missing values, and the size of the final sample was 1540 pupils from 42 schools. The school sizes ranged from 35 to 435 students (M = 229, SD = 89). The sample was 54.6% female, and the school types breakdown was 40.8% public, 33.2% gifted, and 26.0% private. 43.8%, 39.1%, and 17.1% of students were in grade levels of 8th, 9th, and 10th, respectively.

2.2. Procedure

This study was approved by the Ethic Committee of Kerman University of Medical Sciences (Ethics Code: IR.KMU.AH.REC.1395.89) and the Security Office of the Educational Authority of Mazandaran Province, Iran. Informed consent was obtained from the students, parents and teachers of the selected schools. Data were collected from January, 25 until March 12, 2017. Students completed paper-and-pencil surveys in their classrooms during normal school hours. A research assistant briefly explained the study aims and answered pupils' questions before distributing the questionnaires among students.

2.3. Measures

2.3.1. Student-level characteristics

2.3.1.1. Student-demographic variables. Gender (boy and girl), grade (8th, 9th, and 10th) and school types, were variables that were controlled for in the association between the sub-domains of school safety and environment with students' involvement in various forms of bullying categories. School type subgroups included public, gifted, and private schools.

2.3.1.2. Bullying forms. Students' involvement in bullying behaviors (victimization or perpetration) was measured by the Persian- Olweus Bullying Questionnaire (P-OBQ) that is a modified version of the Olweus Bullying Questionnaire (OBQ) validated among Iranian pupils (Rezapour, Khanjani, & Mirzai, 2018a). The perpetration scale includes 11 items that measure physical (hitting, kicking, or pushing another student), verbal (teasing, insulting, or calling other students names), relational (gossiping, telling false stories about others, and excluding others), and cyber forms (sending hurtful emails and text messages, and leaving someone out on purpose). The victimization scale includes 11 items that measure being the victim in the four forms. The internal consistencies of the victimization and perpetration scales are 0.83 and 0.80, respectively. The response options were “never,” “only once or twice,” “2 or 3 times a month,” “about once a week,” or “several times a week”. The cut-off point of “2 or 3 times a month” was recommended as the appropriate cut-off point for dividing data into involved and not involved in victimization or perpetration of bullying (Solberg & Olweus, 2003). According to this cut-off point, pupils were categorized into four groups as not-involved, only-victims, only-bullies and bully-victims; and in verbal, relational, physical, and cyber forms.

2.3.1.3. School environment Scale. Participants completed the school environment scale from the Persian version of the U.S. based MDS3 School Climate Survey that has been validated for Iranian students (Rezapour, Khanjani, & Mirzai, 2018b). The original version of the MDS3 Climate Survey is a self-report multidimensional questionnaire with 54 items and three scales about school climate developed by the Johns Hopkins Center for Youth Violence Prevention (Bradshaw et al., 2014). The environment scale (Cronbach's alpha = 0.84) comprises 4 sub-domains and 17 items: rules and consequences, physical comfort, support, and disorder. All response options were on a 4-point Likert scale from strongly agree to strongly disagree. The exploratory structural equation modeling (ESEM) solution for construct validity showed an excellent goodness of fit ($\chi^2/df = 219.2/74$, CFI = 0.96, TLI = 0.93, RMSEA = 0.04, SRMR = 0.03) (Rezapour et al., 2018b). Factor scores obtained from the exploratory structural equation modeling (ESEM) were used in the subsequent regression analysis as independent variables. Cross loadings of each item on all factors in ESEM solution, decreases the risk of multicollinearity in the subsequent regression analysis outcomes (Marsh et al., 2010).

Five items assessed rules and consequences including the existence and awareness of rules and teachers' classroom management ability (Cronbach's alpha = 0.79). A higher score indicated greater perceptions of regulation. Four items assessed physical comfort including the

overall cleanliness of the school and bathrooms and the temperature of the school (Cronbach's alpha = 0.82). A higher score indicated a greater perception of physical comfort. Students' perception of support was assessed by 3 items including whether someone was available to help students with their problems (teachers at my school help students with their problems) (Cronbach's alpha = 0.77). A higher score indicated greater perceptions of emotional and social support. Five items assessed the existence of disorder in the school. Specifically, 3 items asked about the level of behavioral disruption (misbehaving students get away with it); 2 items measured students´ perception of disorder in school ("there are a lot of broken windows, doors, or desks" and "vandalism of school property is a problem at this school"). But, the items, "Disruptions by other students can get in the way of my learning" and "Misbehaving students get away with it", had a standardized factor loading of 0.18 and 0.30, compared to 0.44–0.65 for the other items in the sub-domain. Removing these items from the sub-domain improved the Cronbach's alpha for the disorder sub-domain from 0.15 to 0.64. Therefore, we measured the disorder sub-domain by three items in the current study. A higher score indicted greater perceptions of disorder.

2.3.2. School-level characteristics

2.3.2.1. School organizational variables. There variables were selected for assessment of the organizational characteristics of schools including: Student-Teacher ratio that was calculated by dividing the number of students to the total number of teachers employed in that school, Space-Student ratio that was calculated by dividing school area size (m^2) to the number of students in school, and Student- Class ratio that was calculated by dividing the number of students in the school to the number of classes in school.

2.3.2.2. Collective-perception of school environment. Four collective-perception variables of school environment (rules, physical comfort, support, and disorder in school) were created by aggregating individual-perception variables of school environment from a lower to a higher level (in our case, the average of students' perceptions in each school).

2.4. Statistical analyses

Descriptive statistics were reported for all variables in this study. Chi square, *t*-test, and one-way ANOVA tests were used for comparing dependent and independent variables across gender, grade levels, and school types. Two-level multinomial logistic regression analysis (random intercept) was conducted to explore the association of both individual and collective (school level) perceptions of school environment sub-domains and various forms, separately. For each form we had four categories (outcomes): only-victim, only-bully, and bully-victim, and not-involved in the same form; which non-involved was the reference category. Thus, each of categories including only-victim, only-bully, and bully-victim were compared with the not-involved in the same form. Student-demographic variables (gender, grade levels, and school types) were adjusted for at student-level and school organizational characteristics (Space-Student ratio, Student–Teacher ratio, and Student- Class ratio) at school-level. Since sampling weights affect the point estimate, and standard errors, they were incorporated into all analyses. Data description and preparation were conducted using SPSS 22 and multilevel analyses by Mplus 7.4 (Muthén &Muthén 1998–2015).

3. Results

Descriptive statistics of independent and dependent variables across gender, grade levels and school types in the sample are presented in Table1. The most common form of bullying was verbal with 32.6% involvement in one of the categories (only-victim, only-bully, and bully-victim), and cyber bullying was the less prevalent form with 4%. Results of Chi-Square tests showed that boys reported significantly more involvement in various forms than girl (*P*-value < .001). 8th grade students reported significantly higher involvement in verbal, relational, and physical forms than 9th and 10th grade students ($p < .01$), while no significant difference was found in the cyber form (*P*-value > .05). The students of public schools reported significantly higher involvement in physical and cyber forms (*P*-value < .01), while no significant differences were found for verbal and relational forms (P-value > .05). Results of *t*-test for gender showed girls had higher individual-perceptions about rules, physical comfort, support, and disorder than boys (*P*-value < .001). But there was no significant differences between girls and boys about the collective-perceptions of school environment sub-domains (*P*-value > .05) except in the disorder domain (P-value < .01). Result of One-way ANOVA showed 10th grade students had higher individual-perceptions about rules, physical comfort, support, and disorder compared with 8th and 9th grades (*P*-value < .001). But there was no significant differences between grade levels about the collective-perceptions of school environment sub-domains (*P*-value > .05) except in the disorder domain (P-value < .01). The result of one-way ANOVA for school types showed that private schools had higher individual-perceptions of rules, physical comfort, support, and disorder (*P*-value < .001). But there was no significant differences between school types about the collective-perceptions of school environment sub-domains (P-value > .05) except in the disorder domain (P-value < .05).

Odds ratios (OR) and 95% confidence intervals (95% CI) of the associations between the individual and collective perception of school environment sub-domains and student's experiences in only-victim, only-bully, and bully-victim of verbal, relational, physical and cyber forms, respectively after controlling for the a fore mentioned confounders using two-level multinomial logistic regression analyses are presented in Table 2 to Table 5. Table 2 shows the association between the predictors and the verbal form. Boys compared with girls had a higher odds for experiencing verbal only-victim (OR = 2.70, *P*-value < .001), verbal only-bully (OR = 3.37, P-value < .001) and verbal bully-victim (OR = 3.42, P-value < .001) relative to not-involved students in the verbal form. The students of public schools compared with gifted schools had a 56% less odds for experiencing verbal only-bully relative to not-involved students in the verbal form. Also by increase in grade level, students had 27% less odds for experiencing verbal only-victim relative to not-involved students in the verbal form. Table 2 shows a high individual-perception of physical comfort and support were related to less involvement in the verbal bully-victim form (OR = 0.72 and 0.74, *P*-value < .05, respectively), while a high individual-perception of disorder in school was related to more involvement in verbal only-victim (OR = 1.73, *P*-value < .001) and verbal only-bully (OR = 1.34, P-value < .05). For school organizational variables, by one unit increase in Student–Teacher ratio, the odds of involvement in verbal only-bully decreased (OR = 0.77, *P*-value < .05). A high collective-perception of rules was related to higher experience of verbal only-bully (OR = 1.99, *P*-value < .05), and also a high collective-perception of disorder was related to higher involvement in verbal only-bully (OR = 2.51, P-value < .05) and verbal bully-victim (OR = 2.14, *P*-value < .05).

Table 3 shows the results for the relational form. Boys compared with girls had a higher odds for experiencing relational only-bully (OR = 3.20, *P*-value < .01) and relational bully-victim (OR = 2.21, P-value < .05) relative to not-involved students in the relational form. A high individual-perception of support was related to less involvement in relational only-bully (OR = 0.56, *P*-value < .05) and relational bully-victim (OR = 0.55, P-value < .001). While a high individual-perception of disorder was related to more involvement in relational only-victim (OR = 1.96, *P*-value < .001). For school organizational variables, by increase in the Student–Teacher ratio, the odds of involvement in relational only-victim decreased (OR = 0.73, *P*-value < .05). And by one unit increase in Space-Student ratio and Student- Class ratio, the

Table 1
Descriptive statistics of independent and dependent variables across gender, grade levels and school types in sample.

Student –level	Total	Gender		p-Value	Grades			p-Value	School types			p-Value
	N = 1540	Girl N = 840	Boy N = 700		8th N = 674	9th N = 602	10th N = 264		Public N = 628	Gifted N = 512	Private N = 400	
Bullying form involvement%												
Verbal form				< 0.001[a]				0.001[a]				0.389[a]
Non-involved	67.5	79.2	53.4		64.4	66.0	78.8		65.1	67.2	71.5	
Only-victim	16.8	13.3	20.9		19.7	16.5	9.9		17.8	16.8	15.0	
Only-bully	7.7	4.1	12.0		7.3	8.5	6.8		7.5	8.4	7.0	
Bully-victim	8.1	3.5	13.7		8.6	9.1	4.6		9.6	7.6	6.5	
Relational form				< 0.001				0.020				0.117
Non-involved	83.3	87.1	78.7		80.6	84.1	88.6		81.2	84.6	85.0	
Only-victim	12.1	10.5	14.0		14.4	11.6	7.2		13.4	10.7	11.8	
Only-bully	2.8	1.3	4.6		2.8	2.3	3.8		2.6	3.5	2.3	
Bully-victim	1.8	1.1	2.7		2.2	2.0	0.4		2.9	1.2	1.0	
Physical form				< 0.001				0.006				< 0.001
Non-involved	87.7	95.7	78.1		85.5	87.7	93.6		83.4	90.6	90.8	
Only-victim	4.6	2.5	7.1		6.2	4.2	1.5		6.5	2.7	4.0	
Only-bully	5.3	1.2	10.3		5.0	6.2	4.2		6.1	5.5	4.0	
Bully-victim	2.3	0.6	4.4		3.3	2.0	0.8		4.0	1.2	1.3	
Cyber form				< 0.001				0.111				0.038
Non-involved	96.0	97.9	93.7		95.0	95.9	98.9		94.1	97.7	96.8	
Only-victim	2.3	1.7	3.0		2.7	2.8	0.0		2.9	1.4	2.5	
Only-bully	1.2	0.2	2.4		1.6	1.0	0.8		2.1	0.8	0.5	
Bully-victim	0.5	0.2	0.9		0.7	0.3	0.4		1.0	0.2	0.3	
Individual-perceptions of school environment: Mean (SD)												
Rules	14.7	14.8	14.6	< 0.001[b]	14.6	14.5	15.2	< 0.001[c]	14.5	14.7	15.0	< 0.001[c]
	(1.0)	(0.9)	(1.0)		(0.9)	(0.9)	(1.0)		(1.0)	(0.8)	(1.1)	
Physical comfort	10.5	10.7	10.4	< 0.001	10.5	10.7	10.8	< 0.001	10.0	10.7	11.0	< 0.001
	(1.4)	(1.4)	(1.4)		(1.3)	(1.3)	(1.7)		(1.4)	(1.4)	(1.2)	
Support	8.7	8.8	8.6	< 0.001	8.8	8.7	8.4	< 0.001	8.7	8.5	9.0	< 0.001
	(0.7)	(0.7)	(0.6)		(0.6)	(0.6)	(0.9)		(0.7)	(0.5)	(0.6)	
Disorder	7.7	8.1	7.3	< 0.001	7.6	7.5	8.3		7.1	8.1	8.2	< 0.001
	(2.2)	(2.1)	(2.3)		(0.8)	(0.8)	(0.8)		(0.9)	(0.8)	(0.5)	
	Total	Gender		p-value	Grades			p-value	School types			
School-level	*N* = 42	Girl *N* = 22	Boy *N* = 20		8th *N* = 18	9th N = 14	10th *N* = 10		Public N = 18	Gifted *N* = 11	Private *N* = 13	p-value
Collective-perception of school environment: Mean (SD)												
Rules	14.7	14.9	14.5	0.284[b]	14.6	14.6	15.2	0.399[c]	14.6	14.8	14.8	0.846[c]
	(1.1)	(1.1)	(1.1)		(1.1)	(1.0)	(1.2)		(1.2)	(0.9)	(1.2)	
Physical comfort	10.4	10.7	10.2	0.233	10.4	11.0	9.8	0.191	10.0	10.6	10.9	0.282
	(1.5)	(1.6)	(1.4)		(1.4)	(1.2)	(1.9)		(1.5)	(1.6)	(1.2)	
Support	8.7	8.7	8.6	0.594	8.6	8.9	8.4	0.312	8.6	8.5	8.9	0.231
	(0.8)	(0.9)	(0.6)		(0.8)	(0.7)	(0.9)		(0.9)	(0.6)	(0.6)	
Disorder	7.8	8.2	7.3	0.001	7.6	7.7	8.3	0.147	7.3	8.2	8.1	0.013
	(0.9)	(0.9)	(0.7)		(0.9)	(0.9)	(0.8)		(1.0)	(0.8)	(0.5)	
School organizational variables: Mean (SD)												
Space-student ratio	10.1	10.3	9.9	0.868[2]	8.5	11.4	11.1	0.509[c]	12.11	11.0	6.5	0.096[c]
	(7.3)	(7.0)	(7.8)		(7.5)	(7.3)	(7.2)		(7.7)	(7.2)	(5.9)	
Student–teacher ratio	7.5	6.4	8.8	0.136	8.7	6.7	6.7	0.479	8.7	7.8	5.8	0.322
	(5.2)	(2.5)	(6.9)		(7.3)	(3.0)	(2.3)		(7.5)	(2.0)	(2.3)	
Student- class ratio	23.9	22.8	25.1	0.174	24.6	23.2	23.8	0.794	24.5	27.1	20.3	0.004
	(5.4)	(5.8)	(4.7)		(4.2)	(6.9)	(5.4)		(4.5)	(3.1)	(6.3)	

The significant odds ratios(***OR***) and their 95% confidence intervals are bolded.
[a] Chi-square test.
[b] T-TEST, Unequal variance estimation.
[c] One-way ANOVA.

odds of involvement in relational bully-victim increased as well (OR = 1.43, *P*-value < .01 and 1.69, P-value < .05, respectively). But, a high collective-perception of support was related to a higher experience of bully-victim in the relational form (OR = 2.96, *P*-value < .01), and also a high collective-perception of disorder was related to higher involvement in relational only-victim (OR = 1.75, *P*-value < .05). While a positive collective-perception of rules was related to less involvement in relational only-victim (OR = 0.53, *P* < .05).

Table 4 shows the association between the predictors and the physical form. Boys compared with girls had higher odds for experiencing physical only-bully (OR = 6.36, P-value < .001) and physical bully-victim (OR = 3.79, P-value < .001) relative to not-involved students in the physical form. The students of public schools compared with gifted school had 2.78 times higher odds for experiencing physical bully-victim relative to not-involved students in the physical form. While by increase in grade level students had 43% less odds for experiencing physical only-victim relative to not-involved students in the physical form. Results show no association between the individual-perception of school environment sub-domains and categories of physical bullying, but by one unit increase in the Space-Student ratio and Student–Teacher ratio, the odds of involvement in physical form as only-victim (OR = 0.59, *P*-value < .05) and bully-victim (OR = 0.77, *P* < .05) decreased. A high collective-perception of physical comfort

was related to more involvement in the physical form as only-victim (OR = 2.57, *P*-value < .05). In addition, a high collective-perception of disorder at school-level was related to more involvement in the physical form as only-victim (OR = 2.92, *P*-value < .001) and only-bully (OR = 4.39, P-value < .001). And a high collective-perception of support at school-level was related to more involvement in the physical form as bully-victim (OR = 2.44, *P*-value < .01).

Table 5 shows the association between the predictors and the cyber form. Boys had 2.92 times higher odds than girls for involvement in cyber only-bully. Result shows a high individual-perception of support was related to less involvement in cyber bully-victim (OR = 0.28, *P*-value < .001), while a high collective-perception of disorder was related to more involvement in cyber form as only-victim (OR = 2.53, P-value < .05), only-bully (OR = 3.55, P-value < .001), and bully-victim (OR = 2.83, P-value < .001). Also, by increase in Student–Teacher ratio, the odds of involvement in cyber bullying as only-bully decreased (OR = 0.77).

4. Discussion

This study adds to the extant literature about macrosystems of the social–ecological model through investigating associations between bullying forms and students' perception of school environment at the individual- and school-level, using multilevel modeling. Accordingly, school environment, as an upper-level construct relative to individual factors, can affect various forms of bullying. Consistent with the study of Wang et al. (2009) in US, in our results the verbal form of bullying was the most common and the cyber form is the least commom. Similar to our study, Gregory et al. (2010) in US and Han et al. (2017) in China have also shown that boys are more engaged in perpetration and victimization of bullying. Our results showed that boys had higher odds for experiencing only-bully in all forms, bully-victim in all forms except in cyber form, and verbal only-victim. Public schools relative to gifted schools had higher reports of physical bully-victim, but lower reports of verbal only-bully. In addition, consistent with previous studies (Cornell & Huang, 2016; Han et al., 2017) by increase in the grade level of students, their odds for involvement in only-victim in the verbal and physical forms decreased.

4.1. School environment sub-domains

Inconsistent with previous studies in United States (Cornell et al., 2015; Gregory et al., 2010; Hung et al., 2015; Jeong et al., 2013), Sweden (Låftman et al., 2017), Canada (Konishi et al., 2017), our findings indicated that individual-perception of rules were not significant predictors for only-victim, only-bully, and bully-victim in all forms. This may be due to the fact that in Iranian schools, there are no specific rules and regulations for controlling bullying behaviors, and therefore there is no significant difference between school types in the school-level perception of rules domain. But a high collective-perception of rules was related to lower odds of relational only-victim, because schools with positive perceptions of rules had high student connectedness (Rezapour et al., 2018b).

Consistent with previous studies done in the US (Williams et al., 2018) and France (Richard et al., 2012) our findings showed a high individual-perception of physical comfort in school is related to lower reports of students´ involvement in bully-victim in the verbal form. While schools with high scores of physical comfort (a high collective-perception of physical comfort at school-level) were related to higher reports of students´ involvement in physical only-victim. This may be because schools in Iran are similar in regard to crowding and physical aspects (Table 1), but there are managemental differences between public, gifted and private schools (Habibi & Damzas, 2010; Khorasani, 2016).

Consistent with previous studies (Cornell et al., 2015; Flaspohler et al., 2009; Gregory et al., 2010; Turner et al., 2014), our findings showed a high individual-perception of support in school is related to lower reports of students´ involvement in bully-victim of all forms except in the physical form, and relational only-bully. But schools with high scores in the support domain (a high collective-perception of support in school-level) had higher reports of students´ involvement in bully-victim of relational and physical forms. Perhaps this is an ecological fallacy that has been controlled here. That is, in schools that have a high prevalence of bullying behaviors (both in perpetrator and in victimization), teachers, parents and councillors try to support the victims. Therefore a positive correlation is seen between support and bullying behaviors. Konishi et al. (2017) in Canada showed a positive perception of adult support at student-level and school-level (collective-perception) increases traditional and cyber victimization, while a positive perception of adult support at student-level decreases perpetration of cyber bullying. These researchers also showed a positive perception of peer-support at student-level was related to decreased involvement in traditional and cyber victimization, but a positive perception of peer-support at school-level was related to decreased involvement in cyber victimization and perpetration. Wei et al. (2010) in Taiwan showed a positive perception of teacher support by students, is significantly associated with lower levels of perpetration in the physical and verbal form. Gage et al. (2014) in a study from the US, New-England states showed a positive students´ perception about adult support (e.g., “At my school, there is a teacher or other adult whom I can trust”) in their school was associated with lower reports of victimization of bullying.

Finding of the current study showed a high individual-perception of disorder in school was related to higher student involvement in only-victim of verbal and relational form, and verbal only-bully. Consistent with the individual-level, a high collective-perception of disorder in school was related to higher reports of students´ involvement in only-victim of all forms except in the verbal form, only-bully of all forms except the relational form, and bully-victim of verbal and cyber form. Bradshaw et al. (2015) in 52 Maryland high schools showed that vandalism in schools was associated with a lower odds of students' physical and relational victimization, while more broken lights in schools was related to an increased odds of being victimized in relational and total bullying. In addition, consistent with our study, Richard et al. (2012) in France showed that behavioral problems in class, at school-level, increase involvement in physical victimization, but there was no association between victimization in the verbal and relational forms and behavior problems in class.

4.2. School organizational variables

Inconsistent with previous studies (Bradshaw et al., 2009; Wei et al., 2010), our results show that high Student–Teacher ratio was related to lower only-victim of relational form, only-bully of verbal and cyber form, and bully-victim of physical form. In addition, high Space-Student ratio (or lower overcrowding in schools) was associated with lower physical only-victim and high relational bully-victim as well as high Student-Class ratio (or higher overcrowding in classroom) was related to higher relational bully-victim. These controversial results may be related to the school culture in Iran. Soori et al. (2014) in Iran showed that only 7.2% of bullying behaviors occur in class (when the teacher was not in the room), while 24% of bullying behaviors occur in the playground/athletic field during recess or break times.

4.3. Limitation

This study had several limitations. First, it was a cross-sectional study; thus, causal inferences cannot be made. Future studies should better consider longitudinal and experimental interventions to demonstrate causal effects. Second, school environment was assessed according to the perceptions of eighth-, ninth-, and tenth-grade students. Students might not be able to properly assess their school environment.

Table 2
Odds ratios and 95% confidence intervals of the association between school environment sub-domains and verbal form of bullying using two-level multinomial logistic regression analysis.

Verbal form	Only-victim[1]	Only-bully[1]	Bully-victim[1]
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Student, level characteristics			
Student-demographic variables			
Gender (ref: girl)	**2.70(1.68, 4.34)*****	**3.37(2.11, 5.37)*****	**3.42(2.54, 4.6)*****
School types (ref: Gifted school)			
Public school	0.74(0.33, 1.66)	**0.44(0.21, 0.92)***	0.83(0.43, 1.64)
Private school	0.76(0.37, 1.57)	0.97(0.41, 2.29)	1.04(0.47, 2.28)
Grade	**0.73(0.55, 0.99)***	1.03(0.76, 1.39)	0.96(0.78, 1.19)
Individual-perception of school environment			
Rules	0.76(0.57, 1.03)	0.71(0.49, 1.04)	0.77(0.56, 1.06)
Physical comfort	0.92(0.57, 1.48)	0.87(0.63, 1.21)	**0.72(0.54, 0.97)***
Support	0.82(0.56, 1.19)	0.71(0.51, 1.00)	**0.74(0.56, 0.98)***
Disorder	**1.73(1.30, 2.29)*****	**1.34(1.04, 1.72)***	1.01(0.79, 1.29)
School-level characteristics			
School organizational variables			
Space-Student ratio	0.95(0.5, 1.79)	0.87(0.59, 1.29)	0.88(0.54, 1.41)
Student–Teacher ratio	0.55(0.21, 1.41)	**0.77(0.61, 0.98)***	1.13(0.78, 1.63)
Student-Class ratio	1.84(0.94, 3.6)	1.22(0.71, 2.11)	1.24(0.79, 1.96)
Collective-perception of school environment			
Rules	0.5(0.17, 1.48)	**1.99(1.06, 3.75)***	1.4(0.63, 3.08)
Physical comfort	1.35(0.33, 5.48)	0.93(0.36, 2.43)	1.51(0.54, 4.22)
Support	2.00(0.67, 6.01)	1.03(0.41, 2.57)	1.18(0.4, 3.45)
Disorder	1.76(0.73, 4.21)	**2.51(1.22, 5.18)***	**2.14(1.08, 4.25)***

The significant odds ratios(***OR***) and their 95% confidence intervals are bolded.
*** $P < .001$.
* $P < 0.05$.
[1] Non-involved in verbal form is the reference category.

Using multiple sources of information (e.g., teacher, parents, school principal) is recommended in future research. Third, bullying behaviors and perception of school environment were assessed using self-reports, which may be susceptible to recall bias and social desirability bias. Using peer nomination accompanied by self-reports of bullying is recommended in future research. Forth, with regard to low prevalence of the cyber form and the number predictors used in this study, the results should be interpreted by caution. Fifth, this study focused on the main effects of student- and school-level predictors. Within and cross-level interactions should be explored in future research. Sixth, the

Table 3
Odds ratios and 95% confidence intervals of the association between school environment sub-domains and relational form of bullying using two-level multinomial logistic regression analysis.

Relational form	Only-victim[1]	Only-bully[1]	Bully-victim[1]
Student-level characteristics	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*
Student-0demographic variables			
Gender (ref: girl)	1.39(0.92, 2.11)	**3.20(1.54, 6.65)****	**2.21(1.21, 4.04)***
School types (ref: Gifted school)			
Public school	0.85(0.40, 1.8)	0.69(0.31, 1.53)	2.62(0.85, 8.06)
Private school	0.77(0.42, 1.43)	0.61(0.23, 1.6)	1.27(0.26, 6.12)
Grade	0.71(0.45, 1.13)	1.01(0.60, 1.69)	0.78(0.49, 1.24)
Individual-perception of school environment			
Rules	0.92(0.54, 1.58)	0.67(0.43, 1.05)	1.36(0.60, 3.08)
Physical comfort	0.8(0.47, 1.36)	1.24(0.78, 1.97)	0.71(0.46, 1.10)
Support	0.69(0.42, 1.14)	**0.56(0.36, 0.88)***	**0.55(0.39, 0.78)*****
Disorder	**1.96(1.42, 2.71)*****	0.83(0.53, 1.30)	0.62(0.36, 1.07)
School-level characteristics			
School organizational variables			
Space-student ratio	1.3(0.85, 1.98)	0.41(0.16, 1.02)	**1.43(1.12, 1.82)****
Student–teacher ratio	**0.73(0.57, 0.95)***	1.00(0.39, 2.58)	0.94(0.77, 1.13)
Student-class ratio	1.3(0.83, 2.03)	0.58(0.23, 1.46)	**1.69(1.10, 2.61)***
Collective-perception of school environment			
Rules	**0.53(0.29, 0.95)***	1.7(0.35, 8.22)	0.8(0.40, 1.63)
Physical comfort	2.07(0.96, 4.45)	1.00(0.05, 19.38)	0.66(0.34, 1.26)
Support	1.80(0.89, 3.65)	0.73(0.05, 11.29)	**2.96(1.38, 6.33)****
Disorder	**1.75(1.01, 3.03)***	1.92(0.23, 16.17)	1.14(0.58, 2.25)

The significant odds ratios(***OR***) and their 95% confidence intervals are bolded.
*** $P < .001$.
** $P < .01$.
* < 0.05.
[1] Non-involved in relational form is the reference category.

Table 4
Odds ratios and 95% confidence intervals of the association between school environment sub-domains and physical form of bullying using two-level multinomial logistic regression analysis.

Physical form	Only-victim[1]	Only-bully[1]	Bully-victim[1]
Student-level Characteristics	OR (95% CI)	OR (95% CI)	OR (95% CI)
Student-demographic variables			
Gender (ref: girl)	2.08(0.87, 4.93)	**6.36(4.94, 8.18)*****	**3.79(2.17, 6.63)*****
School types (ref: Gifted school)			
Public school	2.24(0.89, 5.64)	1.07(0.67, 1.73)	**2.78(1.74, 4.45)*****
Private school	1.31(0.34, 5.11)	0.97(0.47, 1.98)	0.70(0.30, 1.66)
Grade	**0.57(0.38, 0.86)****	0.95(0.78, 1.15)	0.84(0.57, 1.24)
Individual-perception of school environment			
Rules	0.64(0.28, 1.46)	1.01(0.76, 1.34)	1.22(0.70, 2.12)
Physical comfort	0.77(0.36, 1.65)	0.86(0.66, 1.13)	1.05(0.66, 1.67)
Support	1.70(0.85, 3.40)	0.78(0.60, 1.01)	0.63(0.39, 1.01)
Disorder	1.01(0.66, 1.53)	0.89(0.75, 1.05)	0.72(0.48, 1.08)
School-Level Characteristics			
School Organizational variables			
Space-Student ratio	0.59(0.36, 0.96)*	0.59(0.13, 2.63)	0.91(0.64, 1.30)
Student–Teacher ratio	1.07(0.85, 1.36)	0.62(0.27, 1.45)	**0.77(0.61, 0.98)***
Student-Class ratio	0.90(0.55, 1.47)	1.15(0.33, 3.97)	1.49(0.84, 2.63)
Collective-perception of school environment			
Rules	0.77(0.35, 1.71)	1.47(0.53, 4.09)	0.67(0.36, 1.25)
Physical comfort	2.57(1.19, 5.55)*	2.53(0.41, 15.74)	1.25(0.61, 2.57)
Support	0.71(0.28, 1.84)	0.41(0.06, 2.94)	**2.44(1.29, 4.6)****
Disorder	2.92(1.51, 5.63)***	**4.39(2.75, 6.99)*****	1.58(0.69, 3.6)

The significant odds ratios(***OR***) and their 95% confidence intervals are bolded.
*** $P < .001$.
** $P < .01$.
* < 0.05.
[1] Non-involvement in Physical bullying is the reference category.

current study focused on school environment, future research should explore the association between other social-ecological factors and bullying behaviors in Iran. Seventh, the current study focused on bullying perpetration, victimization, and both in various forms, and did not gather information from bystanders. Eighth, for disorder domain, due to the omission of the "misbehaving students get away with it" item, information was not gathered in this area, but might be worth inquiring in future studies, whether students perceive their peers as rewarding or accepting bullying behaviors or not. Finally, the findings of this study were from one province in northern Iran; therefore, considering the cultural and linguistic diversity in Iran, the results might not be generalizable to the whole nation.

Table 5
Odds ratios and 95% confidence intervals of the association between school environment sub-domains and cyber form of bullying using two-level multinomial logistic regression analysis.

Cyber form	Only-victim[1]	Only-bully[1]	Bully-victim[1]
Student-level Characteristics	OR (95% CI)	OR (95% CI)	OR (95% CI)
Student-demographic variables			
Gender (ref: girl)	0.93(0.05, 17.2)	**2.92(1.13, 7.55)***	1.35(0.48, 3.77)
School types (ref: Gifted school)			
Public school	0.64(0.01, 145.3)	0.98(0.05, 18.47)	1.91(0.64, 5.67)
Private school	3.88(0.05, 292.6)	1.77(0.43, 7.26)	1.31(0.30, 5.62)
Grade	0.71(0.23, 2.16)	0.86(0.43, 1.71)	1.06(0.51, 2.22)
Individual-perception of school environment			
Rules	1.69(0.46, 6.25)	1.51(0.62, 3.68)	1.99(0.89, 4.43)
Physical comfort	0.44(0.11, 1.68)	0.61(0.28, 1.35)	1.17(0.67, 2.05)
Support	1.22(0.42, 3.54)	0.61(0.29, 1.30)	**0.28(0.20, 0.38)*****
Disorder	0.79(0.35, 1.74)	0.55(0.29, 1.02)	0.77(0.55, 1.07)
School-Level Characteristics			
School Organizational variables			
Space-Student ratio	0.97(0.62, 1.49)	0.69(0.29, 1.68)	0.97(0.76, 1.23)
Student–Teacher ratio	1.03(0.84, 1.26)	**0.77(0.60, 0.98)***	0.80(0.58, 1.11)
Student-Class ratio	1.29(0.49, 3.38)	1.40(0.81, 2.42)	1.07(0.70, 1.63)
Collective-perception of school environment			
Rules	0.65(0.29, 1.45)	1.01(0.61, 1.68)	0.58(0.27, 1.22)
Physical comfort	1.59(0.54, 4.70)	1.82(0.77, 4.32)	1.90(0.88, 4.08)
Support	1.07(0.30, 3.80)	0.72(0.37, 1.39)	1.03(0.45, 2.38)
Disorder	**2.53(1.20, 5.34)***	**3.55(2.49, 5.05)*****	**2.83(1.65, 4.85)*****

The significant odds ratios(***OR***) and their 95% confidence intervals are bolded.
*** $P < .001$.
* $P < 0.05$.
[1] Non-involved in cyber form is the reference category.

4.4. Implication

Given of the fact that there are no systematic prevention interventions for bullying in Iranian school, these findings can inform policymakers about bullying-related behaviors and its occurrence circumstances, and highlight research needs and opportunities, and offer a perspective for future research. Also these results provide information for policymakers, school administrators, teachers, and parents to control bullying behaviors. Overall, we can provide a supportive school environment and an effective bullying program with focusing on efforts in two areas: 1) increasing staff, students, and parents awareness to bullying and victimization, and how to deal with it; and 2) promoting more care, monitoring, and rules. We can promote a positive school environment by several strategies including maintaining a clean, comfortable, and well-maintained school, using regularly monitored security cameras, conducting small group sessions for students with behavior problems, offering counselling for troubled students, talking with students about personal and academic concerns, and creating opportunities for students to be involved in decision-making in their school. In recent years, the use of the whole school approach based on the social-ecological theory advices both student- and school- levels changes to increase positive school environment in order to reduce bullying incidents at schools (Chan & Wong, 2015b). The Olweus Bullying Prevention Program (OBPP) is one of programs that was designed to promote a safe and supportive school environment through the whole school approach. This program follows the long-term aim to alter students' attitudes and perceptions toward bullying behaviors (Olweus, 1994).

5. Conclusion

Our findings add to the literature by providing a further investigation of school environment as a contextual factor associated with bullying not only in Iran, but also in the Middle East context, which can be used for cross-cultural studies that systematically compare the risk factors of bullying in different contexts. Our results suggest that when students have a positive perception about their school environment, they are less likely to get involved in bullying. Overall, the current study showed that students' perception about disorder is an important sub-domain in the school environment, and it is significantly related to all forms of bullying. This study does not support the association between school rules (high disciplinary structure) and bullying behaviors. More research is needed to explore the association between the rules sub-domain and other domains of school climate in Iran.

Conflict of interest

The authors have no conflict of interest to declare.

Declaration of interest

None.

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