

DOI: 10.1002/pits.22178

## RESEARCH ARTICLE

WILEY

# Verifying the ecological model of peer aggression on Croatian students

Tena Velki<sup>1,2</sup> 

<sup>1</sup>Josip Juraj Strossmayer University of Osijek, Osijek, Croatia

<sup>2</sup>Department of Social Science, Faculty of Education, Josip Juraj Strossmayer University in Osijek, Osijek, Croatia

**Correspondence**

Tena Velki, Department of Social Science, Faculty of Education, Josip Juraj Strossmayer University in Osijek, Cara Hadrijana 10, 31000 Osijek, Croatia.  
Email: [tvelki@foozos.hr](mailto:tvelki@foozos.hr)

**Abstract**

Using the ecological approach, the goal of this study was to determine the predictors of physical and verbal peer aggressive behavior. The participants were 880 school students from the fifth to eighth grade (48% boys and 52% girls) and the same number of parents (19% fathers and 61% mothers) as well as 107 teachers. The main analysis was performed using multivariate-multilevel modeling. The following significant predictors of physical peer aggression were obtained: Boys, a greater degree of impulsivity, more parental punishment, poorer school success, more time spent with the media, and the perception of great neighborhood dangerousness. For verbal peer aggression, the significant predictors were: A greater degree of impulsivity, lower level of affective empathy, more parental punishment, lack of parental supervision, lesser peer acceptance, large differences in family income, more time spent with the media, and the perception of great neighborhood dangerousness. A moderating effect of neighborhood dangerousness and parental supervision was found. The results were interpreted within Bronfenbrenner's ecological model.

**KEYWORDS**

ecological model, elementary school children, peer aggression, predictors

## 1 | INTRODUCTION

In recent literature, there is much debate about the distinction between the terms bullying and peer aggression, which are in many studies used as synonyms (Cornell, Bandyopadhyay, & Espelage, 2010). Peer aggression is defined as all behaviors intended to physically or psychologically hurt or harm another person (Berkowitz, 1993; Hawley & Vaughn, 2003). Bullying is considered as a more severe form of aggression (Olweus, 1993). A commonly

used and widely accepted definition of bullying is Olweus' adapted definition (Whitney & Smith, 1993), "We say a child is being bullied or picked on, when another child or a group of children say nasty and unpleasant things to him or her. It is also bullying when a child is hit, kicked, threatened, locked inside a room, sent nasty notes, when no one ever talks to them, and things like that. These things can happen frequently, and it is difficult for the child being bullied to defend him or herself. It is also bullying when a child is teased repeatedly in a nasty way. But it is *not bullying* when two children of about the same strength have the odd fight or a quarrel." (p. 7). By comparing these two definitions, it can be concluded that bullying and peer aggression may look behaviorally the same but bullying has some additional distinctive characteristics, that is, it is intentional, repetitive, and behavior with an imbalance in power and/or strength between the victim and the bully (Olweus, 1993).

## 2 | A REVIEW OF STUDIES ON THE APPLICATIONS OF ECOLOGICAL MODELS TO THE PROBLEM OF BULLYING AND PEER AGGRESSION

Even though many studies have dealt with the issue of bullying and peer aggression, only a limited number of these took into account the complexity of this phenomenon and in accordance with this researched bullying and peer aggression as part of more complex models of human behavior, such as Bronfenbrenner's ecological model (Swearer & Doll, 2001; Swearer & Espelage, 2004).

One of the first studies that applied Bronfenbrenner's ecological model was the study conducted by Khoury-Kassabri, Benbenishty, Avi Astor and Zeira (2004). The authors tested the predictors of student victimization in elementary and middle school students, but did not test the predictors of bullying or peer aggression. The socioecological model of bullying in the United States was tested by Swearer et al. (2006) who showed that negative school climate and socializing with peers who had positive attitudes toward bullying were good predictors of bullying. This was one of the first published studies that applied the ecological model in testing the predictors of bullying. Espelage and Swearer (2009) tested the moderator effect of school climate in the ecological model of bullying on middle school students. They tested both groups of predictors for bullying and victimization and reported that the use of alcohol and drugs, depression and suicidal thoughts, negative peer pressure, and lack of parental care were significant predictors of bullying. School climate had significant positive moderator effects. As a result of the positive influence of school climate, the correlation between the lack of parental care, and negative peer pressure with bullying was decreasing. The same authors (Espelage & Swearer, 2009) tested the ecological model of bullying on a representative sample of middle school students and showed that previous victimization, negative family environment, a higher level of delinquency in school, and the use of drugs and alcohol were significant predictors of bullying.

Barboza et al. (2009) used the definitional approach and tested the predictors of bullying from all levels of the ecological model on an US national sample of elementary school students. Significant predictors of bullying were the following: Helplessness, previous victimization, increase in parents' income, race (white/Caucasian children), communication problems with parents, greater acceptance by peers and more friends, indifference of teachers, low expectations of academic achievement by parents and teachers, permissiveness of parents and teachers, negative school climate, and more hours spent watching television. Bowes et al. (2009) conducted the first longitudinal study that tested the ecological model of bullying in the United States on a national sample of twins. Significant predictors were the following: externalized child behavior, low family socioeconomic status (SES), parental antisocial behavior, domestic violence, maternal indifference, child abuse, and a large number of children in school. Bullying behavior was operationalized through interviews with mothers without a clear definition. Carvalhosa (2009) tested the ecological model of bullying on elementary and high school students by using the definitional approach, but the data was more than 10 years old. Bullying was predicted by externalizing behaviors, lower support from teachers and the lower or higher gross domestic product (GDP) countries (U-shaped curve). Kim, Orpinas, Kamphaus, and Kelder (2011) tested the influences of four risk domains (individual, family, community, and media) on the

development of peer aggression. Significant predictors of peer aggression were: being male, lower academic achievement, other family living situation (i.e., not living with both parents), low parental monitoring, parental attitude supporting fighting, higher rates of community violence, and more hours spent watching TV.

Lee (2011) conducted research on middle school students in the United States, testing the predictors for bullying from all levels of the ecological model. Among individual characteristics, significant predictors were positive attitude toward aggression and seeking fun. These predictors also affected interaction with peers, which in turn affected the school climate, where a negative school climate increased the incidence of bullying. From the family environment, significant predictors were negative family experience (which leads to the formation of positive attitudes toward aggression and increases seeking fun) and positive parenting (which leads to high self-respect, i.e., a risk factor for bullying). At the mesosystem level, parental communication with teachers and peers significantly affected the individual characteristics of the child and the school climate. The macrosystem had direct and indirect effects on bullying. In cultures in which children perceive the community and peer groups as more collectivistic, they more often perceive the school climate as positive and less often have positive attitudes toward aggression. Collectivist-oriented groups promote a positive school climate, reduce individual aggressive tendencies and prevent the occurrence of bullying.

Outside the United States, in Asia, Lee (2010) first tested the ecological model of bullying on Korean middle school students. Significant predictors were male students, seeking fun, dominance, positive attitudes towards aggression, intolerance of diversity, previous victimization, authoritarian parenting style, weak moral authority of teachers, teachers' lack of concern about the problem of bullying, and pseudofriendship (socializing with dominant or deviant peers). Wei, Williams, Chen, and Chang (2010) conducted similar research on Taiwanese students. For verbal and physical bullying, significant predictors were the following: Being male, depression, delinquent behavior, and lack of support and abuse by teachers. At the exosystem level (school size and the ratio of the number of teacher-students), there were no significant predictors. Yuhong (2012) tested the ecological model on a representative population of high school Chinese students but only for victimization, not for bullying. Another important study was done in Korea. You, Kim, and Kim (2014) examined the long-term effects of individual, family and school factors on bullying and victimization of middle school students. Significant predictors of verbal and physical bullying were being male, a lack of self-control, lack of social skills, higher number of deviant friends, and higher level of parental discord. Additionally, physical bullying was predicted by high level of aggression, lower teacher support, and lack of parental supervision.

In Europe, there was only one study that applied the ecological perspective concerning this problem. In Spain, Ferrer, Ruiz, Amador and Orford (2011) analysed the relationships between community, family, school, and individual characteristic, but tested only the predictors of victimization, not bullying.

### 3 | CONCLUSION ON THE CONDUCTED STUDIES

From this review of the applied ecological framework in the studies of bullying, a significant shift can be noted in the application of the theoretical framework and in the use of an improved methodology and advanced statistical analysis. The measurements of bullying and peer aggression are no longer just self-assessed, but the evaluation is also done by other significant persons (e.g., parents, peers, and teachers). Furthermore, numerous instruments for measuring various correlates of bullying and aggressive behavior have been developed. An important step forward in the use of the statistical analysis, which initially was only univariate analysis (e.g., most commonly used regression analysis and ANOVA), and grew into more complex multivariate analysis (e.g., hierarchical linear modeling and structural equation modeling).

However, only a small number of studies took into account all of these advantages (Table 1). Samples are often not representative (e.g., research on twins; Bowes et al., 2009) which makes it difficult to generalize the obtained results. Furthermore, the studies used different measurement methods of bullying (e.g., self-assessment and

**TABLE 1** Review of studies that applied Bronfenbrenners' ecological model of peer aggression or bullying

Country	Study authors	Sample <sup>a</sup>	Different types of peer violence of bullying	Clear operationalized definition of bullying	Measurement method
Israel	Khoury-Kassabri, Benbenishty, Avi Astor and Zeira (2004)	Nationally representative sample of elementary and middle school students	Physical and verbal-social	No—measured victimization	Behavioral approach
USA	Swearer et al. (2006)	Elementary school students	No	Yes	Behavioral approach
	Espelage and Swearer (2009a)	Middle school students	No	No—only the criteria for peer aggression were met	Behavioral approach
	Espelage and Swearer (2009b)	Representative sample of middle school students	No	No—only the criteria for peer aggression were met	Behavioral approach
	Barboza et al. (2009)	National sample of elementary school students	No	Yes	Definitional approach
	Bowes et al. (2009)	National sample of twins	No	No—interviews with mothers	Behavioral approach
	Carvalho et al. (2009)	Elementary and high school students	No	Yes	Definitional approach
Korea	Kim et al. (2011)	Middle school	No	No—measured peer aggression	Behavioral approach
	Lee (2011)	Middle school students	Relational, verbal, and physical	No—only the criteria for peer aggression were met	Behavioral approach
Taiwan	Lee (2010)	Middle school students	Relational, verbal, and physical	No—only the criteria for peer aggression were met	Behavioral approach
	You et al. (2014)	Middle school students	Relational, verbal, and physical	No—only the criteria for peer aggression were met	Behavioral approach
China	Wei et al. (2010)	Random sample of middle school students	Verbal and physical	No—only the criteria for peer aggression were met	Behavioral approach
	Yuhong (2012)	Representative sample of high school students	No	No—measured victimization	Behavioral approach
Spain	Ferrer, Ruiz, Amador and Orford (2011)	Middle and high school students	Relational, verbal, and physical	No—measured victimization	Behavioral approach

Note. <sup>a</sup>Elementary school students: students from first to sixth grade; Middle school students: students from seventh to ninth grade; High school students: students from 10th or higher grade (usually older than 16 years).

evaluation by peers and teachers, and rarely observation and keeping a diary). The biggest issue was a methodological one, that is, in the definition of bullying the criteria of an intention and an imbalance in power was not met, so they actually tested predictors of peer aggression but reported it as predictors of bullying (Bowes et al., 2009; Espelage & Swearer, 2009a, 2009b; Lee, 2010, 2011; Wei et al., 2010; You et al., 2014). These methodological issues make it difficult to compare the findings and especially to come to firm conclusions. Furthermore, in some studies bullying was operationalized only by one item (definitional approach with a distinct definition of bullying), while in other studies aggression had been divided into different types, for example, verbal and physical (Wei et al., 2010; You et al., 2014) measured with the behavioral approach. Also, there was only one longitudinal study (Bowes et al., 2009) and only one study that directly tested the influence of macrosystem variables (Lee, 2011). Other studies actually tried to predict bullying victimization and not bullying per se (Khoury-Kassabri et al., 2004; Yuhong, 2012).

While there are numerous advantages of using multivariate methods, in the aforementioned studies the authors have not always agreed which variables could have a mediating and which a moderating effect, and generally there has been a fairly small number of studies that explore these effects (except the study of Espelage & Swearer, 2009a). In addition, when using the ecological model, it was not always made clear which variables belong to which level of the model, especially for macrosystem and exosystem level variables, where different authors classified the same variables into different levels of the ecosystem. The studies that had the starting point in ecological theory were mainly carried out in the United States, and only a few in Asia (Taiwan, China, and Korea), while in other cultures (e.g., European cultures, including Croatia) testing the ecological model of bullying or peer aggression has not been done.

Croatia is a good representative example of an Eastern European country, for example, one among countries that have undergone war and had a change of economic policy. In 1991, Croatia declared independence, which led to the Croatian War of Independence that was fought for 4 years following the declaration. Namely, in postwar society violence and aggression may be more often present in the media, as well as considered as more acceptable behavior compared with that in societies that have not seen war for a long time. In addition, Croatia has been going through a transition from socialistic central planning to a free market economy, which has led to changes in the value system from more collectivistic to individualistic and materialistic values. The transition was nontransparent and often criminal as has been depicted in the media. Also, violent and other commercial content have increased as new private media entered the market after decades of exclusively state regulated media. Today, Croatia has a population of 4.28 million, and more than 90% are of Croatian nationality and Roman Catholic. With a long history of education, and today with 55 institutions of higher education, attended by more than 157,000 students, Croatia has a very well developed educational system (99.2% literacy). Since 2013, Croatia has been part of the European Union and today its financial and economic situation (measured by Gini index and GDP—84th place) places Croatia in the middle compared with other countries.

Using the ecological approach for the problem of peer aggression, the study goal was to determine the predictors of peer aggressive behavior among primary school children in Croatia at the four levels of Bronfenbrenner's ecological model (Espelage & Swearer, 2009a; micro-, meso-, and exo-system). The predictors for two different types of aggression, physical and verbal, were tested. In addition, the outcome variables, physical and verbal aggression, were multivariate measures, and consisted of three measures of aggressive behavior toward peers. Although the last level of the ecological model (macrosystem) was not directly tested, the specific characteristics of the Croatian postwar society was discussed in the interpretation of the obtained results.

## 4 | METHODS

### 4.1 | Participants

In the current study, a stratified sample was used. Elementary schools from the eastern part of Croatia were split into small and large ones by the number of their students, and then using a random sample, three large and three

small schools were chosen for participation. The participants were students from the fifth to eighth grade from six schools in the eastern part of Croatia. The total number was 880 participants (52% girls) as well as their parents ( $N = 880$ , 19% fathers, 61% mothers, and 20% of them who did not check gender). The average age of students was  $M = 12.8$  ( $SD = 1.15$ ) years, and the age ranged from 10 to 15 years. Students' teachers ( $N = 107$ ) were also participants (10.2% male, 82.2% female, and 7.6% of them did not check gender).

## 4.2 | Instruments

### 4.2.1 | Peer aggression among school children questionnaire (UNŠD; Velki, Kuterovac Jagodić, & Vrdoljak, 2014)

This instrument was designed for self-assessment of peer aggression and victimization based on the behavioral approach, and consisted of two scales ( $k = 38$ ). The scale of peer aggression among children measures the frequency of aggression committed against peers at school and the scale of peer victimization measures the frequency of experienced aggression at school. The scale of peer aggression among children consists of the subscale of aggression among children in schools (13 items divided into the subscale of verbal aggression [ $k = 6$ ] and the subscale of physical aggression [ $k = 7$ ]) and the subscale of electronic aggression ( $k = 6$ ). For the purpose of the conducted study, only results from the subscale of verbal aggression and the subscale of physical aggression were used. Children indicated the frequency of each committed form of aggression on a 5-point Likert scale where 1 means "never," 2 "rare (a few times per year)," 3 "sometimes (once a month)," 4 "frequently (several times per month)," and 5 "always (nearly every day)." The result for each subscale is computed as the arithmetic mean of responses to the corresponding items, and theoretically ranged from 1 to 5. The internal consistency for the subscale of verbal aggression was  $\alpha = 0.77$  and for the subscale of physical aggression  $\alpha = 0.66$ .

### 4.2.2 | Peer nomination and self-nomination of peer aggression using the definitional approach (Velki, 2012a)

The sociometric technique of peer nomination and self-nomination of peer aggression based on the definitional approach was applied. The students were given the definitions of three different types of peer aggression (verbal, physical, and cyber) and were asked to nominate the classmates from the name list of their class who behave in the described way more often than the other pupils from the class. It was possible for a student to nominate him/herself for the aggressive behavior. The definition of verbal peer aggression included behaviors such as teasing, gossiping, mocking, insulting, and so forth. The definition of physical peer aggression described a person who punches, pushes, hurts, threatens, and so forth. In addition, the definition of cyber peer aggression was presented. Only self-nomination and peer nomination for physical and verbal peer aggression were used in the study. For peer nomination for each student, the total score was formed based on the proportion of nominations from all the students who filled the peer nomination report.

### 4.2.3 | Demographic data

Student filled out a special form with demographic data, for example, age, sex, number of best friends, peer acceptance (two items) and school success (six grades: The academic success from the previous grade and term, the final grade in Mathematics and Croatian at the end of the previous school year and at the end of the previous term).

### 4.2.4 | Empathy questionnaire (Ivanović & Buško, 2008)

The empathy questionnaire measures the degree of empathy for primary school students (from the fifth to eighth grade) and it is divided into two parts ( $k = 22$ ): affective and cognitive aspects of empathy. The affective aspect of

empathy ( $k = 10$ ) is defined as the experience of emotion as a reaction to the emotional state of another person and only this subscale was used in the study. Participants indicated their agreement with the described behavior on a 5-point Likert scale where 0, "means does *not* apply to me at all"; 1, "generally does not apply to me"; 2, "neither applies, nor does not apply"; 3, "generally applies to me"; and 4 "fully applies to me." The result for each subscale is computed as the arithmetic mean of responses to the corresponding items, and theoretically ranged from 0 to 4. The internal consistency for the subscale of affective empathy was high,  $\alpha = 0.79$  ( $k = 10$ ).

#### 4.2.5 | Exposure to the Media Scale (UM; Velki, 2012a)

This self-report scale consists of three items related to the amount of time children spend with media (watching TV daily, playing computer games, and browsing the internet weekly). Students indicated the frequency of time spent with each medium on a 5-point Likert scale where 1 means "never," 2 means use of "less than 3 hr per day/week," 3 means "3 to 5 hr per day/week," 4 means "6 to 10 hr per day/week," and 5 means "the maximum time of use" (more than 10 hr of watching television per day and more than 10 hr per week for internet and computer games). The total score is obtained as the arithmetic mean of answers to all the items and can theoretically range from 1 to 5. The internal consistency was satisfactory but relatively low,  $\alpha = 0.66$ .

#### 4.2.6 | Impulsivity Scale (Vulić-Prtorić, 2006)

The impulsivity scale is part of the wider HIP scale (scale hyperactivity-impulsivity attention) designed to assess hyperactive, impulsive behaviors, and attention problems. HIP is a self-assessment scale, consisting of three subscales ( $k = 19$ ), on which participants on a 5-point Likert scale (from "never" to "very often") evaluate the frequency in which the described behavior occurred to him/her in the last 6 months. The result for each subscale is computed as the arithmetic mean of responses to the corresponding items, and theoretically ranged from 1 to 5. For the purpose of the conducted study only, the impulsivity scale ( $k = 4$ ) was used, and the internal consistency was Cronbach's  $\alpha = 0.72$ .

#### 4.2.7 | Parental behavior questionnaire (URP29; Keresteš, Brković, Kuterovac Jagodić, & Greblo, 2012)

The parental behavior questionnaire examines the most common behavior of a mother and father toward a child. There are three versions of the questionnaire, for the mother, for the father, and for the child. Only a version of the questionnaire for a child was used. This version consists of two identical questionnaires, one related to the mother's behavior and the other to the father's behavior. Each of these two questionnaires consists of 29 items. Participants indicated their agreement with the described mother's/father's behavior on a 4-point Likert scale, wherein 1 means "not true at all"; 2, "not very true"; 3, "quite true"; and 4, "completely true." The result for each subscale is computed as the arithmetic mean of responses to the corresponding items, and theoretically ranged from 1 to 4. The questionnaire has a total of seven subscales: Warmth ( $k = 4$ ), Autonomy ( $k = 4$ ), Intrusiveness ( $k = 4$ ), Supervision ( $k = 4$ ), Permissiveness ( $k = 3$ ), Inductive Reasoning ( $k = 5$ ), and Punishment ( $k = 5$ ). The internal consistency of subscales (Cronbach's  $\alpha$ ) ranged from 0.70 to 0.86. In the preliminary analysis subscale, permissiveness did not have a significant correlation with verbal ( $r = 0.059$ , n.s.) or physical peer aggression ( $r = 0.064$ , n.s.) so it was left out from further analysis.

#### 4.2.8 | Scale of perception of neighborhood dangerousness (POS; Velki, 2012a)

The scale of perception of neighborhood dangerousness consists of six items that measure different types of dangerousness to which children are potentially exposed in the neighborhood. POS is a self-assessment scale on

which participants on a 5-point Likert scale (from “*strongly disagree*” to “*strongly agree*”) indicate their agreement with the statements. The total score is computed as the arithmetic mean of responses to all items, and theoretically ranged from 1 to 5. Internal consistency was Cronbach’s  $\alpha = 0.81$ .

#### **4.2.9 | Croatian School Climate Survey for students (HUŠK-U, version for students; Velki, Kuterovac Jagodić, & Antunović, 2014)**

The Croatian School Climate Survey for students measures a global school climate, that is, the sense of safety and belonging to the school, the relationship between teachers and students, learning atmosphere, parental involvement in school, and predicting the future based on education. It consists of 15 items. HUŠK-U is a self-assessment scale on which participants on a 5-point Likert scale (from “*strongly agree*” to “*strongly disagree*”) indicate their agreement with statements. The total score is computed as the arithmetic mean of responses to all items, and theoretically ranged from 1 to 5. Internal consistency was Cronbach’s  $\alpha = 0.92$ .

#### **4.2.10 | Attendance of parents at the parent–teacher meetings and other school events (Velki, 2012a)**

To evaluate the frequency of attendance of parents to individual meetings, parent–teacher meetings (PTA), and school events, homeroom teachers were asked to estimate the frequency of parents’ arrivals based on the data in the school directory. On a 3-point Likert scale, the homeroom teacher evaluated parents’ arrival by circling the corresponding number, wherein 1, “*meant that parents of that child never come*”; 2, “*that parents of that child sometimes come*”; and 3, “*that parents of the child regularly come.*” The total score is computed as the arithmetic mean of two responses, and theoretically ranged from 1 to 3.

#### **4.2.11 | SES of the family**

The parents provided data on the SES of the family. Three different aspects related to SES (employment, income, and education level) were measured. The parent who filled out the questionnaire gave the information for him/herself and for the other parent (the child’s father/mother). Parents’ answer for every aspect of SES was scored from 1 (lowest SES) to 4 (highest SES). The total score was computed as the arithmetic mean of all items ( $k = 6$ ), and theoretically ranged from 1 to 4. Parents gave demographic data about gender and age and also about the age of their partner.

### **4.3 | Procedure**

The ethical commission at the Faculty of Social Science at the University in Zagreb (Study of Psychology) and the ethical commission at the Faculty of Education at the University of Osijek approved the study. Cross-sectional data were collected during the summer school semester, school year 2011/2012. During the teachers’ meeting, it was explained how the research would be carried out and the homeroom teachers were asked to prepare a list of students from their class so that the instruments (sociometric procedure) could be prepared. At the next PTA meeting, the main researcher explained the purpose of the research and asked parents for written consent for the child’s participation. Parents also gave data about the family SES. Students’ data were collected collectively during classes in schools. Before the data collection, students were clearly reminded of the possibility to give up at any time and guaranteed confidentiality of the data obtained in the study. Data collection lasted about 45 min. During students’ filling out the questionnaires the homeroom teachers evaluated the frequency of parents’ attendance to PTA and other school events.



## 5 | DATA ANALYSIS

Most of the variables were obtained based on the arithmetic means of the above-described items on the questionnaires and scales. For the variable school success, the average values of the sum of the students' academic success from the previous year and from the previous term were used. The achievements in Mathematics and Croatian (with general academic success at the end of the school year/term) were chosen because in elementary school students mostly have very good to excellent grades. Croatian and Mathematics are usually considered to be basic subjects in the elementary school; therefore, the criteria are more severe in comparison to some other subjects (Vrdoljak & Velki, 2012) and give us insights that are more objective. The index of income inequality was obtained based on families' SES, and has provided a more precise measure of inequality within a particular group, in this case within the class that the child attends.

### 5.1 | Multivariate-multilevel modeling (MLM)

All the variables met the assumptions for conducting the MLM analysis (variances were not zero, there is no perfect multicollinearity, the predictors were not correlated with external variables, assumptions about normal distribution of errors and linearity were also met).

At the first level of the model, the latent construct or multivariate outcome (measurement model) has been defined, which consists of three measures of aggressive behavior toward peers (self-assessment of aggressive behavior, peer nomination, and self-nomination for aggressive behavior), previously set up to z-scores. To facilitate the interpretation, all predictor variables were centered on the overall mean (grand-mean centering method).

At the second level of MLM, variables that vary within a group (i.e., between students) were defined. These variables are actually predictors measured on the individual level (for every student) and they were tested as different predictors from the theoretical Bronfenbrenner's ecological model: (a) infrasystem: Sex, age, affective empathy, and impulsivity; microsystem-family: parental punishment, parental inductive reasoning, parental warmth, parental autonomy, parental supervision, and parental intrusiveness; (b) microsystem-peers: number of friends and peer acceptance; microsystem-school: school success; (c) exosystem: time spent using media and perception of neighborhood dangerousness. At the third level of MLM, variables that vary between classes were defined. These variables are group-measured variables for student class, meaning that every student in same class had the same value of this variable, but students from different classes differed on these variables. Three variables were tested as predictors of the ecological model: school climate (estimated by the students-microsystem-school), parents' attendance at the PTA meetings and other school events (mesosystem) and the index of income inequality (mesosystem). At the fourth level of MLM, variables that vary between schools (e.g., school policies against bullying and school climate assessed by teachers) were defined (all students from same school have same score on these variables), but the intraclass correlation coefficient (ICC) did not show a statistically significant variation between schools so these variables were excluded from further analysis. Therefore, the model with three levels was tested and the above described analysis was repeated two times using different criteria variables (physical and verbal aggression). Analyses were done on the variance components (VC) of the covariance structure matrix using the maximum likelihood estimation method.

## 6 | RESULTS

In accordance with the study goal, the significance of the predictors for physical and verbal peer aggression were checked. The results showed (Table 2) that 29.3% (Level 2) of the total variability in physical aggression can be explained by differences among students, while only 4.7% (Level 3) of the total variability can be explained by differences among classes. Although the variability on the third level was less than 5%, Wald Z was statistically

significant ( $p < 0.01$ ), and therefore the significance of predictors on the third level was checked. For verbal aggression, 17.8% (Level 2) of the total variability can be explained by differences among students and 9.9% (Level 3) of the total variability can be explained by differences among classes.

The predictors of peer physical aggression explained 47.14% of the variance on Level 2 (between students), but nonetheless a significant 19.08% still remained unexplained. At the third level, 39.47% of variance (between classes) was explained and another 3.54% of unexplained variance (Table 3, VC in Model A) remained.

For verbal peer aggression there was a significant reduction in variance on both levels of the model. On Level 2 (between students), predictors explained 58.41% of the variance, but there still remained a significant 8.79% of unexplained variance. At the third level, predictors explained 46.22% of variance (between classes) and another 6.73% of unexplained variance remained (Table 3, VC in Model A1).

The model fit for multilevel models of peer physical aggression (Table 2) was tested using the  $\chi^2$  likelihood ratio test. Comparison of Model A with Model B ( $\chi^2 = 26.441$ ;  $p < 0.01$ ) showed a statistically significant improvement of model fit for Model B. In addition, as Model B was extended, comparison with Model C ( $\chi^2 = 7.434$ ;  $p < 0.01$ ) was done, indicating that Model C is better than Model B. Also other indicators of model fit (AIC and AICC; Table 3) showed a better model fit of Model C compared with Models A and B, so it was decided to choose Model C as the final solution.

Model C obtained the following significant predictors of physical aggression toward peers that explained the variability between students: male, poorer school success, more time spent with media, more impulsive behavior, more parental punishment, and a greater perception of neighborhood dangerousness. Furthermore, the Model C had two significant interaction effects, that is, between negative parental discipline and the perception of neighborhood dangerousness (Figure 1) and between impulsivity and parental supervision (Figure 2). Model C had no significant predictors at the third level, between classes (Table 3).

Figure 1 shows the interaction effect of parental punishment and the perception of neighborhood dangerousness on the second level of the model. In cases where the student perceived great neighborhood dangerousness, the parental punishment is more associated with physical aggression toward their peers, but in situations where students perceive medium or low neighborhood dangerousness, this correlation is weaker.

Figure 2 shows the interaction effect of impulsivity and parental supervision on the second level of the model. In cases where students perceive a low level of parental supervision, impulsivity is more strongly associated with physical aggression towards peers, but in situations where students perceive a medium or great level of parental supervision, this correlation is weaker.

**TABLE 2** Estimates of null model of multilevel modeling for criteria variables peer physical aggression and peer verbal aggression

	Parameters	Physical aggression	Verbal aggression
Fixed effects	Intercept	-0.012	0.016
Variance components			
Level 1	Variability in aggression (individual differences)	0.661**	0.728**
Level 2	Variability in aggression within classes	0.047**	0.178**
Level 3	Variability in aggression between classes	0.293**	0.099**
Indicators of model fit	-2 Log likelihood	6022.83	6043.16
	Akaike's Information Criterion (AIC)	6030.83	6051.16
	Hurvich and Tsai's Criterion (AICC)	6030.85	6051.18
	Bozdogan's Criterion (CAIC)	6057.62	6077.96
	Schwarz's Bayesian Criterion (BIC)	6053.62	6073.96

Note. \*\* $p < 0.01$ .

**TABLE 3** Predictors models of multilevel modeling for peer-to-peer physical and verbal aggression

Outcome measures	Parameters	Physical aggression			Verbal aggression
		Model A	Model B	Model C	Model A1
Fixed effects (regression coefficients)	Intercept	0.002	-0.019	-0.033	0.026
Level 2	Gender	-0.219**	-.225**	-.238**	-.020
	Age	0.041	0.038	0.042	0.026
	School success	-0.084**	-0.071**	-0.065**	-0.031
	Affective empathy	-0.061	-0.060	-0.054	-0.077*
	Time spent using media	0.098**	0.104**	0.103**	0.061*
	Impulsivity	0.220**	0.213**	0.206**	0.285**
	Number of friends	-0.006	-0.021	-0.015	-0.034
	Peer acceptance	0.011	0.004	0.003	-0.090*
	Parental inductive reasoning	0.089*	0.090*	0.079	0.066
	Parental punishment	0.106**	0.099*	0.109**	0.149**
	Parental warmth	0.052	0.011	0.003	0.019
	Parental autonomy	-0.131*	-0.112	-0.104	0.024
	Parental intrusiveness	-0.030	-0.040	-0.040	-0.016
	Parental supervision	-0.072	-0.089*	-0.073	-0.120**
	Neighborhood dangerousness	0.201**	0.167**	0.170**	0.115**
Interactions on second level	Parental punishment × neighborhood dangerousness	-	0.222**	0.229**	-
	Impulsivity × parental supervision	-	-	-0.108**	-
Level 3	School climate	0.050	0.051	0.057	0.124
	Parents attendance at the school	-0.016	-0.036	-0.036	0.151
	Index of income inequality	2.242*	2.045	2.029	4.836**
Variance components					
Level 1	Variability in aggression (individual differences)	0.627**	0.628**	0.628**	0.715**
Level 2	Variability in aggression within classes	0.155**	0.141**	0.137**	0.074**
Level 3	Variability in aggression between classes	0.029*	0.029**	0.030**	0.053**
Indicators of model fit	-2 Log likelihood	5545.41	5518.97	5511.54	5640.31
	Akaike's Information Criterion (AIC)	5589.41	5564.97	5559.54	5684.31
	Hurvich and Tsai's Criterion (AICC)	5589.89	5565.49	5560.10	5684.79
	Bozdogan's Criterion (CAIC)	5736.24	5718.48	5719.72	5831.14
	Schwarz's Bayesian Criterion (BIC)	5714.24	5695.48	5695.72	5809.14
Degrees of freedom	Number of parameters	22	23	24	22

Note. \*\* $p < 0.01$ .

\* $p < 0.05$ .

Table 3 shows the final predictor model for verbal peer aggression. For Model A1 data indicated that verbal aggression toward peers can be predicted on the basis of a lower level of affective empathy, more time spent with media, more impulsive behavior, less peer acceptance, more parental punishment, less parental supervision, and perception of greater neighborhood dangerousness. Only one significant predictor was at the third level, index of income inequality, which explains the variability between classes. There were no significant interactions of predictors on the second level of the model, and also there were no significant variation of the second level predictor variables between classes (Table 4), so the final model was Model A1.

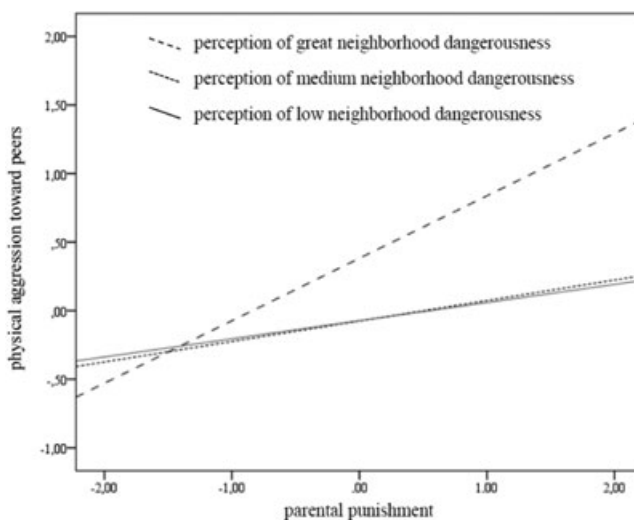
## 7 | DISCUSSION

### 7.1 | Predicting physical and verbal peer aggression

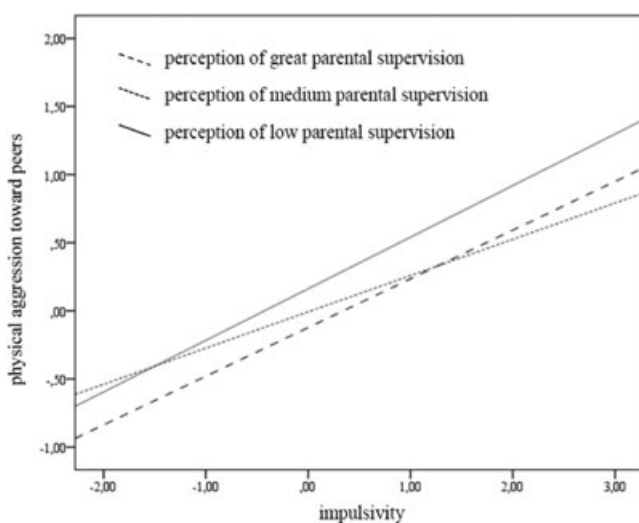
Numerous studies have dealt with the prediction of bullying (Barboza et al., 2009; Bowes et al., 2009; Cook, Williams, Guerra, Kim, & Sadek, 2010; Lee, 2011), however, only a small number of them have dealt with the predictors of various types of peer aggression such as physical and verbal aggression (Marini et al., 2006; Wei et al., 2010).

From the infrasystem level of Bronfenbrenner's ecological model, male gender, a higher level of impulsivity and lower level of empathy were significant predictors of peer aggression. Consistent with previous studies, gender was a significant predictor of physical peer aggression (Kim et al., 2011; Wei et al., 2010; You et al., 2014) but not of verbal aggression (Archer, 2004; Björkqvist, 2017). In addition, impulsivity was a significant predictor for both types of peer aggression, while affective empathy was a significant predictor of verbal aggression.

Teachers should approach every student individually, taking into account his/her specific characteristics. In accordance with biological theories of aggression, boys, because of a greater amount of testosterone and their genetic predisposition, are more prone to aggressive behavior (Constantino et al., 1993a, 1993b; Mazur & Booth, 1998). Gender-role socialization, especially in stereotypical gender role families, influences boys to exhibit more aggressive attitudes and behaviors (Endendijk et al., 2017). Expression of these aggressive behaviors is predominant in the school environment. In postwar society, boys often hear stories about war heroes; men who showed strength and courage through violence in war (Keresteš, 2002) and especially if children have a male teacher who participated in a patriotic war, children identify with that heroic aggressive behavior (Groebel, 1999). Boys are also four times more often diagnosed with ADHD, especially the impulsive type (Velki, 2012c), and generally express a lower level of empathy (Espelage, Mebane, & Swearer, 2004; Gini, Albiero, Benelli, & Altoè, 2007). Generally, studies have shown that hyperactive children, especially those with significant impulsivity, are more often involved in aggressive behavior and bullying (Velki & Dudaš, 2016; Velki & Romstein, 2016). Impulsive children have a low tolerance to frustration and often react inappropriately (i.e., aggressively) in neutral situations. Furthermore, this is a bigger issue for impulsive children, who have a low tolerance to frustration and often react aggressively in neutral situations, especially if there is a lack of teachers' supervision. In addition, children with lower levels of affective empathy are not able to sympathize with others. They rationalize their aggressive behavior



**FIGURE 1** Interaction effects between parental punishment and perception of neighborhood dangerousness for physical aggression toward peers at the second level of model (within the class)



**FIGURE 2** The interaction effect between impulsivity and parental supervision for physical aggression toward peers on the second level of model (within the class)

**TABLE 4** Variations of predictors from the second level of the model (between students) on the third level (between classes) for verbal peer aggression

Variance components	Variables	Coefficients
Level 1	Variability in aggression	0.713**
Intercept <sub>2</sub>	Within classes	0.048*
	Affective empathy	0.017
	Time spent using media	0.008
	Impulsivity	0.010
	Peer acceptance	0.019
	Parental punishment	0.00
	Parental supervision	0.00
	Neighborhood dangerousness	0.009
Intercept <sub>3</sub>	Between classes	0.051**

Note. \*\* $p < 0.01$ .

\* $p < 0.05$ .

as fun without realizing the consequences. The combination of those individual characteristics presents risk behavior for development of aggression in schools.

At the microsystem level, significant predictors of peer aggression were the following: more parental punishment, less parental supervision, poorer school success, and a lower level of peer acceptance. Parental punishment was significant in predicting verbal and physical peer aggression, and parental supervision in predicting verbal aggression. Harsh discipline, especially in families prone to corporal punishment, often borders on abusive parenting behavior, which is a good predictor of aggressive behavior (Bender et al., 2007; Bowes et al., 2009; Gershoff, 2002), and in the conducted study parental punishment (e.g., item *slaps me when I act badly*) indirectly indicates possible abuse. Harsh disciplining of children is considered as a desirable way of upbringing in a traditional society such as Croatia and a study shows that parents believe physical punishment is justified; moreover, 100% of parents of primary school children sometimes physically punish their child (Velki & Bošnjak, 2012). Children learn such aggressive behavior at home and transfer it to school situations in relationships with peers. In families with weak parental supervision, there is neither

control over children's activities, nor the correction of inappropriate behavior and children are more prone to engage in violent activities because they think they will go unpunished (Loeber & Hay, 1997; Yahav, 2007).

Parental supervision also has a moderating role (Figure 1). Impulsive children, due to inability to control their own behavior, often enter a situation of conflict and react violently without thinking. When parents do not supervise and control an impulsive child, the child does not adopt the appropriate form of behavior and does not learn self-control of his/her impulsive behavior, which will lead to the greater expression of aggression (Velki, 2012c). If parents constantly supervise the child and prevent the child's impulsive response on time, consequently the child's aggressive behavior will be reduced as well. Because of the economic crises in Croatia usually both parents need to work and the child is most of the time without their supervision.

Furthermore, peers and school microsubsystems have an important role in school adjustment. Student's grades, as well as peer relations, are an important part of their everyday school life. Consistent with previous studies, poor school success is a significant predictor of physical aggression (Kim et al., 2011; Orpinas & Horne, 2006) while a lower level of peer acceptance is a significant predictor for verbal peer aggression (Asher & Coie, 1990; Snyder, Horsch, & Childs, 1997). Some children with lower academic achievement try to compensate for a sense of incompetence and failure with inappropriate aggressive behavior toward their peers in classroom, but usually their behavior is not approved of either by peers or by the teachers. With aggressive behavior these children are trying to gain status and popularity within the peer group (Rodkin, Farmer, Pearl, & Van Acker, 2000), which presents an additional problem for students and teachers to deal with.

The school also has an important role in the correction of the student's aggressive behavior. Although the school cannot directly influence parental upbringing, it can have a significant role in school-family relations (mesosystem level). A larger difference in family income within the student's class was a good predictor of verbal peer aggression. Numerous studies showed that income inequality within countries, communities, or neighborhoods is a good predictor of aggression, crimes, and bullying (Elgar, Craig, Boyce, Morgan, & Vella-Zarb, 2009). In addition, research in Croatia (Rajhvajn Bulat & Ajduković, 2012) showed that students of lower or higher SES are more aggressive than students who self-estimated themselves to be from average SES families, which schools should take into consideration while organizing classes.

Variables at the distal system (ecosystem) have an indirect influence, through family and school variables, and were found to be significant in the conducted research. More time spent using the media and a perception of greater neighborhood dangerousness have been shown to be significant predictors for physical and verbal peer aggression. Studies have systematically shown that exposure to violence on television is a risk factor for aggressive behavior (Huesmann, Moise-Titus, Podolski, & Eron, 2003; Kim et al., 2011), while playing violent computer games increases aggressive behavior, knowledge about aggression, aggressive emotions, psychological arousal, and decreases prosocial behavior (Barboza et al., 2009; Gentile & Walsh, 2002). Benković and Balabanić (2010) found that information about crime is in the third place in terms of the frequency of publication on Croatian Internet portals. A study on Croatian children aged 10–14 showed that 94% of children watch television everyday mostly alone, and usually programs for adults that contain elements of excitement (Ilišin, 2003). Viewing inappropriate content in the media, especially without adult supervision, lowers the tolerance threshold for aggressive behavior. Studies showed that life in a dangerous community, that is one with a high level of aggression and crime, was a strong predictor of aggression (Bradshaw, Rodgers, Ghandour, & Garbarino, 2009; Kim et al., 2011). In dangerous neighborhoods, children observed conflicts daily (e.g., items such as *in my neighborhood there often occur physical conflicts between adults* and *there are weapons in my neighborhood* confirmed these assumptions) and learnt that violence is an appropriate way to solve problems, especially in postwar societies where the level of violence and use of weapons is usually higher (Groebel, 1999; Keresteš, 2002). In this case, their aggressive behavior toward peers is a survival strategy that they learnt.

In addition, students' perception of neighborhood's dangerousness has a moderating effect (Figure 2). In dangerous neighborhoods, more likely, live families with a common practice of harsh punishment (Buljan Flander & Kocijan-Hercigonja, 2003; Cicchetti & Cohen, 2006), which indirectly teaches children aggressive behavior. It is also possible that in dangerous neighborhoods parents are more concerned about the safety of their child, and therefore are more

prone to corporal punishment as a way of protecting the child. Although punishment is not an appropriate educational method, it still protects children from potentially higher risk (e.g., serious fights in the neighborhood, etc.). Usually, children from the same neighborhood go to the same school, so the teachers should be aware of the potential risk of the neighborhood in which school is located.

The abovementioned predictors better explained variance between students in the verbal peer aggression than in the physical one. In addition, significant variation between classes was explained only for verbal aggression. These results indicate the predominant contribution of the biological and psychological characteristics in the explanation of physical aggression, and parental and schools' variables in the explanation of verbal aggression.

Although it was expected that age would be a significant predictor (older children would be more aggressive), it was not proven. It is possible that age did not show up as a significant predictor because all our students were in the higher classes of primary school (fifth to eighth grade), that is, age homogeneous. In addition, the number of friends was not a significant predictor possibly because, as studies have shown, aggressive children are not lonely and isolated (Pellegrini, Bartini, & Brooks, 1999) and they have friends with similar violent tendencies. Most of the potential parental predictors were not significant maybe because parental variables actually represent the correction of undesirable behavior (parental inductive reasoning and parental intrusiveness) and occur as a consequence of aggression; or because some parental variables are potentially protective factors (parental warmth and parental autonomy) and therefore do not have a key role in predicting peer aggression.

## 7.2 | Practical implications

The school, as an educational institution, can offer comprehensive prevention and intervention programs, taking into account the children's individual and family characteristics and also the influence of community. As the results show, aggressive children have a lower level of affective empathy, which leads to lack of understanding of the consequences of their aggressive behavior. In addition, impulsive behavior causes a child to respond with violence toward peers very often without thinking. Children with poorer school success and who are not accepted by peers are those at risk for aggressive behavior. For all children at risk, various intervention programs can be organized, for example, role-playing games to increase empathy, techniques for gaining self-control, additional classes and various workshops. However, a better option is the introduction of prevention programs that will have a long-term positive effect on the whole school system (Espelage & Swearer, 2009b). Programs, which are suitable for all students, can increase the level of empathy, self-control and develop prosocial behavior. For example, organizing joint extracurricular activities in which students and teachers have a chance to know each other better. In addition, group activities enable the development of tolerance and equality among children and a sense of acceptance, which ultimately has a positive effect on reducing aggressive behavior caused by social differences between children (Keresteš, 2002; Velki, 2012c). Introduction of such prevention programs takes time in terms of the adjustment period, but in different European studies these programs have proven to be very successful (Olweus, 1993; Swearer et al., 2006). Moreover, school can act as an educational institution for parents too, for example, by organizing extra lectures during parent-teacher meetings or school counseling for the parents. Although in most schools some of these interventions have been introduced, they are often not organized intensively enough, and parents often do not take such interventions seriously (Velki, Bačmaga, & Juka, 2016). It is important to raise parents' awareness of how consequential is proper upbringing of children because without their help and involvement it is almost impossible to achieve long-term progress.

## 7.3 | Contributions and limitations of the study

The carried-out study has several important contributions. Unlike previous studies in Croatia, this study has applied an integrative ecological approach to the issue of peer aggression. In this way, the proximal and distal effects were tested simultaneously within a specific community. The methodological contribution was in the application of

different approaches (definitional and behavioral) and methods for the measurement of peer aggression (self-assessment, peer nomination, and self-nomination). Furthermore, it has a clear operational definition of a construct of peer aggression, and also of two different types of this, physical and verbal. In addition, data on individual and contextual characteristics were collected from several sources, (i.e., students, parents, and teachers), which gave a more realistic point of view. The practical contribution refers to an excellent starting point for the development of prevention programs that will specifically be aimed at reducing risk factors not only in the community in which the research was conducted but also for other communities that have similar characteristics (e.g., postwar societies).

However, the study also had some shortcomings. Although the selection of schools that participated in the survey was random, all the schools were from one country, and only elementary school students participated (fifth to eighth grade), which limits the result generalization to other student populations. The results showed a slightly higher prevalence of peer aggression in relation to the data from a national sample (Rajhvajn-Bulut & Ajduković, 2012) which is actually a result of the sample selection from a country which was greatly affected by a patriotic war. Another possible limitation of the sample is the small proportion of students' fathers (19%) that participated in study. The study was not anonymous, which could produce socially desirable answers. Some possible pertinent independent variables (e.g., self-concept, mental health, previous history of victimization, subculture, etc.) which could have an influence on child aggressive behavior were not included in the study. Additionally, the last level of the ecological model, the macrosystem, was not tested, although the results were interpreted in accordance with the specific post-war situation in Croatia. Finally, the study was transversal in design.

## 8 | CONCLUSION

The obtained results are consistent with previous studies conducted in Croatia and worldwide. Most studies of peer aggression and bullying have shown that gender is a significant predictor (Kim et al., 2011; Lee, 2010; Wei et al., 2010; You et al., 2014), but none of them have tested the moderation effect of gender on the prediction of bullying or peer aggression based on an ecological approach. Furthermore, future studies should clearly operationalize whether or not they measure bullying by including all its distinctive characteristics, or peer aggression. Child abuse and neglect proved to be a good predictor of peer violence in previous studies (Bowes et al., 2009; Velki, 2012b), so these variables should be included in future studies. It is also necessary to examine the predictors of other types of bullying, such as relational or cyberbullying. To examine the influence of variables at the macrosystem level, future studies should examine the characteristics of different regions and subcultures and especially crosscultural studies are desirable. In addition, it is preferable to use longitudinal designs.

### ORCID

Tena Velki  <http://orcid.org/0000-0002-9529-8959>

### REFERENCES

- Archer, J. (2004). Sex differences in aggression in real-world settings: A meta-analytic review. *Review of General Psychology*, 8(4), 291–322. <https://doi.org/10.1037/1089-2680.8.4.291>
- Asher, S. R., & Coie, J. D. (1990). *Peer rejection in childhood*. New York, NY: Cambridge University Press.
- Barboza, G. E., Schiamberg, L. B., Oehmke, J., Korzeniewski, S. J., Post, L. A., & Heraux, C. G. (2009). Individual characteristics and the multiple contexts of adolescent bullying: An ecological perspective. *Journal of Youth Adolescence*, 38(1), 101–121. <https://doi.org/10.1007/s10964-008-9271-1>.



- Bender, H. L., Allen, J. P., McElhane, K. B., Antonishak, J., Moore, C. M., Kelly, H. O., & Davis, S. M. (2007). Use of harsh physical discipline and developmental outcomes in adolescence. *Development and Psychopathology*, 19(1), 227-242. <https://doi.org/10.1017/S0954579407070125>
- Benković, V., & Balabanić, I. (2010). Analiza sadržaja najposjećenijih hrvatskih internetskih portala. *Medijska istraživanja*, 16(2), 43-56.
- Berkowitz, L. (1993). *Aggression: Its causes, consequences, and control*. New York, NY: McGraw-Hill.
- Björkqvist, K. (2017). Gender differences in aggression. *Current Opinion in Psychology*, 19, 39-42. <https://doi.org/10.1016/j.copsyc.2017.03.030>
- Bowes, L., Arseneault, L., Maughan, B., Taylor, A., Caspi, A., & Moffitt, T. E. (2009). School, neighborhood, and family factors are associated with children's bullying involvement: A nationally representative longitudinal study. *American Academy of Child and Adolescent Psychiatry*, 48(5), 545-553. <https://doi.org/10.1097/CHI.0b013e31819cb017>
- Bradshaw, C. P., Rodgers, C. R. R., Ghandour, L. A., & Garbarino, J. (2009). Social-cognitive mediators of the association between community violence exposure and aggressive behavior. *School Psychology*, 24(3), 199-210. <https://doi.org/10.1037/a0017362>
- Buljan Flander, G., & Kocijan-Hercigonja, D. (2003). *Zlostavljanje i zanemarivanje djece*. Zagreb: Marko M.
- Carvalho, S. F. (2009). Prevention of bullying in schools: An ecological model. *International Journal of Developmental and Educational Psychology*, 4, 129-134.
- Cicchetti, D., & Cohen, D. J. (2006). *Developmental psychopathology: Risk, disorder, and adaptation*. Hoboken, NJ: John Wiley & Sons, Inc.
- Constantino, J. N., Grosz, D., Saenger, P., Chandler, D. W., Nandi, R., & Earls, F. J. (1993a). Testosterone and aggression in children. *Journal of the American Academy of Child and Adolescent Psychiatry*, 32, 1217-1222.
- Constantino, J. N., Grosz, D., Saenger, P., Chandler, D. W., Nandi, R., & Earls, F. J. (1993b). Testosterone and aggression in children. *Journal of the American Academy of Child and Adolescent Psychiatry*, 32(6), 1217-1222. <https://doi.org/10.1097/00004583-199311000-00015>
- Cook, C. R., Williams, K. R., Guerra, N. G., Kim, T. E., & Sadek, S. (2010). Predictors of childhood bullying and victimization in childhood and adolescence: A meta-analytic investigation. *School Psychology Quarterly*, 25, 65-83. <https://doi.org/10.1037/a0020149>
- Cornell, D., & Bandyopadhyay, S. (2010). The assessment of bullying. In Jimerson, S. R., Swearer, S. M., & Espelage, D. L. (Eds.), *Handbook of bullying in schools: An international perspective* (pp. 265-276). New York, NY: Springer.
- Elgar, F. J., Craig, W., Boyce, W., Morgan, A., & Vella-Zarb, R. (2009). Income inequality and school bullying: Multilevel study of adolescents in 37 countries. *Journal of Adolescent Health*, 45, 351-359. <https://doi.org/10.1016/j.jadohealth.2009.04.004>
- Endendijk, J. J., Groeneveld, M. G., van der Pol, L. D., van Berckel, S. R., Hallers-Haalboom, E. T., Bakermans-Kranenburg, M. J., & Mesman, J. (2017). Gender differences in child aggression: Relations with gender-differentiated parenting and parents' parents' gender-role stereotypes. *Child Development*, 88(1), 299-316.
- Espelage, D. L., Mebane, S. E., & Swearer, S. M. (2004). Gender differences in bullying: Moving beyond mean level differences. In Espelage, D. L., & Swearer, S. M. (Eds.), *Bullying in American schools: A social-ecological perspective on prevention and intervention* (pp. 15-35). Mahwah, NJ: Erlbaum.
- Espelage, D. L., & Swearer, S. M. (2009a). Contributions of three social theories to understanding bullying perpetration and victimization among school-aged youth. In Harris, M. J. (Ed.), *Bullying, rejection and peer victimization: A social cognitive neuroscience perspective* (pp. 151-170). New York, NY: Springer Publishing Company, LLC.
- Espelage, D. L., & Swearer, S. M. (2009b). A social-ecological model for bullying prevention and intervention. In Jimerson, S. R., Swearer, S. M., & Espelage, D. L. (Eds.), *Handbook of bullying in schools: An international perspective* (pp. 61-72). New York: Springer.
- Ferrer, B. M., Ruiz, D. M., Amador, L. V., & Orford, J. (2011). School victimization among adolescents. An analysis from an ecological perspective. *Psychosocial Intervention*, 20(2), 149-160. <https://doi.org/10.5093/in2011v20n1a8>
- Gentile, D. A., & Walsh, D. A. (2002). A normative study of family media habits. *Journal of Applied Psychology*, 23(2), 157-178. [https://doi.org/10.1016/S0193-3973\(02\)00102-8](https://doi.org/10.1016/S0193-3973(02)00102-8)
- Gershoff, E. T. (2002). Corporal punishment by parents and associated child behaviors and experiences: A meta-analytic and theoretical review. *Psychological Bulletin*, 128(4), 539-579. <https://doi.org/10.1037/0033-2909.128.4.539>
- Gini, G., Albiero, P., Benelli, B., & Altoè, G. (2007). Does empathy predict adolescents' bullying and defending behavior? *Aggressive Behavior*, 33(5), 467-476. <https://doi.org/10.1002/ab.20204>
- Groebe, J. (1999). The UNESCO global study on media violence. *UNESCO Bulletin: The Major Project of Education in Latin America and the Caribbean*, 49, 5-17.
- Hawley, P. H., & Vaughn, B. E. (2003). Aggression and adaptive functioning: The bright side to bad behavior. *Merrill-Palmer Quarterly*, 49(3), 239-242. <https://doi.org/10.1353/mpq.2003.0012>

- Huesmann, L. R., Moise-Titus, J., Podolski, C. L., & Eron, L. D. (2003). Longitudinal relations between children's exposure to TV violence and their aggressive and violent behavior in young adulthood: 1977–1992. *Developmental Psychology*, 39(2), 201–221. <https://doi.org/10.1037/0012-1649.39.2.201>
- Ilišin, V. (2003). Mediji u slobodnom vremenu djece i komunikacija o medijskim sadržajima. *Medijska istraživanja*, 9(2), 9–34.
- Ivanović, M., & Buško, V. (2008). *Development of empathy questionnaire*. (Unpublished graduate thesis). Croatia University of Zagreb, Zagreb.
- Keresteš, G. (2002). *Dječje agresivno i prosocijalno ponašanje u kontekstu rata*. Jastrebarsko: Naklada Slap.
- Keresteš, G., Brković, I., Kuterovac Jagodić, G., & Greblo, Z. (2012). Development and validation of parental behavior questionnaire. *Contemporary Psychology*, 15(1), 23–42.
- Khoury-Kassabri, M., Benbenishty, R., Avi Astor, R., & Zeira, A. (2004). The contributions of community, family and school variables to student victimization. *American Journal of Community Psychology*, 34(3), 187–204. <https://doi.org/10.1007/s10464-004-7414-4>
- Kim, S., Orpinas, P., Kamphaus, R., & Kelder, S. H. (2011). A multiple risk factors model of the development of aggression among early adolescents from urban disadvantaged neighborhoods. *School Psychology Quarterly*, 26(3), 215–230. <https://doi.org/10.1037/a0024116>
- Lee, C. H. (2010). Personal and interpersonal correlates of bullying behaviors among Korean middle school students. *Journal of Interpersonal Violence*, 25(1), 152–176. <https://doi.org/10.1177/0886260508329124>
- Lee, C. H. (2011). An ecological systems approach to bullying behaviors among middle school student sin the United States. *Journal of Interpersonal Violence*, 26(8), 1664–1693. <https://doi.org/10.1177/0886260510370591>
- Loeber, R., & Hay, D. (1997). Key issues in the development of aggression and violence from childhood to early adulthood. *Annual Review of Psychology*, 48, 371–410. <https://doi.org/10.1146/annurev.psych.48.1.371>
- Marini, Z. A., Dane, A. V., Bosacki, S. L. (2006). Direct and indirect bully-victims: Differential psychosocial risk factors associated with adolescents involved in bullying and victimization. *Aggressive Behavior*, 32(6), 551–569. <https://doi.org/10.1002/ab.20155>
- Mazur, A., & Booth, A. (1998). Testosterone and dominance in men. *The Behavioral and Brain Sciences*, 21(3), 353–397.
- Olweus, D. (1993). *Bullying at school: What we know and what we can do*. Malden: Blackwell Publishers.
- Orpinas, P., & Horne, A. M. (2006). Risk and protective factors for bullying and aggression. In Orpinas, P., & Horne, A. M. (Eds.), *Bullying prevention: Creating a positive school climate and developing social competence* (pp. 33–53). Washington, DC: American Psychological Association.
- Pellegrini, A. D., Bartini, M., & Brooks, F. (1999). School bullies, victims, and aggressive victims: Factors relating to group affiliation and victimization in early adolescence. *Journal of Educational Psychology*, 91(2), 216–224.
- Rajhvajn Bulat, L., & Ajduković, M. (2012). Obiteljske i psihosocijalne odrednice vršnjačkog nasilja među mladima. *Psihologijske teme*, 21(1), 167–194.
- Rodkin, P. C., Farmer, T. W., Pearl, R., & Van Acker, R. (2000). Heterogeneity of popular boys: Antisocial and prosocial configurations. *Developmental Psychology*, 36(1), 14–24. <https://doi.org/10.1037/0012-1649.36.1.14>
- Snyder, J., Horsch, E., & Childs, J. (1997). Peer relationships of young children: Affiliative choices and the shaping of aggressive behavior. *Journal of Clinical Child Psychology*, 26(2), 145–156. [https://doi.org/10.1207/s15374424jccp2602\\_3](https://doi.org/10.1207/s15374424jccp2602_3)
- Swearer, S. M., & Doll, B. (2001). Bullying in schools: An ecological framework. *Journal of Emotional Abuse*, 2(2-3), 7–23. [https://doi.org/10.1300/J135v02n02\\_02](https://doi.org/10.1300/J135v02n02_02)
- Swearer, S. M., & Espelage, D. L. (2004). A social-ecological framework of bullying among youth. In Espelage, D. L., & Swearer, S. M. (Eds.), *Bullying in American schools. A social-ecological perspective on prevention and intervention* (pp. 1–12). Mahwah, NJ: Erlbaum.
- Swearer, S. M., Peugh, J., Espelage, D. L., Siebecker, A. B., Kingsbury, W. L., & Bevins, K. S. (2006). A socioecological model for bullying prevention and intervention in early adolescence: An exploratory examination. In Jimerson, S. R., & Furlong, M. (Eds.), *Handbook of school violence and school safety: From research to practice* (pp. 257–273). Mahwah, NJ: Erlbaum.
- Velki, T. (2012a). *Verifying the ecological model of peer violence behavior* (Unpublished doctoral thesis). Croatia University of Zagreb, Zagreb.
- Velki, T. (2012b). Uloga nekih obiteljskih čimbenika u pojavi nasilja među djecom. *Psihologijske teme*, 21, 29–60.
- Velki, T. (2012c). *Priručnik za rad s hiperaktivnom djecom u školi*. Jastrebarsko: Naklada Slap.
- Velki, T., Bačmaga, I. i., & Juka, I. (2016). Bullying in Osijek schools and measures of prevention. *Life and School: Journal for the Theory and Practice of Education*, 62(2), 27–46.
- Velki, T., & Bošnjak, M. (2012). Correlation between parental upbringing and corporal punishment of children. *Life and School*, 28(2), 63–82.
- Velki, T., & Dudaš, M. (2016). Pokazuju li hiperaktivnija djeca više simptoma agresivnosti? *Ljetopis socijalnog rada*, 23(1), 87–121.
- Velki, T., Kuterovac Jagodić, G., & Antunović, A. (2014). Development and validation of Croatian School Climate Survey for students. *Contemporary Psychology*, 17(2), 151–166.

- Velki, T., & Romstein, K. (2016). Povezanost samoprocijenjenih simptoma ADHD-a s agresivnim ponašanjem i sudjelovanjem u vršnjačkom nasilju učenika osnovnoškolske dobi. *Hrvatska revija za rehabilitacijska istraživanja*, 52(2), 30–41.
- Vrdoljak, G., & Velki, T. (2012). Metacognition and intelligence as predictors of academic success. *Croatian Journal of Education*, 14(4), 799–815.
- Vulić-Prtorić, A. (2006). Skala hiperaktivnosti – impulzivnosti – pažnje – HIP. In Adorić, V. Čubela, Proroković, A., Penezić, Z., & Tucak, I. (Eds.), *Zbirka psihologijskih skala i upitnika - Svezak 3* (pp. 41–49). Zadar: Sveučilište u Zadru.
- Wei, H. S., Williams, J. H., Chen, J. K., & Chang, H. Y. (2010). The effects of individual characteristics, teacher practice, and school organizational factors on students' bullying: A multilevel analysis of public middle schools in Taiwan. *Children and Youth Services Review*, 32(1), 137–143.
- Whitney, I., & Smith, P. K. (1993). A survey of the nature and extent of bullying in junior/ middle and secondary schools. *Educational Research*, 35, 3–25.
- Yahav, R. (2007). The relationship between children's and adolescents' perceptions of parenting style and internal and external symptoms. *Child: Care, Health and Development*, 33(4), 460–471. <https://doi.org/10.1111/j.1365-2214.2006.00708.x>
- You, S., Kim, E., & Kim, M. (2014). An ecological approach to bullying in Korean adolescents. *Journal of Pacific Rim Psychology*, 8(1), 1–10. <https://doi.org/10.1017/prp.2014.1>
- Yuhong, Z. (2012). A study of child bullying victimization in Xi'an, China: Prevalence, correlates and co-occurrence with family violence (Unpublished doctoral thesis). The University of Hong Kong, Hong Kong, China.

**How to cite this article:** Velki T. Verifying the ecological model of peer aggression on Croatian students. *Psychol Schs*. 2018;1–19. <https://doi.org/10.1002/pits.22178>