Home, school and community violence exposure and emotional and conduct problems among low-income adolescents: the moderating role of age and sex

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Abstract

Purpose The purpose of this study is to assess whether violence exposure is associated with emotional/conduct problems, when adjusting for confounders/covariates and controlling for comorbidity, and to investigate interactions between violence exposure and sex and/or age.

Methods This cross-sectional study evaluated a community-based sample of 669 in-school 11-to-15-year-olds. A three-stage probabilistic sampling plan included a random selection of census units, eligible households, and target child. Multivariable logistic regression investigated the effect of severe physical punishment by parents, peer victimization at school, and community violence on the study outcomes (adolescent-reported emotional/conduct problems identified by the Strengths and Difficulties Questionnaire/SDQ) when controlling for confounders (resilience, parental emotional warmth, maternal education/unemployment/anxiety/depression) and covariates (age, sex, stressful life events, parental rejection).

Results Considering interactions, emotional problems were associated with community violence victimization among girls, while conduct problems were associated with severe physical punishment among the younger, suffering peer aggression among the oldest, bullying victimization among girls, and witnessing community violence among boys. Desensitization (less emotional problems with greater violence exposure) was noted among the youngest exposed to severe physical punishment and the oldest who witnessed community violence.

Conclusion Age and sex are moderators of the association between violence exposure and emotional/conduct problems. Interventions at local health units, schools and communities could reduce the use of harsh physical punishment as a parental educational method, help adolescents deal with peer aggression at school and keep them out of the streets by increasing the usual five hours in school per day and making free sports and cultural/leisure activities available near their homes.

Keywords Adolescence; Exposure to violence; Mental health; Effect modifier, epidemiologic

Introduction

Mental disorders are a leading burden of disease among adolescents worldwide [1], and risk factors involve socioeconomic difficulties and violence exposure at home, school and in the community [2]. Adolescents with low socioeconomic status (SES) are more likely to be exposed to different forms of violence such as abuse and neglect [3], involvement in bullying [4], and community violence [5].

Violence exposure and mental health problems

Independent of SES, harsh physical punishment and abuse are associated with externalizing behaviors [6-8] and youth-onset major depressive disorder [9]. Chronic exposure to peer victimization at school (physical, verbal, relational) increases the likelihood of later depression [10], and victims of bullying during primary school have greater levels of emotional problems at ages 10–12 years [11]. Community violence is a predictor of internalizing [12, 13] and externalizing problems [12], while early aggressive behavior is associated with an earlier onset of community violence exposure in adolescence [14].

Confounding factors and covariates

Adversities other than violence exposure may co-exist with victimization experiences and negatively influence the mental health of adolescents such as low income [15], parental unemployment and parental mental illness [7]. These adversities must be disentangled from the specific effects of violence exposure on the adolescents' mental health. Other co-occurring factors such as stressful life events [16] and parental rejection [17] can put adolescents at risk of emotional or conduct problems. Moreover, protective factors such as resilience and parental emotional warmth can act as a buffer on the negative effect of violence exposure on the adolescents' mental health [11]. Therefore, confounding factors and covariates must be taken into account when examining the independent effect of different forms of violence exposure on adolescents' emotional and conduct problems. In addition, low maternal education is associated with frequent physical abuse of adolescents aged 11-17 years [18] and with bullying victimization at school [19]. Social factors such as low parental education or having unemployed parents are likely to increase mental distress and increase the risk of depressive symptoms [20], while having a non-working mother (as a sign of greater financial deprivation) increases the risk for antisocial behavior among low-income adolescents [8]. Parental mental health problems are associated with conduct problems [6-8], and aggravation of maternal anxiety/depression over time has been shown to be a risk factor for

the aggravation of mental health problems from childhood to adolescence [21]. Furthermore, maternal depression increases the odds of children being victimized by peers or bullied [22, 23]. Considering that protective resources or assets are the defining attributes of resilience [24], adolescents with higher levels of internal assets have lower odds of all forms of peer victimization and lower odds of emotional distress than those with lower levels of internal assets [25]. Finally, parental warmth is an important aspect of positive parenting that is linked to children's social and emotional well-being [26], preventing the onset and growth of adolescent externalizing and internalizing symptoms [11, 27] and lowering the risk for peer victimization over time [28].

The moderating role of age and sex

Different studies have shown the moderating role of age and/or sex influencing the strength of the association between violence exposure and mental health problems in adolescents [29-31]. For instance, exposure to community violence was found to be significantly associated with internalizing symptoms, but this relation was stronger for girls than boys [29]. Another example refers to the fact that an increase in age increases the positive effect of peer victimization on gun related delinquency [31]. Therefore, if interactions exist between sex and a history of violence exposure, we will be able to find which types of violence put more girls than boys, or more boys than girls at risk for different mental health problems. Younger and older adolescents can also differ in their risk for mental health problems depending on the type of violence they suffered. Results will inform violence prevention programs.

Current study

The current study evaluates adolescents living in a low-income Brazilian city which is characterized by poverty, violence and family stress, a setting which is described in more detail in a previous publication [32]. This study aims to examine the independent effect of five forms of violence exposure (suffering severe physical punishment from one or both parents in the past 12 months, being exposed to peer aggression at school in the past six months, considering himself/herself a victim of bullying at school in the past six months, being a victim of community violence in the past 12 months, and witnessing community violence in the past 12 months) on emotional and conduct problems of adolescents, when adjusting for potential confounders (resilience, parental emotional warmth, maternal education as an indicator of family SES, mother not working for pay in the past 30 days, and maternal anxiety/depression) and covariates (adolescent's age and sex, exposure to stressful life

events, and parental rejection), and controlling for comorbidity. This study also aims to establish whether interactions exist between the five forms of violence exposure and the adolescents' sex and/or age when considering the two study outcomes (emotional and conduct problems with scores in the clinical range, indicating a higher risk for clinical disorders).

Hypothesis tested

Our hypothesis is that violence exposure at home, at school and in the community will be associated with adolescent mental health problems, when adjusting for potential confounders and covariates, and controlling for comorbidity. In addition, the strength of the association between violence exposure and mental health problems may vary according to sex and age.

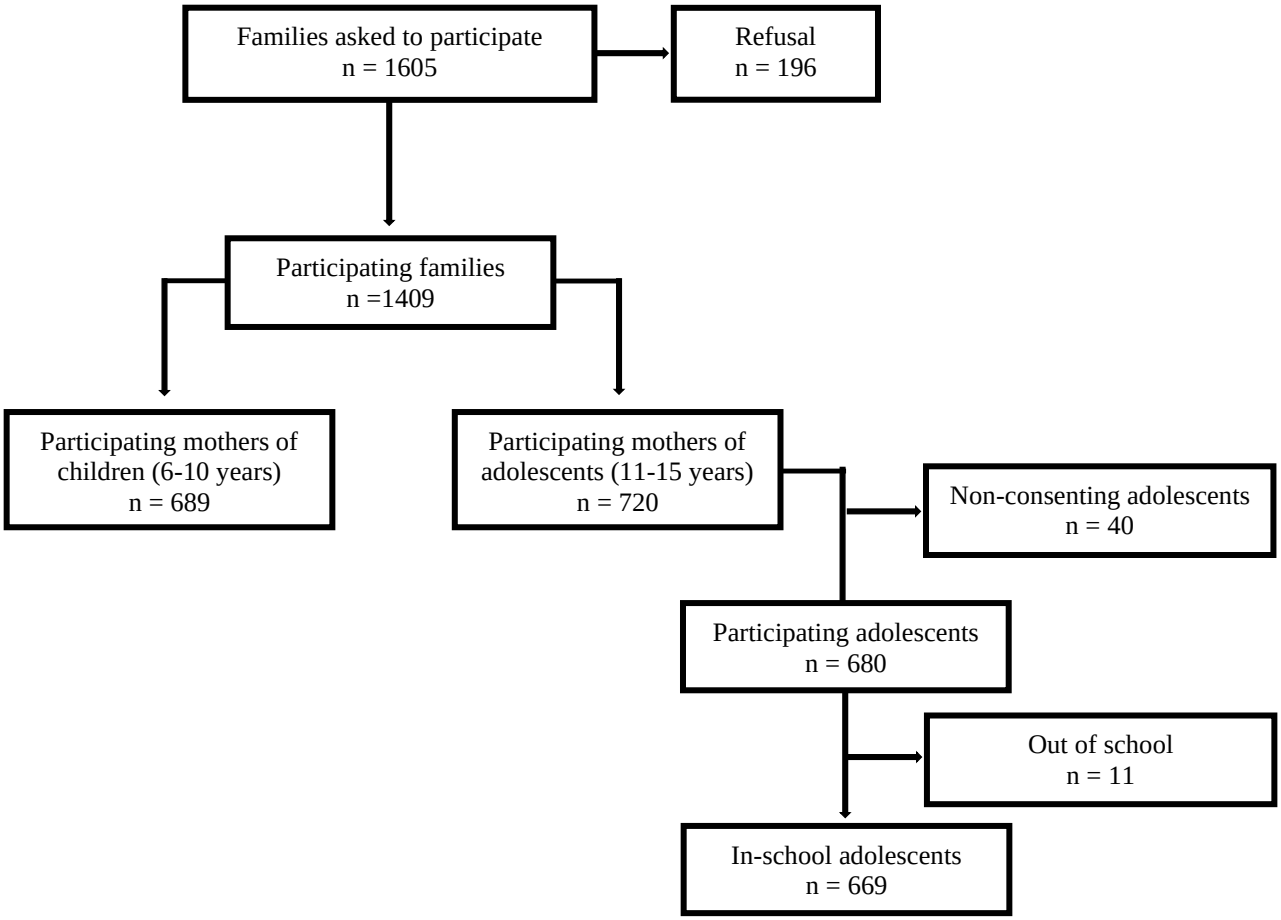
Methods

Study design and sampling

This is a cross-sectional study nested in a longitudinal study (Itaboraí Youth Study) that was conducted in Itaboraí, a low-income medium-size city in Rio de Janeiro State, Southeast Brazil (218,008 inhabitants, 98% urban) [33]. At baseline, a probabilistic community-based sample of 1,409 6- to 15-year-olds (response rate = 87.8%) was selected based on a three-stage sampling procedure that involved a random sample of census units (107/420), eligible households (15 in each selected census unit) and a target child randomly selected among all eligible children in each participant household. The eligibility criteria were boys and girls aged 6-15 years residing with his/her biological, step or adoptive mother. Exclusion criteria were intellectual disabilities (child not able to play with other children or go to a mainstream school or class) and the mother being younger than 18 years. The main aim of the Itaboraí Youth Study was to investigate the potential association between violence exposure and mental health problems among children and adolescents. Data collection occurred in two periods of time: wave 1 (2014) and wave 2 (2015-2016) with an interval of 12.9 months. More detailed information on the Itaboraí Youth Study methods can be found elsewhere [32].

The baseline sample of the Itaboraí Youth Study (N = 1,409) included 720 adolescents (11-15 years), and 94.4% of them were individually interviewed (N = 680). The current paper analyzes data reported by 669 adolescents who had been attending school in the previous 6 months (mean age ± SE: 13.01 ± 0.07 years, 51.7% girls) and their mothers. Figure 1 shows a flow diagram of the selection process of participants.

Fig. 1 Flow chart of participation in the study



Procedures and measures

Between February and December 2014, trained lay interviewers individually applied semi-structured questionnaires to the adolescents and their mothers at home under confidential conditions (interviews were 60-90 min long) [32].

Study outcomes

The study outcomes of interest were emotional problems and conduct problems reported by the adolescents as measured by two scales of the Brazilian version of the Strengths and Difficulties Questionnaire (SDQ) which is a screening instrument to identify children and adolescents at risk for mental disorders (the psychometric properties of the Brazilian version of the SDQ are discussed by Woerner et al. [34] based on reported findings of

previous studies conducted with different samples of Brazilian children and adolescents). The SDQ is a widely used measure of child mental health. Scale scores are classified in three categories: normal, borderline and clinical. The greater the scale scores, the higher the odds of presenting a clinical disorder [35]. In the current study, the clinical range of scale scores was determined according to pre-established cut-off points based on normative data from large population-based studies conducted in the United Kingdom [emotional problems scores: normal (0-4), borderline (5), clinical (6-10); conduct problems scores: normal (0-2), borderline (3), clinical (4-10)] since Brazilian cut-offs are not available (www.sdqinfo.org). The focus on a dichotomized version of the emotional problems' variable and conduct problems' variable (scores in the clinical range vs. borderline/normal scores) rather than a continuous score is warranted given our goal of identifying independent correlates of clinically significant emotional and conduct problems.

Violence exposure variables, potential confounders and covariates

The current study considered the influence of different forms of violence exposure (at home, school and in the community) on the adolescents' emotional and conduct problems, adjusting for potential confounders and covariates, and controlling for comorbidity. Violence exposure variables, potential confounders and covariates are described in detail in Table 1, including information about the instruments used to measure them, the definitions adopted by the current study and type of informant (adolescents, mothers).

Supplementary figure shows the questionnaire items related to the study variables of interest including the study outcomes, violence exposure variables, potential confounders and covariates.

Ethical considerations

All procedures performed in this study, which involved human participants, were in accordance with the ethical standards of the Brazilian National Committee for Ethics in Research and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. A written informed consent was obtained from mothers confirming their voluntary participation and authorizing the participation of their son/daughter, and a written informed assent was obtained from all participating adolescents.

Table 1 Variables of interest for the study: instruments applied to adolescents and/or mothers and definition of variables

STUDY VARIABLES	Instrument	Definition
STUDY OUTCOMES – ADOLESCENT REPORTED		
Adolescent-reported emotional problems and conduct problems	Brazilian version of the self-rated Strengths and Difficulties Questionnaire (SDQ) for 11-to-17-year-olds [34]. Items from the emotional problems scale and the conduct problems scale are listed in Supplementary Figure	Emotional and conduct problems scale scores were classified as normal, borderline and clinical according to pre-established cut-off points based on normative data from large population-based studies conducted in the United Kingdom [emotional problems scores: normal (0-4), borderline (5), clinical (6-10); conduct problems: normal (0-2), borderline (3), clinical (4-10)] since Brazilian cut-offs are not available (details at www.sdqinfo.org). A dichotomous variable was used in the multivariable logistic regression analyses (clinical scores vs. borderline/normal scores). Continuous scores were used in the multiple linear regression analyses
VIOLENCE EXPOSURE – ADOLESCENT REPORTED		
Exposure to violence at school – peer aggression events	A 15-item scale previously used in a Norwegian study with schoolchildren [59] included selected and modified items from Arora's "My Life in School" checklist [60, 61]. An exploratory factor analysis assessed the factor structure of this 15-item scale. Regarding model fit, a 3-factor solution fit well, and had significantly better fit than a 2-factor solution. The 3-factor solution was interpreted to consist of the three latent factors - physical aggression, verbal harassment, and social manipulation. These findings were similar to results from a confirmatory factor analysis reported by a Norwegian study that supported a 3-factor structure of this scale, with the same latent variable interpretations as in the present study [59]	Three types of peer aggression events were investigated (number of events occurring more than once in the past 6 months): physical aggression (4 items), verbal harassment (5 items) and social manipulation (6 items). Possible answers for all items: "not at all" (0), "once" (1), "more than once" (2). "Any peer aggression" corresponds to at least one event occurring more than once in the past 6 months from the 15 items listed in Supplementary Figure. The number of positive items (items = 2) was used in the multivariable logistic regression and multiple linear regression analyses (range: 0-15)
Bullying victimization at school	After defining bullying (when one or more school peers are repeatedly doing bad things to you such as name-calling, threatening, hitting, spreading rumours about you, excluding you from the group or teasing you to hurt your feelings), one	Possible answers for this question: "not at all" (0), "less than once a week" (1), "more than once a week" (2), "almost every day" (3). Bullying victimization in the past 6 months corresponds to an answer of more than once a week or almost every day. A dichotomous variable was used in the multivariable

	question was asked: "How often have you been bullied in the past 6 months?" The general question asked to investigate bullying victimization was not restricted to the 15 peer aggression events examined but could be related to any type of peer victimization experienced by the respondents in the past 6 months	logistic regression and multiple linear regression analyses (more than once a week/most days vs. not at all/less than once a week)
Exposure to violence at home – severe physical punishment by one or both parents	Brazilian version of the World Studies of Abuse in the Family Environment (WorldSAFE) Core Questionnaire [62]	Severe physical punishment by one or both parents in the past 12 months [number of positive items from the 8 items listed in Supplementary Figure – possible answers for all items: "no" (0), "yes" (1)]. The number of positive items (items = 1) was used in the multivariable logistic regression and multiple linear regression analyses (range: 0-8)
Exposure to violence in the community: victimization events that occurred outside the school and home environments	Investigation of eight topics (beatings and muggings, forced entry, being chased, arrests, threats, knife attacks, shootings, sexual molestation) selected from the Survey of Exposure to Community Violence – Self Report Version, developed at the National Institute of Mental Health by Richters and Saltzman [63]. Differently from the original Self Report Version, two separate items investigated beatings and muggings, and two new items were added by our research team (being around a shoot-out and suffering death threats)	Number of victimization events in the past 12 months [number of positive items from the 11 items listed in Supplementary Figure – possible answers for all items: "no" (0), "yes" (1)]. The number of positive items (items = 1) was used in the multivariable logistic regression and multiple linear regression analyses (range: 0-11)
Exposure to violence in the community: eye-witnessed events that occurred outside the school and home environments	Investigation of eight topics (beatings and muggings, forced entry, being chased, arrests, threats, knife attacks, shootings, sexual molestation) selected from the Survey of Exposure to Community Violence – Self Report Version, developed at the National Institute of Mental Health by Richters and Saltzman [63]. Differently from the original Self Report Version, two separate items investigated beatings and muggins, and two new items were added by our research team (being around a shoot-out and suffering death threats)	Number of eye-witnessed events in the past 12 months [number of positive items from the 11 items listed in Supplementary Figure – possible answers for all items: "no" (0), "yes" (1)]. The number of positive items (items = 1) was used in the multivariable logistic regression and multiple linear regression analyses (range: 0-11)

POTENTIAL CONFOUNDERS – ADOLESCENT REPORTED (PROTECTIVE FACTORS)

Resilience	The Resilience Scale for Adolescents (READ), developed by Odin Hjemdal and Oddgeir Friborg [64, 65] includes 28 exclusively positively phrased items that describe thoughts and feelings. In our sample, according to confirmatory factor analysis the final model with 24 items (removing items 1, 4, 8 and 28) was suggested to be the best	Possible answers for the 24 items of the READ-Short Version (see Supplementary Figure): "I do not agree at all" (1), "I disagree" (2), "I do not agree or disagree" (3), "I partially agree" (4), "I totally agree" (5). The higher the scale total score, the higher the level of resilience. The total score was used in the multivariable logistic regression and multiple linear regression analyses (range: 24-120)
Perceived parental rearing style: emotional warmth	Egna Minnen Beträffande Uppfostran – child version (EMBU-C): 33 items were selected from the Spanish version [66] and translated to Brazilian Portuguese from the original English version for adults [67] and adapted to be comprehensible for young adolescents (11-15 years). In our sample, exploratory factor analysis (principal component analysis) showed that emotional warmth had satisfactory internal consistency. The Brazilian version of EMBU-C has 20 items: 13 for emotional warmth and 7 for rejection (see Supplementary Figure)	Possible answers for all items: "never" (0), "occasionally" (1), "often" (2), "always" (3). A clear factor emerged from exploratory factor analysis: emotional warmth (Cronbach's alpha = 0.89). The total score (sum of scores of 13 EMBU-C items: 1, 7, 9, 12, 14, 16, 20, 21, 24, 27, 29, 31, 33) was used in the multivariable logistic regression and multiple linear regression analyses (range: 0-39)
POTENTIAL CONFOUNDERS – MOTHER REPORTED		
Maternal anxiety/depression	Self-Reporting Questionnaire (SRQ-20) [68]	The SRQ-20 has 20 items (listed in Supplementary Figure) with answers "yes" (1) or "no" (0). A total score > 7 identifies maternal anxiety/depression. A dichotomous variable was used in the multivariable logistic regression and multiple linear regression analyses (total score > 7 vs. total score 0-7)
COVARIATES – ADOLESCENT REPORTED		
Exposure to stressful life events	12 items (see Supplementary Figure) developed by the authors based on the content of the UCLA Posttraumatic Stress Disorder Reaction Index for DSM-IV, a screening instrument for the assessment of trauma exposure and PTSD symptoms among children and adolescents [69, 70]	Possible answers for all items: "no" (0), "yes" (1). The number of stressful life events in the past 12 months was determined by the number of positive items. The number of positive items (items = 1) was used in the multivariable logistic regression and multiple linear regression analyses (range: 0-12)
Perceived parental rearing style: rejection	Egna Minnen Beträffande Uppfostran – child version (EMBU-C): 33 items were selected from the Spanish version [66] and translated to Brazilian Portuguese from the original English version for adults [67] and adapted to be	Possible answers for all items: "never" (0), "occasionally" (1), "often" (2), "always" (3). A clear factor emerged from exploratory factor analysis: rejection (Cronbach's alpha = 0.83). The total score (sum of scores of 7

	comprehensible for young adolescents (11-15 years). In our sample, exploratory factor analysis (principal component analysis) showed that rejection had satisfactory internal consistency. The Brazilian version of EMBU-C has 20 items: 13 for emotional warmth and 7 for rejection (see Supplementary Figure)	EMBU-C items: 10, 11, 17, 25, 26, 28, 32) was used in the multivariable logistic regression and multiple linear regression analyses (range: 0-21)

Strategy for data analysis

The prevalence rates reported in this paper are based on weighted percentages (refer to the city population), but weighting was not used in the statistical analyses. No missing data was registered during the interviews with the study participants. In this study, two multivariable logistic regression models were used with emotional problems (clinical vs. borderline/normal scores) being the outcome in Model 1A (Table 3), and conduct problems (clinical vs. borderline/normal scores) being the outcome in Model 2A (Table 4). When examining the association between violence exposure and mental health problems, we were able to adjust for a comprehensive range of potentially confounding factors and covariates. Both models also took into account the high comorbidity that is typical between emotional problems, conduct problems and hyperactivity. To test for significant two-way interactions, considering that the study involves five different violence exposure variables, we first tested the overall effect of the 10 interaction terms (five violence exposure by sex interaction terms and five violence exposure by age interaction terms). If this test of the overall effect was significant, we removed non-significant interaction terms one by one, starting with the least significant term (backward elimination procedure). This process was continued until the final model in which only significant interaction terms remained [36]. In order to probe interactions, the PROCESS 3.5 macro for SPSS was used (see http://www.processmacro.org/index.html). In the interaction probing analyses, estimated effects of violence exposure on mental health problems are given for boys and girls, and three age levels: (1) mean age minus one standard deviation (11.6 years), (2) mean age (13.0 years), and (3) mean age plus one standard deviation (14.3 years). We centered variables involved in significant two-way interaction terms so that main effects for violence variables in Tables 3 and 4 could have a meaningful interpretation as average effects for boys and girls or effects at the sample average age [37]. Furthermore, variance inflation factors were computed for all variables included in the multivariable tests and the quite low values overall obtained showed no collinearity problems. We also ran multiple linear regression on SDQ emotional problems continuous scores (Model 1B) and conduct problem continuous scores (Model 2B) to identify significant correlates and interactions (Supplementary Table) aiming to compare these results with those obtained by using multivariable logistic regression (Tables 3 and 4). SPSS 26 was used for all analyses. Statistical significance was evaluated with a significance level of 0.05.

Results

The current study interviewed 669 in-school adolescents (11-15-years; mean age ± SE: 13.01 ± 0.07 years; 51.7% girls). Table 2 presents the sample characteristics including the frequency of mental health problems and violence exposure variables, among other.

Multivariable logistic regression models

Model 1A (outcome = emotional problems)

Three significant interactions were found in Model 1A: severe physical punishment by age, community violence victimization by sex, and witnessing community violence by age (Table 3). We found that for the youngest adolescents (age level 1) but not for the older ones (age levels 2 and 3) as the number of severe physical punishment events increased, the probability of presenting emotional problems decreased ($p < 0.01$). For girls, but not for boys, an increasing number of community violence victimization events was associated with an increased probability of emotional problems ($p < 0.001$). We also found that for the oldest adolescents (age level 3) but not for the younger ones (age levels 1 and 2) as the number of witnessed community violence events increased, the probability of presenting emotional problems decreased ($p < 0.01$).

Model 2A (outcome = conduct problems)

Four significant interactions were found in Model 2A: number of suffered peer aggression events by age, bullying victimization by sex, number of suffered severe physical punishment events by age, and number of witnessed community violence events by sex (Table 4). We found that for the oldest adolescents (age level 3) but not for the younger ones (age levels 1 and 2) as the number of suffered peer aggression events increased, the probability of presenting conduct problems also increased ($p < 0.05$). Bullying victimization increased the probability of presenting conduct problems among girls ($p < 0.05$) but decreased this probability among boys ($p < 0.05$). For the younger adolescents (age levels 1 and 2) but not for the oldest ones (age level 3) as the number of suffered severe physical punishment events increased, the probability of presenting conduct problems also increased ($p < 0.001$). We also found that as the number of witnessed community violence events increased, the probability of presenting conduct problems also increased for boys ($p < 0.001$) but not for girls.

Table 2 Sample characteristics (N = 669)

VARIABLES OF INTEREST FOR THE STUDY	N	Weighted % (95% CI)	Non-weighted %
Adolescent sex			
Boy	327	48.3 (43.8-52.7)	48.9
Girl	342	51.7 (47.3-56.2)	51.1
Adolescent age			
11-12 years	259	38.0 (33.4-42.7)	38.7
13-15 years	410	62.0 (57.3-66.6)	61.3
Victimization by any peer aggression event[a]			
Yes (at least 1 out of 15 items)	141	21.9 (17.7-26.6)	21.1
No	528	78.1 (73.4-82.3)	78.9
Bullying victimization (past 6 months)			
Yes (more than once a week/most days)	37	5.5 (3.7-8.0)	5.5
No (not at all/less than once a week)	632	94.5 (92.0-96.3)	94.5
Any severe physical punishment by parents[b]			
Yes (at least 1 out of 8 items)	75	12.4 (9.2-16.4)	11.2
No	594	87.6 (83.6-90.8)	88.8
Community violence: any victimization event[b]			
Yes (at least 1 out of 11 items)	95	14.0 (10.2-19.0)	14.2
No	574	86.0 (81.0-89.8)	85.8
Witnessing any community violence event[b]			
Yes (at least 1 out of 11 items)	157	20.9 (16.4-26.1)	23.5
No	512	79.1 (73.9-83.6)	76.5
Stressful life events[b]			
Yes (at least 1 out of 12 items)	294	42.1 (36.0-48.6)	43.9
No	375	57.9 (51.4-64.0)	56.1
Emotional problems (SDQ)			
Yes (clinical scores)	70	11.5 (8.6-15.2)	10.5
No (borderline/normal scores)	599	88.5 (84.8-91.4)	89.5
Conduct problems (SDQ)			
Yes (clinical scores)	91	13.8 (10.5-18.0)	13.6
No (borderline/normal scores)	578	86.2 (82.0-89.5)	86.4
Hyperactivity (SDQ)			
Yes (clinical scores)	75	9.8 (7.5-12.7)	11.2
No (borderline/normal scores)	594	90.2 (87.3-92.5)	88.8
Maternal education			
0-7 years	313	51.8 (45.6-58.0)	46.8
8+ years	356	48.2 (42.0-54.4)	53.2
Mother not working for pay (past 30 days)			
Not working	296	47.4 (42.0-52.8)	44.2
Working	373	52.6 (47.2-58.0)	55.8
Maternal anxiety/depression			
Yes (SRQ total score > 7)	157	25.0 (21.1-29.3)	23.5
No (SRQ total score 0-7)	512	75.0 (70.7-78.9)	76.5
Resilience (24 items, range: 24-120)[c]		Mean ± SD: 107.7 ± 12.7	
Parental emotional warmth (13 items, range: 0-39)[c]		Mean ± SD: 32.0 ± 7.0	
Parental rejection (7 items, range: 0-21)[c]		Mean ± SD: 4.8 ± 5.0	

SRQ Self-Reporting Questionnaire, *SDQ* Strengths and Difficulties Questionnaire, *CI* Confidence interval

[a] Events that occurred more than once in the past 6 months, [b] Past 12 months, [c] Total score

Table 3 Correlates of adolescent-reported SDQ clinical emotional problems identified by bivariate and multivariable tests

	SDQ applied to in-school adolescents (n = 669)				
	Bivariate tests		Multivariable test MODEL 1A		
CORRELATES	OR (95% CI)	Wald	OR (95% CI)	Wald	VIF
Adolescent sex					
Boy	0.67 (0.40, 1.11)	2.44	1.04 (0.56, 1.92)	0.01	1.04
Girl[a]					
Adolescent age (years)	0.93 (0.77, 1.11)	0.63	0.83 (0.66, 1.04)	2.56	1.08
Victimization by peer aggression events[b]	1.22 (1.08, 1.38)	10.13**	1.02 (0.84, 1.23)	0.03	1.43
Bullying victimization					
Yes	4.75 (2.27, 9.95)	17.06***	2.34 (0.79, 6.93)	2.37	1.27
No[a]					
Severe physical punishment by parents[b]	1.59 (1.09, 2.31)	5.78*	0.58 (0.30, 1.14)	2.50	1.19
Community violence victimization[b]	2.15 (1.57, 2.92)	23.75***	1.80 (1.12, 2.89)	5.98*	1.47
Witnessing community violence[b]	1.11 (0.95, 1.30)	1.76	0.78 (0.59, 1.02)	3.29	1.43
Stressful life events[b]	1.43 (1.23, 1.65)	22.95***	1.36 (1.09, 1.69)	7.46*	1.45
Resilience[c]	0.98 (0.96, 0.99)	10.76**	1.01 (0.98, 1.04)	0.55	1.36
Parental rearing style: emotional warmth[c]	0.93 (0.90, 0.96)	25.49***	0.97 (0.92, 1.01)	2.32	1.48
Parental rearing style: rejection[c]	1.11 (1.06, 1.16)	21.08***	1.08 (1.01, 1.14)	5.80*	1.32
Clinical conduct problems (SDQ)					
Yes	7.71 (4.48, 13.25)	54.61***	4.44 (2.20, 8.94)	17.36***	1.28
No[a]					
Clinical hyperactivity (SDQ)					
Yes	3.96 (2.20, 7.12)	21.01***	2.48 (1.13, 5.44)	5.14*	1.18
No[a]					
Maternal education					
0-7 years	2.38 (1.42, 4.01)	3.01**	1.94 (1.04, 3.64)	4.32*	1.09
8+ years[a]					
Mother not working for pay (past 30 days)					
Not working	0.88 (0.53, 1.45)	0.25	1.03 (0.56, 1.90)	0.01	1.05
Working[a]					
Maternal anxiety/depression					
Yes (SRQ total score > 7)	2.43 (1.45, 4.07)	11.35**	1.61 (0.84, 3.08)	2.10	1.10
No (SRQ total score 0-7)[a]					
INTERACTIONS					
Severe physical punishment by parents *Adolescent age	NA		2.34 (1.38, 3.98)	9.84**	1.11
Community violence victimization *Adolescent sex	NA		0.30 (0.13, 0.68)	8.25**	1.07
Witnessing community violence *Adolescent age	NA		0.80 (0.67, 0.95)	6.49*	1.18

SDQ Strengths and Difficulties Questionnaire, *OR* Odds ratio, *CI* Confidence interval, *VIF* Variance Inflation Factor, *SRQ* Self-Reporting Questionnaire, *NA* Not applicable

* $p < 0.05$, ** $p < 0.005$, *** $p < 0.0005$

[a] Reference category, [b] Number of positive items, [c] Total score

Table 4 Correlates of adolescent-reported SDQ clinical conduct problems identified by bivariate and multivariable tests

	SDQ applied to in-school adolescents (n = 669)				
	Bivariate tests		Multivariable test MODEL 2A		
CORRELATES	OR (95% CI)	Wald	OR (95% CI)	Wald	VIF
Adolescent sex					
Boy	0.76 (0.48, 1.18)	1.52	0.88 (0.50, 1.55)	0.20	1.05
Girl[a]					
Adolescent age (years)	1.00 (0.85, 1.18)	0.0001	0.90 (0.73, 1.11)	0.89	1.08
Victimization by peer aggression events[b]	1.24 (1.10, 1.39)	13.14***	1.11 (0.92, 1.33)	1.12	1.46
Bullying victimization					
Yes	2.52 (1.18, 5.40)	5.65*	0.81 (0.24, 2.75)	0.11	1.26
No[a]					
Severe physical punishment by parents[b]	2.50 (1.72, 3.64)	22.95***	2.12 (1.39, 3.24)	12.25***	1.16
Community violence victimization[b]	2.00 (1.49, 2.68)	21.12***	1.03 (0.64, 1.64)	0.01	1.52
Witnessing community violence[b]	1.31 (1.15, 1.49)	16.41***	1.17 (0.95, 1.44)	2.16	1.42
Stressful life events[b]	1.32 (1.15, 1.51)	16.15***	1.01 (0.82, 1.25)	0.02	1.48
Resilience[c]	0.97 (0.95, 0.98)	21.18***	1.00 (0.98, 1.02)	0.13	1.36
Parental rearing style: emotional warmth[c]	0.91 (0.89, 0.94)	42.69***	0.95 (0.92, 0.99)	5.27*	1.47
Parental rearing style: rejection[c]	1.13 (1.09, 1.18)	38.06***	1.10 (1.04, 1.16)	10.44**	1.13
Clinical emotional problems (SDQ)					
Yes	7.71 (4.48, 13.25)	54.61***	5.73 (2.86, 11.50)	24.15***	1.20
No[a]					
Clinical hyperactivity (SDQ)					
Yes	5.41 (3.17, 9.23)	38.39***	4.77 (2.36, 9.64)	18.92***	1.14
No[a]					
Maternal education					
0-7 years	1.71 (1.09, 2.67)	5.47*	1.52 (0.85, 2.73)	2.00	1.10
8+ years[a]					
Mother not working for pay (past 30 days)					
Not working	0.58 (0.36, 0.92)	5.34*	0.47 (0.26, 0.85)	6.27*	1.05
Working[a]					
Maternal anxiety/depression					
Yes (SRQ total score > 7)	1.45 (0.89, 2.37)	2.24	1.00 (0.52, 1.93)	0.00	1.10
No (SRQ total score 0-7)[a]					
INTERACTIONS					
Victimization by peer aggression events *Adolescent age	NA		1.15 (1.01, 1.29)	4.72*	1.15
Bullying victimization *Adolescent sex	NA		0.02 (0.001, 0.16)	12.05**	1.06
Severe physical punishment by parents *Adolescent age	NA		0.62 (0.43, 0.89)	6.71*	1.10
Community violence witnessing *Adolescent sex	NA		1.81 (1.27, 2.57)	10.84**	1.04

SDQ Strengths and Difficulties Questionnaire, *OR* Odds ratio, *CI* Confidence interval, *VIF* Variance Inflation Factor, *SRQ* Self-Reporting Questionnaire, *NA* Not applicable

* $p < 0.05$, ** $p < 0.005$, *** $p < 0.0005$

[a] Reference category, [b] Number of positive items, [c] Total score

Multiple linear regression models

When using continuous scores for SDQ emotional problems, conduct problems and hyperactivity, and running multiple linear regression on SDQ emotional problems scores (Model 1B) and conduct problem scores (Model 2B), the identified significant correlates and interactions (Supplementary Table) confirmed the majority of results obtained by using multivariable logistic regression. Two out of three significant correlates and all three significant interactions identified in Model 1A (Table 3) were also significant in Model 1B. All three significant correlates and two out of four significant interactions identified in Model 2A (Table 4) were also significant in Model 2B.

Discussion

In the current study, age and sex were found to be moderators of the association between different forms of violence exposure and emotional and/or conduct problems among adolescents. Our findings regarding exposure to violence at school, in the community and at home are discussed below.

Exposure to peer victimization at school

We observed that a greater number of experienced peer aggression events was associated with a higher probability of presenting conduct problems among the oldest adolescents (age level 3), but not among the younger ones (age levels 1 and 2). In addition, higher odds of having conduct problems were associated with bullying victimization among girls but with no bullying victimization among boys. Our findings corroborate the study results of Halabi et al. [38] who evaluated a population-based sample of 510 adolescents (11-17 years) from Beirut and found that direct peer victimization was significantly associated with higher odds of having disruptive behavior disorders among girls but not among boys, and among 13- to 15-year-olds but not among 11- to 12-year-olds. One hypothesis to explain the association of peer victimization with externalizing behaviors is the moderating role of deviant peer affiliation. Adolescents exposed to peer victimization (including direct and indirect events) may be avoided by their peers, will feel alone and excluded, and may be more likely to make friends with deviant peers who will provide opportunities and support for the development of aggressive behaviors [39, 40]. Deviant peer groups provide consistent opportunities for the encouragement of aggressive behaviors, as aggression is likely to be perceived as normative behavior, which could shape maladaptive attitudes toward aggression [41]. In our study, an unexpected association was found between conduct problems

and bullying victimization among boys, where non-victimized boys showed more conduct problems than victimized boys. This finding may have different explanations. It is reasonable to suppose that boys with conduct problems for a long period of time would be considered aggressive and dangerous by their peers who will be afraid to take risks bullying them. It is also possible that boys with conduct problems would resist admitting that they were harmed by their peer victimization experiences because they might associate bully victimization with weakness and want to affirm a perceived masculine norm of "toughness".

Exposure to community violence

Girls and boys may be differentially affected by community violence. In our study, girls with increased experiences of community violence victimization had an increased probability of presenting emotional problems, while boys with increased experiences of witnessing community violence had an increased probability of presenting conduct problems. Regarding girls, our finding is in accordance with data reported in a study by Bacchini et al. [42]. The authors evaluated 489 adolescents (16-19 years) from four secondary schools in the city of Naples, Italy, and found that girls victimized by community violence reacted with higher levels of anxiety and depressive symptoms compared to boys. One may suppose that adolescents could interpret violence in the community as a sign that the world is unsafe and that he or she is unworthy of protection, which may lead to helplessness and negative self-perceptions [43]. Furthermore, disruption in emotion regulation is a potential mechanism linking community violence exposure to internalizing symptoms during adolescence, a developmental period of heightened risk for depression and continued risk for anxiety [44]. Regarding boys, our result is in line with findings reported by Pierre et al. [13] who evaluated 119 African-American male adolescents from Time 1 (14-18 years) to Time 2 (15-19 years) and found that witnessing community violence during Time 1 had a significant main effect on Time 2 aggression. In addition, Kersten et al. [45] found that the strong association between witnessing community violence in the past year and current conduct problems was mediated by proactive aggression (intentional) not only in a clinically impaired sample (adolescents with a diagnosis of conduct disorder) but also among healthy controls. However, one must remember that the relationship between community violence and externalizing behaviors may be bidirectional. According to Lambert et al. [14], the effects of early aggression on community violence exposure (witnessing events and victimization) are accounted for, in part, by peer rejection and deviant peer affiliation. The fact that adolescents with aggressive behaviors are frequently involved with deviant peers may explain why they are more exposed to community violence since they are encouraged to participate in violent activities to fit in with the group [5].

The moderating role of sex influencing the strength of the association between community violence victimization and emotional problems (a significant association was found among girls but not boys), and the strength of the association between witnessing community violence and conduct problems (a significant association was found among boys but not girls) could be explained by the cumulative effects model of community violence exposure, according to which as experiences of violence exposure accumulate, the risk for psychopathology (e.g., depression, aggression) increases [46]. Our study also showed that among the oldest adolescents, higher levels of witnessed community violence were associated with lower levels of emotional problems. This result can be explained by the desensitization model, according to which community violence exposure starts by compromising the adolescents' well-being but then they become desensitized to violence as it accumulates over time, leading to emotional numbing and a weaker association between community violence exposure and internalizing symptoms [46]. For instance, when evaluating a sample of 241 African-American adolescents (11-15 years) from five public schools in urban areas of economically disadvantaged communities, Gaylord-Harden et al. [47] found that adolescents exposed to high levels of community violence (including victimization and witnessing events) in the past 3 months showed the lowest levels of depressive symptoms compared to adolescents exposed to low levels of violence or moderately high levels of victimization, suggesting a desensitization outcome. Interestingly, desensitization was confirmed in a psychophysiological assessment of adolescents in which they watched a montage of media violence, and youth exposed to high levels of community violence had lower baseline heart rates than those with low exposure [48].

Exposure to violence at home

Desensitization was also noted among the youngest adolescents since they responded to higher levels of severe physical punishment by their parents with less emotional problems. Furthermore, the younger adolescents responded to higher levels of severe physical punishment by parents with more conduct problems. Some authors refer to this pattern as "pathologic adaptation," implying that young people become desensitized to violence exposure in terms of psychological distress (they adapt to chronic exposure emotionally) while displaying more aggressive behaviors (maladaptive behaviors) [49, 50]. However, another explanation for the association between severe physical punishment and conduct problems is the possibility of reverse causation since children's externalizing behavior predicts subsequent parental aggression [51].

Theoretical models of the relationship between violence exposure and mental health

Theoretical models were developed to explain the mechanisms by which violence exposure influences mental health symptoms in youth. These models include the presence of mediators and moderators. Mediators are factors in the pathway between violence exposure and mental health problems, while moderators affect the strength and direction of this relationship. Mediators (such as negative coping, community chaos, symptoms of posttraumatic stress disorder/PTSD, neighborhood safety and family conflict) and moderators (such as gender, family relationship characteristics, school connectedness, parental mental health, and grade level) can influence the association between community violence exposure and mental health symptoms [52]. For instance, when examining PTSD symptoms as a mediator, McDonald and Richmond [52] found that community violence exposure increased the odds of developing PTSD symptoms which increased the odds of developing other mental health symptoms such as depression, anxiety, or aggression in urban adolescents. In addition, a stress process model proposed by Foster and Brooks-Gunn [53] included the influence of multilevel mediators and moderators on the relationship between risk factors and mental health outcomes. For instance, school climate, family organization, and social support, all moderated the effects of community violence exposure on mental health. According to these authors, the process of stress begins with social conditions and moves through mediating and moderating factors to explain how violence exposure affects mental health. Therefore, researchers should understand the context in which victimization occurs and the importance of distinguishing the traumatic impact of specific forms of victimization [54]. Our study results revealed that different forms of violence exposure influence the occurrence of different types of mental health symptoms according to the age and sex of adolescents. We observed that emotional problems were associated with community violence victimization among girls, while conduct problems were associated with severe physical punishment among the younger, suffering peer aggression among the oldest, bullying victimization among girls, and witnessing community violence among boys. Therefore, our study supports the theoretical model that proposes the presence of moderators affecting the strength of the association between violence exposure and mental health problems and confirms the moderating role of age and sex on this association.

Study strengths and limitations

The strengths of the current study include the rigorous methods used to select a probabilistic community-based sample of adolescents; the high participation rate among the eligible individuals; the use of interviews to collect data given that a significant proportion of participants could have had difficulty reading a self-administered questionnaire; the use of two different measures of exposure to peer victimization at school (exposure to peer

aggression events, bullying victimization); differentiating victimization from witnessing community violence; using multivariable logistic regression models to examine the effects of five different forms of violence exposure on adolescent mental health problems, adjusting the logistic models by a great variety of potential confounders and covariates, controlling for comorbidity and examining the potential moderating roles of age and sex on the association between violence exposure and adolescent mental health problems. However, some limitations of the study must be recognized such as the cross-sectional design of the study which prevented the establishment of causal effects between different forms of violence exposure and mental health problems. In addition, a greater sample size would favor the precision of the associations between violence exposure and emotional and conduct problems, particularly when producing results of the interaction tests.

Conclusions and recommendations

Age and sex are moderators of the association between different forms of violence exposure and emotional/conduct problems. Our results show that emotional and conduct problems are associated with factors such as peer victimization at school, parental severe physical punishment and exposure to community violence depending on adolescents' sex and age. Therefore, interventions designed to reduce violence at home, at school and in the community could help to prevent emotional and conduct problems among low-income adolescents. Moreover, the observed desensitization (less emotional problems related to greater violence exposure) among the oldest adolescents who witnessed community violence and among the youngest adolescents who suffered severe physical punishment by parents may be explained by viewing violence as normal in a low-income and violent context.

In Brazil, the Unified National Health System (SUS) provides free access to health services for the entire Brazilian population [55], and the users of the public health system are mainly individuals with low educational level and income [56]. Because primary care units are the most accessible type of free health service in Brazil [55], one possible governmental strategy to cut down the exposure to violence at home would be the development of preventive programs in local primary care health units aiming to promote healthy relationships between adolescents and their parents to reduce the use of harsh physical punishment as a parental educational method. Furthermore, to lower the rates of peer victimization, it would be necessary to adapt effective school intervention models developed in other countries to the local context and pilot test them before disseminating these models regionally and nationally. Regarding schools, school enrolment in Brazil is compulsory for children and adolescents aged 4-17 years to complete basic education from pre-school to secondary education,

and it is free in public schools [57]. However, due to the high number of students, school hours are usually divided into three 5-h sessions (7AM-12PM, 12PM-5PM, 5PM-10PM) and students attend one session per day [58]. Therefore, one possible governmental strategy to reduce the time adolescents spend on the streets and the opportunity to become involved with violence and crime is to increase the number of public-school daily hours, particularly in disadvantaged neighborhoods. In addition, because people in worse economic situations usually live in areas with fewer facilities and spaces for recreational activities, actions are needed to offer free sports, arts, music, and other cultural and leisure activities in the local community to promote positive behaviors and protect the adolescents from involvement with community violence. Ideally, these initiatives should be taken in partnership with local schools and primary care health units to take advantage of the existing infrastructure and human resources. In conclusion, the results of this study are expected to be generalizable to adolescents living in low-income and violent communities in different parts of Brazil and abroad. However, it is important to have these results confirmed by studies with a proper longitudinal design.

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Declarations

Conflicts of interest The authors declare that they have no conflicts of interest.

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Supplementary Figure Items related to variables of interest for the study including outcomes, violence exposure, confounders and covariates

STUDY OUTCOMES – ADOLESCENT REPORTED

Emotional problems based on the Strengths and Difficulties Questionnaire (SDQ) [www.sdqinfo.org]

- I get a lot of headaches, stomach-aches or sickness
- I worry a lot
- I am often unhappy, down-hearted or tearful
- I am nervous in new situations. I easily lose confidence
- I have many fears, I am easily scared

Conduct problems based on the Strengths and Difficulties Questionnaire (SDQ) [www.sdqinfo.org]

- I get very angry and often lose my temper
- I usually do as I am told
- I fight a lot. I can make other people do what I want
- I am often accused of lying or cheating
- I take things that are not mine from home, school or elsewhere

VIOLENCE EXPOSURE – ADOLESCENT REPORTED

Exposure to violence at school [59]

(events of peer aggression at school occurring more than once in the past 6 months)

Physical aggression

- Another pupil has tried to kick him/her
- Another pupil has threatened him/her
- Another pupil has tried to trip him/her up
- Another pupil has tried to hit him/her

Verbal harassment

- Another pupil has called him/her names
- Another pupil has teased him/her
- Another pupil has teased him/her about his/her family
- Another pupil has teased him/her because he/she was different
- Another pupil has tried to hurt his/her feelings

Social manipulation

- Another pupil has ganged up on him/her
- Another pupil has tried to make him/her hurt other people
- Another pupil has tried to get him/her into trouble
- Another pupil has made him/her do something he/she didn't want to
- Another pupil has threatened to tell on him/her
- Another pupil has told a lie about him/her

Bullying victimization (occurring more than once a week in the past 6 months)

Exposure to violence at home [62]

(severe physical punishment by one or both parents occurring at least once in the past 12 months)

- Being hit with an object (e.g. stick, broom, cane, belt)
- Being kicked
- Being choked by putting hands (or something else) around his/her neck
- Being smothered with hand or pillow
- Being burned, scalded or branded
- Being beaten
- Being threatened with a knife or gun
- Being harmed with a knife or gun

Exposure to violence in the community [63]

(victimization events occurring outside home and school at least once in the past 12 months)

(**witnessed events = seeing this happening with another person)**

- Being mugged
- Someone has broken into or tried to force their way into the house/apartment when he/she was there
- Being chased by gangs or individuals

Being picked-up, arrested or taken to the precinct by the police
Being threatened by someone with serious physical harm
Suffering death threats
Being beaten-up
Being attacked or stabbed with a knife
Being around a shoot-out
Being shot
Being sexually molested by someone much older than him/her

CONFOUNDERS – ADOLESCENT REPORTED (PROTECTIVE FACTORS)

Resilience (READ-Short) [64, 65]

I function better when I know what I want
My friends and family often support me
In my family, we have the same opinion about what are the important things in life
It's easy for me to make people feel good around me
I know how to get where I want in life
My friends stand together
I feel good when I'm with my family
It's easy for me to make new friends
When it is impossible to change something, I forget about it and don't worry anymore
I know how to use my time to do what I need to do
My friends and family really care about me
In my family, we have the same opinion about almost everything
It's easy for me to talk to people I've just met
I think I'm good at what I do
In my family, we have some habits that make our daily routine easier
I always have someone to help me when I need help
When I have to choose from several options, I almost always know how to choose what is best for me
Even when very bad things happen, my family thinks that the future will be all right
I always talk about interesting things
Believing in me helps me overcome tough times
In my family, we support each other
I always find something to say to comfort people when they are sad
I usually see the positive side even in bad things
In my family, we like to do things together

Perceived parental rearing style: emotional warmth (Brazilian version of EMBU-C) [66, 67]

My parents show that they like me through the way they behave and what they say
If things do not go well for me, my parents try to comfort me and support me to move on
If I have something difficult to do, I feel that my parents support me
I feel that my parents like me
I think my parents respect my opinions
I feel that my parents want to be together with me
My parents try to do things so that I have fun and learn things
My parents often pay me compliments
When I'm sad, I can count on my parents to comfort me
My parents accept me the way I am
My parents usually participate with me in things I like to do
I think there is love and affection between my parents and I
My parents usually hug me

CONFOUNDERS – MOTHER REPORTED

Maternal anxiety/depression based on the Self-Reporting Questionnaire (SRQ) [68]

(total score: > 7 vs. ≤ 7)

Do you often have headaches?
Is your appetite poor?

Do you sleep badly?
Are you easily frightened?
Do your hands shake?
Do you feel nervous, tense or worried?
Is your digestion poor?
Do you have trouble thinking clearly?
Do you feel unhappy?
Do you cry more than usual?
Do you find it difficult to enjoy your daily activities?
Do you find it difficult to make decisions?
Is your daily work suffering?
Are you unable to play a useful part in life?
Have you lost interest in things?
Do you feel that you are a worthless person?
Has the thought of ending your life been on your mind?
Do you feel tired all the time?
Do you have uncomfortable feelings in your stomach?
Are you easily tired?

COVARIATES – ADOLESCENT REPORTED

Exposure to stressful life events in the past 12 months [69, 70]

Child's exposure to building collapse
Child's exposure to fire, flood or other natural disaster
Child's exposure to a life-threatening accident
Child's exposure to running over with serious injury
Child's exposure to an accident (biking, motorcycle, car, other traffic accident) with serious injury
Child saw a dead person victim of violence
Child saw a dead person victim of accident
Child received bad news about violent death or serious injury of a loved one
Life-threatening illness of a close family member
Death of a close family member
Problems with alcohol or drugs of a close family member
Close family member being arrested or having problems with the police

Perceived parental rearing style: rejection (Brazilian version of EMBU-C) [66, 67]

My parents think I'm guilty for everything that happens
My parents would like me to be different than I am
I think my parents do not treat me well and do not give me the love that they could give me
My parents say all the time that they do not like the way I behave at home
My parents criticize me, telling in front of other people that I'm lazy and I'm useless
My parents beat me for no reason
It has happened that my parents have sulked or gotten angry with me without telling me why

Supplementary Table Multiple linear regression on SDQ emotional and conduct problems scale scores

	SDQ applied to in-school adolescents (n = 669)			
	Emotional problems MODEL 1B		Conduct problems MODEL 2B	
CORRELATES	B (95% CI)	t	B (95% CI)	t
Adolescent sex				
Boy	-0.41 (-0.72, -0.11)	-2.66*	-2.48¥ (-3.50, -1.45)	-4.74***
Girl[a]				
Adolescent age (years)	-0.06 (-0.17, 0.06)	-1.00	-0.02 (-0.11, 0.06)	-0.54
Victimization by peer aggression events[b]	0.10 (-0.02, 0.23)	1.66	0.05† (-0.04, 0.15)	1.06
Bullying victimization				
Yes	0.23 (-0.51, 0.97)	0.61	1.60†† (0.81, 2.39)	3.98***
No[a]				
Severe physical punishment by parents[b]	0.05† (-0.28, 0.37)	0.28	0.28† (0.03, 0.54)	2.18*
Community violence victimization[b]	0.63§ (0.23, 1.03)	3.11**	0.04 (-0.20, 0.29)	0.36
Witnessing community violence[b]	-0.05† (-0.19, 0.08)	-0.77	0.02‡ (-0.12, 0.16)	0.30
Resilience[c]	0.001 (-0.01, 0.01)	0.13	-0.01 (-0.02, 0.003)	-1.50
Parental rearing style: emotional warmth[c]	-0.01 (-0.04, 0.02)	-0.78	-0.03 (-0.05, -0.01)	-2.82**
Maternal education				
0-7 years	0.23 (-0.08, 0.55)	1.48	0.04 (-0.21, 0.29)	0.33
8+ years[a]				
Mother not working for pay (past 30 days)				
Not working	0.06 (-0.25, 0.37)	0.38	-0.31 (-0.55, -0.07)	-2.51*
Working[a]				
Maternal anxiety/depression				
Yes (SRQ total score > 7)	0.37 (0.01, 0.74)	1.99*	0.01 (-0.28, 0.30)	0.09
No (SRQ total score 0-7)[a]				
Stressful life events[b]	0.19 (0.06, 0.31)	2.92**	0.02 (-0.08, 0.12)	0.39
Parental rearing style: rejection[c]	0.04 (0.003, 0.07)	2.13*	0.05 (0.02, 0.07)	3.33**
Conduct problems	0.39 (0.30, 0.48)	8.31***	-	-
Emotional problems	-	-	0.25 (0.19, 0.31)	8.63***
Hyperactivity	0.21 (0.13, 0.28)	5.41***	0.23 (0.17, 0.29)	7.86***
INTERACTIONS				
Victimization by peer aggression events				
*Adolescent age	-	-	0.02 (-0.05, 0.08)	0.48
Bullying victimization				
*Adolescent sex	-	-	-2.52 (-3.57, -1.46)	-4.68***
Severe physical punishment by parents				
*Adolescent age	0.31 (0.04, 0.57)	2.27*	-0.13 (-0.34, 0.08)	-1.23
Community violence victimization				
*Adolescent sex	-0.72 (-1.25, -0.19)	-2.68**	-	-
Witnessing community violence				
*Adolescent age	-0.12 (-0.21, -0.02)	-2.49*	-	-
Witnessing community violence				
*Adolescent sex	-	-	0.18 (0.001, 0.36)	1.97*

SDQ Strengths and Difficulties Questionnaire, *B* Unstandardized regression coefficient, *CI* Confidence interval

* p < 0.05, ** p < 0.005, *** p < 0.0005

[a] Reference category, [b] Number of positive items, [c] Total score

¥ Estimated difference between boys and girls within the group that has experienced bullying (and otherwise average levels of violence, † Estimated effect at mean age, †† Estimated effect for girls (estimated effect for boys is 2.52 lower than this), § Estimated effect for girls (slope of boys is 0.72 lower than this – see interaction effect), ‡ Estimated effect for girls (the estimated effect for boys is 0.18 points higher)