



The health consequences of child mental health problems and parenting styles: Unintentional injuries among European schoolchildren ☆☆☆



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ABSTRACT

Objective. Unintentional injury is the leading cause of death for schoolchildren. We assessed the association between externalizing psychopathology, parenting style, and unintentional injury in European children in the community.

Methods. Data were drawn from the School Children Mental Health in Europe project and included 4517 schoolchildren across seven diverse European regions. Past-year injuries serious enough to seek medical attention were reported by mothers. Child mental health problems were assessed using validated measures and reported by the mothers, teachers, and children. Parenting styles were based on The Parenting Scale and the Parent Behaviors and Attitudes Questionnaire.

Results. Children with attention-deficit/hyperactivity symptoms and oppositional defiant symptoms had a higher risk of injury compared to other children whether based on parent report (OR = 1.47, 95% C.I. 1.2–1.9), teacher report (OR = 1.36, 95% C.I. 1.1–1.7), or parent and teacher report combined (OR = 1.53, 95% C.I. 1.1–2.1). Children who self-reported oppositional symptoms also had higher risk of injury (OR = 1.6, 95% C.I. 1.1–2.4). Low-caring behavior of parents increased the risk of injury (OR = 1.4, 95% C.I. 1.1–1.9).

Conclusion. Unintentional injury is a potential adverse health consequence of child externalizing problems. Interventions to improve parent–child relationships and prevention as well as focused treatment for externalizing problems may reduce the burden of injury.

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Introduction

The leading cause of death among elementary school children is unintentional injury (Danseco et al., 2000; Deal et al., 2000; Organization and Dept, 2002). In high-income countries, unintentional injuries account for more child deaths than any other cause (Lalloo et al., 2003; Organization, 2005; Rowe et al., 2004, 2007). Identification of at-risk groups based on the characteristics of children and their families may allow for refinement in intervention and prevention strategies. Two

factors potentially important for injury prevention include child behavior and parenting style.

Epidemiological research indicates that children who are hyperactive, aggressive, and oppositional are more likely to experience unintentional injuries (Bijur et al., 1986; Brehaut et al., 2003; Davidson et al., 1992; Garzon et al., 2008; Lam, 2002; Rowe et al., 2004, 2007; Spinks et al., 2008; Swensen et al., 2004), and among injured children, those with attention-deficit/hyperactive (ADHD) symptoms have more severe injuries (DiScala et al., 1998) though findings are inconsistent (Bijur et al., 1988; Davidson et al., 1992). ADHD is characterized by inattention, impulsivity, and high levels of motor activity, which may directly impact injury risk (e.g., falls, burns); further, these children may be less able to appraise injury risk in dangerous situations, perceive fewer consequences of dangerous activities (Farmer and Peterson, 1995), and be more exposed to injury-producing activities (e.g., sports participation).

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Three limitations of previous literature, however, preclude firm assessment of the role of childhood psychiatric disorders in childhood injury. First, there is substantial comorbidity among these disorders which has not been extensively evaluated. For example, a recent study of US 5th graders indicated that conduct disorder was not associated with injury once ADHD was taken into consideration (Schwebel et al., 2011). Second, previous studies have relied primarily on mother report of child mental health (Bijur et al., 1986; Danseco et al., 2000; Davidson et al., 1992; Rowe et al., 2004, 2007) which has known limitations. Thus multi-informant studies within the same sample are critical. Third, a limited literature has also found associations between internalizing problems such as anxiety and depression and childhood injury (Lalloo et al., 2003; Rowe et al., 2004; Sherrard et al., 2002), though more robust empirical evidence from diverse contexts is needed.

Child mental health problems and injury risk exist within a context of parenting styles, which substantial research has demonstrated to be associated with injury risk behavior. Offspring of parents and caregivers who regularly monitor their children, set appropriate boundaries, model positive behavior, and rate the quality of their relationship with children as positive are less likely to engage in risky behaviors in adolescence (Clark and Shields, 1997; Dishion et al., 2004; Ryan et al., 2011; Taris et al., 1998; Tulloch et al., 1997; Wills and Cleary, 1996). However, hyperactive, oppositional and conduct-related behavior, including anger and aggression, often emerge prior to adolescence (Nock et al., 2007), indicating that research on parenting styles across the full range of childhood is warranted. Existing research demonstrates that parental supervision and a positive parent–child relationship are associated with reduced risk of injury (Morrongiello and House, 2004; Morrongiello et al., 2004, 2006; Saluja et al., 2004), and that this association is stronger for boys compared with girls (Schwebel and Brezaussek, 2010). However, while parenting beliefs and styles are hypothesized to be important determinants of injury risk, empirical evidence is scarce (Morrongiello et al., 2006). Greater understanding of how parenting style is associated with childhood injury may be a potentially important avenue for the development of risk-reducing interventions and educational programming.

To date, research on child mental health, parenting style, and unintentional injury has been conducted predominantly among samples recruited from the US, United Kingdom, and Australia. Rates of child mental health problems, norms about parenting and supervision of children, and exposure to situations that may increase risk for injury vary substantially cross-nationally (Bornstein, 2013). Thus, examination of the association between mental health problems, parenting style, and injury across countries with diverse norms may provide a fuller understanding of these interrelationships.

The present study utilizes data on >4500 children recruited from seven regions in east and west Europe to examine three aims. First, we examine the diversity of childhood unintentional injuries across European regions, including burden of injury, type, and setting. Second, we examine associations between childhood mental health problems and unintentional injury based on mother, teacher, and child report, as well as associations with comorbid mental health symptoms. Finally, we examine the diversity of parenting styles across regions and associations between parenting style and injury risk.

Methods

Sample

School Children Mental Health Europe (SCHME) was a cross-sectional survey conducted in 2010 of school children aged 6–11 years and one of their parents, typically the mother (86.5%). Data for the present study were drawn from: East Germany ($N = 220$), West Germany ($N = 216$), Netherlands ($N = 661$), Lithuania ($N = 1,032$), Romania ($N = 1,006$), Bulgaria ($N = 985$) and Turkey ($N = 491$). Details on the sampling by country are provided elsewhere (Kovess et al., submitted for publication; Pez et al., 2011). Briefly, primary schools were randomly selected in each participating country. Approximately

45–50 schools were approached per country (a greater number of schools were approached in Germany and the Netherlands), with varying participation rates from 6.5% (Netherlands) and 95.6% (Romania). Classes were randomly selected in each participating school, and approximately 48 children were randomly selected in each class. The exception was the Netherlands, where a lesser number of schools participated, and complete classes were included. Parents received an informational letter and consent form to return to school; children were included if present at school unless the parent actively refused. Among participating schools, between 50.5% (Turkey) and 90.5% (Netherlands) selected children participated as did between 45.5% (Netherlands) and 90.9% (Lithuania) of the parent and teacher informants. To reduce heterogeneity, we restricted these analyses to children for whom there was a mother's report (90% of respondents). The total sample size was 4207 for teacher-reported outcomes, and 4517 for mother-reported outcomes.

Measures

Data were collected from three informants: child, teacher, and parent. Parents completed a demographic questionnaire concerning household composition (age, gender, and familial link for each member), parental education (highest level completed), marital status, occupational level, and rural/urban residence. In the Netherlands the same questions were completed electronically using a secured website, although paper questionnaires were made available upon request.

Unintentional injuries

Parents were queried whether their child had been injured in the previous 12-months. If the child had been injured, follow-up questions queried characteristics of injuries that “were serious enough to require medical attention by a doctor, nurse, or dentist,” the number of injuries, and, for the worst injury, the type, cause, and place where the injury occurred.

Parenting style

Five dimensions of parenting style were queried: caring (hugging, complimenting, and enjoying the child), overreactivity (responding in an emotionally charged, harsh manner), verbosity (using verbal means to respond to misbehavior), and autonomy (allowing child to choose clothes and friends, travel alone). Scales of overreactivity and verbosity were drawn from the 30-item Parenting Scale (Arnold et al., 1993), which has well-documented reliability and validity in samples with diverse characteristics (Arnold et al., 1993; Reitman et al., 2001), including those selected to assess parenting behavior among families with a child with ADHD (Arnold et al., 1997; Harvey et al., 2001). Each item was rated on a 7-point scale. Autonomy and caring scales were drawn from the Parent Behaviors and Attitudes Questionnaire (Bergeron et al., 1992), and included 7 and 8 items, respectively. These scales also have well-documented reliability and validity (Bergeron et al., 2000, 2007; Henry et al., 2014). Three-levels of response were allowed (all of the time, some of the time, and never). For all scales, items were summed and cut-points were created based on being more than one standard deviation above the mean.

Child mental health problems

Child mental health problems were assessed using parent- and teacher-report versions of the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997). The SDQ has been extensively utilized in studies of child mental health, with studies documenting its reliability and validity in international samples (Goodman and Goodman, 2009, 2011; Richter et al., 2011; Van Roy et al., 2008). In our data, SDQ measures were reliable (α 's ranged from 0.59 for parent-reported conduct problems to 0.84 for teacher-reported hyperactivity). Further, a validation study among a subset of respondents comparing SDQ scores against the Development and Well-Being Assessment indicated adequate agreement ($\kappa = 0.46$ for any disorder) and strong validity (Pez et al., 2011). In the present study, we included three SDQ subscales: emotional problems, hyperactivity and inattention, and conduct problems. Each scale was based on 5 items, rated from 0 to 2. Internalizing mental health problems were defined as those with a score greater than 5, and ADHD and conduct problems were as those with a score greater than 4 and 7, respectively, based on established cut-points (Goodman, 1997).

Children reported on their mental health problems using the Dominic Interactive, a computerized program following an imaginary character through

various real-life scenarios. Children are asked if they empathize with Dominic in these scenarios. A total of 81 situations are used to represent the 7 common DSM-IV childhood mental health problems: ADHD, Conduct and Oppositional Defiant Disorder, Phobias, Separation Anxiety, Generalized Anxiety, and Major Depressive symptoms. Pictures, texts, and voices are used to illustrate abstract emotional and behavioral content of mental health problems and to simplify the scenario for children in primary school. Test–retest and internal consistency reliabilities for the Dominic Interactive (and its cross-culture derivatives) were excellent (α between 0.60 and 0.90 (Bidaut-Russell et al., 1998; Kuijpers et al., 2013; Murphy et al., 2000; Shojaei et al., 2009; Valla et al., 1994, 1997). In this sample, alphas for specific disorders ranged from 0.70 to 0.94. Validity of the Dominic Interactive scales is well established (Bergeron et al., 2010; de la Osa et al., 2011; Kuijpers et al., 2013; Valla et al., 2000), including validation in this sample against a clinical instrument (Pez et al., 2011). Probable cases were determined based on established cut-points.

Maternal psychological distress

Maternal psychological distress was measured using the MH-5 scale of the Short-Form-36 (Aaronson et al., 1992), a five question scale with scores ranging from 1 to 100 (mean = 73.8, SD = 16.6), assessing non-specific symptoms of psychological distress. These include the frequency in the past two-weeks of feeling nervous, low mood, blue, happy, calm and peaceful. This instrument has been extensively used with excellent reliability (McHorney et al., 1994; Tsai et al., 1997; Ware and Gandek, 1994; Ware et al., 1993) and validity (McHorney et al., 1993; Ware and Gandek, 1994; Ware et al., 1995) in cross-national samples. The MH-5 scale was highly reliable in this sample (α = 0.83). Women scoring below 57 were classified as distressed as recommended by the authors (Lewontin, 1974; Wadsworth et al., 2001).

Socio-demographic characteristics

Mothers reported on the sex and age of the child as well as the number of other children in the home. Mothers also reported on their own highest level of education, marital status, and whether they were employed outside the home.

Statistical analyses

First, we estimated prevalence, determinants, and number of childhood injuries in each region. Second, we estimated associations between child

mental health problems and injury risk based on mother, teacher, and child reports using logistic regression. Because few differences emerged by country in our initial analyses, we pooled countries for this aim. Third, we estimated associations between parenting style and injury risk. Control covariates included socio-demographics. Finally, we estimated interactions between child mental health problems and parenting style in association with injury using cross-product terms in logistic regression. All analyses were done using SAS Version 9.3.

Results

Unintentional injury among schoolchildren across seven regions in Europe

Table 1 describes the prevalence, mean and range, type, and setting of past-year injuries serious enough to seek medical attention across regions. The past-year unintentional injury prevalence significantly varied across regions, ranging from 13.1% (Netherlands) to 30.4% (West Germany). Among the injured, children in Bulgaria showed the highest mean number of injuries (mean = 3.5, SD = 5.1) and East Germany the lowest (mean = 1.6, SD = 1.0). In most regions, injuries commonly occurred at home, with falls the most frequent event in five of the seven regions. Cuts or bruises were the most frequent result of injury in four out of the seven regions.

When subset by gender and age (not shown), we observed a higher risk of injury among boys compared with girls (21.9% versus 15.0%, respectively chi-square = 15.8, df = 1, p < 0.01), and a non-significantly higher risk among those older than age-8 compared with those age-8 or younger (19.95% versus 18.26%, respectively, chi-square = 2.08, df = 1, p = 0.15). There were no gender or age differences in the place, activity, or injury type, either across or within any specific region.

Associations between child mental health problems and unintentional injury

Table 2 shows associations between child mental health problems and injury. Mother-reported internalizing problems were associated with injury (OR = 1.31, 95% C.I. 1.09–1.59), though the relationship

Table 1
Childhood past-year injury in seven European regions.

	Total (N = 4517)	Bulgaria (N = 962)	Lithuania (N = 1015)	Turkey (N = 485)	Romania (N = 993)	Netherlands (N = 628)	West Germany (N = 214)	East Germany (N = 220)	Chisq, df, p value
	N	%	%	%	%	%	%	%	
Any injury									
Yes	909	17.3%	24.7%	19.0%	18.8%	15.7%	13.1%	30.4%	Chi-square = 159.44, df = 7, p < 0.01
No	4295	82.7%	75.3%	81.0%	80.2%	84.3%	86.9%	69.6%	
Among the injured:									
Place									
School	184	21.9%	29.2%	14.5%	27.5%	9.2%	25.0%	27.0%	Chi-square = 138.50, df = 28, p < 0.01
Home	363	43.2%	34.5%	60.9%	53.9%	37.4%	27.5%	44.4%	
Sports field	62	7.4%	6.7%	5.0%	2.2%	9.2%	13.8%	11.1%	
Playground	102	12.1%	14.8%	2.8%	5.5%	29.8%	6.3%	12.7%	
Other	130	15.5%	14.8%	15.8%	11.0%	14.5%	27.5%	4.8%	14.6%
Activity									
Sports	146	17.7%	16.9%	14.0%	4.6%	19.5%	21.0%	40.0%	Chi-square = 154.22, df = 21, p < 0.01
Falls	321	39.0%	31.1%	55.3%	56.3%	33.6%	14.8%	36.7%	
Bike accident	146	17.7%	33.3%	5.6%	6.9%	25.0%	17.3%	3.3%	
Other	210	25.5%	18.7%	25.1%	32.2%	21.9%	46.9%	20.0%	
Lesion type									
Broken/fracture	160	18.7%	13.8%	20.0%	20.4%	17.3%	22.0%	29.7%	Chi-square = 123.08, df = 21, p < 0.01
Cut/bruise	366	42.9%	55.6%	46.7%	36.6%	55.4%	28.1%	15.6%	
Sprain	90	10.5%	3.1%	13.3%	9.7%	3.6%	19.5%	21.9%	
Other ^a	238	27.9%	27.6%	20.0%	33.3%	23.7%	30.5%	32.8%	
Number of injuries									
Mean (std. dev.)	2.61 (3.95)	3.45 (5.05)	2.05 (1.87)	1.74 (1.68)	3.29 (5.54)	1.95 (2.04)	2.43 (4.29)	1.61 (1.04)	
Range	1 to 50	1 to 50	1 to 12	1 to 15	1 to 50	1 to 10	1 to 34	1 to 5	

^a Burn, dislocation, concussion, poisoning, internal/dental injury, other, multiple.

was explained by demographic differences and comorbid mental health problems. Externalizing problems were robustly associated with injury in a fully adjusted model (OR = 1.49, 95% C.I. 1.16–1.92) and by gender. Teacher-reported internalizing problems were not associated with injury, while externalizing problems were associated with injury in fully-adjusted models (OR = 1.36, 95% C.I. 1.10–1.68) and among girls (OR = 1.68, 95% C.I. 1.11–2.54). Similarly, when considering mother and teacher combined reports, internalizing problems were not associated with injury, and externalizing problems were associated with injury in fully-adjusted models (OR = 1.53, 95% C.I. 1.14–2.06) and among girls (OR = 2.50, 95% C.I. 1.26–4.97). When examined using oppositional and ADHD symptoms as separate predictors, results were robust across mother, teacher, and combined reports (data not shown).

Table 3 describes the relationships between each category of mental health problem assessed by child report and injury risk. Children reporting oppositional symptoms had higher odds of injury (OR = 1.63, 95% C.I. 1.10–2.41), and the relationship was particularly strong among boys (OR = 2.11, 95% C.I. 1.06–4.22) although the interaction between disorder and gender was not statistically significant (chi-square = 0.92, $p = 0.34$).

Associations between parenting style and unintentional injury

Fig. 1 shows the associations between parenting style and injury in each region and pooled across regions. Those who were weak on caring were more likely to have an injured child, with significant bivariate associations for the whole sample, Romania, and West Germany. Table 4 documents the relationships between parenting style and injury risk in a pooled analysis across regions. Those who were low on caring were more likely to have a child with an injury in fully adjusted models (OR = 1.42, 95% C.I. 1.07–1.89) and among boys (OR = 1.65, 95% C.I. 1.07–2.54).

Shown in Online Table 1, we examined interactions between parenting style and child mental health problems in association with injury risk. Of 60 interactions tested, one was statistically significant, which could be attributable to chance in the context of multiple comparisons. Specifically, autonomy significantly interacted with child-report of internalizing disorder in predicting injury risk ($F = 4.33$, $df = 1$, $p = 0.04$). Among children who were high on autonomy, internalizing disorders were associated with higher risk of injury (OR = 1.68, 95% C.I. 1.03–2.74); no association between internalizing disorder and injury was observed among children with mothers low on autonomy. We conducted a sensitivity analysis examining interactions between child mental health and parenting style, comparing those two standard deviations above the mean to all others. No interactions were statistically

significant, indicating that parenting style did not modify the relationship between child mental health and injury risk.

Discussion

Utilizing data collected on more than 4500 European schoolchildren across seven regions, the present data are consistent with prior studies documenting an association between externalizing problems and injury in schoolchildren. We extend these previous findings in several ways. First, we document that children with probable externalizing disorders including ADHD as reported by mothers and teachers, and oppositional disorders as reported by mothers, teachers, and the children themselves have higher odds of injury compared with children without such disorders. This was true even after adjusting for comorbid disorders. Both boys and girls have increased odds, though our data suggest that mother- and teacher-reported externalizing problems are particularly associated with injury risk among girls. Second, we document that children of parents who are low on caring have increased odds of injury. There was little evidence for interactions between child mental health problems and parenting style, suggesting that these were largely independent risk factors.

These results underscore the adverse health consequences of childhood externalizing behavior. While previous studies have documented that children with externalizing problems are more likely to have other persistent mental health problems (Goldstein et al., 2006), substance use disorders (Biederman et al., 1997), criminal offenses (Sourander et al., 2007), and increased risk for intentional injury (e.g., self-harm and suicide attempts) (Goldston et al., 1999), these data indicate that unintentional injury may be an additional health consequence. In particular, these results support a growing literature that children exhibiting hyperactive, inattentive, and oppositional behavior have higher rates of unintentional injury compared with other children (Bijur et al., 1986; Brehaut et al., 2003; Davidson et al., 1992; Rowe et al., 2004, 2007). These data document an association between externalizing problems and injury in school-age children; however, previous work has documented similar associations at many stages of development, including preschool (Garzon et al., 2008; Schwebel et al., 2002), adolescence, and early adulthood (Barkley, 2004; Barkley et al., 1993, 1996; Lam et al., 2006).

Several mechanisms have been proposed for the association between externalizing disorders and injury risk. Oppositional children may: have a higher propensity to engage in potentially injury-inducing behavior (Bijttebier et al., 2003), be more likely to engage in physical fights with other children (Barker and Salekin, 2012), seek stimulation in dangerous activities (Steinberg et al., 2008), and disregard rules and authority figures (LeBlanc et al., 2006). Children with

Table 2

Internalizing and externalizing child mental health problems across two reporters (parent and teacher) and past-year risk of injury in European school children.

	Unadjusted	Adjusted for demographics ^a	Adjusted for demographics and all mental health problems simultaneously ^b	Boys Adjusted for demographics and all mental health problems simultaneously ^b	Girls Adjusted for demographics and all mental health problems simultaneously ^b
	OR (C.I.)	OR (C.I.)	OR (C.I.)	OR (C.I.)	OR (C.I.)
Internalizing disorder					
Mother	1.31 (1.09, 1.59)	1.23 (0.98, 1.54)	1.17 (0.96, 1.42)	1.22 (0.89, 1.67)	1.02 (0.72, 1.44)
Teacher	0.89 (0.66, 1.20)	1.02 (0.73, 1.42)	0.81 (0.59, 1.10)	1.01 (0.64, 1.59)	0.85 (0.50, 1.44)
Mother and teacher ^c	0.78 (0.44, 1.39)	0.90 (0.46, 1.74)	0.73 (0.41, 1.30)	0.95 (0.40, 2.23)	0.68 (0.23, 2.05)
Externalizing disorder					
Mother	1.57 (1.33, 1.86)	1.51 (1.24, 1.84)	1.47 (1.20, 1.80)	1.49 (1.16, 1.92)	1.44 (1.02, 2.02)
Teacher	1.44 (1.20, 1.72)	1.35 (1.09, 1.67)	1.36 (1.10, 1.68)	1.28 (0.99, 1.64)	1.68 (1.11, 2.54)
Mother and teacher ^c	1.75 (1.36, 2.25)	1.53 (1.14, 2.05)	1.53 (1.14, 2.06)	1.37 (0.99, 1.91)	2.50 (1.26, 4.97)

Bold values indicate that odds ratio is statistically significant at $p < 0.05$.

^a Adjusted for sex, age of child, mother's education, mother's age, number of children, marital status, east/west Europe, maternal employment, and maternal psychological distress.

^b Adjusted for sex, age of child, mother's education, mother's age, number of children, marital status, east/west Europe, maternal employment, maternal psychological distress, and all mental health problems other than the focal mental health problem.

^c Child rated as a probable case by both parent and teacher.

Table 3
Child reported mental health problems and odds of past-year unintentional injury.

	Unadjusted OR (C.I.)	Adjusted ^a OR (C.I.)	Boys (adjusted) ^a OR (C.I.)	Girls (adjusted) ^a OR (C.I.)
Specific phobia	0.94 (0.70, 1.28)	1.01 (0.71, 1.45)	0.92 (0.57, 1.46)	1.20 (0.69, 2.10)
Separation anxiety	1.03 (0.82, 1.29)	1.10 (0.85, 1.42)	0.99 (0.69, 1.44)	1.22 (0.85, 1.74)
General anxiety	1.23 (0.88, 1.72)	1.24 (0.84, 1.82)	0.94 (0.53, 1.67)	1.62 (0.94, 2.76)
Depression	1.05 (0.73, 1.53)	0.89 (0.57, 1.38)	0.60 (0.28, 1.28)	1.15 (0.65, 2.01)
Oppositional	1.64 (1.15, 2.32)	1.63 (1.10, 2.41)	2.11 (1.06, 4.22)	1.45 (0.90, 2.35)
ADHD	0.95 (0.62, 1.47)	0.91 (0.56, 1.48)	0.78 (0.33, 1.89)	0.96 (0.53, 1.72)
Conduct	1.27 (0.86, 1.88)	1.13 (0.71, 1.79)	1.06 (0.35, 3.17)	1.11 (0.66, 1.84)

Bold values indicate that odds ratio is statistically significant at $p < 0.05$.

^a Adjusted for sex, age of child, mother's education, mother's age, number of children, marital status, east/west Europe, maternal employment, maternal psychological distress, and all disorders other than the focal disorder.

externalizing problems should be considered as a high-risk group for injury, and parents should be provided with information and recommendations to ensure proper safety and supervision. Our findings contrast with other studies suggesting an association between internalizing problems and injury risk (Lalloo et al., 2003; Rowe et al., 2004; Sherrard et al., 2002), with suggested mechanisms including disrupted attentional control. Since disrupted attentional control is common to both internalizing and externalizing disorders, we would expect associations between both internalizing and externalizing disorders and injury risk if this were the operative mechanism. Because we see associations only with externalizing disorders, we suggest that rule disregard, physicality, and propensity for high-risk behavior may be more promising avenues to pursue as mechanisms underlying these associations.

Our findings regarding children of parents who are low on caring behavior support a host of previous research indicating that the

warmth of the parent–child relationship predicts injury risk (Morrongiello and House, 2004; Schwebel et al., 2004). Parents who rate low on caring and warmth toward their children may provide less supervision, increasing the probability of an injury (Morrongiello et al., 2004, 2006; Saluja et al., 2004; Schwebel and Bounds, 2003). While some studies have suggested that parental supervision may minimize the adverse consequences of child externalizing problems on injury risk (Schwebel and Bounds, 2003), we did not document interactions between parenting style and child mental health problems. Thus based on our data, we would not conclude that caring behavior mitigates the adverse effects of child externalizing problems on injury risk. Parents with low levels of caring behavior may have underlying psychopathology or higher levels of hostility, creating an environment where acting out and risk-taking by the children are more likely. Interventions to improve parent–child relations and provide a safe context for children are effective

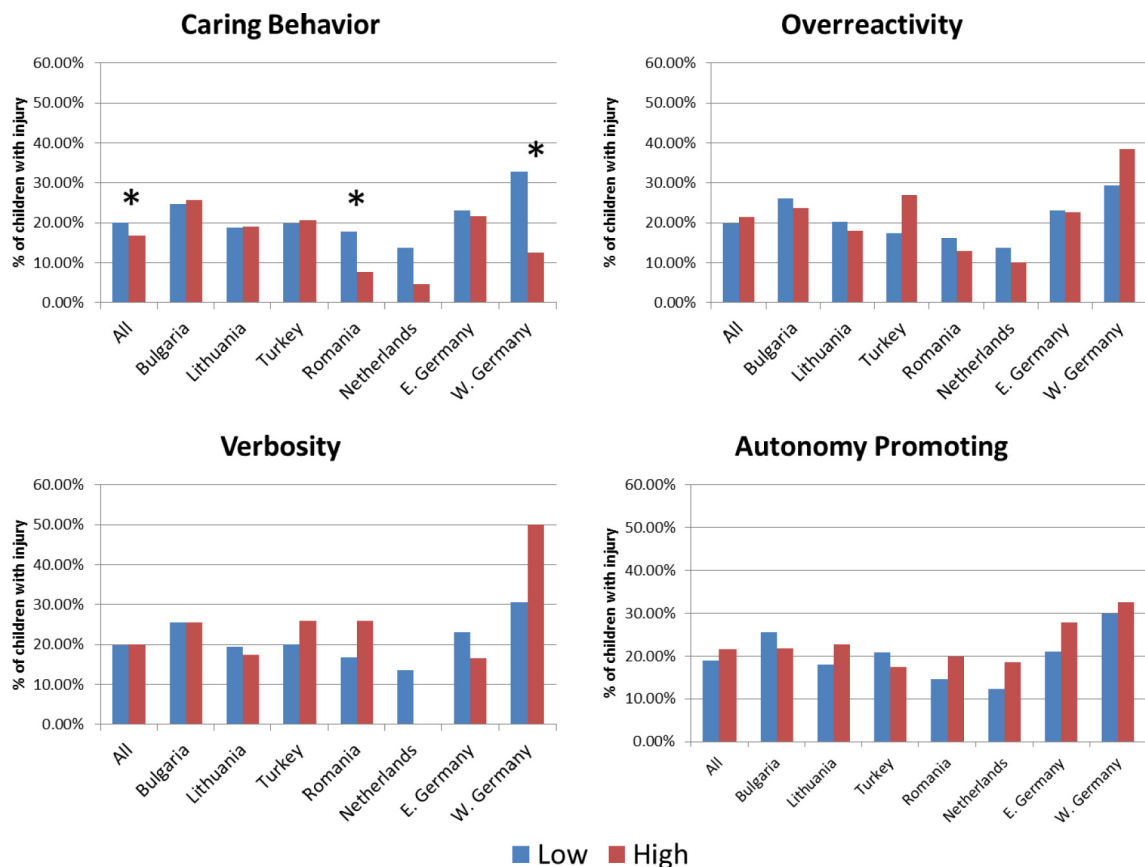


Fig. 1. Parenting styles and past-year injury risk in seven European regions. $P < 0.05$ for difference.

Table 4

Association between parenting style and risk of past-year child injury in European school children.

	Unadjusted	Adjusted for demographics, region, and maternal psychological distress ^a	Adjusted for previous covariates other styles	Adjusted for previous covariates, other styles, and region	Adjusted model (girls only)	Adjusted model (boys only)
	OR (C.I.)	OR (C.I.)	OR (C.I.)	OR (C.I.)	OR (C.I.)	OR (C.I.)
Over-reactivity (high vs. low)	1.11 (0.90, 1.37)	1.03 (0.81, 1.32)	1.21 (0.93, 1.57)	1.18 (0.91, 1.54)	1.39 (0.99, 1.96)	0.89 (0.58, 1.38)
Verbosity (high vs. low)	1.02 (0.82, 1.26)	1.00 (0.78, 1.28)	1.11 (0.83, 1.47)	1.05 (0.79, 1.40)	0.97 (0.65, 1.45)	1.20 (0.79, 1.83)
Low caring (high vs. low)	1.24 (1.00, 1.55)	1.32 (1.03, 1.70)	1.37 (1.04, 1.82)	1.42 (1.07, 1.89)	1.24 (0.85, 1.82)	1.65 (1.07, 2.54)
Low autonomy (high vs. low)	0.85 (0.70, 1.02)	0.83 (0.67, 1.03)	0.78 (0.62, 0.98)	0.79 (0.63, 1.00)	0.75 (0.55, 1.02)	0.84 (0.59, 1.2)

Bold values indicate that odds ratio is statistically significant at $p < 0.05$.^a Adjusted for sex, age of child, mother's education, mother's age, number of children, marital status, east/west Europe, maternal employment, and maternal psychological distress.

and available (Pridham et al., 2010; Stewart-Brown, 2008; Walker, 1996).

Study limitations are noted. First, these data are cross-sectional, thus we cannot rule out an interpretation that injuries may cause child mental health problems. Previous studies have documented that children with head injuries, for example, exhibit personality and behavior change (Bryant et al., 2004). The majority of injuries reported in the present study, however, were cuts, bruises, breaks and fractures, which would be unlikely to cause behavioral change. Second, injuries were parent-reported and not confirmed by clinicians. Finally, the relationship between parenting style and injury risk may be bidirectional. For example, children who are more calm and withdrawn may be parented differently than children who are hyperactive and oppositional, thus parenting style may be dependent on the temperament and injury risk of the child. Further, parenting style may influence the reporting of injuries overall and their severity. However, we note that these data are combined across seven regions in Europe with wide variation in parenting styles and norms about parenting, thus it is unlikely that differences in reporting fully explain our results.

The strengths of the present study mitigate these limitations. These data are drawn from diverse regions spanning eastern and western European countries with substantial variability in social context, parenting norms, and psychopathology. Thus, we would expect these results to be generalizable across diverse settings. Our data indicate that children with externalizing problems, e.g., ADHD and oppositional symptoms, are at higher risk for injuries, especially among girls. These findings, in the context of previous literature, underscore the health consequences of childhood externalizing problems, suggesting a need for focused prevention and intervention efforts, to reduce consequences of childhood externalizing symptoms. These include empirically-based treatments for symptoms of ADHD and oppositional problems (Frick and Nigg, 2012; Hazell, 2010; Villodas et al., 2012) and global efforts to provide children high sensation seeking preferences outlets that are safe and monitored (Naeini et al., 2011).

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