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Polytraumatization and Trauma Symptoms in Adolescent Boys and Girls: Interpersonal and Non-interpersonal Events and Moderating Effects of Adverse Family Circumstances

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Abstract

Objective: The objective of this study was to investigate the cumulative effect of interpersonal and non -interpersonal traumatic life events (IPEs and nIPEs, respectively) on the mental health of adolescents, and to determine if the adverse impacts of trauma were moderated by adverse family circumstances (AFC). **Method:** Adolescents (mean age 16.7 years) from the normative population (n=462) completed the questionnaire the Linköpings Youth Life Experiences Scale (LYLES) together with Trauma Symptom Checklist for Children (TSCC). **Results:** The lifetime accumulation of interpersonal, non-interpersonal and adverse family circumstances was independently related to trauma-related symptoms in both boys and girls. The number of AFCs moderated the mental health impact of both IPEs and nIPEs in boys but not in girls. **Conclusion:** Cumulative exposure to both interpersonal and non-interpersonal traumatic events is important for the mental health of adolescents, and at least for boys, family circumstances seem to be relevant for the impact of trauma. Our results suggest that broader approaches to the study, prevention and treatment of trauma, including consideration of cumulative exposure, different types of trauma and additional social risk factors, could be fruitful.

Key words: Cumulative trauma, adolescents, family circumstances, moderating factors

Introduction

Today we know a lot about the potentially detrimental consequences of exposure to traumatic events, both for adults and children (Cloitre et al., 2009). It is important to identify the symptoms after exposure to a potentially traumatic event but it is equally important to produce knowledge about adolescents' trauma history (Turner, Finkelhor, & Ormrod, 2010). A recent review of reviews (Maniglio, 2009) including 270 000 subjects found that survivors of child sexual abuse are significantly at risk for a wide range of medical, psychological, behavioral, and sexual disorders. However, this review emphasized that sexual abuse was not the only factor important for child mental health; other biological, psychological or social factors may contribute and increase the risk of negative outcomes. Further research should therefore aim to elucidate the processes that contribute to the adverse consequences associated with child sexual abuse. In the research by Turner and co-workers (2010) it was found that 50% of the sexually abused also were polyvictims, i.e. victims of multiple traumas. They state that there is a need for research focusing on psychosocial processes to explain the powerful effects of polyvictimization, and what behavioral mechanisms are associated with polyvictimization.

Research in recent years has shown and highlighted the fact that the cumulative exposure to traumatic life events among adolescents, polyvictimization (Finkelhor et al., 2007; Turner et al., 2010) or polytraumatization (Gustafsson, Nilsson, & Svedin 2009a), is the most important predictor of reported trauma symptoms. For example, Turner and co-workers (2010) showed that lifetime exposure to multiple victimizations substantially accounted for the effects of individual victimization types. They stress that the effects of multiple forms of victimization often become evident in childhood and that this accumulation of exposure has damaging effects even at early stages in life. Polytraumatization (Gustafsson et al., 2009a), a

broader concept than polyvictimization, which includes not only interpersonal but also non-interpersonal traumatic exposures (e.g. accidents), has also been shown to be important for self-reported symptoms of anxiety, depression, and dissociation (Gustafsson et al., 2009a; Nilsson, Gustafsson, & Svedin, 2010a).

In addition to the impact of traumatic events, there are many studies demonstrating that family functioning has an impact on the mental health of children and adolescents (Alderfer, Navasarin, & Kazak, 2009; Flouri, Tzavidis, & Kallis, 2010; Harland et al., 2002; Peltonen, Ellonen, Larsen, & Helweg-Larsen; Zimmerman, et al., 2007). For example, studies have demonstrated that cumulative exposure to adverse family circumstances such as family disruption and parental stress, are important factors in adolescent mental health (Appleyard et al., 2005; Schilling et al., 2007; Schilling et al., 2008). Although they are not in themselves traumatic events, such conditions might be relevant for the developmental impact of traumatic events.

First, although traumatic stressors can be considered a special class of exposures due to their singularly detrimental mental consequences, they occur in a broader social context in which additional adversities might be present (Lynch, & Cicchetti, 1998). As adverse social circumstances often co-occur with traumatic experiences (Maniglio, 2009) it is important to study both types of exposures simultaneously; this is however rarely done in research on traumatic life events. To elucidate the impact of trauma it is therefore important to also consider other adverse social exposures, as such exposures may confound the estimated association between traumatic events and outcome.

Second, parent-child relationships influence children's responses to traumatic events (Fremont, 2004; Osofsky, 1999; Gustafsson, Larsson, Nelson, & Gustafsson, 2009b. Power, 2004; Proctor et al., 2007), and adverse family circumstances that unfavorably affect the parents' ability to support their child in the face of such exposures can be an important

determinant for the outcome. In a review (Grant et al., 2006) on moderating and mediating effects of stressors on child and adolescent psychopathology the authors conclude that there was substantial evidence for the mediating role of family relationship in the relationship between stressors in general and child and adolescent psychological symptoms. More specifically, Schilling and co-workers (2008) have demonstrated that the cumulative effect of adverse childhood circumstances might interact with more severe experiences such as child maltreatment, sexual abuse/assault, physical assault, physical abuse and serious neglect. Furthermore, childhood victimization and childhood adversities might also confer enduring effects in adulthood (Cloitre et al., 2009; Edwards, Holden, Feletti, & Anda, 2003; Feletti, et al., 1998; Koskenvuo et al., 2010; Dube, et al. 2001; Widom, Czaja, & Dutton, 2009), a notion that highlights the importance of early interventions for both individuals and families.

Most self-report instruments concerning exposure to trauma and trauma history have concentrated on one or two important domains of exposure, for example, either interpersonal and non-interpersonal traumas, or the presence of difficult circumstances during childhood. There are few instruments that measure adverse childhood circumstances; Burgermeister (2007) found six instruments where childhood psychological, physical and sexual abuse were addressed. She observed that research on childhood adversity in diverse populations and of different ages needs to measure a broad spectrum of trauma and adversities, together with a broad spectrum of symptoms.

From our clinical work and research in the field of children and adolescents who have been exposed to trauma and maltreatment, the Linköping Youth Life Events Scale (LYLES) was developed (Nilsson, Gustafsson, & Svedin, 2008). This is a trauma-history scale asking about non-interpersonal traumas such as natural disasters, interpersonal traumas and adverse childhood circumstances.

The general aim of the present cross-sectional study was to examine the cumulative impact of a diverse set of traumatic exposures such as non-interpersonal events (nIPE), interpersonal events (IPE) and Adverse Family Circumstances (AFC) as measured by the recently-developed LYLES, on the mental health of adolescents, that was itself measured by the Trauma symptom Checklist for Children (TSCC) (Briere, 1996).

Specifically, we aimed at investigating

- a) the relative importance of interpersonal and non-interpersonal traumatic exposures and adverse family circumstances
- b) whether the impact of trauma was moderated by adverse family circumstances,

Method

Participants

A total of 568 adolescents from 13 different schools and 27 classes were asked to answer the self-rating instruments. The participants were recruited from secondary schools (34.9%) and high schools (65.1%) in two different cities in the south of Sweden. There was a uniform distribution between theoretical and practical educational programs as well as gender. Of those who were asked, 462 adolescents completed the questionnaires. There were 53.2 percent females, 46.8 percent males and the mean age was 16.7 years (SD = 1.1, range 15-20). The participation rate was 82.1%. The absentee rate on that day - 17.9 % - was substantially higher than the average absentee percentage in Swedish schools, which usually lies around 10% according to statistics Sweden. Only one pupil refused to participate in the study.

Procedures

The headmaster at each school was contacted by e-mail, and after approving participation in the study, supplied us with the name of a teacher that we could contact. Written information was given to pupils and parents. After informed consent was obtained, the researchers (MJ and

DN) went to the classes and administrated the questionnaires. Participation in the study was voluntary and the students were briefly informed in advance about the content of the questionnaires. The data collection was based on self-rating instruments and the authors were available during the completion of the instruments for answering questions. The authors also explained practical issues and briefly defined some of the central concepts in the instruments. The Swedish Science Council's principles concerning information, confidentiality, consent and use were applied.

Instruments/Measures

The Linköping Youth Life Experience Scale (LYLES) is a trauma-history inventory (Nilsson, Gustafsson, Larsson, & Svedin, 2010). It contains 23 main questions, and 18 more detailed secondary items, in all 41 questions (see Table 1 for frequencies). Eighteen items are considered to identify non-interpersonal (nIPE's) traumas, 13 items identify interpersonal (IPE's) traumas and 10 items ask questions about more longstanding Adverse Childhood /Family Circumstances, (AFC's), such as being separated from parents against will, having had a parent in jail or having parents with problems of alcohol or other drugs. LYLES is intended to cover several important areas of potentially traumatic events and circumstances during an adolescent's lifespan. There are sub-questions on several items to identify the respondent's proximity to the event, i.e., whether the person has experienced the event himself or herself, has seen it or has only heard about it. LYLES is a newly-constructed trauma history inventory. The test-retest reliability has been found to be $r = .79$ ($p < .01$) and kappa statistics (Cohen's kappa) item per item range between .44 -1.0 (Nilsson, et al., 2010b). Cumulative exposure to interpersonal events (IPE) was operationalized by summing up the 13 dichotomous (yes/no) items on interpersonal trauma (nIPE) items, and in the same way for the

Table 1. Frequencies of individual non-interpersonal events (nIPE), interpersonal events (IPE) and adverse family circumstances (AFC) from the LYLES questionnaire, in boys (N=216) and girls (N=246)

Type	Item	Boys (N=216)		Girls (N=246)		Total (N=462)	
		n	%	n	%	n	%
nIPE	Have you been in a car accident?	46	21,3	48	19,5	94	20,3
nIPE	Have you witnessed a car accident where you were not involved?	106	49,1	98	39,8	204	44,2
nIPE	Has anyone in your family been in a car accident (without you being there)	91	42,1	109	44,3	200	43,3
nIPE	Has anybody else close to you been in a car accident (without you being there)?	90	41,7	89	36,2	179	38,7
nIPE	Have you been in another accident?	128	59,3	100	40,7	228	49,4
nIPE	Have you witnessed another accident where you were not involved?	128	59,3	120	48,8	248	53,7
nIPE	Has anyone in your family been in another accident (without you being there)?	109	50,5	125	50,8	234	50,6
nIPE	Has anybody else close to you been in another accident (without you being there)?	110	50,9	115	46,7	225	48,7
nIPE	Have you been in hospital?	112	51,9	103	41,9	215	46,5
nIPE	Has anyone in your family been in hospital?	168	77,8	176	71,5	344	74,5
nIPE	Has anybody close to you been in hospital?	145	67,1	170	69,1	315	68,2
nIPE	Has anybody in your family died?	79	36,6	77	31,3	156	33,8
nIPE	Has anybody close to you died?	124	57,4	149	60,6	273	59,1
nIPE	Have you been in a fire?	35	16,2	32	13,0	67	14,5
nIPE	Have you witnessed a fire in another house?	94	43,5	83	33,7	177	38,3
nIPE	Have you experienced a natural disaster?	54	25,0	52	21,1	106	22,9
IPE	Have you been beaten or wounded by an adult in your family?	27	12,5	36	14,6	63	13,6
IPE	Have you been beaten or wounded by another person?	87	40,3	58	23,6	145	31,4
IPE	Have you witnessed anyone in your family (mother, sibling) been beaten or wounded by an adult in your family?	20	9,3	31	12,6	51	11,0
IPE	Have you witnessed anybody else been beaten or wounded?	132	61,1	126	51,2	258	55,8
IPE	Have you been bound or locked up against your will?	24	11,1	18	7,3	42	9,1
IPE	Have you been exposed sexual acts against your will by an adult in your family?	0	0,0	4	1,6	4	0,9
IPE	Have you been exposed to sexual acts against your will by another person?	2	0,9	19	7,7	21	4,5
IPE	Have you witnessed anybody else get exposed to sexual acts against their will?	12	5,6	9	3,7	21	4,5
IPE	Have you been threatened that anybody should harm you or somebody you care for?	108	50,0	89	36,2	197	42,6
IPE	Have you been robbed?	17	7,9	22	8,9	39	8,4
IPE	Have you been present when anybody else has been robbed?	28	13,0	27	11,0	55	11,9
IPE	Have you been home when anybody committed burglary?	10	4,6	17	6,9	27	5,8
IPE	Have you come home after a burglary?	23	10,6	26	10,6	49	10,6

nIPE	Have you been in a war where you have heard or seen bombings or firings?	26	12,0	14	5,7	40	8,7
nIPE	Have you escaped from your native country?	29	13,4	22	8,9	51	11,0
AFC	Have you against your will, been separated from your parents to live in another place?	9	4,2	9	3,7	18	3,9
AFC	Have you been emotionally abused (eg disparaged, humiliated)?	57	26,4	85	34,6	142	30,7
AFC	Have your parents got a divorce during your upbringing?	52	24,1	82	33,3	134	29,0
AFC	Have your parents quarreled a lot after the divorce?	21	9,7	46	18,7	67	14,5
AFC	Have your parents had problems with alcohol or other drugs during your upbringing?	15	6,9	31	12,6	46	10,0
AFC	Have your parents had mental problems health problems during your upbringing?	10	4,6	32	13,0	42	9,1
AFC	Do you, or have you had, a prolonged illness or handicap during your upbringing?	28	13,0	25	10,2	53	11,5
AFC	Do your parents have, or have they had, a prolonged illness or handicap?	26	12,0	25	10,2	51	11,0
AFC	Has anyone of your parents been in jail during your upbringing?	13	6,0	15	6,1	28	6,1

18 non-interpersonal events and the 9 adverse family circumstances (AFC) items. The variable polytraumatization (PT) was operationalized by summing up all 40 dichotomous (yes/no) items. In this study, in the multiple regression analyses, the question about bullying was removed since we wanted to have only family circumstances in the analysis. This variable is called, adverse family circumstances (AFC).

In complementary analyses, a reduced formulation of IPE limited to events involving exposure to violence (including only direct exposure, excluding witnessing violence), which comprised the sum of the following five items (sample range 0-4): beaten or wounded by an adult in your family; beaten or wounded by another person; bound or locked up against your will; sexual acts against your will by an adult in your family; sexual acts against your will by another person. This variable was examined both as a continuous variable (i.e., including the whole range of cumulative violence exposure, range 0-4) and as dichotomized variable, with those who had been exposed to significant amount of violence (2 or more of the above events; n=32 boys (15%) and n=32 girls (13%)).

The Trauma Symptom Checklist for Children (TSCC) is a self-reporting, multi-trait instrument designed to identify symptoms of traumatic experiences in children and adolescents, aged 8 to 17. It comprises 54 items, where each item can be marked on a 4- point scale: 0 “never”, 1 “sometimes”, 2 “lots of times” and 3 “almost all of the time”. The measure has 6 clinical scales with 9 to 10 items in each; Anxiety (Anx), Depression (Dep), Post traumatic Stress (Pts), Sexual Concerns (Sc), Dissociation (Dis), and Anger (Ang). Briere (1996) has reported, in the manual for TSCC, Cronbach’s alpha coefficients ranging between 0.77-0.89. Validity has been tested in various ways and has been found to be satisfactory. TSCC has been translated to Swedish (Larsson, Lindell, & Svedin, 1996) and the psychometrics have been investigated, and good reliability such as internal consistency

(Cronbach's alpha) for the total scale .94 (ranging in the clinical scales .78 -.83) and test-retest for the total scale $r = .81$ (ranging in the clinical scales .67-.81) was found. Validity measures such as concurrent validity and criterion-related validity were also shown to be satisfactory (Nilsson, Wadsby, & Svedin, 2008). TSCC represents a broad-based measure with both abuse specific (e.g. Sexual concerns, Dissociation, Post traumatic stress) and generic (e.g. Anxiety, Depression and Anger) subscales. It also includes two scales to identify over and under reporting of traumatic symptoms and is standardized in both normal and clinical populations (Briere, 1996; Nilsson, Wadsby, & Svedin, 2008). TSCC has been used in several studies as a measure of trauma symptoms (Bal, Crombez, Van Oost, & Debourdeaudhuij, 2003; Bal, Van Oost, Debourdeaudhuij, & Crombez, 2003; Bray, & Caraway, 2002; Johnson et al., 2002; Shaw, Lewis, Loeb, Rosado, & Rodrigues, 2000; Shaw, Lewis, Loeb, Rosado, & Rodrigues, 2001) and in treatment-outcome studies (Cohen, Mannarino, & Knudsen, 2005; Lanktree, & Briere, 1995; Nolan, et al., 2002; Nilsson, & Wadsby, 2010).

Data analysis

All analyses were performed on boys and girls separately. Multiple regression analysis (MRA) was used as the principal statistical method, with psychological symptoms (TSCC total score) regressed on LYLES variables (IPE, nIPE and AFC). In the first model (Model 0), the predictors were examined separately in simple regressions. Next (Model 1), they were entered simultaneously into the model, for mutual adjustment. As age might be related to both adverse exposures and symptoms, age was added as a covariate in model 1. Finally (Model 2), moderating effects were examined by including the (centered) multiplicative interaction terms between the putative moderator AFC and the other variables (Baron & Kenny 1986). Since the $IPE \times AFC$ and $nIPE \times AFC$ interactions were highly correlated particularly in boys ($r =$

.70) and introduced a degree of multicollinearity into the model (max Variance Inflation Factor (VIF) = 2.3), the IPE × AFC and nIPE × AFC terms were added in separate models (Model 2a and 2b, respectively). In the reported models, max VIF=1.4.

Ethical considerations

The study was approved by the Human Research Ethics Committee, Faculty of Health Sciences, Linköping University, 970225 (Dnr. 97046) and 020514 (Dnr. 02-196). Written informed consent was given by all participants.

Results

Descriptive statistics

See Table 2 for descriptive statistics by gender. The results on LYLES indicated that the participants had experienced an average of 10.0 (SD=4.6) potentially traumatic events, for boys, and 8.80 (SD 4.0) for girls. Cumulative exposure to non-interpersonal events was about three times more common than interpersonal events, in both boys M (SD)=7.5(3.3) and 2.5(1.93), respectively) and in girls (mean(SD)=6.7(3.0) and 2.1(1.9), respectively). Almost all participants (99.6%) stated on LYLES that they had experienced one or more non-interpersonal potentially traumatic events. As can be seen in Table 1, the most frequently reported interpersonal events were witnessing violence and exposure to threat, for both boys and girls, whereas the most common adverse family circumstance was emotional abuse and divorce.

With regard to sex differences, girls reported significantly more symptoms and adverse family circumstances while boys reported significantly higher exposure to both interpersonal and non-interpersonal events (Table 2).

Table 2. Descriptive statistics of key variables in boys (N=216) and girls (N=246) and difference between genders (t test).

Variable	Boys	Girls	Difference
	M (SD)	M (SD)	p value
TSCC total score	29.9 (15.8)	40.3 (20.3)	<.001
Polytraumatization (PT)	10.0 (4.63)	8.80 (4.0)	.003
Interpersonal events (IPE)	2.52 (1.93)	2.11 (1.88)	.019
Non-Interpersonal events nIPE)	7.50 (3.33)	6.69 (3.00)	.007
Adverse family circumstances (AFC)	1.06 (1.33)	1.43 (1.49)	.006
Age	16.7 (1.16)	16.7 (1.04)	.742

Correlations

Adverse family circumstances were moderately strongly correlated with polytraumatization (PT), IPE and nIPE (see Table 3), indicating that cumulative traumatic exposures tend to occur in a setting where other adverse circumstances in the family may be present. Moreover, non-interpersonal events were correlated with interpersonal events, suggesting that these two dimensions of potentially traumatic stressors also tend to co-occur. While increased age involved higher exposure to interpersonal events in boys, no such tendencies were found among girls.

All adverse exposures were significantly related to symptoms reported on TSCC in both boys and girls ($p < .001$), with comparable strength of association for PT, IPE, nIPE and AFC. In the following section, these preliminary analyses were extended to multiple regression analyses.

Linear regression analyses

A) The relative importance of interpersonal, non-interpersonal traumatic exposures and adverse family circumstances

To examine the independent contribution of interpersonal and non-interpersonal events as well as adverse family circumstances to trauma-related symptoms, a series of multiple

Table 3. Zero-order correlations (Pearson r) between the main variables in boys (above diagonal) and girls (below diagonal).

Variable	TSCC	PT	IPE	nIPE	AFC	Age
TSCC total score	–	.49***	.48***	.41***	.39***	.23***
Polytraumatization (PT)	.34***	–	.79***	.93***	.37***	.20**
Interpersonal events (IPE)	.33***	.71***	–	.51***	.35***	.32***
Non-Interpersonal events (nIPE)	.25***	.90***	.32***	–	.31***	.09
Adverse family circumstances (AFC)	.31***	.32***	.33***	.22**	–	.04
Age	.05	.00	.03	-.02	.18**	–

* p<.05, ** p<.01 *** p<.001

regression analyses were performed. In these analyses, the total score of TSCC was first regressed on each of the independent variables in separate analyses (i.e., simple regression). In these unadjusted analyses (Table 4, Model 0), interpersonal and non-interpersonal events as well as adverse family circumstances were strongly related to psychological symptoms, each variable explaining between 15 and 23% of the variance in symptoms in boys, and between 6 and 11% in girls (all $p < .001$). Thus, interpersonal event, non-interpersonal events and adverse family circumstances seemed to be a more important determinant for symptoms for boys than for girls. Moreover, interpersonal events appeared to be the most important determinant of symptoms in both boys and girls, as indicated by numerically higher coefficients for IPE than for nIPE and AFC in both genders.

In the second step, all three variables were entered simultaneously together with age (Table 4, Model 1), in order to assess whether each variable contributed independently to symptoms, or whether any association displayed in Model 0 was dependent on the covariance between the variables. In both boys and girls, this adjustment led to a substantial attenuation of the contribution of each exposure, as gathered from the drop in the magnitude of regression coefficients from Model 0 to Model 1. Although, particularly nIPE was attenuated, by this all three variables still made significant independent contributions after mutual adjustment, with IPE and AFC making the greatest numerical contribution. Explained variance increased substantially from the unadjusted models to 32% in boys and 17% in girls in the adjusted model. These observations suggest that interpersonal events, non-interpersonal events and adverse family circumstances all contributed independently to trauma symptoms, but also that they made a considerable joint contribution to symptoms. Thus, whereas the individual influence of each type of exposure appeared to be important for trauma-related symptoms even when taking their co-occurrence into account, the entire spectrum of different types of

Table 4. Linear regression models with psychological symptoms (TSCC total score) on traumatic events exposure (interpersonal events, IPE, and non-interpersonal events, nIPE), and interaction with adverse family circumstances (AFC), in boys(N=216) and girls(N=246). Model 0=Simple regression, Model 1= IPE+nIPE+AFC adjusted for age, Model 2a=Model 1 +AFC×IPE interaction, Model 2b=Model 1 + AFC×nIPE interaction. β = standardized regression coefficient.

Predictor	Model 0: unadjusted			Model 1: Mutual adjustment			Model 2a: Model 1+ AFC × IPE interaction			Model 2b: Model 1+ AFC × nIPE interaction		
	Model R ²	β	p	Model R ²	β	p	Model R ²	β	p	Model R ²	β	p
Boys				.32			.34			.34		
IPE	.23	.48	<.001		.25	<.001		.25	<.001		.26	<.001
nIPE	.16	.41	<.001		.19	.005		.18	.007		.20	.003
AFC	.15	.39	<.001		.24	<.001		.18	.009		.15	.038
AFC × IPE	–	–	–		–	–		.15	.022		–	–
AFC × nIPE	–	–	–		–	–		–	–		.16	.017
Girls				.17			.17					
IPE	.11	.33	<.001		.22	<.001		.21	.001		.22	<.001
nIPE	.06	.25	<.001		.13	.045		.13	.043		.13	.045
AFC	.10	.31	<.001		.22	<.001		.21	.002		.21	.001
AFC × IPE		–	–		–	–		.02	.728		–	–
AFC × nIPE		–	–		–	–		–	–		.00	.944

adversities and traumatic events seemed to yield the most comprehensive explanation of symptoms in both boys and girls.

B) Whether the impact of trauma was moderated by adverse family circumstances

In the third step of the multiple regression analyses, we aimed to examine whether the impact of interpersonal and non-interpersonal traumatic events on trauma-related symptoms was moderated by the extent of family adversity. To accomplish this, multiplicative interaction terms between each trauma measure (IPE and nIPE) and AFC was added in a separate model. As the interaction terms IPE×AFC and nIPE ×AFC were strongly interrelated ($r=.70$) and led to multicollinearity, the interaction terms were introduced in separate models (Model 2a including the AFC × IPE interaction and Model 2b including the nIPE ×AFC interaction). As can be seen in Table 4 (Model 2a: AFC × IPE interaction and Model 2b: nIPE ×AFC interaction), the impact of both IPE and nIPE was significantly moderated by adverse family circumstances in boys (interaction $p=.022$ and $p=.017$, respectively). The moderation was in the positive direction; that is, increased family adversity involved a stronger impact of traumatic events. With regard to relative contribution (beta coefficients), the moderating influence on symptoms ($\beta=.15-16$) was numerically of comparable importance to the influence of nIPE ($\beta=.18-20$) and AFC ($\beta=.15-18$), although IPE remained as the numerically strongest factor ($\beta=.25-26$). As seen from the attenuation of the AFC regression coefficient from Model 1 to Model 2a/2b, this moderating influence of AFC appeared to explain some of the independent contribution by AFC; i.e., a portion of the effect of family adversity on symptoms appeared to be explained by the fact that family adversities exacerbated the already deleterious impact of exposure to traumatic events. In contrast to the findings in boys, AFC did not seem to moderate the impact of either IPE or nIPE in girls ($ps>.70$). Thus, whereas we found that family adversity moderated the impact of traumatic events in boys, no such

influence was found in girls. Nevertheless, although patterns differed in boys and girls, adding three-way interactions including sex, corresponding to the question of whether the moderating influence of AFC differed between boys and girls, was not significant ($p > .05$, data not shown).

Corresponding models with polytraumatization instead of IPE and nIPE (data not shown) yielded similar results; significant interaction effect in boys ($p = .010$) but not in girls. Thus, adverse family circumstances seemed to moderate the impact of traumatic events in boys only.

To examine whether adverse family circumstances also moderated the impact of exposure to significant violence, corresponding analyses were performed on a formulation of IPE only comprising significant exposure to direct violence (>2 violence events, $n=32$ boys and $n=32$ girls). These analyses (data not shown) did not indicate that AFC moderated the impact of violence exposure ($ps > .10$). However, the results pointed toward tendencies in the same direction as the analyses with IPE, with a numerically stronger moderating influence in boys (interaction term $\beta = .10$, $p = .15$) than in girls ($\beta = .01$, $p = .95$). Similar estimates were found when performing the analyses on cumulative violence exposure (i.e. the number of direct violence exposures, range 0-4) (data not shown). Because these variables comprised fewer events and, in the case of significant violence exposure, dichotomization, the weaker estimated effects could be a consequence of the loss of variance. Thus, these complementary analyses indicated that the moderating effect of adverse family circumstances demonstrated for cumulative interpersonal and non-interpersonal events might also be relevant for direct violence exposure, but of weaker magnitude.

Discussion

The aim of this study was to investigate the cumulative effect of interpersonal and non-interpersonal traumatic life events on the mental health of adolescents, and to determine if the adverse impacts of trauma were moderated by adverse family circumstances. The main results of the study may be summarized in three findings.

First, we found that prevalence of traumatic events were high and it was common as in other studies that adolescents report experience of a range of different traumatic life events (Bödvarsdóttir, & Elkit, 2007; Elkit, & Petersen, 2008; Nilsson, et al. 2010a,b; Turner, et al.; Widom, et al.; 2008). Almost all participants reported at least one exposure, and we have demonstrated in an earlier study, a near linear relationship between the number of reported traumatic events and the occurrence of reported symptoms of trauma measured by TSCC (Nilsson et al., 2010a).

Second, in this study it was clearly shown that the cumulative exposure to traumatic events, polytraumatization, made a contribution to the total score of trauma symptoms reported, and that both interpersonal and non-interpersonal events were important. It has also been emphasized in other studies (Finkelhor, et al., 2007; Gustafsson, et al., 2009; Nilsson et al., 2010a,b; Turner, et al., 2010) that polytraumatization or polyvictimization are important factors to take in to consideration when working with children and adolescents.

Third, the main findings of the present study are that the lifetime accumulation of traumatic events, particularly interpersonal but also non-interpersonal events, as well as adverse family circumstances during childhood, are independently related to trauma-related

symptoms in boys and girls. We also found support for adverse family circumstances moderating the impact of trauma in boys only.

The present study further emphasizes, that researchers and practitioners should not focus merely on the interpersonal types of trauma, but also should include non-interpersonal traumas in the trauma history. Although non-interpersonal traumas individually might cause less impact than severe interpersonal trauma, such as violence exposure and maltreatment, the fact that they are more frequent than the more severe traumas makes it possible for them to adversely affect the mental health of adolescents at a population level, to a greater degree than we might first assume. Given this notion, a broader approach in the assessment of traumatic and other adverse exposures should be given more serious attention in research and practice. The finding that cumulative interpersonal events, non-interpersonal events and adverse family circumstances are all interrelated also suggests that focusing on a single aspect may lead to an underestimation of the total impact of adverse exposures on adolescents, and potentially to an over-estimation of the individual contribution of each type of exposure. Widom, and co-workers (2008) found, after adjustment for possible risk factors that there was a substantial risk that childhood victimization leads to re-victimization at a later stage in life. Early strategies for prevention are vital, and our study suggests that in formulating preventive measures, health professionals might need to consider a broad range of interrelated exposures during childhood and adolescence, to ensure that the ultimate goal of improving adolescent-, and adult-, mental health is accomplished in a satisfactory manner.

Furthermore, we found that adverse family circumstances moderated the impact of trauma in boys only, so that family circumstances of a worse nature were coupled with greater impact of interpersonal and non-interpersonal events. The reason this moderation was demonstrable in boys only is unclear to us but is however an interesting finding that warrants some tentative interpretations. It might be viewed as more acceptable for girls than for boys to

express troubling feelings and experiences, and therefore girls could engage their broader social network (such as peers or other relatives) more easily than could boys. Support for this can be found in the fact that girls are more likely to prompt friends to talk about problems (Rose, Swenson, & Robert, 2009) and to both friends and parents about traumatic events such as sexual abuse (Priebe, & Svedin, 2008). As such, when girls encounter traumatic experiences, they may be able to find support from other sources than from within the family. Boys on the other hand may be expected to be tough and strong, and might therefore have more difficulties in recognizing feelings of weakness and particularly in reaching out for support. The parents might therefore not be as attentive to boys' emotional needs and boys may not be sufficiently capable to engage in help-seeking behavior directed at the broader social network. In a poor-functioning family this lack of support might therefore be more marked for boys, and boys might therefore be more dependent on a well-functioning family that is attentive to their emotional needs in the face of troublesome experiences.

However, this could also be linked to gender differences concerning internalizing versus externalizing problems, where girls are more prone to internalize and boys more prone to externalize (Angold, & Rutter, 1992). Other studies (Gore, Aseltine, & Colten, 1993; Leadbeater, Blatt, & Quinlan, 1995; Zahn-Waxler, 1993) suggest that girls' greater socialization of self-regulation and greater sensitivity to interpersonal concerns increases their vulnerability to internalizing problems. They indicate that girls show greater vulnerability to interpersonal concerns, and reactivity to stressful events, engagement in others and reliance on support from parents and peers for coping and have more social competence compared with boys. However social competence and involvement in relationships with others can also be seen as a protective factor (Bal, Turi, Skre, & Kvernmo, 2011). More research is needed on how boys and girls use their social networks in the face of accumulated traumatic experiences and how this moderates the impact of trauma.

A limitation of this study is its cross sectional design, and thus the causal pathways cannot be disentangled. Another limitation is the lack demographical data, except for the educational programs in secondary school, which cover both practical and theoretical programs that in Sweden relates to different socioeconomic backgrounds. Sweden has many immigrants from various countries and one of the cities in the sample is known to have a high percentage of immigrants which could have affected the results. However, in another study concerning adolescent victimization in the same areas as this study, there were no differences found, concerning immigrant status and victimization, except for immigrants from outside Europe where the adolescents reported less sexual victimization (submitted manuscript). As the adolescents were the single informants of both exposures and outcomes, common-method variance might bias the results. A limitation of this study is also that the TSCC is normed for youth up to 17 years old and in this study we had some who were up to 20 years old.

The clinical application for this study is to stress the importance of early interventions for children and adolescents and to consider polytraumatization as a very important risk factor in the mental health of young people. The broad spectrum, of potentially traumatic interpersonal and non-interpersonal as well as adverse family circumstances needs to be addressed in clinical settings.

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