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The relationship between childhood exposure to trauma and intermittent explosive disorder

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ABSTRACT

There has been a paucity of research linking intermittent explosive disorder (IED) to trauma and posttraumatic stress responses, despite evidence that trauma is strongly associated with anger reactions. The present study investigated the relationship between IED and a number of trauma-related factors, including trauma dosage, timing of first trauma, and posttraumatic stress disorder (PTSD). Participants were 4844 trauma-exposed and 731 non trauma-exposed adults who took part in the National Comorbidity Survey-Replication (NCS-R). Findings indicated that IED was associated with greater trauma exposure, PTSD and generalized anxiety disorder (GAD) diagnosis, and first exposure to traumatic events in childhood. Exploratory analyses investigating the link between IED and age at first trauma exposure across trauma types suggested that IED is related to childhood exposure to interpersonal traumatic events. These findings are discussed in the context of developmental trauma and cycles of violence models.

1. Introduction

Intermittent explosive disorder (IED) has attracted little research attention since its inclusion in the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III, American Psychiatric Association (APA), 1987). While anger responses play a role in several psychological disorders including depression, posttraumatic stress disorder (PTSD), borderline personality disorder, and antisocial personality disorder (APA, 1994), IED is the only psychological disorder in the DSM-IV to explicitly focus on aggressive impulses. To meet criteria for IED, one must engage in recurrent assaultive or destructive acts that are out of proportion to triggering stressors (APA, 1994). Epidemiological research conducted in the United States, Japan and South Africa has suggested that lifetime prevalence rates of IED range from 1.2 to 9.0% (Kessler et al., 2006; Fincham et al., 2009; Yoshimasu and Kawakami, 2010). Recent research on IED focusing on the correlates of this disorder suggest that IED occurs relatively early in life, often during adolescence or the teenage years, that it is more common in men, among those with low education, and that it is often co-morbid with other psychological disorders (Coccaro et al., 2005; Kessler et al., 2006; Fincham et al., 2009; Yoshimasu and Kawakami, 2010). Previous investigation of IED in the National Comorbidity Survey-Replication also suggests that it is associated with impairment in functioning (Kessler et al., 2006).

There has been a paucity of research investigating factors that may contribute to IED. One factor that has been implicated in the development of this disorder is exposure to traumatic experiences. A study undertaken with a nationally representative sample in South Africa suggested that IED was related to exposure to multiple traumatic events (Fincham et al., 2009). A second study conducted in Timor-Leste (East Timor) suggested that high levels of trauma exposure was the strongest predictor of explosive anger attacks amongst survivors of human rights violations (Silove et al., 2009). Findings from these studies are consistent with the growing body of research suggesting that anger is prevalent amongst trauma survivors. Studies undertaken with combat veterans (Lasko et al., 1994; Novaco and Chemtob, 2002; Jakupcak et al., 2007), victims of crime (Riggs et al., 1992; Orth et al., 2008), refugees and post-conflict populations (Hinton et al., 2003; Hinton et al., 2009; Silove et al., 2009), police and emergency service workers (Jayasinghe et al., 2008; Meffert et al., 2008), and other trauma survivors (Orth and Wieland, 2006) have documented a strong relationship between trauma, PTSD and anger reactions. Further research is needed to determine the extent to which the link between the dosage of exposure to traumatic events, symptoms of posttraumatic stress and anger reactions extends to the explosive anger attacks defined in the clinical criteria of IED.

Considering the typically early onset of IED (Kessler et al., 2006; Coccaro, 2010; Yoshimasu and Kawakami, 2010), it is possible that traumatic events occurring early in life may have a particularly strong impact on the development of this disorder. Childhood trauma may

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interfere with normal biological and psychological developmental processes, and thus impair the ability of the survivor to successfully navigate the social environment as an adult. This may then manifest in emotion regulation and interpersonal difficulties in adulthood (Bremner and Vermetten, 2001; De Bellis, 2001; De Bellis et al., 2002; van der Kolk, 2003; Kinniburgh et al., 2005; Santa Ana et al., 2006; Cloitre et al., 2009; Walter et al., 2010). Many studies have documented the association between childhood trauma and negative mental health outcomes, including depression and anxiety (Hovens et al., 2010), drug and alcohol use (Tucci et al., 2010; Wu et al., 2010), suicidality (Sarchiapone et al., 2009), and borderline personality disorder (Herman et al., 1989; McLean and Gallop, 2003). The timing of trauma, and particularly trauma occurring during childhood, may thus impact the development of IED. Further, research has highlighted the heterogeneous impact of various types of traumatic events on PTSD reactions. Studies have suggested that military traumas, as well as interpersonal traumatic events, such as sexual and physical assault, have stronger relations with PTSD than other types of traumatic events, such as motor vehicle accidents and crime (Amir et al., 1996; Frans et al., 2005; Hapke et al., 2006; Naifeh et al., 2008; Kelley et al., 2009). Therefore, it is possible that the impact of age of first exposure to a traumatic event on IED may differ according to trauma type.

The aim of the present study is to examine the impact of trauma exposure, PTSD and timing of trauma on IED in traumatized adults who had taken part in the National Comorbidity Survey-Replication (NCS-R). This study builds on past research to determine the extent to which trauma dosage, PTSD and timing of first exposure to trauma is related to IED in a nationally representative sample. We hypothesized that a) greater trauma exposure (i.e., dosage) would be related to increased likelihood of developing IED; and b) individuals who had first been exposed to trauma in childhood would be more likely to have a diagnosis of IED compared to those who had first experienced trauma in adulthood (controlling for trauma dosage effects and PTSD). We also explored the relationship between various types of traumatic events and IED.

2. Methods

2.1. Participants

The objective of the National Comorbidity Survey-Replication (NCS-R) was to assess the mental health of persons residing in the United States. Data collection was conducted between February 2001 and April 2003. The method and design of this survey have been described in detail elsewhere (Kessler and Merikangas, 2004; Kessler et al., 2004a, 2004b). This survey was designed to replicate the first National Comorbidity Survey, undertaken in 1993 (Wittchen et al., 1994). In the NCS-R, 11,222 households were initially screened, with individuals who were institutionalized, did not speak English or lived on military bases being excluded from this survey. Part I of the NCS-R, which focused on core psychological disorders, was administered to a nationally representative sample consisting of 9282 adults (18 years and older) residing in the United States (excluding Alaska and Hawaii). This represented a 70.9% follow-up rate. Part II of the NCS-R, which focused on certain types of psychopathology, risk factors and correlates of mental disorders, was administered to 5692 persons (see below). Participants who took part in Parts I and II of the NCS-R were included in the present analyses. The present sample encompassed a total of 5575 individuals. Of these, 4844 had experienced at least one traumatic event and 731 had not been exposed to trauma. Of the 4844 who had been exposed to trauma, 1453 had first been exposed to trauma during adulthood, and 3312 had first been exposed to trauma during childhood. For 79 participants, no information regarding the timing of the first trauma exposure was available.

2.2. Measures

The World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) developed for the WHO World Mental Health (WMH) Survey Initiative, (known as the WMH-CIDI (Kessler et al., 2004a, 2004b)) was implemented in the NCS-R. In the current study, we used demographic information including age, sex, race and level of education.

Participants were asked if they had been exposed to 26 different types of traumatic events; these types of events were subsumed into five major trauma categories: war-related trauma (including participating in combat, peacekeeping, being an unarmed civilian in war, being a civilian in ongoing terror, being a refugee); accident-related trauma (being exposed to a toxic chemical, being involved in a life-threatening motor-vehicle accident (MVA), being in another life-threatening accident); disaster-related trauma (experiencing a major natural disaster, experiencing a man-made disaster); interpersonal trauma (being kidnapped or held captive, being badly beaten by parents, being badly beaten by a partner, being badly beaten by someone else, being mugged, held up or threatened with a weapon, being raped, being sexually assaulted, being stalked, witnessing serious physical fights at home as a child, seeing someone badly injured/killed or unexpectedly seeing a dead body) or other trauma (experiencing a life-threatening illness, having someone very close die unexpectedly, having a child with a life-threatening illness or injury, having someone close experience an extremely traumatic event, seeing atrocities or carnage). For each category, a dichotomous score was calculated (0 = not exposed to this trauma type, 1 = exposed to this trauma type). A count of number of individual types of traumatic events was also calculated to represent trauma exposure.

For each traumatic event experienced, participants were asked to identify the age at which they were first exposed to this event type. For each trauma type, this was coded such that 0 = never exposed to this trauma type, 1 = first exposed in adulthood (18 years or older), and 2 = first exposed in childhood (17 years or younger). An overall measure of first trauma exposure was also calculated, such that the earliest age at which the individual was exposed to any type of trauma was coded into 1 = first exposed in adulthood (18 years or older), and 2 = first exposed in childhood (17 years or younger).

We employed the lifetime mental disorders modules for PTSD, generalized anxiety disorder (GAD) and IED, which were coded to represent the presence (1) or absence (0) of each disorder.

2.3. Procedure

The NCS-R utilized a four-stage area probability sample. At the first step, a representative probability sample of 62 primary sampling units was identified and stratified for geographic variations. At the second step, these primary sampling units were divided into areas consisting of between 50 and 100 housing units. At the third step, the addresses of all residences in housing units were recorded. At the fourth step, an informant visited each residence and obtained a household listing of occupants who were over 18 years of age and spoke English. One or two residents from each household were selected to be interviewed using a probability procedure. Weights were calculated to take into account the probability of being selected to take part in the survey and to adjust for non-response bias.

The interviews were administered using laptop computer-assisted personal interview (CAPI) methods in participants' homes. Study procedures were outlined for participants and written informed consent obtained. Interviews were administered by trained interviewers, with a random sample being re-interviewed by supervisors for data validation. The interviews were administered in two parts, with Part I, which was administered to all participants, investigating core psychological disorders. Part II focused on the assessment of additional disorders, as well as other mental health correlates and other variables of interest. Part II was administered to a sub-sample of persons who took part in Part I ($N = 5692$), with those exhibiting psychopathology being oversampled. Participants in Part II were drawn from three strata based on their responses to Part I. Firstly, all participants who met lifetime criteria for a disorder, had sub-clinical levels of psychopathology for which they had sought treatment and/or had experienced significant suicidality were interviewed. Secondly, a probability sample (59%) of participants who had lifetime subthreshold clinical symptoms, had sought treatment for such problems, had ever experienced suicidal ideation or used psychotropic medications over the past year were interviewed. Finally, 25% of all other participants were administered Part II. Data from both Parts I and II of the NCS-R was used in the current study.

2.4. Statistical analysis

We used the complex samples module of SPSS 17.0 to undertake analyses while implementing weights to correct for selection and non-response bias as described above. Demographic frequencies and the prevalence of psychological disorders were calculated for all participants. A multivariate logistic regression was undertaken to examine the impact of number of types of traumatic events and timing of first trauma exposure (no exposure vs. first exposure in childhood vs. first exposure in adulthood) on lifetime IED, controlling for age, sex, race and level of education. We also investigated the relationship between GAD (a non-trauma related anxiety disorder), PTSD, and IED. In order to render odds ratios interpretable in the context of hypothesized relationships, older age, higher education and first trauma exposure in adulthood served as reference groups. Thus, odds ratios of greater than one would suggest that IED was related to younger age, less education and first exposure to trauma in childhood. To elucidate the relationship between various types of traumatic events and IED, univariate logistic regression analyses were then conducted comparing individuals exposed to each type of traumatic event with non-trauma exposed participants on IED. As multiple comparisons were utilized, a Bonferroni adjustment was implemented ($p = 0.05/5$ comparisons), such that $p < 0.01$ was adopted as the significance threshold. Multivariate logistic regression analyses were undertaken to examine the relationship between first exposure to each type of traumatic event in adulthood vs. childhood and IED. Finally, exploratory univariate logistic regression analyses were then undertaken for interpersonal trauma sub-types to elaborate the significant relationship between

exposure to individual traumatic events and interpersonal trauma. As multiple comparisons were utilized, a Bonferroni adjustment was implemented ($p = 0.05/9$ comparisons), such that $p < 0.006$ was adopted as the significance threshold.

3. Results

Demographic information for the sample is presented in Table 1.

3.1. Multivariate logistic regression predicting intermittent explosive disorder

The results of the multivariate logistic regression analysis are presented in Table 2. All variables were entered in the model at the same time. Variables emerging as significant included younger age, male gender, and education level. Participants who had been exposed to more types of traumatic events were significantly more likely to have a diagnosis of IED, as were participants with a diagnosis of PTSD or GAD. While having been exposed to trauma for the first time in adulthood was not associated with greater likelihood of having IED, first trauma exposure in childhood was associated with a significantly greater likelihood of having IED.

3.2. Univariate logistic regressions predicting intermittent explosive disorder by trauma type

Univariate logistic regression analyses indicated that exposure to all trauma types, compared to no trauma exposure, was associated with greater likelihood of having IED. These included war-related trauma ($\chi^2(1) = 6.88$, $p < 0.01$, OR = 2.20, 95% CI = 1.22–3.97), accident-related trauma ($\chi^2(1) = 29.16$, $p < 0.01$, OR = 2.84, 95% CI = 1.95–4.15), disaster-related trauma ($\chi^2(1) = 33.05$, $p < 0.001$, OR = 3.16, 95% CI = 2.13–4.68), interpersonal trauma ($\chi^2(1) = 40.02$, $p < 0.001$, OR = 3.21, 95% CI = 2.24–4.61), and other trauma ($\chi^2(1) = 23.10$, $p < 0.001$, OR = 2.43, 95% CI = 1.69–3.49).

Table 1
Demographics of participants ($N = 5575$).

	Number (%) of respondents or mean (standard deviation)
Age	43.34 (16.59)
Male sex	2325 (41.70%)
Education	
0–11 years	834 (14.96%)
12 years	1668 (29.92%)
13–15 years	1670 (29.96%)
16+ years	1403 (25.17%)
Race	
Asian	81 (1.45%)
Hispanic	516 (9.26%)
African-American	696 (12.48%)
White	4098 (73.51%)
Other	184 (3.30%)
Number of trauma types	3.29 (2.89)
Age at first trauma	14.98 (12.00)
Trauma exposure	
No trauma exposure	731 (13.11%)
First trauma in adulthood	1453 (26.06%)
First trauma in childhood	3312 (59.41%)
Lifetime IED	618 (11.09%)
Lifetime PTSD	579 (10.39%)

Note: IED = intermittent explosive disorder, GAD = generalized anxiety disorder.

Table 2
Multivariate logistic regression predicting presence or absence of intermittent explosive disorder (IED) in trauma-exposed and non-trauma-exposed participants.

	χ^2/OR	95% CI	χ^2 (d.f.)
Age	OR = 1.04	1.03–1.04	$\chi^2(1) = 95.07$, $p < 0.001$
Sex			$\chi^2(1) = 28.78$, $p < 0.001$
Female	–	–	
Male	OR = 1.80	1.45–2.23	
Education			$\chi^2(3) = 14.38$, $p < 0.01$
0 to 11 years	OR = 1.94	1.37–2.76	
12 years	OR = 1.36	0.97–1.86	
13 to 15 years	OR = 1.48	1.09–2.01	
16+ years	–	–	
Race			$\chi^2(4) = 9.14$, *ns*
Asian	–	–	
Hispanic	OR = 0.49	0.23–1.03	
African American	OR = 0.39	0.19–0.82	
White	OR = 0.46	0.23–0.90	
Other	OR = 0.68	0.30–1.54	
Number of traumas experienced	OR = 1.13	1.09–1.17	$\chi^2(1) = 39.81$, $p < 0.001$
PTSD			$\chi(1)^2 = 10.79$, $p < 0.001$
No PTSD	–	–	
Lifetime PTSD	OR = 1.67	1.23–2.26	
GAD			$\chi(1)^2 = 35.53$, $p < 0.001$
No GAD	–		
GAD	OR = 2.61	1.91–3.58	
Time of first trauma			$\chi^2(1) = 6.70$, $p < 0.05$
No trauma	–	–	
Adulthood	OR = 1.13	0.72–1.75	
Childhood	OR = 1.33	1.05–2.28	

Note: The table shows odds ratios (OR), 95% confidence intervals, and the results of χ^2 tests. GAD = generalized anxiety disorder; PTSD = post-traumatic stress disorder.

3.3. Multivariate logistic regression predicting intermittent explosive disorder from age at first exposure to trauma in trauma-exposed participants

Findings from a multivariate logistic regression analysis undertaken to examine the relationships between age at first exposure to trauma types and IED are presented in Table 3.The overall model evidenced good fit: $\chi^2(10) = 121.18$, $p < 0.001$. Findings suggested that only exposure to interpersonal trauma was associated with greater likelihood of developing IED when controlling for all other trauma types. Individuals who were exposed to interpersonal trauma in adulthood were significantly more likely to have IED than those who had not been exposed to interpersonal trauma (but had been exposed to other trauma types). First exposure to interpersonal trauma in childhood was associated with an even greater likelihood of developing IED compared to not being exposed to interpersonal trauma.

Table 3
Multivariate logistic regression predicting the presence or absence of intermittent explosive disorder (IED) from trauma type in trauma-exposed participants ($N = 4844$).

Trauma type	First exposure	*N* (%)	OR	95% CI
War-related trauma	No exposure	4337 (89.55%)	–	–
	First in adulthood	365 (7.54%)	OR = 0.59	0.38–0.91
	First in childhood	141 (2.91%)	OR = 1.24	0.74–2.07
Accident-related trauma	No exposure	3073 (63.49%)	–	–
	First in adulthood	1140 (23.52%)	OR = 1.14	0.87–1.48
	First in adulthood	624 (12.86%)	OR = 1.06	0.78–1.46
Disaster-related trauma	No exposure	3575 (73.82%)	–	–
	First in adulthood	611 (12.55%)	OR = 1.19	0.87–1.62
	First in childhood	642 (13.65%)	OR = 1.27	0.92–1.74
Interpersonal trauma	No exposure	1397 (28.84%)	–	–
	First in adulthood	993 (19.88%)	OR = 1.78	1.23–2.58
	First in childhood	2411 (51.28%)	OR = 3.55	2.66–4.81
Other trauma	No exposure	1385 (28.59%)	–	–
	First in adulthood	2023 (42.28%)	OR = 0.84	0.64–1.11
	First in childhood	1408 (29.09%)	OR = 1.28	0.97–1.68

Note: The table shows odds ratios (OR), 95% confidence intervals, and the results of χ^2 tests. GAD = generalized anxiety disorder; PTSD = post-traumatic stress disorder.

3.4. Univariate logistic regression analyses predicting intermittent explosive disorder from age at first exposure to sub-types of interpersonal trauma in trauma-exposed participants

Univariate logistic regression analyses indicated that exposure to all types of interpersonal trauma, with the exception of being kidnapped or held captive, were associated with a greater likelihood of having IED (see Table 4). First exposure to sexual trauma (being raped or sexually assaulted) and witnessing injury or death in childhood, but not adulthood, was associated with greater likelihood of having IED. Being first stalked in adulthood, but not childhood, was associated with greater likelihood of being diagnosed with IED compared to not having been the victim of stalking. All other interpersonal trauma types (including being badly beaten by a partner or someone else, and being mugged) were associated with IED, with first exposure in childhood being more strongly related to IED than first exposure in adulthood. Finally, exposure to the two childhood-specific traumatic events (being badly beaten as a child and witnessing fights at home) was related to greater likelihood of having a diagnosis of IED.

4. Discussion

Findings from the present study are consistent with the hypotheses that trauma dosage contributes to IED, and that exposure to trauma in childhood is related to the development of IED, over and above the impact of trauma dosage, PTSD and GAD. These findings highlight the key importance of traumatic experiences, particularly in childhood, in contributing to explosive anger reactions.

4.1. Trauma exposure and IED

The finding that exposure to traumatic events significantly predicted IED is consistent with research undertaken in South Africa (Fincham et al., 2009) and Timor-Leste (Silove et al., 2009) that has documented a dose–response association between trauma and explosive anger. Considerable research has attested to the high prevalence of anger amongst populations that have been exposed to multiple traumas, including combat veterans (Lasko et al., 1994; Novaco and Chemtob, 2002; Jakupcak et al., 2007), refugees (Hinton et al., 2003; Hinton et al., 2009) and emergency service workers (Jayasinghe et al., 2008; Meffert et al., 2008). Attempts to characterize the symptom profile of survivors of repeated or "complex" trauma have identified anger as a key psychological reaction following these events (e.g., Complex PTSD, Herman, 1992; Enduring Personality Change after Catastrophic Experience (EPCACE), World Health Organization (WHO), 1992; Disorders of Extreme Stress Not Otherwise Specified (DESNOS), Roth et al., 1997). It is possible that repeated exposure to situations characterized by violence and injustice may contribute to ongoing feelings of anger, and manifest in explosive anger attacks (Silove, 1999). Further research is required to determine the mechanisms by which repeated exposure to traumatic events may contribute to IED and other anger reactions across populations.

It is important to note that a diagnosis of GAD was even more strongly related to IED than PTSD.Both GAD and PTSD specify irritability as a criterion for diagnosis, thus anger reactions are likely to be common amongst both diagnostic groups. One possibility is that the strong relationship between GAD and IED may be attributed to the fact that both disorders are characterized by difficulty controlling internal states — worry in the case of GAD, and anger in the case of IED. Further research is needed to elucidate this relationship.

4.2. Childhood trauma exposure and IED

The present findings suggest that exposure to trauma in childhood contributes to the development of IED in adulthood, over and above the impact of trauma dosage and PTSD. These findings are consistent with other research suggesting that experiencing trauma during childhood is linked to poorer mental health outcomes in adulthood (Sarchiapone et al., 2009; Hovens et al., 2010; Tucci et al., 2010),

Table 4
Univariate logistic regression analyses predicting presence or absence of intermittent explosive disorder (IED) from interpersonal trauma experienced first in childhood or adulthood in trauma-exposed participants ($N = 4844$).

Trauma type	First exposure	*N* (%)	OR	95% CI	χ^2 (d.f.)
Badly beaten by parents	No exposure	4350 (89.80%)	–	–	$\chi^2(1) = 47.21$, $p<0.001$
	First in childhood	434 (9.20%)	OR = 2.70	2.03–3.59	
Badly beaten by partner	No exposure	4276 (88.31%)	–	–	$\chi^2(2) = 26.38$, $p<0.001$
	First in adulthood	442 (9.13%)	OR = 1.96	1.42–2.69	
	First in childhood	124 (2.56%)	OR = 2.62	1.49–4.62	
Badly beaten by someone else	No exposure	4363 (90.24%)	–	–	$\chi^2(2) = 105.70$, $p<0.001$
	First in adulthood	164 (3.39%)	OR = 3.00	1.88–4.80	
	First in childhood	308 (6.37%)	OR = 4.73	3.45–6.49	
Mugged, held up or threatened with weapon	No exposure	3669 (75.87%)	–	–	$\chi^2(2) = 77.51$, $p<0.001$
	First in adulthood	780 (16.13%)	OR = 2.02	1.56–2.63	
	First in childhood	387 (8.00%)	OR = 3.51	2.58–4.78	
Raped	No exposure	4115 (85.30)	–	–	$\chi^2(2) = 29.24$, $p<0.001$
	First in adulthood	188 (3.90%)	OR = 1.44	0.89–2.34	
	First in childhood	521 (10.80%)	OR = 2.16	1.63–2.87	
Sexually assaulted	No exposure	3898 (80.92%)	–	–	$\chi^2(2) = 12.06$, $p<0.01$
	First in adulthood	204 (4.24%)	OR = 1.28	0.78–2.10	
	First in childhood	715 (14.84%)	OR = 1.61	1.23–2.12	
Stalked	No exposure	4149 (85.71%)	–	–	$\chi^2(2) = 12.42$, $p<0.01$
	First in adulthood	528 (10.91%)	OR = 1.63	1.23–2.19	
	First in childhood	164 (3.39%)	OR = 1.57	0.95–2.58	
Kidnapped/held captive	No exposure	4734 (97.73%)	–	–	$\chi^2(2) = 3.47$, ns
	First in adulthood	45 (0.93%)	OR = 1.51	0.68–3.36	
	First in childhood	65 (1.34%)	OR = 1.85	0.86–3.97	
Witness serious physical fights at home as child	No exposure	3861 (81.03%)	–	–	$\chi^2(1) = 89.14$, $p<0.001$
	First in childhood	904 (18.97%)	OR = 3.10	2.05–3.92	
See someone badly injured/killed or unexpectedly saw dead body	No exposure	3176 (66.06%)	–	–	
	First in adulthood	843 (17.53%)	OR = 1.08	0.81–1.46	$\chi^2(2) = 20.30$, $p<0.001$
	First in childhood	789 (16.41%)	OR = 1.80	1.40–2.32	

Note: The table shows number of participants (*N*), percentages (%), odds ratios (OR), and 95% confidence intervals.

and that childhood trauma impacts on symptom complexity beyond the effects of adult trauma (Cloitre et al., 2009). For example, the relationship between childhood trauma and borderline personality disorder has been well-established (Sabo, 1997; Goodman and Yehuda, 2002). Potential mechanisms underlying the relationship between childhood trauma and adult psychopathology may be derived from developmental models suggesting that trauma that occurs during childhood may be related to later interpersonal and emotion regulation difficulties (Neumann et al., 1996; Davis et al., 2001; Briere et al., 2008; Cloitre et al., 2009). These models propose that significant childhood trauma can impede adequate development of emotion regulation abilities, and this deficit subsequently contributes to explosive anger and symptoms of borderline personality disorder. Difficulties regulating anger responses may contribute to the disproportionate nature of the attacks of anger characteristic of IED. Such attacks may also be exacerbated by and add to difficulties in interpersonal relations. It may be the case that trauma experienced during childhood precludes optimal development, interfering with the individual's ability to learn the skills that facilitate psychological health and emotion regulation in adulthood (van der Kolk, 2003; Kinniburgh et al., 2005; Shipman et al., 2005; Santa Ana et al., 2006; Zlotnick et al., 2008).

The relationship between childhood exposure to trauma and subsequent IED may be moderated by genetic influences. There is convergent evidence of an association between genetic factors and impulsive aggression (e.g., Brunner et al., 1995; Manuck et al., 1999; Giegling et al., 2006). Aggression has been linked to a wide range of polymorphisms, including those implicated with serotonin, brain derived neurotrophic factor, dopamine, oxytocin, estrogen, and MAOA (see Takahashi et al., 2011). It is likely that the observed relationship between childhood trauma and subsequent aggression is heightened if the individual carries genetic risk; these gene × environment interactions require further investigation.

4.3. Interpersonal trauma exposure and IED

It is notable that the pattern of results from analyses undertaken with various types of traumatic events suggested that interpersonal trauma is strongly associated with IED. Exploratory analyses revealed that this relationship was consistent across most types of interpersonal trauma, with first exposure during childhood typically being more strongly related to IED than first exposure to interpersonal trauma during adulthood. Notably, first exposure to sexual trauma in childhood, but not adulthood, was associated with greater likelihood of developing IED. Although further research is necessary to elucidate the role of different types of traumatic events in the development of IED, these findings are consistent with studies suggesting that various types of traumatic events have a differential impact on mental health outcomes, and particularly the documented association between interpersonal trauma and PTSD (Amir et al., 1996; Frans et al., 2005; Hapke et al., 2006; Naifeh et al., 2008; Kelley et al., 2009). These findings provide preliminary evidence that the experience of interpersonal trauma during childhood may contribute to anger regulation difficulties in adulthood. Kinniburgh et al. (2005) argue that trauma during childhood disturbs the attainment of interpersonal, intrapersonal, cognitive and emotional developmental competencies that underlie emotional understanding and regulation in adulthood. It is possible that interpersonal trauma plays an important role in compromising the individual's ability to develop adequate emotion regulation and relational skills as an adult, manifesting in explosive anger attacks. This is consistent with research evidence suggesting that childhood interpersonal trauma such as sexual abuse, physical abuse and neglect is associated with interpersonal difficulties (Davis et al., 2001) and anger responses (Neumann et al., 1996; van der Kolk et al., 2005) in adulthood.

4.4. Childhood trauma and aggression in adulthood

The relationships between trauma in childhood and aggressive and assaultive acts in adulthood found in the present study have implications for models of cycles of violence. Such models posit that being exposed to interpersonal trauma increases the likelihood that the victim may later become a perpetrator (Ryan, 2005). Supporting evidence has been drawn from numerous studies that have documented relationships between violence, abuse and neglect during childhood and violence and abuse of others during youth and adulthood (Rivera and Widom, 1990; Jonson-Reid, 1998; DiLillo et al., 2000; Newcomb and Locke, 2001). In the present study, participants who had experienced trauma in childhood were more likely to report engaging in recurrent anger attacks associated with violence and/or property destruction that were out of proportion to triggering events, even after controlling for the effects of trauma dosage. Ryan (1989, 2005) has posited that anger may serve as an enduring threat response, such that individuals who face traumatic events during childhood may continue to respond to perceived threats with anger, even when the danger associated with the traumatic event is no longer present. It may be the case that potential triggers are perceived as threatening in the context of past trauma exposure, and thus potentiate explosive anger responses. The role of anger in influencing the relationship between past victimization and future perpetration merits further investigation.

4.5. Study limitations

The present study has several limitations. As noted above, the data was cross-sectional in nature, and thus conclusions about causality cannot be drawn. Further, the self-report nature of the data may have introduced bias into the reporting of trauma events and symptoms. Other factors that may have influenced the development of IED were not examined, including the early loss of a parent, childhood neglect, cumulative injustice and genetic factors. Finally, while we considered trauma exposure in childhood versus adulthood in the present study, it may be of interest to examine the relative impact of trauma exposure in different stages of childhood (e.g. early, middle or late) in future investigations of the relationship between trauma and IED.

4.6. Study conclusions

The present study documents for the first time the impact of childhood trauma on IED in adults over and above the effects of trauma dosage and PTSD. The finding that interpersonal traumas experienced in childhood were strongly related to IED has potential implications for how models of developmental trauma integrate the contribution of childhood trauma to subsequent anger attacks. Further research is required to elucidate the impact of traumatic events experienced in childhood on the development of emotion regulation and interpersonal skills, and the pathways by which such traumatic events may lead to explosive anger.

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