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Intermittent explosive disorder: Associations with PTSD and other Axis I disorders in a US Military veteran sample

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Abstract

This study examined the prevalence of intermittent explosive disorder (IED) and its associations with trauma exposure, posttraumatic stress disorder (PTSD), and other psychiatric diagnoses in a sample of trauma-exposed veterans (n = 232) with a high prevalence of PTSD. Structural associations between IED and latent dimensions of internalizing and externalizing psychopathology were also modeled to examine the location of IED within this influential structure. Twenty-four percent of the sample met criteria for a lifetime IED diagnosis and those with the diagnosis were more likely to meet criteria for lifetime PTSD than those without (30.3% vs. 14.3% respectively). Furthermore, regression analyses revealed lifetime PTSD severity to be a significant predictor of IED severity after controlling for combat, trauma exposure, and age. Finally, confirmatory factor analysis revealed significant cross-loadings of IED on both the externalizing and distress dimensions of psychopathology, suggesting that the association between IED and other psychiatric disorders may reflect underlying tendencies towards impulsivity and aggression and generalized distress and negative emotionality, respectively.

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Introduction

Intermittent explosive disorder (IED) is defined in the Diagnostic and Statistical Manual of Mental Disorders (*DSM-IV*; American Psychiatric Association [(APA], 1994) as an impulse control disorder characterized by recurrent, discrete episodes of aggression that result in assaults against others or the destruction of property. By definition, the intensity of the aggressive behavior is grossly out of proportion to any psychosocial precipitant and the aggressive episodes may not be better accounted for by other mental disorders such as major depressive (MDD), borderline personality (BPD) or mania/hypomania.

The diagnosis of IED was first introduced into the nomenclature in *DSM-III* (APA, 1980). Originally, the diagnosis was ruled out in the presence of generalized aggression or impulsivity between "aggressive episodes" or if a diagnosis of antisocial personality disorder (ASPD) applied. The *DSM-III-R* (APA, 1987) added an additional rule-out for BPD. In *DSM-IV* these rule-outs were eliminated and the exclusion criteria changed to: "aggressive episodes are not better accounted for by another disorder" (APA, 1994, p. 612). Finally, *DSM-5* (APA, 2013) brought IED together with other disorders characterized by problems with self-control into a new chapter, "Disruptive, Impulse-Control and Conduct Disorders." The *DSM-5* IED criteria addressed important limitations in prior versions of the IED diagnostic criteria, including changes to the type of aggression that can be considered for the diagnosis; it allows for both verbal and non-destructive/non-injurious physical aggression, in addition to the serious assaultive or destructive aggression required in *DSM-IV*. *DSM-5* also provides specific frequency and timeframe requirements, and requires marked distress in the individual or functional impairment. Finally, the relationship of IED to frequently comorbid disorders has been clarified; a diagnosis can be given in the presence of attention-deficit/hyperactivity disorder, conduct disorder, and/or oppositional defiant disorder when the aggressive episodes are in excess of those usually seen in those disorders and merit independent clinical attention (APA, 2013).

DSM-IV lifetime IED prevalence in the National Comorbidity Survey Replication sample (Kessler et al., 2006) was estimated at 7.3%. In that study, individuals with IED reported an average of 43 episodes of explosive behavior over their lifetimes, resulting in an estimated $1,300 or more in total property damage. The sociodemographic correlates of IED have been fairly consistent across studies and include a mean onset at 15 years of age, duration of 20 years, and a higher prevalence among men than women (ratio of 3:1; Coccaro, 2000). In addition, IED has been shown to exert deleterious effects on job performance and health, and has been linked to coronary heart disease (McCloskey et al., 2010).

IED is often accompanied by comorbid diagnoses; studies have found high frequencies of co-occurring mood (76–93%), anxiety (48 – 78%), and substance use disorders (48 – 60%; Coccaro et al., 2005; McElroy et al., 1998). In addition, evidence suggests links to trauma exposure and PTSD. For example, in a nationally representative sample of South African adults, Fincham et al. (2009) found an association between exposure to multiple traumatic life events and IED. Similarly, Nickerson et al. (2012) examined the correlates of IED in trauma-exposed and non-trauma-exposed civilians and found IED was associated with greater trauma exposure and PTSD. Indirect support for a possible link between trauma,

PTSD and IED comes from an extensive body of research documenting associations between PTSD and problems with anger and aggression among combat veterans (for review, see McHugh et al., 2012) and among veterans with combat-related PTSD, specifically (Lasko et al., 1994).

One possible explanation for the substantial psychiatric comorbidity associated with IED is that IED and accompanying disorders are manifestations of a common underlying factor. Factor analytic studies suggest that an externalizing dimension (EXT) accounts for common variance across substance use disorders and ASPD while an internalizing dimension (INT) accounts for common variance across unipolar mood, anxiety, and somatiziation disorders (see Krueger et al., 1998, 2001). In several studies, the INT dimension is further divided into two correlated factors termed “anxious-misery” or “distress” (comprised of unipolar depression, dysthymia, GAD) and “fear” (comprised of panic and phobic disorders; Cox et al., 2002; Krueger, 1999; Slade & Watson, 2006; Vollebergh et al., 2001). This model has been replicated across a range of populations, including samples of veterans with a high prevalence of PTSD (Miller et al., 2008, 2012). To our knowledge, no study has specifically examined the location of IED within this model. The existing literature suggests that the aggression and impulsivity associated with IED and its demonstrated links with substance abuse (Coccaro et al, 2005) may align primarily with EXT. Alternatively, evidence for an association with generalized anxiety disorder and depression (Nickerson et al., 2012) also suggests it might also show an additional association with INT (a cross-loading on EXT and INT).

Aims and Hypotheses

The primary aim of this study was to examine lifetime prevalence of IED and associated patterns of comorbidity in a sample of male veterans, and to test the hypothesis that IED is associated with trauma exposure, combat exposure severity, and PTSD. The second aim was to examine the relationship between IED and the INT and EXT latent psychopathology dimensions. We hypothesized that IED would show evidence of significant cross-loadings on both EXT and distress (an INT factor).

Methods

Participants and Procedure

This study focused on male veterans who were drawn from a larger study of couples recruited at two U.S. Department of Veterans Affairs medical centers (n = 298 couples). Study eligibility required that one member of the couple be a veteran who had been cohabitating with an intimate partner for at least 12 months, and that the veteran endorsed a history of exposure to a traumatic event meeting PTSD *DSM-IV* Criterion A1. Of the 298 couples, data for 11 couples were omitted from analyses due to voluntary withdrawal, ineligibility, or inability to meet protocol requirements. Of the remaining 287 couples, 267 individuals were male veterans; 232 (87%) of them completed all self-reports and diagnostic psychiatric interviews for this study, and were the focus of the data analyses reported below. As we were interested in the relative associations between IED and trauma exposure generally as compared to combat exposure specifically, only veterans were included in this

study; because the study included only 33 female veterans, we focused on male veterans as the small number of female veterans precluded us from examining possible sex effects. All interviews were administered by psychology post-doctoral fellows or licensed clinical psychologists and were videotaped for reliability purposes.

Veterans ranged in age from 22 to 74 (*M* = 52.5). The sample was primarily White non-Hispanic (67.4%); other self-reported races included Black/African American (10.4%), American Indian/Alaska Native (6.5%), and Hawaiian/Pacific Islander (.9%); a total of 19.6% of participants reported Hispanic or Latino ethnicity. The majority of participants was married (81.8%) and reported their primary service occurred during the Vietnam War era (59.5%), Operation Iraqi/Enduring Freedom (14.7 %), and Operation Desert Storm (12.1%). An additional 12.0% reported service during other conflicts or peacetime and 1.7% as spanning two or more conflicts.

Of the final sample, 63.6% (*n* = 147) met for lifetime PTSD, as determined by the Clinician-Administered PTSD Scale (CAPS; Blake et al., 1995). Index trauma events, on which the PTSD assessment was based, were determined by CAPS interview: 60.7% endorsed combat-related trauma as the index event; 7.4% endorsed sudden death/life-threatening illness of a friend/loved one; and, 6.6% endorsed a motor vehicle accident. Several other trauma types were endorsed as index events, but each occurred in less than 5% of the sample. In terms of trauma history, participants reported an average of seven different trauma types (*SD* = 4.2; range: 0 −21), as reported on the Traumatic Life Events Questionnaire (TLEQ; Kubany et al., 2000) with a mean of 21 total traumatic events occurring in their lifetimes (*SD* = 17.2, range 1-113). Most frequently reported traumas include the sudden death of a friend or loved one (90.0%), natural disaster (74.9%), combat (74.6%), threat of death or serious harm (66.5%), life-threatening or disabling event to a loved one (61.9%), and physical punishment as a child (53.7%).

The Institutional Review Boards at VA Boston Healthcare System, VA New Mexico Health Care System, and Boston University School of Medicine approved and annually reviewed the study.

Measures

The Clinician Administered PTSD Scale (CAPS; Blake et al, 1995)—The CAPS, the gold standard structured diagnostic interview that assesses the 17 *DSM-IV* PTSD symptoms, was used to determine lifetime PTSD symptom severity scores and diagnoses according to *DSM-IV* (APA, 1994) criteria. A PTSD diagnosis required endorsement of at least one re-experiencing, three avoidance, and two hyperarousal symptoms, each with a minimum frequency score of one and minimum intensity score of two (see Weathers et al., 1999). Lifetime severity scores were calculated by summing frequency and intensity ratings (individual symptom severity range: 0-8; overall PTSD severity range: 0-136). Inter-rater reliability, based on secondary ratings of videotaped recordings of 25% of total participant interviews, was excellent for lifetime PTSD diagnosis (kappa =.92) and severity (intraclass correlation coefficient (ICC) = .99).

World Health Organization (WHO) – Composite International Diagnostic Interview (CIDI) Intermittent Explosive Disorder Module (IED; WHO, 2004)—The 16-item IED measure, an adaptation of the WHO CIDI IED module (2004), was used to assess symptoms that meet the *DSM-IV* definition of IED. *DSM-IV* IED criteria requires the degree of aggressiveness expressed during an IED episode be grossly out of proportion to any precipitating psychosocial stressors, and that aggressive episodes must not be better accounted for by other mental disorders such as major depressive, BPD or mania/hypomania disorders. This criterion was only partially operationalized in the IED measure; it includes prompts to assess if anger attacks occur only in the context of substance use or when depressed, but does not assess if symptoms are better accounted for by mania/hypomania or ASPD. Because of this, we excluded cases from an IED diagnosis if they met lifetime criteria for mania/hypomania, or ASPD based on Structured Clinical Interview for *DSM-IV* (SCID) ratings. Lifetime IED severity scores were calculated by summing the scores of the seven items assessing anger frequency (0=never, 1=once or twice, 2=3 times or more) and degree of damage (overall severity range 0-14). Inter-rater reliability based on secondary ratings of the IED interview was excellent for both lifetime IED diagnoses (kappa = .95) and severity score ratings (ICC = .99). The measure demonstrated good internal consistency in this sample (α = .93).

Structured Clinical Interview for *DSM-IV* (SCID-IV; First et al., 1997)—Lifetime Axis I disorders were assessed with the SCID. To obtain dimensional scores for each diagnosis, rather than utilizing standard "skip-out" procedures, all symptoms within a module were anchored temporally to a consistent time period to ensure that the rated symptoms were co-occurring. Inter-rater reliability for lifetime dimensional severity, completed on 21% of the SCID interviews, ranged from .95 for cannabis use/dependence to . 99 for alcohol abuse/dependence and panic disorders (mean ICC = .97).

Structured Clinical Interview for *DSM-III-R* Personality Disorders (SCID-II; First et al., 1994)—Adult antisociality was assessed using the ASPD module of the SCID-II, a semistructured interview that is widely used for the assessment of personality disorders based on Axis II *DSM-R* criteria. Inter-rater reliability based on secondary ratings of the ASPD interviews was excellent for both lifetime ASPD diagnosis (kappa = .93) and severity (ICC = .96).

Traumatic Life Events Questionnaire (TLEQ; Kubany et al., 2000)—The TLEQ is a self-report measure that assesses exposure to 22 different traumatic events that meet the *DSM-IV* PTSD definition for a traumatic event. Follow-up questions assess whether the event meets *DSM-IV* PTSD Criterion A2 (i.e., the individual experienced intense fear, helplessness, or horror in response to the event) and the frequency of each event on a 7-point scale ranging from "never" to "more than five times." The TLEQ has shown good test–retest reliability and predictive validity with respect to PTSD diagnoses (Kubany et al., 2000).

Combat Exposure Scale (CES; Keane et al., 1989)—The CES is a seven-item scale designed to assess intensity, frequency, and duration of traditional combat experiences involving threat of danger, loss of life, or severe physical injury. Keane et al. (1989)

reported good internal consistency and excellent 1 week test–retest reliability, and positive associations between the CES and measures of PTSD.

Statistical Analyses

We evaluated the pattern of bivariate correlations among the psychiatric symptom variables and used chi-square analyses to examine whether IED prevalence differed significantly as a function of other lifetime Axis I diagnoses. We also examined the bivariate association between IED and PTSD excluding anger and irritability from the calculation of PTSD total severity scores. We used hierarchical linear regression analyses to evaluate the extent to which the total number of traumatic events, combat exposure severity, and PTSD lifetime severity predicted IED lifetime severity, while controlling for age. Variables were entered into the model sequentially, as follows: age in Step 1; number of traumatic experiences (with combat exposure omitted) and combat exposure severity in Step 2; and PTSD severity in Step 3.

To examine the location of IED in the broader structure of common mental disorders, we first compared the fit of the two- (INT and EXT) and three-factor (Distress, Fear, and EXT) models of this structure using confirmatory factor analysis to determine the best-fitting model in this sample. Indices of Distress (and INT) were lifetime symptom severity scores on major depression, dysthymia, and generalized anxiety disorder; indices of Fear (and INT) were lifetime symptom severity scores on panic, agoraphobia, and specific phobia disorders; and indices of EXT were lifetime adult antisociality, alcohol abuse/dependence, cannabis abuse/dependence, and cocaine abuse/dependence. IED was not included in these models so that we could establish the basic factor structure in this sample first and then test the location of IED. In all models, cannabis and cocaine abuse/dependence residuals were allowed to correlate with each other to account for identical item wording (with the exception of drug class name) in this SCID module. After comparing the fit of the two and three-factor models using a nested-chi square design, we retained the best fitting model and tested the location of IED severity on the factors by first including IED as an indicator of each factor, and then setting each loading to 0 (in separate nested models) to determine if doing so degraded model fit.

Structural analyses were conducted with Mplus version 7.11 (Muthén & Muthén, 2012) statistical modeling software using the robust maximum likelihood estimator (MLR) to account for non-normal distribution of symptom scores. Model fit was evaluated with respect to overall chi-square value, root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), confirmatory fit index, and Tucker-Lewis fit index, using guidelines described by Hu and Bentler (1999). We also examined Bayesian (Schwartz, 1978) and Akaike (Akaike, 1987) information criteria (BIC and AIC, respectively); lower relative values on these indices indicate preferred fit. Nested chi-square tests were evaluated using a correction factor to account for the non-normal distribution of the chi-square when MLR estimation is employed (Bryant & Satorra, 2012).

Results

Descriptive Statistics and Lifetime Prevalence of *DSM-IV IED*

Fifty-six participants (24.3%) received a lifetime *DSM-IV* IED diagnosis. An additional 35 (15.1%) participants met inclusion (criteria A and B) but not exclusion (criterion C) criteria for *DSM-IV* IED. Of these 35, nine (25.7%) were excluded due to adult antisociality, 15 (42.9%) due to episodes that occurred only in the context of sadness or depression, four (11.4%) due to mania/hypomania diagnoses, four (11.4%) due to direct physiological effects of alcohol/drug use, one (2.9%) due to physical illness or head injury, and two (5.7%) due to having more than one rule out. Mean severity for lifetime IED was $M = 4.56$, $SD = 4.89$ (range: 0 – 14). Internal consistency was excellent for the IED lifetime scale ($\alpha = .93$).

Comorbidity Patterns Among Individuals With and Without *DSM-IV IED*

IED lifetime severity scores were strongly correlated with lifetime severities of adult antisociality ($r = .49$, $p < .001$), moderately correlated with PTSD ($r = .37$, $p < .001$), alcohol use ($r = .37$, $p < .001$), and major depression ($r = .37$, $p < .001$), and weakly correlated with generalized anxiety ($r = .28$, $p < .001$), panic ($r = .24$, $p < .001$), cannabis abuse/dependence ($r = .22$, $p < .01$), cocaine abuse/dependence ($r = .16$, $p < .05$), and obsessive-compulsive ($r = .15$, $p < .05$). Its association with specific phobia just missed the threshold for statistical significance ($r = .13$, $p = .05$). To test whether the association between IED and PTSD was a function of the shared role of anger/irritability in each disorder, we re-ran the correlation with the anger/irritability symptoms eliminated from PTSD total severity scores. The correlation between the two variables was essentially unchanged ($r = .36$ $p < .001$).

There was substantial Axis I lifetime comorbidity among individuals with an IED diagnosis, including PTSD (78.6%), alcohol use (76.8%), major depressive (64.3%), cannabis abuse/dependence (21.4%), panic (21.4%) disorders, and 14.3% each for cocaine abuse/dependence, social phobia, and generalized anxiety disorders. As noted earlier, an IED diagnosis was excluded for individuals who met lifetime criteria for a manic or hypomanic episode or ASPD. The lifetime comorbidity patterns were not significantly different when this exclusion was eliminated. The prevalence of Axis I disorders by IED diagnostic status is listed in Table 1. PTSD was the only diagnosis that differed significantly between those with and without a lifetime IED diagnosis (30.3% vs. 14.3%, respectively; χ^2 [1, $n = 229$] = 7.43, $p = .006$).

Regression

Results of the hierarchical regression model predicting veteran IED severity are shown in Table 2. The analysis revealed a significant main effect of total number of traumatic experiences in step 2 that accounted for 4% of the variance in IED. In the final step of the model, lifetime PTSD severity accounted for an additional 10% of the variance in IED severity. In contrast, neither age nor combat exposure severity was a significant predictor of IED severity. In total, the model explained 14% of the variance in IED severity.

Confirmatory Factor Analysis of Latent Psychopathology Dimensions

The three-factor model provided superior fit to that of the two-factor model when evaluating the basic structure of common mental disorders (excluding IED), as shown in Table 3. All indicators loaded significantly on their respective latent variables in the three-factor model at the $p < .01$ level and the magnitude of the standardized loadings ranged from .22 for specific phobia to .91 for panic disorder; all loadings except for specific phobia were above .50. We next tested a model in which lifetime IED symptom severity was added as an indicator of Distress, Fear, and EXT. The fit of this model is shown in Table 3. IED was a significant indicator of Distress ($\beta = .24$, $p = .02$) and EXT ($\beta = .41$, $p < .001$), but not of Fear ($\beta = .04$, $p = .59$). We then set the IED loading on Fear to 0 and determined that doing so did not degrade model fit (see Table 3). In a separate model, we also set the IED loading on Distress to 0 (so IED loaded only on EXT); doing so degraded model fit (see Table 3). Next, we freely estimated the IED loading on Distress and set its loading on EXT to 0 and determined that this, too, yielded significantly degraded model fit (see Table 3). Therefore, the final model, shown in Figure 1, included factor loadings of IED on both Distress ($\beta = .27$, $p = .001$) and EXT ($\beta = .40$, $p < .001$).

Discussion

This study examined lifetime prevalence of IED and associated patterns of comorbidity in a sample of trauma-exposed male military veterans. Results revealed that 24.3% met *DSM-IV* criteria for lifetime IED, and of these, 79% also met criteria for lifetime PTSD compared to 58.4% of those without an IED diagnosis. The prevalence of IED in this sample was much higher than observed in *DSM-IV* epidemiological surveys (i.e., 1.2-9%; Alhasnawi et al, 2009; Fincham et al., 2009), though given that we recruited a trauma-exposed veteran sample, a more relevant comparison is the prevalence of 19% obtained by Hryvniak and Ross (1989) in a sample of military veterans using *DSM-III/III-R* criteria. Given our recruitment strategy and the high prevalence of PTSD in the sample, the greater prevalence of IED in our sample as compared to epidemiological ones is expected. IED was also associated with substantial comorbidity with other Axis I lifetime disorders; more than 76% of those with lifetime IED also met criteria for a lifetime alcohol use disorder and 64% for lifetime depression. Hierarchical regression analyses revealed significant effects of the number of traumatic experiences and lifetime PTSD severity in predicting IED severity; in total, the model explained 14% of the variance in IED.

Contrary to our hypothesis, combat exposure severity was not a significant predictor of IED. Rather, it was trauma exposure generally (i.e., total number of traumatic events), not combat exposure specifically, that predicted aggressive behavior. These results are consistent with studies that have documented a higher prevalence of IED among individuals exposed to multiple traumatic events (Fincham et al., 2009; Nickerson et al., 2012). Indirect support for a link between trauma exposure and IED is also provided by research documenting a relationship between trauma exposure, PTSD and anger and aggression across a variety of populations and trauma types, including combat veterans (McHugh et al. 2012), emergency workers (Evans et al., 2006), and survivors of human rights violations (Silove et al., 2009).

These findings raise the possibility that the comorbidity between IED and PTSD might be related to common clinical correlates of each disorder (e.g., ASPD, mania or depressive disorders) or might be reflective of symptom overlap, given that anger is a criterion for both disorders. To address the former possibility, we imposed a post-hoc rule to exclude an IED diagnosis if individuals met lifetime criteria for mania, hypomania or ASPD based on evidence that IED has a particularly strong relationship with these disorders. Thus, in this sample, the high prevalence of PTSD in individuals with an IED diagnosis is not simply a manifestation of overlap in comorbid disorders. To address the concern about symptom overlap, we examined the bivariate association between IED and PTSD after excluding anger from the calculation of PTSD total severity scores. We found that the correlation between IED and PTSD did not decrease substantially when these symptoms were excluded (r = .37 to r = .36 for those with and without the anger and irritability symptoms, respectively) suggesting that the association between PTSD and IED is not a methodological artifact related to criterion overlap. Our finding that the association between anger and PTSD does not appear to be an artifact of measurement derived from anger's inclusion in the PTSD criteria is consistent with other research (Novaco & Chemtob, 2002; Orth et al., 2008).

Results of this study also suggest that the comorbidity between IED and other diagnoses may be a function of common factors that underlie IED and a range of other disorders including unipolar mood, anxiety, substance use, and ASPD. In particular, IED evidenced significant cross-loadings on both EXT and Distress, but not Fear. This is consistent with the symptom description of IED in that the disorder is defined by core problems with aggression and impulsivity, which would align the disorder with the EXT spectrum, and with work by Nickerson and colleagues (2012) showing an association between IED and both depression and GAD, which would align the disorder with the distress spectrum. Thus IED may develop out of latent liability to either EXT or distress disorders (or both). This is similar to prior work with PTSD in that PTSD has shown associations with both the INT and EXT spectra (Wolf et al., 2010). Moreover, subtype analyses have repeatedly suggested that there are both INT and EXT subtypes of PTSD, with the former characterized by high negative emotionality, low positive emotionality, and comorbid depression and anxiety, and the latter characterized by high negative emotion, low behavioral constraint, comorbid substance use, and ASPD (Forbes et al., 2010; Miller, 2003; Miller et al., 2004; Miller & Resick, 2007). Thus, initial findings suggest that the significant comorbidity between IED and PTSD may arise from a shared liability to distress and EXT.

Three prevailing theories have been posited to explain the relationship between PTSD symptoms and anger and these may be useful in considering the association between PTSD and IED. One theory, the Survivor Mode Theory (see Chemtob, Novaco, Hamada, Gross, & Smith, 1997; Novaco & Chemtob, 1998) hypothesizes that individuals with PTSD have a lowered threshold for perceiving ambiguous situations as threatening and that the perception of threat activates a biologically driven fight or flight survival mode that includes anger reactions. This would suggest that IED might arise out of a similar process whereby situations are deemed threatening and the fight response is initiated. A second theory, the Fear Avoidance Theory (Feeny, Zoellner, & Foa, 2000; Foa, Riggs, Masie, & Yarczower,

1995; Riggs et al., 1992), asserts that individuals with PTSD are motivated to avoid feelings of fear that are engendered by posttraumatic intrusions and that anger serves to deflect those feelings, suggesting that IED may manifest out of an unconscious effort to avoid feelings of sadness or anxiety. The third theory, the Neo-Associationist Memory Networking Model (Berkowitz, 1990), which was applied to PTSD in a study of combat veterans by Taft et al. (2007), proposes that individuals with PTSD experience more frequent and severe negative affect which serves to activate associative networks of anger-related feelings, thoughts, memories and aggressive inclinations that results in a higher propensity for aggressive behavior. This would suggest that IED symptoms are related to a more general propensity towards negative emotionality and arousal in those with PTSD.

Conclusions

These findings should be considered in light of the study strengths and limitations. The primary limitation was the cross-sectional measurement, which precluded conclusions about etiology or direction of associations involved in IED-PTSD comorbidity. Another limitation was the composition of the sample which was comprised of male veterans with predominantly combat-related trauma. Although most participants endorsed multiple types of trauma, both civilian and military, it is unclear to what extent results generalize to female veterans or other trauma populations. At the same time, these limitations were arguably offset by the strengths of the study, which included a large sample of male veterans and the use of gold-standard structured clinical diagnostic interviews with demonstrated strong inter-rater reliability. Our focus on a disorder that is often chronic and that exacts a high cost to the individual and society in terms of impaired social relationships, job performance, and legal entanglements, is a significant strength of the study.

In conclusion, results of this study suggest that IED has a prevalence of approximately 25% among trauma-exposed male U.S. military veterans and that the disorder is associated with substantial comorbidity, particularly PTSD. This substantial comorbidity between IED and other psychiatric disorders may reflect a shared liability to distress and/or EXT disorders. To our knowledge, this is the first study to specifically examine IED within a model of latent INT and EXT dimensions of psychopathology; thus, additional studies are needed to test whether these findings can be replicated in independent samples. Finally, results suggest it is important to assess for the presence of IED when evaluating veterans with trauma exposure.

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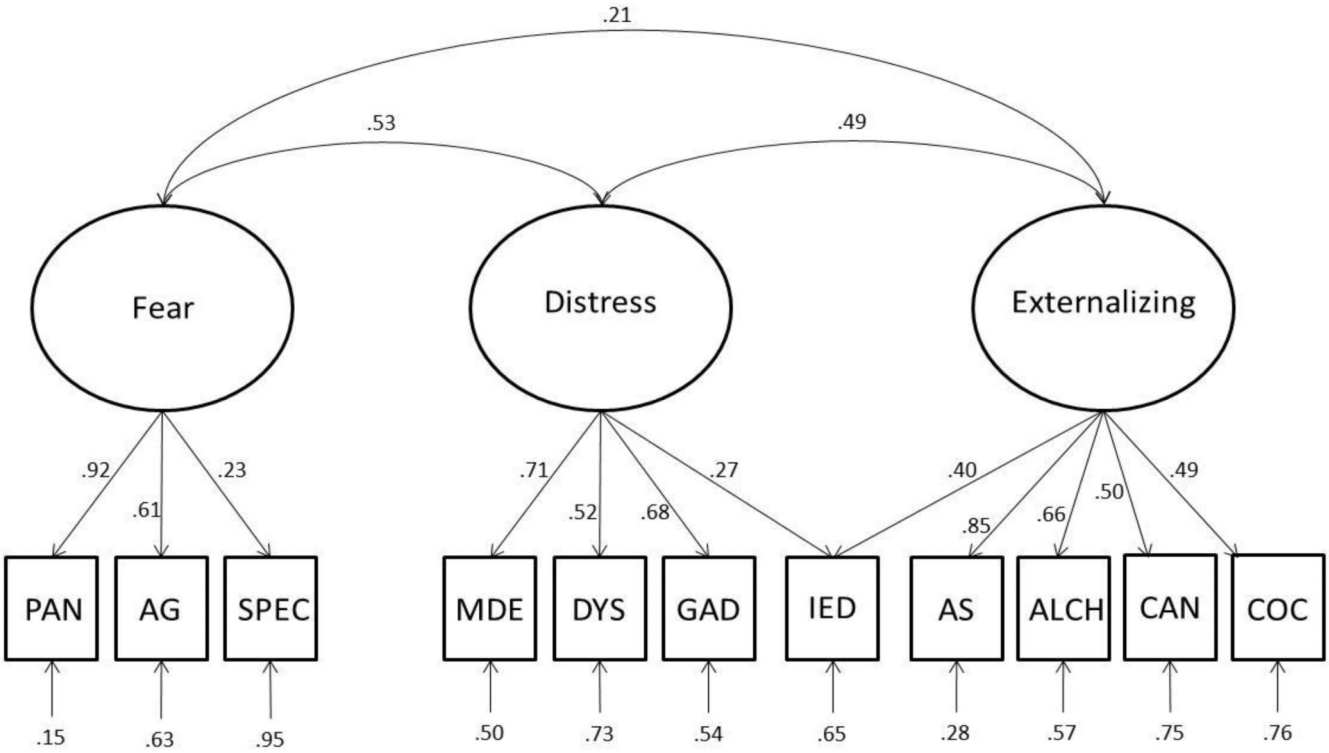

Figure 1.

The figure shows the cross-loading of IED on the latent Distress and Externalizing dimensions. All indicators reflect lifetime severity scores. All loadings are completely standardized and were significant at the $p < .01$ level. PAN = panic disorder; AG = agoraphobia; SPEC = specific phobia; MDE = major depression; DYS = dysthymia; GAD = generalized anxiety disorder; IED = intermittent explosive disorder; AS = adult antisociality; ALCH = alcohol abuse/dependence; CAN = cannabis abuse/dependence; COC = cocaine abuse/dependence.

Table 1
Prevalence of Axis I Disorders by IED Diagnosis

Axis I Lifetime Disorder	Lifetime IED Prevalence (%) (*N* = 56)	No Lifetime IED Prevalence (%) (*N* = 176)	X^2	*p*
PTSD	30.3	14.3	7.43	.006
Alcohol Abuse/Dependence	28.3	17.3	3.24	.072
MDD	29.0	18.9	3.21	.073
Specific Phobia	16.0	25.9	1.16	.28
GAD	33.3	23.3	1.18	.28
Panic Disorder	27.9	23.5	.36	.55
OCD	30.0	24.5	.15	.70
Social Phobia	27.6	24.4	.14	.71
Cannabis Abuse/Dependence	25.5	24.0	.05	.83
Cocaine Abuse/Dependence	20.0	25.3	.50	.48

Note. PTSD = posttraumatic stress disorder; MDD = major depressive disorder; GAD = generalized anxiety disorder; OCD = obsessive compulsive disorder.

Table 2
Hierarchical Linear Regression Analyses Predicting IED Symptom Severity

Variable	β	ΔR^2
Step 1		.00
Age	.04	
Step 2		.04*
# Trauma Occurrences	.17*	
Combat Exposure	.05	
Step 3 (Final Model)		.10***
Age	.06	
# Trauma Occurrences	.06	
Combat Exposure	−.08	
PTSD Severity	.37***	
Total R^2		.14***

Note. PTSD = posttraumatic stress disorder. Table lists the new predictor variables entered at each step until step 3 which lists all variables in the model simultaneously.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 3

Fit and Comparative Fit of Confirmatory Factor Analytic Models

Model	Chi Square	df	*p*-value	RMSEA	SRMR	CFI	TLI	AIC	BIC	Model Comparison	Δ Chi Square	Δ df	*p*-value
No IED													
1a. 2 Factor	88.32	33	< .001	.09	.06	.87	.82	12812	12922				
2a. 3 Factor	28.37	31	.60	< .001	.04	1.0	1.0	12754	12872	1a vs. 2a	121.05	2	< .001
With IED													
1b. IED on Distress, Fear, & Ext	38.32	38	.45	.006	.04	1.0	1.0	14070	14204				
2b. IED on Distress & Ext	38.68	39	.48	< .001	.04	1.0	1.0	14068	14199	1b vs. 2b	.29	1	.59
3b. IED on Ext	47.92	40	.18	.03	.05	.98	.98	14076	14204	2b vs. 3b	9.27	1	.002
4b. IED on Distress	59.37	40	.02	.05	.05	.96	.95	14088	14216	2b vs. 4b	30.78	1	< .001

Notes. IED = intermittent explosive disorder; Ext = Externalizing; df = degrees of freedom; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; CFI = confirmatory fit index; TLI = Tucker-Lewis index; AIC = Akaike information criterion; BIC = Bayesian information criterion.