Abstract

Experiences of potentially traumatic events (PTE), commonly assessed with the Life Events Checklist for *DSM-5* (LEC-5), can be both varied in pattern and type. An understanding of LEC-assessed PTE type clusters and their relation to psychopathology can enhance research feasibility (e.g., address low base rates for certain PTE types), research communication/comparisons via the use of common terminology, and nuanced trauma assessments/treatments. To this point, the current study examined (1) clusters of PTE types assessed by the LEC-5; and (2) differential relations of these PTE type clusters to mental health correlates (posttraumatic stress disorder [PTSD] severity, depression severity, emotion dysregulation, reckless and self-destructive behaviors [RSDBs]). A trauma-exposed community sample of 408 participants was recruited via Amazon's Mechanical Turk (M_{age} = 35.90 years; 56.50% female). Network analyses indicated three PTE type clusters: Accidental/Injury Traumas (LEC-5 items 1, 2, 3, 4 and 12), Victimization Traumas (LEC-5 items 6, 8, and 9), and Predominant Death Threat Traumas (LEC-5 items 5, 7, 10, 11, 13-16). Multiple regression analyses indicated that the Victimization Trauma Cluster significantly predicted PTSD severity ($\beta = .23$, $p < .001$), depression severity ($\beta = .20$, $p = .001$), and negative emotion dysregulation ($\beta = .22$, $p < .001$); and the Predominant Death Threat Trauma Cluster significantly predicted engagement in RSDBs ($\beta = .31$, $p < .001$) and positive emotion dysregulation ($\beta = .26$, $p < .001$), accounting for the influence of other PTE Clusters. Results support three PTE type classifications as assessed by the LEC-5, with important clinical and research implications.

Keywords. Life Events Checklist for DSM-5; trauma type classification; network analyses; psychopathology correlates

Introduction

Experience of traumatic events is a critical etiological criterion or vulnerability factor for several disorders within the Diagnostic and Statistical Manual of Mental Disorders (e.g., posttraumatic stress disorder [PTSD]; American Psychiatric Association, 2013). Thus, greater clinical and research attention is needed on screening and assessing traumatic events; yet this aspect is quite understudied compared to trauma-related health outcomes. One of the most widely used self-report measures of diverse potentially traumatic events (PTEs) is the Life Events Checklist (LEC; Gray, Litz, Hsu, & Lombardo, 2004; F. W. Weathers et al., 2013). Despite their inherent diversity (Contractor, Caldas, Fletcher, Shea, & Armour, 2018; Litz et al., 2018; Luz et al., 2011), PTEs can be meaningfully clustered together based on underlying shared risk factors (e.g., neuroticism) and/or characteristics (e.g., perpetrated by other individuals; Breslau, Davis, & Andreski, 1995; Finkelhor, 2008). To extend this line of research, the current study examined the structure of lifetime PTE types (i.e., clusters) assessed by the LEC, and their relations with mental health correlates.

Clinicians and researchers use a wide array of measures to assess lifetime PTEs. One such widely used self-report measure is the LEC, which is either administered in conjunction with the Clinician-administered PTSD Scale (Blake et al., 1995) or as a screening instrument by itself (F. W. Weathers et al., 2013). Specifically, the LEC for *DSM-5* (LEC-5; F. W. Weathers et al., 2013), adapted from the *DSM-IV* version (Gray et al., 2004), is composed of 17 items assessing different lifetime PTEs. This scale uses six nominal categories of responses: happened to me, witnessed it, learned about it, part of my job, not sure, and does not apply. Psychometrically, the LEC for *DSM-IV* has demonstrated good convergent and discriminant validity, test-retest reliability over a seven-day period, and concurrent validity with other trauma measures (Bae, Kim, Koh, Kim, & Park, 2008; Gray et al., 2004). There is no known study on the psychometrics of the LEC-5, although the LEC-5 only differs from the LEC for *DSM-IV* in the addition of the response option "part of my job" corresponding to *DSM-5* changes in the PTSD diagnostic criteria (American Psychiatric Association, 2013).

Moreover, relatively unexplored is the clustering and classifications of PTE types as examined by the LEC-5. Supporting this line of investigation, evidence indicates that most individuals experience more than one PTE type in their lifetime (Carlson et al., 2011; Higgins & McCabe, 2001), and PTEs could be clustered together attributed to various reasons. One, common risk factors such as higher levels of trait neuroticism and lower education may contribute to the classification of PTE types (Breslau et al., 1995). Two, different PTE types may share common characteristics. For example, physical and sexual assault are perpetrated by another individual and considered victimization experiences involving malevolence, betrayal, and/or immorality (Finkelhor, 2008); while hurricanes, tornados, and earthquakes, as natural disasters, are conceptualized as uncontrollable, hazardous, and threatening natural phenomena with profound impacts on society and functioning (e.g., loss of life and livelihood; Alcántara-Ayala, 2002; Fritz, 1961). Indeed, preliminary evidence has supported the clustering of PTE types across diverse trauma measures: interpersonal vs. non-interpersonal traumas (Sijbrandij et al., 2013); intentional (e.g., assault) vs. non-intentional traumas (e.g., natural disaster; Santiago et al., 2013); different military-related traumas (e.g., traumatic loss, being betrayed by others; Litz et al., 2018); and traumas differentiated by affected developmental functions (e.g., attachment) and trauma characteristics (e.g., cumulative stress, Kira, Lewandowski, Somers, Yoon, & Chiodo, 2012).

There are two noteworthy limitations in this regard. First, most existing PTE type clusters were not empirically-derived using recommended statistical techniques. Relatedly, some trauma assessments have been factor-analyzed such as the Stressful Life Events Screening Questionnaire (Allen, Madan, & Fowler, 2015) and Childhood Trauma Questionnaire (Spinhoven et al., 2014). Such an approach is problematic and unsuited to examining clusters of PTE types (Hooper, Stockton, Krupnick, & Green, 2011) because it assumes (1) that a latent variable of "trauma/stressor type" is causing specific PTEs, and (2) the association between all PTE types within a cluster will be accounted for by the latent variable disregarding any potential directional relations among the PTE types (i.e., assumption of local independence; Hodgdon et al., 2019). Second only one study, to our knowledge, has examined clusters of PTE types as assessed by the LEC. Bae et al. (2008) found an optimal six-factor solution: physical assault/others (items 6, 9, 13, 16, 17), accident/injury (items 2, 3, 4, 12, 17), natural disaster/witnessing death (items 1, 14, 15), sexual abuse (items 8, 9), criminal assault (items 7, 11, 16), and man-made disaster (items 5, 7, 10). Notably, this study used the LEC for *DSM-IV*, a Korean version of the LEC, and a factor-analytical approach to clustering PTE types. Further, although research indicates clusters of PTE types assessed by other trauma measures (Allen et al., 2015; Spinhoven et al., 2014); these measures are not comparable to the LEC as the number and nature of items are vastly different, hence limiting transferability and applicability of findings to the LEC.

Overall, we know very little about empirically-derived clusters of PTE types for trauma assessments in general, and specifically for those examined by the LEC. Addressing these limitations, the current study examined (1) clusters of lifetime PTE types assessed by the LEC-5 using a novel and empirically-supported statistical approach of network analysis (Hodgdon et al., 2019); and (2) differential relations of the obtained clusters to theoretically- and empiricallyrelevant mental health correlates (i.e., PTSD severity, depression severity, emotion dysregulation, and reckless and self-destructive behaviors [RSDBs]). The network approach to psychopathology conceptualizes mental disorders as a group of causally-related symptoms that influence each other; this symptom-to-symptom interaction pattern represents a network structure (Borsboom, 2017; Borsboom, Cramer, & Kalis, 2019). Symptoms that are closely related to each other, influence each other to a greater extent, and have more associations with each other form clusters or network communities (Borsboom, Cramer, Schmittmann, Epskamp, & Waldorp, 2011; P. J. Jones, Mair, & McNally, 2018). This network approach has been extensively applied to the study of post-trauma psychopathology (Contractor, Greene, Dolan, Weiss, & Armour, 2020; Weiss, Contractor, Raudales, Greene, & Short, 2020).

In the network approach, the constructs of traumas and stressors have traditionally been conceptualized as external "trigger events" that activate symptoms in a psychopathology network (Isvoranu et al., 2016), and they have not been directly addressed within the network structure (Borsboom, 2017; Borsboom et al., 2019). However, the network approach to psychopathology as well as the corresponding analytical tool of network analyses has direct relevance to the current study's research questions for three reasons. One, PTE types (i.e., nodes), conceptually, form a network of mutually interactive components connected by associational parameters (i. e., edges; degree of co-occurrence; Hodgdon et al., 2019). If two PTE types co-occur together, they are statistically connected within the network (Hodgdon et al., 2019). Second, this approach can identify network communities or clusters of PTE types (Hodgdon et al., 2019; P. J. Jones et al., 2018), representing PTE types that co-occur in meaningful ways across individuals (Hodgdon et al., 2019). Results can enhance our understanding regarding mechanisms/types of co-occurrence across PTE types (Fried et al., 2017). The concept of network communities/clusters is parallel to the concept of factor loadings on a latent factor as discussed in factor analyses (Borsboom, 2017). Lastly, network analyses overcome limitations of applying a latent variable model approach to examining PTE type clusters as elaborated in the earlier text (Hodgdon et al., 2019).

Given the lack of research in this area, we considered the study aims to be exploratory; however, expected to find a PTE type cluster including interpersonal/sexual traumas drawing from relevant research (Allen et al., 2015; Contractor, Brown, & Weiss, 2018; Contractor, Caldas, et al., 2018; Hodgdon et al., 2019; Spinhoven et al., 2014). Moreover, based on existing research, we expected that the interpersonal/sexual trauma category would be more strongly associated with psychopathology correlates. As examples, Breslau et al. (1998) found that assaultive violence was most likely to trigger PTSD; Kilpatrick et al. (2013) indicated that the highest prevalence rates of lifetime PTSD was among those experiencing interpersonal violence or military combat; Allen et al. (2015) found that sexual traumas was more related to negative emotion dysregulation and RSDBs such as suicide attempts, and assaults were more related to RSDBs such as substance misuse; and Vrana and Lauterbach (1994) indicated that sexual assault explained 7% of the variance in depression.

Delineating empirically-derived PTE type clusters is a viable and feasible compromise between options of using a composite score of PTE exposure (which is most parsimonious but at the cost of considering heterogenous PTE types) vs. examining each PTE type separately in trauma research (which is not always feasible and/or meaningful; Hodgdon et al., 2019). Regarding the latter approach, there is “low base rate” problem, wherein certain PTE types are less prevalent in certain study samples (Gray et al., 2004), which makes it difficult to consider all PTE types meaningfully in research. As an example, combat-related PTEs are less frequently endorsed in student samples (Frazier et al., 2009; Read, Ouimette, White, Colder, & Farrow, 2011). Further, empirically-derived PTE type clusters will additionally facilitate: (1) research on the influence of PTE types on diverse psychopathology using derived clusters as LEC-5 subscales (Floyd & Widaman, 1995); (2) comparisons across research studies; and (3) communication via common terminology among researchers/clinicians using the LEC-5 (Luz et al., 2011). Lastly, understanding relations of different PTE type clusters to psychopathology may enable a more nuanced assessment and treatment approach for trauma clinicians.

Methods

Procedure and Participants

Participants were recruited from Amazon's Mechanical Turk (MTurk) platform. The current study was described as a 45-60-minute survey about stressful life experiences. Inclusion criteria were (1) 18 years or older, (2) living in North America, (3) fluency in English, and (4) the presence of PTE(s) screened with the Primary Care PTSD Screen for *DSM-5* (Prins et al., 2015). Participants who met eligibility criteria, provided informed consent, and completed the survey on Qualtrics validly received $1.25. These procedures were approved by the [redacted] Institutional Review Board.

Exclusions and Missing Data

We implemented several steps to ensure data quality and integrity. Of the obtained 891 responses, 47 responses from 18 participants who attempted to answer the questionnaire multiple times were excluded (remainder n = 844). We further excluded 150 participants not meeting all inclusionary criteria, 122 participants not passing all four validity checks to ensure attentive responding and comprehension (Meade & Craig, 2012; Thomas & Clifford, 2017), 97 participants missing data on all measures, and 11 participants not endorsing a PTE/most distressing PTE on the LEC-5 (F. W. Weathers et al., 2013). We also excluded 56 participants who missed >30% item-level data on the primary study variables. The final sample included 408 trauma-exposed participants, averaging 35.90 years with 56.50% female and 62.50% having a probable PTSD diagnosis. Further, the majority identified as non-Hispanic or Latino/a (*n* = 348, 85.3%) and as White (*n* = 314, 77%. See *Table 1* for detailed information on socio-demographic variables. Missing data in this sample was minimal (e.g., one participant was missing one LEC-5 item; 9 participants were missing one Patient Health Questionnaire-9 item; one participant was missing one Difficulties in Emotion Regulation Scale–16 item; two individuals were missing one Difficulties in Emotion Regulation Scale–Positive item; and 77 participants were missing two Posttrauma Risky Behaviors Questionnaire items).

Measures

Life Event Checklist for DSM-5 (LEC-5; F. W. Weathers et al., 2013). It is a 17-item self-report measure assessing lifetime PTE types. Participants rate each item with 6 response options: *happened to me, witnessed it, learned about it, part of my job, not sure*, or *doesn't apply*. For the current study, a positive trauma endorsement was indicated when individuals selected either of the first four response options consistent with PTSD *DSM-5* Criterion A (American Psychiatric Association, 2013).

Posttrauma Risky Behaviors Questionnaire (PRBQ; Contractor, Weiss, Kearns, Caldas, & Dixon-Gordon, in press). It is a 16-item self-report measure assessing the extent of engaging in post-trauma RSDBs in the past month. The first 14 PRBQ items assess the extent of engaging in specific RSDBs with response options ranging from 0 (*never*) to 4 (*very frequently*). The last two items assess functional impairment and relation of RSDB frequency to onset of the worst PTE. In the current study, scores for 14 items were summed; higher scores represented greater extent of RSDB engagement. The PRBQ has good psychometric properties (Contractor, Weiss, Dolan, & Mota, 2019; Contractor et al., in press); the Omega was .95 in the current study.

PTSD Checklist for DSM-5 (PCL-5; F.W. Weathers et al., 2013). It is a 20-item self-report measure assessing PTSD severity referencing the past month. Response options range from 0 (*not at all*) to 4 (*extremely*). The PCL-5 has excellent psychometric properties (Bovin et al., 2016); the Omega was .97 in the current study. Participants completed the PCL-5 referencing the most distressing PTE endorsed on the LEC-5 (F. W. Weathers et al., 2013).

Patient Health Questionnaire-9 (PHQ-9; Kroenke & Spitzer, 2002). It is a 9-item self-report measure assessing depression symptoms over the past two weeks. Response options range from 0 (*not at all*) to 3 (*nearly every day*). The PHQ-9 has good psychometric properties (Kroenke, Spitzer, & Williams, 2001); the Omega was .83 in the current study.

The Difficulties in Emotion Regulation Scale-16 (DERS-16; Bjureberg et al., 2016). It is a 16-item self-report measure of negative emotional dysregulation using a 5-point Likert scale ranging from 1 (*almost never*) *to* 5 (*almost always*). For the current study, we used the DERS-16 total score; higher scores indicated greater difficulties regulating negative emotions. The DERS-16 has good psychometric properties (Hallion, Steinman, Tolin, & Diefenbach, 2018); the Omega was .99 in the current study.

The Difficulties in Emotion Regulation Scale–Positive (DERS-P; Weiss, Gratz, & Lavender, 2015). It is a 13-item self-report measure of positive emotion dysregulation using a 5-point Likert scale ranging from 1 (*almost never*) *to* 5 (*almost always*). For the current study, we used the DERS-P total score; higher scores indicated greater difficulties regulating positive emotions. The DERS-P has good psychometric properties (Weiss, Darosh, Contractor, Schick, & Dixon-Gordon, 2019; Weiss et al., 2015); the Omega was .96 in the current study.

Statistical Plan

For the primary analyses, we excluded LEC-5 item 17 which asked for another stressful life event not captured by the other items because of the ambiguity in obtained content. Following guidelines of utilizing samples of ~500 participants to estimate binary variable-based networks of low-moderate sizes (i. e., 10-30 nodes; Dalege, Borsboom, van Harreveld, & van der Maas, 2017), our sample size was sufficient for exploratory data-driven analyses for 16 binary nodes. The network was estimated using complete pairwise observations (i.e., using all available data).

Network Estimation, Visualization, and Accuracy. We used the *bootnet* (which imports the IsingFit package; Epskamp, Borsboom, & Fried, 2018) and *qgraph* (Epskamp, Cramer, Waldorp, Schmittmann, & Borsboom, 2012) packages in R. For network estimation, we used the Ising model that is appropriate for binary data and estimates parameters with logistic regression (van Borkulo et al., 2014). To reduce the likelihood of spurious edges and obtain a sparse/parsimonious network, we estimated a regularized partial correlation network structure using the enhanced least absolute shrinkage and selection operator (*eLasso*; van Borkulo et al., 2014), with Extended Bayesian Information Criterion (EBIC; Chen & Chen, 2008) to select a value for the tuning parameter. In the current network, a node indicated a psychological variable (PTE type) and an edge was a regularized partial correlation between two nodes after statistically controlling for other network nodes (Borsboom & Cramer, 2013). For each edge, we examined its weight reflecting strength and sign reflecting direction; weights were graphically represented by line thickness (Borsboom & Cramer, 2013; Costantini et al., 2019). The network's graphical layout was based on the Fruchterman-Reingold algorithm (Fruchterman & Reingold, 1991); weaker nodes with fewer connections are placed further apart and stronger nodes with more connections are placed closer together (Hevey, 2018). We used this visualization technique amongst others because we were concerned primarily with viewing of network edges and clustering structures rather than meaningful/interpretable positioning of nodes (P. J. Jones et al., 2018).

To examine network accuracy, we estimated confidence intervals (CIs) on the edge-weights (nonparametric bootstrapping with replacement) and statistically significant differences between edge-weights (bootstrapped difference test; Epskamp et al., 2018). Finally and most relevant to the current study, to detect network communities (i.e., clusters of nodes highly connected with one another and less connected with nodes outside that cluster), we used the *walktrap* algorithm (Pons & Latapy, 2005) derived from the R package *igraph* (Csardi & Nepusz, 2006). The walktrap algorithm computes a community structure in time depending on the density of the community, the height of the corresponding hierarchical community structure, the number of vertices, and the number of edges.

Examination of Influential Nodes and Predictability of Nodes. The *one-step expected influence* (EI_1) estimate is a measure of a node's influence with other neighboring nodes (i.e., nodes connected to and share edges with the target node) and considers positive and negative edge weight values in its computation (Robinaugh, Millner, & McNally, 2016). With a positive EI_1 value, changes in the node is associated with changes in the overall network in the same direction; with a negative EI_1 value, changes in the node is associated with changes in the network in the opposite direction (Robinaugh et al., 2016). We computed EI_1 using the R package *networktools* (P. Jones, 2018).

We additionally computed *predictability* of nodes, which indicates how well a certain node can be predicted by neighboring nodes in the network (J. M. Haslbeck & Waldorp, 2018; J.

M. B. Haslbeck & Fried, 2012). In other words, the predictability estimate indicates how much of the variance in a certain node can be explained by all edges connected to that node (J. M. Haslbeck & Waldorp, 2018; J. M. B. Haslbeck & Fried, 2012). In the current study, we computed a predicted probability for each category of the binary nodes (i.e., endorsed vs. not endorsed) using a multinomial distribution (J. M. Haslbeck & Waldorp, 2018). We computed a *normalized accuracy measure* for binary nodes which quantified how a node is determined by its neighboring nodes beyond the intercept model; for instance, this measure is 0 when other variables do not predict the node beyond the intercept model (J. M. B. Haslbeck & Fried, 2012). The normalized accuracy measure ranges from 0 (no predictability) to 1 (perfect prediction) (J. M. B. Haslbeck & Fried, 2012). We used R packages *mgm* (J. M. B. Haslbeck & Waldorp, 2015, 2020) and *qgraph* (Epskamp et al., 2012) to compute and visualize predictability estimates. Higher predictability of a node is indicated by prediction estimates being closer to the actual values of a node (J. M. Haslbeck & Waldorp, 2018).

PTE Type Clusters and Mental Health Correlates. All study variables were normally distributed (-2 < skewness < 2; -7 < kurtosis < 7; Curran, West, & Finch, 1996). We examined multicollinearity for the PTE type clusters using the Variance Inflation Factor (VIF) ≥ 10 and tolerance value < .01 rules (Hair, Black, Babin, & Anderson, 2009); multicollinearity was not violated. To examine the differential relations of the obtained PTE type clusters to mental health correlates, we (1) created a score for the PTE type clusters (i.e., summed the scores of all LEC-5 item in a certain cluster drawing from the network communities/clusters obtained from network analyses), and (2) used the PTE type cluster scores as predictors of each mental health correlate (PTSD severity, depression severity, difficulties regulating negative and positive emotions, RSDBs) in a multiple regression model. We used SPSS v. 26 (IBM Corp, 2017) for these analyses.

Results

Network Estimation, Visualization, and Accuracy. *Figure 1* indicates the regularized partial correlation network corresponding to *Table 2* values. Examining the edge weights, the strongest associations were between these nodes: LEC-5 4 with LEC-5 5 (1.03) and LEC-5 7 (.80), LEC-5 5 with LEC-5 10 (1.04) and LEC-5 11 (1.22), LEC-5 6 with LEC-5 7 (.96) and LEC-5 9 (.81), LEC-5 7 with LEC-5 10 (1.08) and LEC-5 11 (.94), LEC-5 8 with LEC-5 9 (1.79), LEC-5 11 with LEC-5 13 (1.01), and LEC-5 14 with LEC-5 15 (.95). Regarding network accuracy *(Supplemental Figures 1 and 2),* results indicated that the LEC-5 8 with LEC-5 9 edge weight was significantly stronger than all other edge weights; both of these nodes represented sexual interpersonal traumas. Importantly, we found three PTE type clusters/communities: PTE Type Cluster 1 (LEC-5 items 1, 2, 3, 4 and 12); PTE Type Cluster 2 (LEC-5 items 6, 8, and 9); and PTE Type Cluster 3 (LEC-5 items 5, 7, 10, 11, 13-16). We created PTE cluster descriptions based on prominent patterns; notably Cluster 3 was more heterogenous in PTE types than other clusters. PTE Type Cluster 1 was described as Accidental/Injury Traumas; PTE Type Cluster 2 was described as Victimization Traumas; and PTE Type Cluster 3 was described as Predominant Death Threat Traumas (this had prominent death-related traumas).[1]

Examination of Influential Nodes and Predictability of Nodes. See *Table 3* for the EI_1 estimates for each node. Results indicated that all EI_1 estimates are positive meaning that changes in each node is associated with changes in the overall network in the same direction (i.e.,

[1] Of note, using a latent variable approach, almost similar clusters (i.e., latent variables) were obtained with Exploratory and Confirmatory Factor Analyses; Factor 1 (Accidental Traumas) - LEC-5 items 1 -5; Factor 2 (Injury/Death Traumas) - LEC-5 items 10-16; Factor 3 (Victimization Traumas) - LEC-5 items 6-9.

increase or decrease in activation of each PTE type is associated with an increase or decrease in activation of other neighboring nodes respectively. Further, nodes with the highest EI_1 values included LEC-5 items 13, 11, 4 and 7 in that order (most belonged to PTE Cluster 3). See Table 3 for predictability estimates and Figure XXX for the visualization of node predictability. Results indicated that nodes with the predictability values (normalized accuracy measure) included LEC-5 items 9, 8, 4, 7, and 6 in that order (most belonged to PTE Cluster 2).

PTE Type Clusters and Mental Health Correlates. To account for multiple comparisons, we used Bonferroni corrections (.05/15) for each scoring methodology, resulting in a p = .003 benchmark to detect significance (Huberty, 1999; Mulaik, Raju, & Harshman, 1997). See *Table 4* for results of the multiple regression analyses. PTE Type Cluster 1 had near zero correlations with all the dependent variables (ranging from -.03 to .09), whereas all 3 PTE Type Clusters had medium to large correlations (.41 to .6) with the dependent variables. Therefore, in the regression equation, the near-zero relationships between PTE Type Cluster 1 and the dependent variables ended up as statistically non-significant negative relationships in each regression model. This relationship does not warrant substantive interpretation. PTE Type Cluster 2 was a statistically significant predictor of PTSD severity, depression severity, and negative emotion dysregulation, accounting for the influence of other PTE type clusters. PTE Type Cluster 3 was a statistically significant predictor of engagement in RSDBs and positive emotion dysregulation, accounting for the influence of other PTE type clusters.

Discussion

The current study identified clusters of PTE types assessed by the LEC-5 using network analyses and examined their differential relations with mental health correlates. Results provided support for a three-cluster LEC-5 model. Most clusters were differentiated in their relations to

PTSD severity, depression severity, emotion dysregulation, and RSDBs, providing partial support for their construct validity. Our findings suggest the potential utility of these PTE type classifications for research and clinical practice.

Results provided support for three PTE type clusters characterized by (1) Accidental/Injury Traumas (e.g., fire, transportation accident); (2) Victimization Traumas (e.g., physical or sexual assault); and (3) Predominant Death Threat Traumas (e.g., sudden or violent death). These findings differ from Bae et al. (2008) who found support for six PTE type factors: physical assault/others, accident/injury, natural disaster/witnessing death, sexual abuse, criminal assault, and man-made disaster. Among explanations for these divergent results, to cluster PTE types, Bae et al. (2008) used a factor-analytical approach, whereas the current study used a more appropriate statistical tool of network analysis which overcomes limitations of applying a latent variable model approach to examining PTE type clusters. Further, Bae et al. (2008) used a translated (Korean) version of the LEC for *DSM-IV* within a Korean sample of psychiatric patients, whereas the current study used the original (English) version of the LEC-5 within a trauma-exposed community sample in the United States. Indeed, evidence supports cultural variation in the types of PTEs (e.g., exposure to genocide; Hinton & Lewis-Fernández, 2011), and the prevalence rates of some PTE types reported in the Bae et al. (2008) study varied considerably from those found in the current study (e.g., severe human suffering = 54.30% vs. 31.60%, respectively; physical assault = 82.90% vs. 55.90%, respectively). Further, the classification of PTE types may vary as a function of culture (e.g., individuals within war-affected countries may be more likely to report exposure to war and sexual victimization than individuals not affected by war; Foster & Brooks-Gunn, 2015). Additionally, differences in the obtained LEC-5 clusters may relate to the clinical vs. non-clinical nature of the samples.

Specifically, evidence suggests that certain PTE types (e.g., sexual victimization, combat exposure) are more strongly linked to clinically-relevant outcomes including PTSD and depression severity (Kilpatrick et al., 2013; Tracy, Morgenstern, Zivin, Aiello, & Galea, 2014). Future research is needed to validate this empirically-derived PTE type classification across diverse samples.

The most important network properties for this study were network communities/clusters of nodes, one-step expected influence (EI_1) as a measure of node influence, and predictability values (J. M. Haslbeck & Waldorp, 2018; P. J. Jones et al., 2018; Robinaugh et al., 2016). In terms of what the results of these network properties mean to our study, we found PTE type nodes to be clustered in three meaningful communities (elaborated above) perhaps indicating that experience of certain PTE types correlates with the experience of other specific PTE types; reasons for such co-occurrence could be common vulnerability factors or certain characteristics (e.g., Breslau et al., 1995; Finkelhor, 2008) which need further exploration. Additionally, positive EI_1 estimates indicated that the experience of a certain PTE type increases the experience of other PTE types and a lack of an experience of a certain PTE type decreases the experience of other PTE types. Relatedly, PTE types with the highest EI_1 estimates were primarily Predominant Death Threat Traumas, indicating their dominant influence on other PTE types assessed by the LEC-5. Lastly, Victimization Traumas, in particular, were most predicted by the neighboring nodes in the network, with implications for remedial and preventive interventions. Victimization Traumas were predicted to a large extent by the PTE types connected to them (e.g., assault with a weapon; life-threatening illness/injury); thus, perhaps, intervening on and addressing the impacts of the PTE types connected to each of those Victimization Traumas may have beneficial impacts for preventing or dealing with Victimization

Traumas (J. M. B. Haslbeck & Fried, 2012). Broadly, while Predominant Death Threat Traumas seem to be most influential in the network, Victimization Traumas are most predictable by connected PTE types. Notably, all such network properties depend on the number and strength of edges of neighboring nodes for a target node (J. M. B. Haslbeck & Fried, 2012). For instance, a node with many strong edges will have higher EI_1 and predictability values and a well-defined cluster with connected nodes; hence, this technique is data-driven and important to replicate with different samples to ascertain generalizability.

Notably, the three PTE type clusters had construct validity; they had differential relations with psychopathology symptom severity, engagement in RSDBs, and emotion dysregulation. Regarding psychopathology symptoms, PTE Type Cluster 2 (Victimization Traumas) was a significant predictor of PTSD and depression severity, accounting for the influence of other PTE type clusters. Results are consistent with empirical evidence indicating a detrimental psychological impact of interpersonal traumas including sexual/physical assault (Contractor, Caldas, et al., 2018). The strong association between victimization traumas and greater psychological harm relates to the intentional, purposeful nature of victimization and interpersonal traumas (Herman, 1992); victim’s sense of betrayal following these traumas (Freyd, 1994); shifts in beliefs regarding interpersonal loss and benevolence of others from pre- to post- trauma (Janoff-Bulman, 1992), and more frequent and intense trauma-related emotions post-trauma (Creamer, McFarlane, & Burgess, 2005). Indeed, such results are consistent with findings that PTE types within the Victimization Trauma Cluster (e.g., sexual assault) are associated with the highest conditional probabilities of clinically-relevant variables (e.g., PTSD; Breslau et al., 1998; Kilpatrick et al., 2013; Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993).

Conversely, PTE Type Cluster 3 (Predominant Death Threat Traumas) was a significant predictor of engagement in RSDBs, accounting for the influence of other PTE type clusters. PTE Type Cluster 3 was most heterogenous compared to other clusters, and perhaps, specific PTE types within that cluster are driving the current study findings. For instance, combat exposure, which is one of the PTE types in this cluster, has been associated with an elevated likelihood of RSDBs, such as substance use (Larson, Wooten, Adams, & Merrick, 2012) and aggressive behaviors (Taft, Vogt, Marshall, Panuzio, & Niles, 2007). Alternatively, perhaps, the cumulative effect of multiple PTE types within this cluster may have influenced their relations to RSDBs, consistent with the *building block effect* (Kolassa et al., 2010; Schauer et al., 2003); this needs further empirical investigation.

Lastly, PTE Type Cluster 2 (Victimization Traumas) was a unique predictor of negative emotion dysregulation and PTE Type Cluster 3 (Predominant Death Threat Traumas) was a unique predictor of positive emotion dysregulation. To our knowledge, this is the first study to examine the impact of PTE type assessed via the LEC-5 on emotion dysregulation. The finding that negative emotion dysregulation was uniquely associated with Victimization Traumas is consistent with evidence indicating (1) associations between negative emotion dysregulation and the examined psychopathology correlates (Tull, Barrett, McMillan, & Roemer, 2007; Weiss, Tull, Anestis, & Gratz, 2013); (2) higher negative emotion dysregulation among individuals endorsing sexual and physical victimization (Weiss, Tull, Lavender, & Gratz, 2013); and (3) greater negative emotion dysregulation linked to early chronic interpersonal trauma compared to early single interpersonal trauma, late interpersonal trauma, and non-interpersonal trauma (Ehring & Quack, 2010). Evidence for the unique role of Death Threat Traumas on positive emotion dysregulation extends research in this area considering that emerging research has begun to link traumatic experiences and consequent post-trauma outcomes to positive emotion dysregulation (Weiss, Contractor, Forkus, Goncharenko, & Raudales, in press; Weiss, Dixon-Gordon, Peasant, & Sullivan, 2018). Perhaps, the potential interpersonal nature of many PTE types (e.g., combat exposure, violent or accidental death) captured with this cluster may be driving the obtained findings through the mechanisms mentioned above (e.g., intentional nature of the trauma, sense of betrayal, interpersonal loss; Freyd, 1994; Herman, 1992; Janoff-Bulman, 1992). Further, certain characteristics specific to combat experiences and learning about/witnessing death may explain the obtained findings, such as moral and ethical challenges embedded in those experiences (Litz et al., 2009); this needs further empirical investigation.

Results should be considered in the context of study limitations. First, the cross-sectional nature of the data precludes causal determination of relations among PTE type clusters and psychopathology correlates. Hence, prospective, longitudinal studies are needed. Second, collecting data via the internet (e.g., MTurk) has disadvantages that may limit generalizability of results. Concerns include sample biases because of self-selection (Kraut et al., 2004) and lack of control over the research environment with no opportunity to clarify questions (Kraut et al., 2004). Thus, we implemented steps to enhance data quality such as using validity checks, excluding individuals missing too much data, and excluding individuals attempting the survey multiple times (Aust, Diedenhofen, Ullrich, & Musch, 2013; Buhrmester, Kwang, & Gosling, 2011; Oppenheimer, Meyvis, & Davidenko, 2009). The drawback is that such steps resulted in sample truncation, notably though, the extent of our sample truncation (~47%) was comparable to other MTurk trauma studies (57%; van Stolk-Cooke et al., 2018). Future research may benefit from using other data enhancement and quality checks such as restricting participation to MTurk workers with high reputation (Hauser, Paolacci, & Chandler, 2019; Peer, Vosgerau, & Acquisti, 2014).

Third, we note concerns specific to a network perspective to psychopathology. Specifically, evidence indicates concerns about replicability of network models, primarily for estimates of edges, most central nodes, and rank-order of node centrality attributed to measurement error of nodes (Forbes, Wright, Markon, & Krueger, 2017). Relatedly, this data-driven network methodology is specific to sample characteristics (Epskamp et al., 2018) including cultural and other contextual factors (Borsboom et al., 2019). Thus, replication in demographically and clinically diverse samples is needed to ascertain generalizability of the current study findings. Further, it is important to acknowledge contrasts between a network perspective vs. a latent variable approach to disorders in terms of their underlying premise of whether co-occurring symptoms interact dynamically to reflect a disorder vs. share a common underlying/latent cause (the disorder itself; Borsboom & Cramer, 2013). Recently, investigators are considering the idea if these differences are better represented as being symptom-oriented vs. syndrome-oriented, and as a dynamic vs. a static perspective to disorders (Bringmann & Eronen, 2018).

Fourth, we used the selected scoring method for the LEC-5 in the current study for several reasons. One, this scoring methodology is consistent with PTSD *DSM-5* Criterion A (American Psychiatric Association, 2013). Further, the selected LEC-5 scoring method allows us to account for the endorsement of more than one response option for any LEC-5 item. In other words, whether one endorses one (*happened to me*) or multiple response options (*happened to me* and *witnessed it*) to a LEC-5 item, their responses will indicate a positive trauma endorsement. In fact, dichotomizing trauma endorsement based on one response option (*happened to me* vs. *witnessed it*) would be complicated for situations wherein both these response options were used. Additionally, while we acknowledge differential impacts of direct vs. indirect trauma exposure on psychopathology (Kim et al., 2009), other trauma characteristics beyond type/count such as age of exposure (Dunn, Nishimi, Powers, & Bradley, 2017) and trauma appraisal (Kucharska, 2017) may have additional variance in explaining relations of PTE type clusters to psychopathology. Lastly, we acknowledge concerns regarding the definition and measurement of PTSD *DSM-5* Criterion A. Criterion A has been controversial since its inception (Breslau & Kessler, 2001; Kilpatrick, Resnick, & Acierno, 2009), resulting in several revisions across *DSM* versions. For *DSM-5*, significant revisions including the removal of the subjective component to the definition of trauma and broadening the definition of trauma to include PTEs experienced as part of one's job (American Psychiatric Association, 2013; Brewin, Lanius, Novac, Schnyder, & Galea, 2009). Nonetheless, concerns regarding the definition and measurement of trauma persist (Larsen & Berenbaum, 2017; Stein, Wilmot, & Solomon, 2016). In fact, one recent study found that adding non-Criterion A traumas (i.e., attachment and collective identity) increased the incremental predictive validity of Criterion A (Kira et al., 2019). Thus, it appears that the definition of trauma will continue to evolve in response to empirical data, which is important to consider in the further examination of the current study's research questions.

Despite these limitations, results of the current study advance our preliminary understanding of the classification of PTE types using the LEC-5. Specifically, we found empirical support for three PTE type clusters characterized by accidental/injury, victimization, and predominant death threat traumas. Moreover, these PTE type clusters were differentiated by clinically-relevant variables; victimization traumas were uniquely related to PTSD severity, depression severity, and negative emotion dysregulation; and predominant death threat traumas were uniquely related to RSDBs and positive emotion dysregulation. Regarding research implications, our results provide a framework for conceptualizing and measuring PTE types. Given the low base rates of some PTE types, these classifications, if replicated in future research, may spur additional research on the influence of PTE types on health behaviors. Moreover, they may promote comparisons of PTE types across studies and improve communication via common terminology among researchers and clinicians using the LEC-5. Clinically, our findings may inform trauma assessments to identify individuals at a higher risk for negative post-trauma outcomes. For instance, clinicians may benefit from assessing victimization and death threat PTE types, and intervening with individuals who endorse these traumas early in the therapeutic process. Relatedly, intervening on the impacts of certain PTE types most strongly associated with victimization PTEs such as being assaulted with a weapon may help to reduce detrimental impacts and occurrence of victimization PTEs; this is an empirical question worthy of future research. Additional empirical investigations would benefit from examining relations of these PTE type clusters to intervention outcomes using clinical trial data.

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Table 1. Descriptive Information on Demographic, Psychopathology, and Traumatic Events Data (n = 408)

	M	**SD**	**Skewness**	**Kurtosis**
Age	35.90	11.22	.88	.12
Years of schooling	15.26	2.40	-.39	4.84
PTSD severity	24.84	20.16	.61	-.60
Depression severity	7.06	6.41	.80	-.20
Reckless and self-destructive behaviors	6.74	9.27	1.83	2.73
Negative emotion dysregulation	34.68	15.78	.62	-.66
Positive emotion dysregulation	19.47	10.55	1.77	1.96
PTE Type Cluster 1	2.89	1.58	-.14	-1.14
PTE Type Cluster 2	1.50	1.23	.02	-1.60
PTE Type Cluster 3	2.35	2.46	1.03	-.05
	n		**% within column***	
Gender				
Female	234		57.4%	
Male	168		41.2%	
Male to female transgender	1		0.2%	
Female to male transgender	3		0.7%	
Other	2		0.5%	
Ethnicity				
Hispanic or Latino/a	54		13.2%	
Non-Hispanic or Latino/a	348		85.3%	
Unknown	6		1.5%	
Race (could endorse multiple responses)				
White or Caucasian	314		77%	
African American or Black	39		9.6%	
Asian	44		10.8%	
American Indian or Alaska Native	19		4.7%	
Native Hawaiian or other Pacific Islander	3		0.7%	
Unknown	6		1.5%	
Employment				

Full-time	289	70.8%
Part-time	64	15.7%
Unemployed	34	8.3%
Unemployed student	8	2%
Retired	13	3.2%
Income		
< $15,000	39	9.6%
$15,000 to $24,999	54	13.2%
$25,000 to $34,999	62	15.2%
$35,000 to $49,999	55	13.5%
$50,000 to $64,999	77	18.9%
$65,000 to $79,999	37	9.1%
≥ $80,000	84	20.6%
Relationship status		
Not dating	66	16.2%
Casually dating	30	7.4%
Seriously dating	99	24.3%
Married	180	44.1%
Divorced	18	4.4%
Separated	8	2%
Widowed	7	1.7%
Currently receiving mental health treatment	45	11%
Received past mental health treatment	180	44.1%
Currently taking medications for mental health or emotional problem	69	16.9%
Taken medications for mental health or emotional problem in the past	77	18.9%
Potentially traumatic event types endorsed on the LEC-5		
Natural disaster	267	65.4%
Fire or explosion	209	51.2%
Transportation accident	318	77.9%
Serious accident at work/home/during recreational activity	180	44.1%

Exposure to a toxic substance	100	24.5%
Physical assault	228	55.9%
Assault with a weapon	151	37%
Sexual assault	185	45.3%
Other unwanted/uncomfortable sexual experience	198	48.5%
Combat or exposure to war	106	26%
Forced captivity	68	16.7%
Life-threatening illness or injury	204	50%
Severe human suffering	129	31.6%
Sudden, violent death	165	40.4%
Sudden, accidental death	169	41.4%
Serious injury/harm/death you caused to someone else	69	16.9%
Any other stressful event or experience	165	40.4%

Note. LEC-5 is the Life Events Checklist for DSM-5; *percentages are reported accounting for missing data; PTE Type Cluster 1 - Accidental/Injury Traumas, PTE Type Cluster 2 - Victimization Traumas, PTE Type Cluster 3 - Predominant Death Threat Traumas.

Table 2

Regularized partial correlation matrix

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
1. LEC-5 1	0	.68	.41	.63	0	.15	0	0	0	0	0	.28	0	0	0	0
2. LEC-5 2		0	.60	.46	.74	0	.32	0	0	0	0	0	0	0	.58	0
3. LEC-5 3			0	.45	0	.42	0	0	0	0	0	.37	0	0	0	0
4. LEC-5 4				0	1.03	0	.31	.80	0	0	0	.54	.63	0	.28	.39
5. LEC-5 5					0	0	0	0	.37	1.04	1.22	0	0	0	0	0
6. LEC-5 6						0	.96	.68	.81	0	0	.20	.50	0	0	0
7. LEC-5 7							0	.23	0	1.08	.94	0	0	.50	0	.18
8. LEC-5 8								0	1.79	0	.72	0	0	0	0	0
9. LEC-5 9									0	0	0	0	.47	0	0	0
10. LEC-5 10										0	.29	.46	.26	0	.47	0
11. LEC-5 11											0	0	1.01	.47	0	.64
12. LEC-5 12												0	.64	0	.60	0
13. LEC-5 13													0	.68	.75	.38
14. LEC-5 14														0	.95	.48
15. LEC-5 15															0	.53
16. LEC-5 16																0

Note. LEC-5 is the Life Events Checklist for DSM-5; LEC-5 1 is natural disaster; LEC-5 2 is fire/explosion; LEC-5 3 is transportation accident; LEC-5 4 is serious accident at work/home/during recreational activity; LEC-5 5 is exposure to toxic substance; LEC-5 6 is physical assault; LEC-5 7 is assault with a weapon; LEC-5 8 is sexual assault; LEC-5 9 is other unwanted/uncomfortable sexual experience; LEC-5 10 is combat or exposure to war; LEC-5 11 is forced captivity; LEC-5 12 is life-threatening illness/injury; LEC-5 13 is severe human suffering; LEC-5 14 is sudden, violent death; LEC-5 15 sudden, accidental death; LEC-5 16 is serious injury/harm/death you caused to someone else.

Table 3

One-step expected influence and predictability values for each of the potentially traumatic events type node.

Nodes	**One-step expected influence values**	**Predictability Values**		
		Accuracy/Correct Classification ("CC")	**Normalized Accuracy ("nCC")**	**Accuracy of intercept/marginal model ("CCmarg")**
LEC-5 1	2.16	0.70	0.14	0.65
LEC-5 2	3.35	0.75	0.48	0.51
LEC-5 3	2.22	0.78	0	0.78
LEC-5 4	5.23	0.79	0.52	0.56
LEC-5 5	4.39	0.88	0.49	0.76
LEC-5 6	3.73	0.78	0.50	0.56
LEC-5 7	5.01	0.82	0.51	0.63
LEC-5 8	3.42	0.81	0.58	0.55
LEC-5 9	3.45	0.82	0.63	0.52
LEC-5 10	3.60	0.86	0.47	0.74
LEC-5 11	5.30	0.91	0.49	0.83
LEC-5 12	3.10	0.72	0.45	0.50
LEC-5 13	5.34	0.83	0.46	0.68
LEC-5 14	3.08	0.78	0.46	0.60
LEC-5 15	4.16	0.78	0.47	0.59
LEC-5 16	2.60	0.87	0.25	0.83

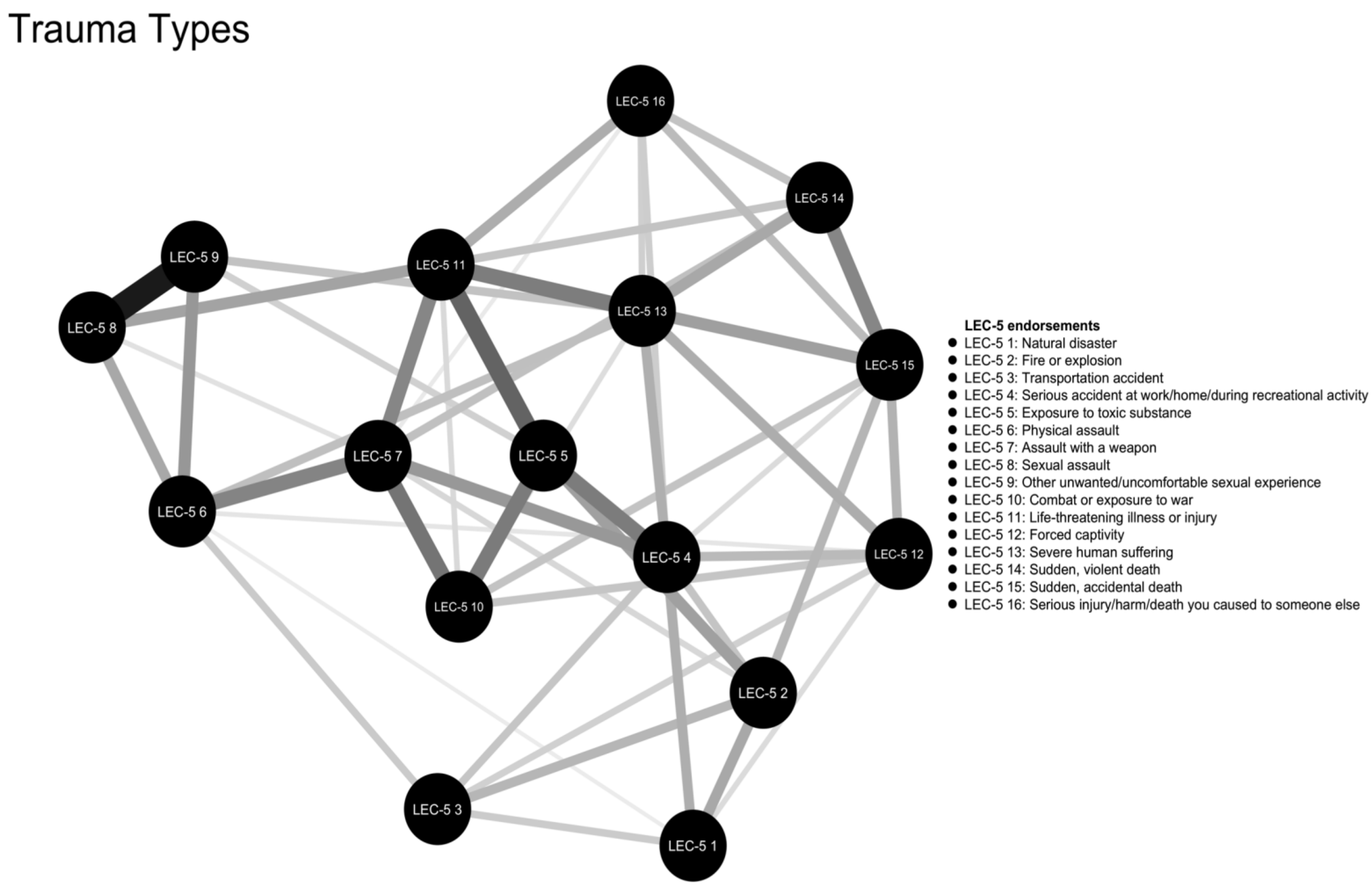
Note. LEC-5 is the Life Events Checklist for DSM-5; LEC-5 1 is natural disaster; LEC-5 2 is fire/explosion; LEC-5 3 is transportation accident; LEC-5 4 is serious accident at work/home/during recreational activity; LEC-5 5 is exposure to toxic substance; LEC-5 6 is physical assault; LEC-5 7 is assault with a weapon; LEC-5 8 is sexual assault; LEC-5 9 is other unwanted/uncomfortable sexual experience; LEC-5 10 is combat or exposure to war; LEC-5 11 is forced captivity; LEC-5 12 is life-threatening illness/injury; LEC-5 13 is severe human suffering; LEC-5 14 is sudden, violent death; LEC-5 15 sudden, accidental death; LEC-5 16 is serious injury/harm/death you caused to someone else.

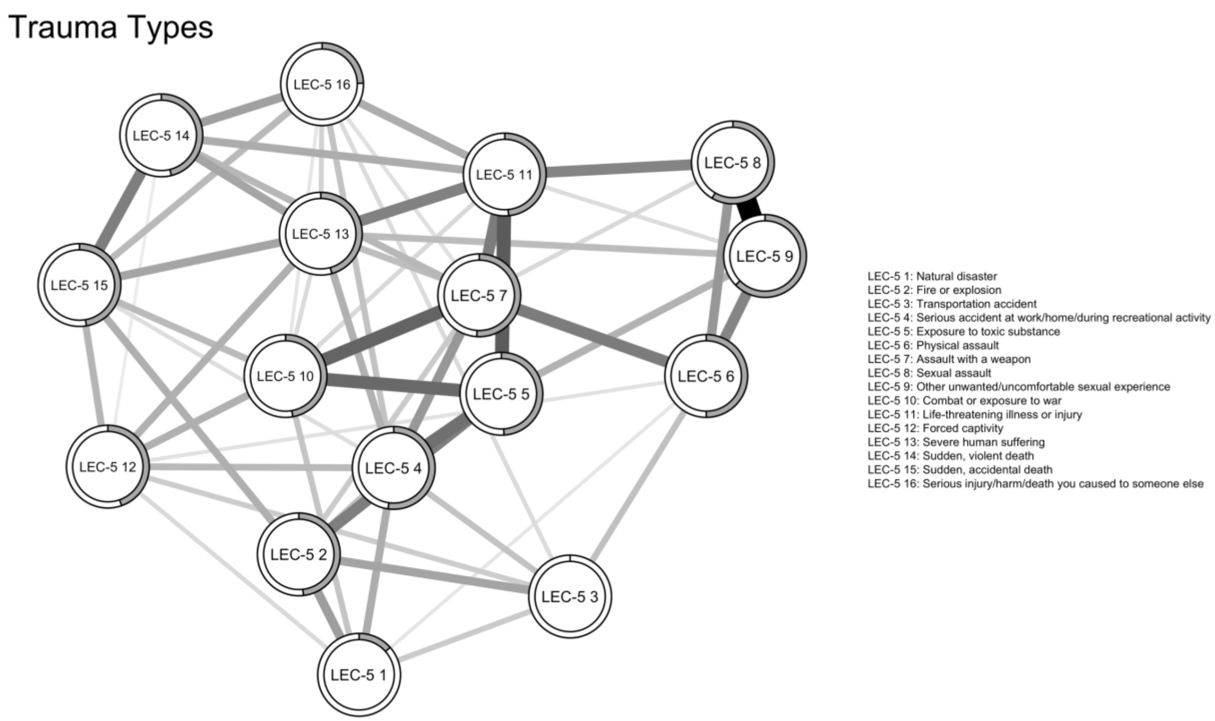
Table 4. *Results of the regression analyses on relations between trauma type clusters and mental health correlates.*

	B	*SE*	β	*t*	R^2	*F*
			Posttraumatic Stress Disorder Severity			
Step 2					.06	**9.15** $p < .001$
PTE Cluster 1	-1.82	.77	-.14	-2.35 $p = .019$		
PTE Cluster 2	3.67	.96	.23	**3.83** $p < .001$		
PTE Cluster 3	.85	.55	.10	1.54 $p = .125$		
			Depression Severity			
					.06	**8.09** $p < .001$
PTE Cluster 1	-.55	.25	-.14	-2.24 $p = .025$		
PTE Cluster 2	1.02	.31	.20	**3.33** $p = .001$		
PTE Cluster 3	.31	.18	.12	1.79 $p = .075$		
			Engagement in Reckless and Self-Destructive Behaviors			
					.11	**16.06** $p < .001$
PTE Cluster 1	-.84	.35	-.14	-2.43 $p = .016$		
PTE Cluster 2	.92	.43	.12	2.14 $p = .033$		
PTE Cluster 3	1.17	.25	.31	**4.73** $p < .001$		
			Negative Emotion Dysregulation			
					.05	**6.80** $p <.001$
PTE Cluster 1	-1.33	.61	-.13	-2.17 $p = .03$		
PTE Cluster 2	2.82	.76	.22	**3.71** $p <.001$		
PTE Cluster 3	.29	.43	.05	.67 $p = .502$		
			Positive Emotion Dysregulation			
						6.48 $p <.001$
PTE Cluster 1	-.68	.42	-.10	-1.64 $p = .103$		
PTE Cluster 2	.03	.51	.003	.06 $p = .956$		
PTE Cluster 3	1.13	.30	.26	**3.82** $p <.001$		

Note. PTE Type Cluster 1 - Accidental/Injury Traumas, PTE Type Cluster 2 - Victimization Traumas, PTE Type Cluster 3 - Predominant Death Threat Traumas; Bolded results are significant considering the *p* = .003 benchmark correcting for multiple comparisons

Figure 1. Regularized partial correlation network with predictability values of each node.





Note. Solid lines indicate positive associations; dashed lines indicate negative associations; the grey part of the ring around each node represents its predictability