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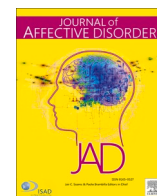
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Research paper

Evaluating traumatic event scoring schemas for their predictive value to concurrent diagnostic profiles: Texas Childhood Trauma Research Network

Nazan Aksan^{a,*}, Andrew G. Guzik^b, Leslie Taylor^c, Robyn Richmond^d, Israel Liberzon^e,
Jeremyra Cross^f, Cynthia Garza^g, Justin Rousseau^{a,h}, Jeffrey D. Shahidullahⁱ,
Shaunna L. Clark^e, Paul J. Rathouz^a, Cody G. Dodd^j, Josh Cislerⁱ, D. Jeffrey Newportⁱ,
Karen D. Wagner^j, Charles B. Nemeroffⁱ

^a Dept of Population Health, Dell Medical School, University of Texas at Austin, United States of America

^b Dept of Psychiatry, Baylor College of Medicine, University of Pennsylvania, United States of America

^c Dept of Psychiatry & Behavioral Sciences, University of Texas Health Science Center, Houston, United States of America

^d Dept of Surgery, Texas Tech University Lubbock, United States of America

^e Dept of Psychiatry, Texas A&M University, United States of America

^f Dept of Psychiatry, University of Texas Health Science Center, San Antonio, United States of America

^g Adult Primary Care University of Texas Health Science Center Rio Grande Valley, United States of America

^h Dept of Neurology, Dell Medical School, University of Texas at Austin, United States of America

ⁱ Dept of Psychiatry, Dell Medical School, University of Texas at Austin, United States of America

^j Dept of Psychiatry & Behavioral Sciences, University of Texas Medical Branch, United States of America

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ABSTRACT

Background: To prospectively chart pathways of risk and resiliency following childhood trauma studies need to address three limitations of prior work: 1) recruit beyond social service/ treatment settings; 2) include broad spectrum of trauma types and 3) cast a broad longitudinal measurement framework of both clinical diagnoses and traumatic exposures. The Texas-Childhood Trauma Research Network (TX-CTRN) is a multi-site collaboration that addresses these limitations. In this baseline-only report, we examined domains of trauma and evaluated the concurrent predictive validity of various traumatic event scoring schemas for clinical diagnoses.

Methods: Broad-base recruitment of 8–20 year-olds ($N = 1289$) included trauma centers, emergency departments, pediatric and primary care clinics, and other community settings. Assessments were comprehensive and based on clinical interviews by trained research interviewers.

Results: Factor analyses supported a five-factor solution of trauma domains including unintentional/acute, intentional/interpersonal, bullying, in-home versus community witnessed interpersonal harms. Trauma burden scoring schemas were examined for their predictive superiority. Domain-specific counts of traumas that met DSM-5 post-traumatic-stress disorder (PTSD) Criterion-A was the best overall schema in distinguishing among youth with no diagnosis, comorbidities, those with depression, suicidality, substance misuse, and PTSD.

Limitations: There were no assessments of neglect.

Conclusions: Findings largely aligned with earlier studies on the relative importance of intentional interpersonal traumas and showed bullying may be an important source of traumatic stress that independently adds to prediction of several diagnoses and should be considered in clinical practice.

1. Introduction

Adverse childhood experiences (ACEs) including traumas are associated with chronic medical conditions, mental illness, and substance misuse (Bellis et al., 2019; Hughes et al., 2017). The prevalence of two or

more ACEs is estimated to be 35 % in North America with 30 to 40 % of anxiety and depression cases attributable to ACEs based on the same meta-analytic study (Bellis et al., 2019). However, the studies informing these estimates are retrospective in nature and narrow in scope, often neglecting highly prevalent childhood traumas such as traumatic loss,

* Corresponding author at: Dept of Population Health, 1601 Trinity Street, Austin, TX 78712, United States of America.

E-mail address: nazan.aksan@austin.utexas.edu (N. Aksan).

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community violence, and natural disasters. Prospective, comprehensive studies of childhood trauma are needed to understand the pathways of adjustment after exposure to better delineate risk for and resiliency against psychopathology.

Among the central issues in understanding the impact of trauma in pediatric populations is relying on a measurement framework that assesses clinical outcomes broadly rather than narrowly. Studies that have prospectively examined trauma-affected youth have adopted a limited outcome measurement framework. Typically, clinical evaluation is limited to symptoms of depression, post-traumatic stress disorder (PTSD) (e.g., Kennedy et al., 2009, 2010), ratings of broad spectrum externalizing and internalizing symptoms (e.g., Briggs et al., 2021; Kisiel et al., 2014; Hogdon et al., 2019). This is informative but not a substitute for standard clinical interviews that can evaluate whether criteria are met for a broad array of diagnoses beyond those most commonly seen following trauma.

Another central issue in understanding the impact of childhood trauma concerns how best to summarize responses from trauma exposure checklists to facilitate an understanding of the clinical sequelae. Rasmussen et al. (2020) noted a simple count of event types from trauma screening checklists captures *variety* rather than actual count of traumatic events. Although event count and variety counts are intercorrelated, variety-based scores appear to show stronger associations with symptoms of PTSD. Reliance on cumulative trauma scores is common (e.g., Alisic et al., 2014) but this approach has garnered criticism because it assumes each traumatic experience contributes similarly to outcomes. Cumulative trauma counts can obscure identification and delineation of emotional and behavioral concerns specific to certain types of trauma (Briggs et al., 2021; Kulkarni et al., 2011; Putnam et al., 2020). Similarly, complex trauma presentations demonstrate the unique symptomology tied to chronic trauma and/or multiple trauma exposures rather than certain types of traumas (Maercker et al., 2022).

Studies examining domains of trauma have shown factor analytic support for distinctions among trauma events. For example, the initial ACEs proposal for distinguishing household dysfunction (e.g., parental mental illness) and maltreatment (e.g., abuse) factors (Felitti et al., 1998; Negri, 2020) were supported by follow-up psychometric studies (Afifi et al., 2020; Mersky et al., 2016). Others have supported correlated but distinct physical and sexual abuse factors (Ford et al., 2014) or that parental loss/separation emerges as a distinct factor (Green et al., 2010; Mersky et al., 2016). Samples drawn from treatment-seeking youth in social service settings, the National Child Traumatic Stress Network (NCTSN) core data, have pointed to five domains: 1) maltreatment (neglect, emotional abuse, impaired caregiver, domestic violence, physical abuse), 2) acute trauma (injury, illness, traumatic loss/separation, natural disaster), 3) community trauma (war/political violence in the U.S., school violence, community violence), 4) assault (sexual assault/rape, sexual abuse, physical assault), and 5) trauma based in international war contexts (Pynoos et al., 2014). The only other youth sample to our knowledge that examined factor structure in ACEs supported the original two factor solution among adolescents (Afifi et al., 2020).

Studies that capture traumatic burden in different domains have shown differential associations with mental health outcomes. For example, youth exposed to interpersonal traumas (i.e. sexual, physical abuse) had increased odds of major depressive, substance use, PTSD diagnoses and were also more likely to endorse delinquency and association with delinquent peers compared to youth exposed to accidents/disasters and community violence (Ford et al., 2010). Several findings from the NCTSN also support complexity in clinical profiles of exposure to interpersonal traumas that include maltreatment, physical, sexual abuse compared to trauma burden in the acute domain or household dysfunction (Dierkhising et al., 2013; Hodgdon et al., 2019; Kisiel et al., 2014). For example, interpersonal traumas were associated with PTSD, externalizing, and internalizing symptoms while household dysfunction was associated with externalizing only, acute trauma with internalizing

only, and trauma from violence in the community was associated with PTSD and externalizing (Hogdon et al., 2019). These findings suggest domain-specific characterization of trauma may improve specificity in understanding risk and resiliency pathways.

1.1. Present study

Among the central limitations of the evidence to date is that findings primarily reflect samples that are receiving social services/treatment or are recruited from populations with exposure to specific traumas. Outcome assessments often lack standardized comprehensive screening for clinical diagnoses. Our goal in this study is to report baseline data from the Texas Childhood Trauma Research Network (TX-CTRN) which was designed to address these limitations. TX-CTRN was established in 2020 as a multi-site collaboration to develop a state-wide registry of children and youth (8–20 years of age) who have experienced a traumatic lifetime event. Recruitment is broad and includes trauma centers, emergency departments, pediatric and primary care clinics, and other community settings. The goal of the registry is to inform trajectories of mental health and to develop models of risk and resilience after trauma. To that end, standard clinical interviews of the child are conducted at baseline to capture both trauma exposure and clinical diagnoses. Assessments are repeated every 6 months for 2 years to prospectively capture trajectories of both symptoms and additional traumas.

Given the overarching goal of TX-CTRN, the study protocol relied on a comprehensive instrument, the Traumatic Event Screening Inventory (TESI-C; Ford et al., 2000) to assess history of witnessed and directly experienced 20 trauma types shown in Table 1. For each trauma item, TESI-C captures simple exposure, exposures that meet DSM-5 Criterion-A, and frequency of exposure to each type of event. Given the clinical sequelae of bullying in youth (Wagner, 2018; Winding et al., 2020), two simple exposure items were added regarding in-person and cyberbullying (Table 1).

Our **first** aim was to examine how the item-content of TESI-C may be organized with respect to ‘domains’ of trauma relying on confirmatory factor analysis of the frequency ratings of 20 items. We adopted a conceptually agnostic, item-content driven lens to ask the following questions: a) are typically intentional/interpersonal harms (physical, sexual abuse) distinct from typically unintentional harms (accidents, medical trauma, loss); b) are distinctions between witnessing vs directly experiencing harms supported; and c) does the context and manner of intentional/interpersonal harms produce additional distinctions in the latent factor structure? For example, we asked if bullying items and the single sexual abuse item were best thought of as distinct ‘domains’ of intentional/interpersonal traumas from the items that assess threatened or actual physical harms (i.e. item 2.1 through 2.4 in Table 1). We also asked whether witnessing violence in the home versus in the community were distinct.

Our **second** aim was to rely on the domains identified in the factor analytic setting to generate various ‘scoring schemas’ and examine which schemas provided the ‘best’ prediction for concurrent diagnostic profiles from clinical interviews. Scoring schemas included both cumulative count and domain-specific counts of trauma burden (e.g., intentional/interpersonal harms). We further differentiated scoring schemas by counting only those exposures that met PTSD Criterion-A and counting all endorsed exposures irrespective of Criterion-A. In addition, responses to “who was involved” follow-up query to TESI-C events (e.g., parent/caregiver, other family members) were included as predictors. Higher levels of parental or family involvement in the ‘worst’ events across all interpersonal harms would be a marker of risk for persistent trauma whereas higher levels of non-family involvement may lack that persistency across time and context. We evaluated the strength of concurrent prediction in the following three settings: a) which schema distinguishes children without any diagnosis from those who have at least one; b) which schema predicts broad categories of disorders such as PTSD, depressive episodes/ disorders, suicidality

Table 1
Distribution of TESI-C items along axes that may inform trauma domains.

Item content	Intentional/ Interpersonal vs Unintentional Harms	Experienced (E) vs Witnessed (W)
1.1 ever BEEN IN a really bad accident (e.g. car, fall, fire)	Unintentional	Experienced
1.2 ever SEEN a really bad accident that you weren't actually in?	Unintentional	Witnessed
1.3 ever been in a <i>really</i> bad storm (e.g. tornado, hurricane, blizzard, flood, earthquake)	Unintentional	Experienced
1.4 known someone who got severely hurt or sick, or even died?	Unintentional	Witnessed
1.5 Have you ever had to stay overnight at the hospital or have an operation?	Unintentional	Experienced
1.6 Have you ever had to go away from your parents or family for a long time?	Unintentional	Experienced
2.1 Has someone ever attacked you or tried to severely hurt you on purpose— (e.g. beating, shaking, biting, burning, choking, knife, gun)	Intentional/ interpersonal	Experienced
2.2 Has someone ever <i>told</i> you they were going to hurt you really badly, or <i>acted like</i> they would hurt you really badly?	Intentional/ interpersonal	Experienced
2.3 Has someone a lot older ever tried to steal from you? Or from a family member or friend when you were right there?	Intentional / interpersonal	Experienced
2.4 ever kidnapped you or taken you away when they weren't supposed to?	Intentional / interpersonal	Experienced
2.5 Have you ever been attacked by a dog or another animal?	Unintentional	Experienced
3.1 Have you ever seen people in your family fighting or attacking each other?	Intentional & interpersonal	Witnessed
3.2 Even if they weren't physically attacking each other, have you ever heard people in your family really yelling and screaming at each other a lot?	Intentional & interpersonal	Witnessed
3.3 Has someone in your family ever been put in jail or prison?	Intentional & interpersonal	Witnessed
4.1 Have you ever seen people outside your home fighting or attacking each other?	Intentional & interpersonal	Witnessed
4.2 Even if they weren't physically attacking each other, have you ever heard people outside your home really yelling and screaming at each other a lot?	Intentional & interpersonal	Witnessed
4.3 Have you seen or heard people attacking each other <i>for real</i> on television, radio, or online?	Intentional & interpersonal	Witnessed
5 Has someone ever touched your body in a way you didn't want them to or in a way that made you uncomfortable?	Intentional & interpersonal	Experienced
Additional Items implemented in CTRN		
6.1 Have you ever been picked on by someone over and over again? This type of bullying includes someone calling you names, making fun of you, spreading lies or rumors about you, telling other people not to like you, leaving you out of activities, or saying mean things to hurt your feelings.	Intentional & interpersonal	Experienced
6.2 Has someone ever used social media, text messaging, or group chats to bully you? This can include someone spreading rumors about you online, sending you mean messages, pretending to be you online, or posting messages or videos to embarrass you.	Intentional & interpersonal	Experienced

Note. Items 1.1 through 5 are the original items of the TESI-C (Ford et al., 2000).

issues, anxiety disorders, externalizing, substance misuse, and serious mental disorders; and c) which schema distinguishes children with a single disorder from those who are comorbid for at least two disorders.

2. Methods

2.1. Sample

Recruitment for TX-CTRN occurred across 12 academic medical centers in Texas, including University of Texas (UT) Southwestern Medical Center, Baylor College of Medicine, UT-Rio Grande Valley, UT-Health Science Center at Tyler, UT-Health Science Center at Houston, Texas Tech University Health Science Center Lubbock, UT-Austin Dell Medical School, UT-Health Science Center at San Antonio, University of North Texas Health Science Center, Texas A&M Health Science Center, Texas Tech University Health Science Center El Paso, UT-Medical Branch.

Inclusion criteria included: 1) youth have a history of trauma exposure that fulfills DSM-5 Criterion-A for PTSD, and/or have experienced less severe but persistent forms of childhood trauma including bullying; 2) between 8 and 20 years of age; 3) able to provide consent for 18–20 year-olds, assent for those under 18 with parental consent; 4) able to speak and read English or Spanish; 5) function at a level that allows accurate completion of the assessment instruments; 6) willing to dedicate appropriate time to complete scheduled study assessments. *Exclusion* criteria included either the child or the consenting parent being: a) intoxicated; b) not alert/ oriented/ or coherent/ or medically unstable; c) exhibiting psychotic symptoms; or d) the child had pervasive developmental disorder/ moderate intellectual disability.

Recruitment and follow-up assessments are ongoing at the time of the current report. For the current report, only the baseline data were extracted. 1289 participants completed the baseline assessments. Because 403 youth were older than 18 years and did not have a participating parent, we do not have information on parental/family income or parental age from this subsample. Among those who participated with a parent, 854 parents indicated a mean age of 43.5 years (SD = 8.9 years) and the distribution of parental/family income for the 859 parents who reported it were as follows: 20.2 % < \$25,000, 21.6 % between \$25,000–\$49,999, 27.6 % between \$50,000–\$99,999, 17 % between \$100,000–\$199,999, 7.9 % > \$200,000, and 5.6 % indicated they did not know income. The participants were compensated \$100 at baseline.

2.2. Measures

In the current report, we utilized the TESI-C (Ford et al., 2000), and two well-established interviews to characterize children's clinical diagnostic profile: MINI International Neuropsychiatric Interview for Children and Adolescents MINI-KID (Sheehan et al., 2010) and Clinician-Administered PTSD Scale for DSM-5, Child/Adolescent Version (CAPS-CA-5; Pynoos et al., 2015). The MINI-KID is a well-established structured diagnostic interview used to assess the presence of several DSM-child and adolescent psychiatric disorders and risk of suicide. CAPS-CA-5 is a semi-structured interview to measure severity of PTSD symptoms.

All three instruments were administered by trained research assistants. Shahidullah et al. (2023) described the training and certification process for research assistants across the clinical sites. The interrater reliabilities were excellent. Median Kappa for TESI-C items was 0.79, median weighted Kappa for CAPS-CA-5 was 0.71. The major depressive episode and PTSD modules were evaluated for interrater reliability due to their clinical relevance in childhood trauma; the median Kappa was 0.71 and 0.91 respectively on the MINI-KID.

2.2.1. TESI-C

TESI-C is a clinician-administered interview that assesses a child's experience of potential traumatic events, including injuries, hospitalizations, domestic violence, community violence, disasters, accidents, physical and sexual abuse. It is widely used with individuals aged 6–18 (e.g., Choi et al., 2019). At the baseline visit it is used to identify lifetime traumatic experiences. When the participant did not endorse the type of

event described, they were assigned a score of ‘0 = never’ on the frequency rating scale (“How often did this happen to you”) for use in analyses. When the participant endorsed the type of event described, they were asked to think of the worst instance of that type of event and describe details. Descriptions were systematically queried for ‘who was involved’ (e.g., parent/caregiver, family, non-family) and responses to these follow-up questions were counted across all TESI-C items as parent/caregiver, family members, and non-family members as three separate variables in the predictive analyses of aim-2.

2.2.2. Data reduction for clinical/ diagnostic profile

Several specific categories within the MINI-KID were combined to form larger clinical/ diagnostic profiles to facilitate robust inference with respect to clinically distinct problems of interest in trauma-exposed populations and reduce type-I error rate. Specifically, PTSD diagnosis from either the CAPS-CA-5 or the MINI-KID were pooled into a binary outcome of PTSD versus not, anxiety disorders from the MINI-KID were pooled into a binary outcome of anxiety-related disorders (i.e., generalized anxiety, separation anxiety, simple phobia, social phobia, panic disorder, obsessive-compulsive disorder, agoraphobia) versus not, and distinctions among depressive episodes and/or disorders (i.e., major depressive disorder, recurrent, current etc.) were combined into a single category of depressive versus not. Similarly, four additional binary outcomes were formed by combining specific MINI-KID categories relevant to suicidality/ suicide behavior disorder versus not, externalizing disorders (i.e., oppositional defiant, conduct disorder, attention-deficit/hyperactivity disorder) versus not, substance misuse (i.e., alcohol and substance use disorders) versus not, and serious mental illness (e.g., various bipolar disorders, manic/hypomanic episodes, and/or psychotic disorders) versus not. Respondents who did not meet criteria for any of the specific diagnoses were pooled into a binary outcome of no diagnosis versus at least one diagnosis. Finally, we formed a binary comorbid outcome contrasting those with any single disorder with those who met criteria for at least two. In specifying children who had no diagnoses and those who were comorbid, additional specific diagnostic categories such as eating disorders, Tic/Tourette's were also taken into consideration.

2.3. Analytic plan

Data cleaning and predictive analyses were carried out in STATA version 16.1 (StataCorp, 2019) and confirmatory factor analyses were carried out in Mplus 8.8 (Muthén and Muthén, 1998-2017). For the first aim, identifying domains of trauma from the frequency ratings for 20 event types, we relied on confirmatory factor analytic methods. Because the distribution of the frequency ratings from the TESI-C were generally skewed, robust maximum likelihood was used and comparison of nested models relied on Satorra-Bentler scaling of chi-square. The scales of the latent factors were defined by fixing the respective latent factor variances to one, each of the 20 items were only allowed to load on their respective factor in a given model and no residual correlations among the items were permitted. Following Kaplan (2001), we examined absolute and relative model fit in the following ways: a) comparing improvement in fit among nested models with chi-square difference tests, b) Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Information Criteria (Akaike, AIC and Bayesian, BIC), and standardized root mean square error (SRMR). Latent factor correlations exceeding 1 or negative residual error variances were considered indications of a poor model and eliminated from further consideration. The CFA models began with a single-factor model and increased in complexity to address the questions raised in the introduction.

Guided by the results of the CFA for domains of trauma, we constructed observed sums that could be readily computed in clinical settings using binary endorsement of specific items, either simple exposure or DSM-5 PTSD Criterion-A to generate each ‘schema.’ There were a

total of six scoring schemas: 1) Domain-specific counts of individual items where Criterion-A was met; 2) domain specific counts of individuals items where simple exposure was endorsed; 3) count of all items where Criterion-A was met; 4) count of all simple exposures endorsed; 5) count of the number of domains where at least one item met Criterion-A and 6) count of the number of domains where at least one simple exposure item was endorsed. A series of logistic regressions then examined the concurrent predictive value of each schema along with the three subtotals for ‘who was involved’ (parents/caregivers, other family, non-family) for broad diagnostic outcomes. We examined the relative performance of each ‘schema’ in predicting: a) respondents who had no diagnoses from those who had at least one disorder, b) predicting broad categories of disorders among those who had at least one disorder, and c) comorbidity status among those who had at least one disorder. The criteria for selecting the best ‘schema’ relied chiefly on information criteria (AIC), as different ‘schemas’ had varying degrees of freedom. Finally, for the best schema, we examined whether the predictive value of the TESI-C scores were robust to statistical controls for demographic variables with an additional set of logistic regressions.

3. Results

Table 2 shows distributions for demographic and outcome variables and Table 3 shows the distribution of TESI-C items, and proportion of cases that met Criterion-A. The most commonly endorsed traumas included serious illness, or death of someone close to the child (72 %), being hospitalized (69 %), and experiencing threats of aggression (53 %). The most commonly endorsed traumas that met DSM-5 PTSD Criterion-A included hospitalization (47 %), being involved in an accident (44 %), and sexual abuse (28 %).

3.1. Aim-1: identifying domains of trauma in TESI-C

Table 4 presents the model fit statistics for seven models with the structure column indicating the number of latent factors and their labels in each model. A single-factor model would be consistent with the traditional practice of a single count of total cumulative exposures (model M1); two factor model that tested whether the ‘overarching’

Table 2
Descriptive statistics for demographic variables and outcome measures used in the analyses.

Variables	N (%)	Mean	SD
Demographics			
Female sex at birth ^a	745 (58.3)		
Child Age	1288	15.08	3.44
Child's non-white and/or Hispanic ^a	855 (66.9)		
MINI-KID/CAPS-CA-5 Diagnoses			
No diagnosis ^b	252 (20.7)		
PTSD ^c	510 (53.3)		
Anxiety disorders ^c	629 (65.7)		
Depressive Disorder/ Episodes ^c	665 (69.5)		
Suicidality ^c	377 (39.4)		
Substance misuse ^c	139 (14.5)		
Externalizing (ADHD, CD, ODD) ^c	325 (34.0)		
Serious Mental Illness (SMI) ^c	189 (19.8)		
Comorbid ^c	762 (80.7)		

Abbrev: ADHD = Attention Deficit Hyperactivity Disorder CD = Conduct Disorder ODD = Oppositional Defiant Disorder SMI = Serious Mental Illness PTSD = Post-traumatic Stress Disorder.

^a Proportions reflect those who completed baseline assessments (N = 1289 individuals with 12 who did not report sex and 11 who did not report race/ethnicity included in the denominator).

^b Proportion reflects those who completed both MINI/ CAPS and baseline assessments, N = 1215.

^c Proportions reflect those who completed MINI/CAPS assessments and met criteria for at least one diagnosis (N = 957).

Table 3

Relative frequency distribution for each TESI-C item and proportion of cases that met DSM5-PTSD- criterion-A.

Variables	Relative frequency (%)					Crit-A met (%)
	0 = Never	1 = Only once	2 = A few times	3 = Many times/ Several times/ mo	4 = Several times/ wk	
1.1 Involved in an accident	49.5	41.9	8.35	0.24	n/a	43.97
1.2 Seen an accident	64.3	29.07	6.0	0.63	n/a	25.69
1.3 Natural disaster	60.0	31.31	9.21	0.47	n/a	19.43
1.4 Close other hurt/sick/died	28.06	49.48	20.86	1.60	n/a	50.59
1.5 Own hospitalization	30.58	47.17	16.9	5.35	n/a	47.33
1.6 Separation from family/parents	63.3	22.2	10.26	4.25	n/a	15.49
2.1 Physical aggression	66.64	12.3	11.28	5.52	4.26	25.47
2.2 Threat of physical aggression	69.04	10.82	10.51	5.21	4.42	21.35
2.3 Steal/ mugging	91.48	6.94	1.26	0.32	n/a	4.26
2.4 Kidnapped	91.69	7.36	0.87	0.08	n/a	5.45
2.5 Animal attack	73.53	22.35	3.65	0.48	n/a	14.16
3.1 Physical aggression	69.16	9.46	12.48	5.17	3.74	22.4
3.2 Threat of aggression	46.94	6.92	21.88	14.0	10.26	20.8
3.3 Police officers to family home	55.59	27.72	13.58	3.12	n/a	14.13
4.1 Physical aggression outside home	74.6	10.19	11.23	3.11	0.88	13.78
4.2 Threat of aggression outside home	76.83	9.05	8.17	4.37	1.59	5.69
4.3 Media (i.e. real footage) of aggression/ violence	59.34	12.34	21.36	4.67	2.29	14.05
5. Sexual abuse	68.9	11.43	10.95	4.40	4.32	28.41
6.1 Bullying	50.99	3.70	14.34	10.24	20.72	n/a
6.2 Cyberbullying	81.77	5.37	6.0	3.79	3.08	n/a

Abbrev: Mo = month wk. = week. Crit-A = Criterion-A.

Note. The label for frequency rating point 3 and 4 varied depending on the item. In rating scales with five points the label of “several times per month” was applicable for that item (e.g., TESI-C item 2.1). In contrast, in rating scales with four points, the label of “Many times” was applicable for that item (e.g., TESI-C item 1.6).

distinction between unintentional and intentional/ interpersonal harms improved model fit (model M2); four factor model that tested whether an additional axis of witnessed versus experienced improved model fit (model M3). Because model M3 failed due to latent factor correlations exceeding 1, we also fit a simplified model M4 where the distinction between witnessed versus experienced were only applied to intentional/ interpersonal harm items. As indicated in the introduction, we also tested distinctions within intentional interpersonal experienced harms based on context and manner of harm (models M5, M6, M7). Nested model comparisons relied on Satorra-Bentler scaling of chi-square which are shown with reference to model numbers and the associated *p*-value. The best fitting model, M6, was consistent with a domain structure where intentional harms differed by both the manner and the context of harm. For example, witnessed intentional harms differed depending on

the context: inside the home versus not. Among experienced intentional harms, bullying was distinct from other harms that included sexual abuse, physical assault/ attacks/ mugging/ kidnapping, and verbal threat of physical harms. We did not have sufficient evidence to support the distinctiveness of sexual abuse from other intentional experienced physical harms, and hence we accepted the five-factor model as the best and parsimonious option. The final retained factors included: 1) intentional experienced harms (e.g., sexual and physical abuse), 2) bullying, 3) intentional harms witnessed outside the home (e.g., witnessing community violence), 4) intentional harms witnessed inside the home (e.g., witnessing domestic violence), and 5) unintentional harms (e.g., accidents, illness). In all models, two items, being involved in an accident and being hospitalized, did not load significantly to the unintentional harm latent factor. (TableS1).

3.2. Aim-2: evaluating concurrent predictive value of TESI-C scoring schemas

Guided by the results of the CFA, we constructed observed summary scores for six ‘scoring schemas.’ These were: 1) Domain-specific counts of individual items where PTSD Criterion-A was met; 2) domain specific counts of individuals items where simple exposure was endorsed; 3) count of all items where Criterion-A was met; 4) count of all simple exposures endorsed; 5) count of domains within which at least one item met Criterion-A and 6) count of domains within which at least one simple exposure item was endorsed. The first part of Table 5 shows the univariate sample statistics for these summary scores. The maximum Spearman-rank correlation among the domain-specific ‘scoring schema’ variables was 0.41 with Criterion-A totals and 0.46 with simple exposure totals which support specificity among trauma domains. The second half of Table 5 addresses the second aim: which scoring schema provides the ‘best’ concurrent predictive value for particular diagnostic profiles with a series of logistic regressions. In addition to AIC, Table 4 also reports the proportion of TESI-C predictors that significantly contributed to prediction. Scoring schemas with the lowest AIC for the given outcome are bolded. (See TableS2 for full results).

Results show that in distinguishing respondents who had no diagnoses at baseline from those with at least one diagnosis, scoring schema#1 has the lowest AIC. In addition, for scoring schema#1, three out of five PTSD Criterion-A trauma domain predictors were significant and one out of 3 predictors on ‘who was involved’ were significant. Scoring schema#1 also had the lowest AIC for five out of eight diagnoses: PTSD, depression, suicidality, substance misuse, and comorbidity. Importantly, for outcomes where the scoring schema associated with the lowest AIC were different than schema#1 (i.e., schema #2 through #6), two things were noteworthy. First the TESI-C trauma domain predictors were not significant for externalizing and second the difference in the AIC associated with the scoring schema #1 and the lowest AIC for a different scoring schema were small for anxiety (0.10). Only in the case of serious mental illness, schema#2, domain-specific simple exposure count produced a notably smaller AIC.

Collectively, these findings supported scoring schema#1, the sum of all items in each trauma domain separately where the incident described by the respondent meets Criterion-A, as the best performing schema among the six evaluated. Table 6 shows the results of the final set of logistic regressions for each of nine outcomes, along with odds ratios while controlling for demographic variables. The findings showed that boys were more likely to have no diagnosis, and less likely to meet criteria for PTSD, other anxiety, depression, suicidality, and more likely to meet criteria for externalizing. Older respondents were less likely to have no diagnosis, more likely to meet criteria for PTSD, depression, and substance use diagnoses, less likely to meet criteria for externalizing, and more likely to have comorbidities. Respondents with minoritized status were more likely to meet criteria for PTSD and less likely to meet criteria for substance misuse. Interpersonal experienced traumas including sexual abuse, interpersonal witnessed traumas at home,

Table 4
Model fit statistics for confirmatory factor analyses.

Model #	Model Structure	AIC/ BIC	SRMR	RMSEA LL UL	CFI	M1 vs M2 SB χ^2 (df)	p-value
1	Single Trauma Factor	60,176.6	0.045	0.045	0.81		
2	2-factors: Intentional/Interpersonal harms Unintentional harms	60,486.2 60,178.2 60,492.9	0.045	0.041 0.048 0.045 0.041 0.049	0.81	#2 vs #1 0.42 (1)	ns
3	4-factors: Interpersonal W harms Interpersonal E harms Unintentional E harms Unintentional W harms	60,082.5 60,429.0	0.042	0.041 0.037 0.045	0.85	#3 vs #2 < 0 (4) ^a	n/a
4	3-factors: Interpersonal W harms Interpersonal E harms Unintentional harms	60,086.9 60,411.7	0.042	0.041 0.037 0.045	0.85	#4 vs #2 61.94(2) #4 vs #1 62.40 (3)	<0.001 <0.001
5	4-factors: Interpersonal W harms @ home Interpersonal W outside home Interpersonal E harms Unintentional harms	59,977.4 60,317.8	0.039	0.036 0.032 0.040	0.88	#5 vs #4 68.53 (3)	<0.001
6	5- factors: Interpersonal E harms Bullying harms Interpersonal W harms @ home Interpersonal W outside home Unintentional harms	59,932.2 60,293.3	0.037	0.034 0.029 0.038	0.90	#6 vs #5 38.42(4)	<0.001
7	6-factors: Interpersonal E harms Bullying harms Sexual Abuse Interpersonal W harms @ home Interpersonal W outside home Unintentional harms	59,926.5 60,308.1	0.037	0.034 0.029 0.038	0.90	#7 vs #6 9.01(4)	ns

Abbrev. W = Witnessed E = Experienced; CFI = Comparative Fit Index; AIC = Akaike's Information Criteria; BIC = Bayesian Information Criteria; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Error; LL = Lower Limit UL = Upper Limit; SB = Satorra-Bentler; df = degrees of freedom; ns = not significant.

^a Latent factor correlations exceeded one and hence this model was rejected.

bullying, and nonfamily involvement in traumas were associated with lower odds of having no diagnosis. Interpersonal experienced traumas including sexual abuse were associated with greater odds of each diagnostic outcome we examined except substance misuse. Unintentional harms were associated with lower odds of depression. Interpersonal witnessed harms at home were associated with greater odds of PTSD and suicidality. Bullying was associated with greater odds of depression, suicidality, externalizing, serious mental illness, and comorbid status. The follow-up items concerning who was involved in these events provided additional predictive power. Parental involvement was associated with lower odds of depression but greater odds of serious mental illness. Nonfamily involvement was associated with greater odds of substance misuse.

4. Discussion

The findings from this TX-CTRN report were consistent with others from the literature despite fundamental differences in measurement framework, sample characteristics, and analytic methods used. We discuss consistencies with prior works concerning both trauma domains and associations with outcomes and point out novel added value of this report to the evidence base.

The specific domains that were supported in this report aligned with notable prior findings despite lack of 'alignment' in item content of traumas from one study to another. For example, principal component analyses from the NCTSN supported an acute trauma dimension that aligned with what we labeled 'unintentional harms' (Pyne et al., 2014). Sexual abuse did not separate out in our sample from exposure to other intentional, interpersonal and physically abusive traumas. This is

consistent with Putnam et al. (2020) who found sexual abuse to pair up with other intentional interpersonal experienced harms in person-centered analyses of the NCTSN core data. Findings on distinctive associations of community and family violence (e.g., Kennedy et al., 2009, 2010; Kulkarni et al., 2011; Hogdon et al., 2019) align with the distinction we observed in intentional witnessed harms in the home versus outside the home.

Results showed that adopting a domain-based approach to exposure characterization was superior in concurrent prediction of interview-based clinical profiles. Findings also supported reliance on whether the event met DSM-5 PTSD Criterion-A when generating domain-specific trauma burden scores as opposed to simple endorsement. An important strength of this report relative to prior studies concerned the breadth of the predictive validity we demonstrated for domain-specific trauma burden scores. Most prior works had examined predictions of trauma burden in relation to a limited set of outcomes such as PTSD, depression, internalizing, and externalizing ratings. We cast a wider net that included PTSD, anxiety disorders, depression, suicidality, externalizing, substance misuse, and serious mental illness. With the exception of externalizing diagnoses, burden in trauma domains and who was involved contributed to the prediction of these diagnoses. Domain-specific trauma burden scores also distinguished those without any diagnosis from those with at least one diagnosis and distinguished those with a single diagnosis from those with comorbidities. These predictions held above and beyond child age, gender and minority status. Results showed that exposure to intentional, interpersonal and directly experienced traumas predicted every outcome except substance misuse. Exposure to intentional, interpersonal but witnessed traumas in the home, also added uniquely to PTSD, suicidality, and comorbidity. An

Table 5

Descriptive statistics and predictive performance of six scoring schemas in relation to outcomes.

		Scoring Schemas					
	Statistics	#1 Domain specific count of Crit-A	#2 Domain specific count of simple exposure	#3 Crit-A total	#4 Simple exposure total	#5 Domain counts w/ Crit-A	#6 Domain counts w/ simple exposure
Tesi-C dimensions							
Unintentional E	Mean (SD)	2.15 (1.3)	3.31 (1.42)	n/a	n/a	n/a	n/a
Intentional & Interpersonal E	Mean (SD)	0.84 (1.02)	1.13 (1.17)	n/a	n/a	n/a	n/a
Bullying	Mean (SD)	0.67 (0.73)	0.67 (0.73)	n/a	n/a	n/a	n/a
Intentional W @ home	Mean (SD)	0.57 (0.85)	1.29 (1.05)	n/a	n/a	n/a	n/a
Intentional W not home	Mean (SD)	0.33 (0.62)	0.90 (0.94)	n/a	n/a	n/a	n/a
Total	Mean (SD)	n/a	n/a	4.56 (2.82)	7.0 (3.34)	3.03 (1.82)	3.5 (1.28)
Outcomes ^c							
No diagnosis	AIC	983.09	1005.40	1018.04	1042.13	993.73	1032.64
	Sig Tesi-C ^a	3/5	3/5	1/1	0/1	1/1	1/1
	Sig “who” scores ^b	1/3	2/3	3/3	3/3	3/3	3/3
PTSD	AIC	1220.25	1250.59	1232.99	1265.31	1232.01	1262.12
	Sig Tesi-C ^a	2/5	1/5	1/1	0/1	1/1	0/1
	Sig “who” scores ^b	0/3	0/3	1/3	3/3	1/3	3/3
Anxiety	AIC	1216.10	1228.43	1218.65	1231.99	1216.01	1231.59
	Sig Tesi-C ^a	2/5	1/5	1/1	0/1	1/1	0/1
	Sig “who” scores ^b	1/3	0/3	0/3	0/3	0/3	0/3
Depression	AIC	1018.40	1029.65	1061.02	1068.38	1042.43	1055.00
	Sig Tesi-C ^a	3/5	3/5	1/1	0/1	1/1	1/1
	Sig “who” scores ^b	1/3	0/3	3/3	3/3	2/3	2/3
Suicidality	AIC	1125.99	1138.98	1154.93	1166.66	1152.14	1164.08
	Sig Tesi-C ^a	3/5	2/5	1/1	1/1	1/1	1/1
	Sig “who” scores ^b	0/3	0/3	3/3	3/3	3/3	3/3
Externalizing	AIC	1227.01	1224.52	1224.65	1222.73	1224.48	1221.25
	Sig Tesi-C ^a	0/5	1/5	0/1	0/1	0/1	0/1
	Sig “who” scores ^b	0/3	0/3	0/3	0/3	0/3	0/3
Substance misuse	AIC	731.64	735.62	732.38	733.02	732.06	733.47
	Sig Tesi-C ^a	1/5	1/5	0/1	0/1	1/1	0/1
	Sig “who” scores ^b	1/3	1/3	1/3	1/3	1/3	1/3
SMI	AIC	877.17	859.87	886.5	876.79	888.59	891.86
	Sig Tesi-C ^a	2/5	3/5	1/1	1/1	1/1	1/1
	Sig “who” scores ^b	1/3	0/3	2/3	0/3	2/3	2/3
Comorbid	AIC	825.23	828.5	863.87	878.31	851.75	864.30
	Sig Tesi-C ^a	3/5	5/5	1/1	0/1	1/1	1/1
	Sig “who” scores ^b	0/3	0/3	3/3	3/3	2/3	3/3

Abbrev. AIC = Akaike's Information Criteria, Crit-A: PTSD Criterion A, SMI = Serious Mental Illness, E = Experienced, W = Witnessed.

Notes. Bolded values for AIC indicate the lowest value in the relevant model.

^a Sig Tesi-C indicates the number of significant predictors out of the total predictors in each scoring schema. In scoring schema #1 and #2 there are 5 predictors in each logistic regression but in scoring schema in #3 through #6 there is a single predictor.^b “who” scores indicates the three predictors generated from the ‘who was involved’ follow-up items: caregiver, family, and non-family.^c N's for the outcomes in the logistic regressions were $N = 1209$ for the no diagnosis ($N = 252$) vs. at least one diagnosis ($N = 957$), and $N = 957$ for the remaining eight outcomes.

important contribution of this report is that bullying had unique additive prediction to all outcomes except PTSD, other anxiety, and substance misuse. Future studies need to make an effort to consider including bullying into assessment protocols in order to better dimensionalize this particular exposure beyond frequency counts and to better understand its relations to psychopathology. Collectively, findings are largely consistent with prior works and underscore the importance of intentional/ interpersonal experienced harms including bullying.

Consistencies between our findings and those reported in the literature are remarkable in part because, in the absence of a common measurement framework, it is not possible to closely examine

replication patterns on either person-centered or variable-centered approaches to traumatic exposures or associations between traumas and outcomes. Hence, we consider the results of the CFA in TX-CTRN as providing guidance for future studies rather than being prescriptive on how traumas should be classified in either the person-centered or the variable-centered mode. For example, if one wanted to examine the effects of sexual abuse on clinical symptoms trajectories, our results and prior studies (e.g., Hogdon et al., 2019) would encourage statistical controls for other intentional/interpersonal experienced traumas. Similarly, if one wanted to examine the effects of loss of attachment figures, our results would encourage statistical controls for other

Table 6

Odds ratios for the best TESI-C scoring schema from the logistic regressions for nine clinical outcome variables.

	Outcomes								
	No diagnosis ^a	Among those with at least a single diagnosis ^b							
		PTSD	Anxiety	Depression	Suicidality	Externalizing	Substance misuse	SMI	Comorbid
Male	1.68**	0.61**	0.55**	0.69	0.49**	1.74**	1.38	0.82	0.79
Minority	1.03	1.56**	1.04	0.81	0.75	0.92	0.51**	0.84	0.79
Age	0.91**	1.11**	1.03	1.25**	0.99	0.89**	1.36**	1.00	1.15**
Unintentional E	1.01	1.12	1.08	0.87	0.94	0.97	1.06	1.10	0.89
Intentional Interpersonal E	0.51**	1.54**	1.30**	1.56**	1.42**	1.19	1.19	1.44**	1.73**
Intentional W at home	0.53**	1.33*	1.22	1.01	1.34**	0.91	0.76	0.96	1.37
Intentional W not at home	0.95	0.97	0.91	0.95	1.13	0.92	1.19	1.00	1.16
Bullying	0.60**	1.09	1.10	1.53**	1.48**	1.28	1.00	1.47**	1.94**
Who: Caregiver	0.89	0.99	0.91*	1.10	1.06	1.07	1.08	1.10	0.99
Who: Family	0.82	1.10	1.05	1.10	1.10	1.05	1.15	0.97	1.21
Who: Nonfamily	0.82	0.98	0.95	1.12	1.08	1.09	1.24**	1.06	1.06

Abbrev. W = Witnessed E = Experienced SMI = Serious Mental Illness PTSD = Post-traumatic stress disorder. * $p < 0.05$ ** $p < 0.01$ *** $p < 0.005$ or better.^a $N = 1197$ for the no diagnosis vs at least a single diagnoses contrast.^b $N = 946$ for the remaining outcomes.

unintentional traumas.

4.1. Limitations

We relied on retrospective assessment of lifetime trauma from children and youth at baseline. The design of TX-CTRN will remedy this specific limitation of the current report as follow-up prospective data collection includes exposure to additional traumas and repeated assessments of clinical symptoms every six months. An important limitation of our assessments was that we were unable to obtain assessments of ‘neglect.’ Neglect, whether emotional or with respect to basic needs, were not part of the TESI-C items, and should be included in future work. It is likely however that many children who experienced neglect also endorsed instances of interpersonal experienced and witnessed harms in the home and/or community as prior research has shown neglect to co-occur with these intentional harms in both variable-centered and person-centered analyses (e.g., Brown et al., 2019; Pynoos et al., 2014). Finally, although our outcome measurement framework is broader in breadth than prior works, we pooled across granular distinctions among MINI-Kid diagnoses to create clinically distinct problems to facilitate robust inference. Future work will remedy this limitation as more focused questions are posed of this registry.

4.2. Conclusions

The current study addressed several limitations of prior research in laying the groundwork for prospectively charting pathways of adjustment following traumatic exposure. A broad base recruitment strategy of children, youth and their caregivers allowed us to sample a broad range of traumatic exposures. Both the screening for traumas and clinical diagnoses were done with standardized clinical interviews. Findings largely aligned with earlier studies on the relative importance of intentional interpersonal traumas and suggested bullying maybe an important source of traumatic stress that independently adds to prediction of several diagnoses.

CRedit authorship contribution statement

DJN, KDW, CBM, JS responsible for study design and measurement protocol; JDS responsible for training of research interviewers; JR responsible for setting up the RedCap database for all instruments across multiple sites; AGG, LT, RR, IL, JC, CG, CGD, JC, SLC, PJR, responsible for critical review of write-up and assistance in literature review, NA responsible for analyses, write-up and posing the questions addressed in this report.

Ethical standards

The study was approved by the Institutional Review Board of University of Texas-Southwestern.

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Declaration of competing interest

Drs. Aksan Clark, Dodd, Taylor, Shahidullah, Richmond, Wagner, Cisler, Cross, Garza, have reported no biomedical financial interests or potential conflicts of interest.

PJR serves on a data safety monitoring board for Sunovion Pharmaceuticals.

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CBM, in the last three years, served as a consultant to AbbVie, ANeuroTech (division of Anima BV), Signant Health, Magstim, Inc., Intra-Cellular Therapies, Inc., EMA Wellness, Sage, Silo Pharma, Engrail Therapeutics, Pasithea Therapeutic Corp., EcoR1, GoodCap Pharmaceuticals, Inc., Senseye, Clexio, EmbarkBio, SynapseBio, BioXcel Therapeutics. He is a stockholder with Seattle Genetics, Antares, Inc., Corcept Therapeutics Pharmaceuticals Company, EMA Wellness, Precisem Health, Relmada Therapeutics. He has served on advisory boards for ANeuroTech (division of Anima BV), Brain and Behavior Research Foundation (BBRF), Anxiety and Depression Association of America (ADAA), Skyland Trail, Signant Health, Laureate Institute for Brain Research (LIBR), Inc., Heading Health, Pasithea Therapeutic Corp., Sage. He has served on the Board of Directors for Gratitude America, ADAA, Lucy Scientific Discovery, Inc. He holds the following patents: Method and devices for transdermal delivery of lithium (US 6375,990B1); Method of assessing antidepressant drug therapy via transport inhibition of monoamine neurotransmitters by ex vivo assay (US 7148,027B2).

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Appendix A. Supplementary data

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