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Development of a Short Trauma Screening Tool (STST) to Measure Child Trauma Symptoms: Establishing Content Validity

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Development of a Short Trauma Screening Tool (STST) to Measure Child Trauma Symptoms: Establishing Content Validity

Background

Nearly 70 percent of children seen in pediatric health care settings have been exposed to traumatic events[1,2] and as many as 90% of children in urban pediatric clinics have had a traumatic exposure.[3] For the more than 437,000 children[4] in foster care in the USA, this number approaches 100%. *Complex trauma* describes both children's exposure to multiple traumatic events, often of an invasive, interpersonal nature (i.e. abuse or neglect), as well as the wide-ranging, long-term impact of this exposure.[5] For the purposes of this study, *child trauma* refers to the behavioral and emotional impacts of a child's exposure to these experiences.

Research has clearly linked child trauma with impairments in cognitive development, behavioral and psychological functioning, and physical health.[5-7] Associated mental health diagnoses include attention deficit hyperactivity disorder, externalizing problems including oppositional defiant and conduct disorders, internalizing problems including depression and anxiety, substance abuse, self-harm and suicidal behavior.[8] Developmental impairments include difficulty developing and sustaining relationships, behavioral issues, dissociation, and learning disabilities.[8] Yet, pediatric clinical or office-based interventions[9,10] and trauma-focused evidence-based therapeutic treatments (TF-EBTs), which mitigate these long-term consequences for children demonstrating child trauma symptoms, do exist.[11] The availability of such treatments has resulted in a decade-long call for pediatric medical providers to identify these children .[11,12]

Pediatric medical care providers are likely to be the first, and perhaps only, professionals with the opportunity to assess the myriad symptoms demonstrated by children experiencing trauma. Yet, many children do not benefit from early recognition and intervention because symptoms of child trauma are often missed, or overlooked, by the general pediatrician.[13-15] Evidence based approaches to identify and diagnose the impact of childhood trauma are limited because there are not adequate pediatric screening tools to help the practitioner distinguish which constellation of symptoms specifically needs attention.

Existing trauma screening tools have been developed for mental health settings and are not optimal for use in the medical setting. Some tools were primarily designed to identify symptoms of specific types of trauma, such as sexual abuse[16] or post-traumatic stress disorder[17]. These tools often require recall of a specific traumatic event. For children in foster or other out-of-home care, the exact nature of past traumatic events

may be unknown to the child or their present caregiver. Furthermore, for some children, specific trauma events may be too numerous or too distant to recall.

Well-established pediatric mental health trauma evaluation tools such as the Child Behavior Checklist (CBCL)[18] and Trauma Symptom Checklist for Children (TSC)[19] do reflect the range of child trauma symptoms, which may be found. However, these clinical evaluation tools can be both long and costly, which limits their implementation and utility in pediatric medical outpatient settings.[20] While shortened versions[21] or subscales[22] of the these measures[16] have been employed, their length (20+items) and formats can be cumbersome for medical providers in busy outpatient settings. Additionally, pediatric medical providers are less familiar with the lexicon used in these mental health tools (e.g., dissociation, trauma reminders), thus pediatricians may be uncomfortable with how best to respond when these issues are endorsed.

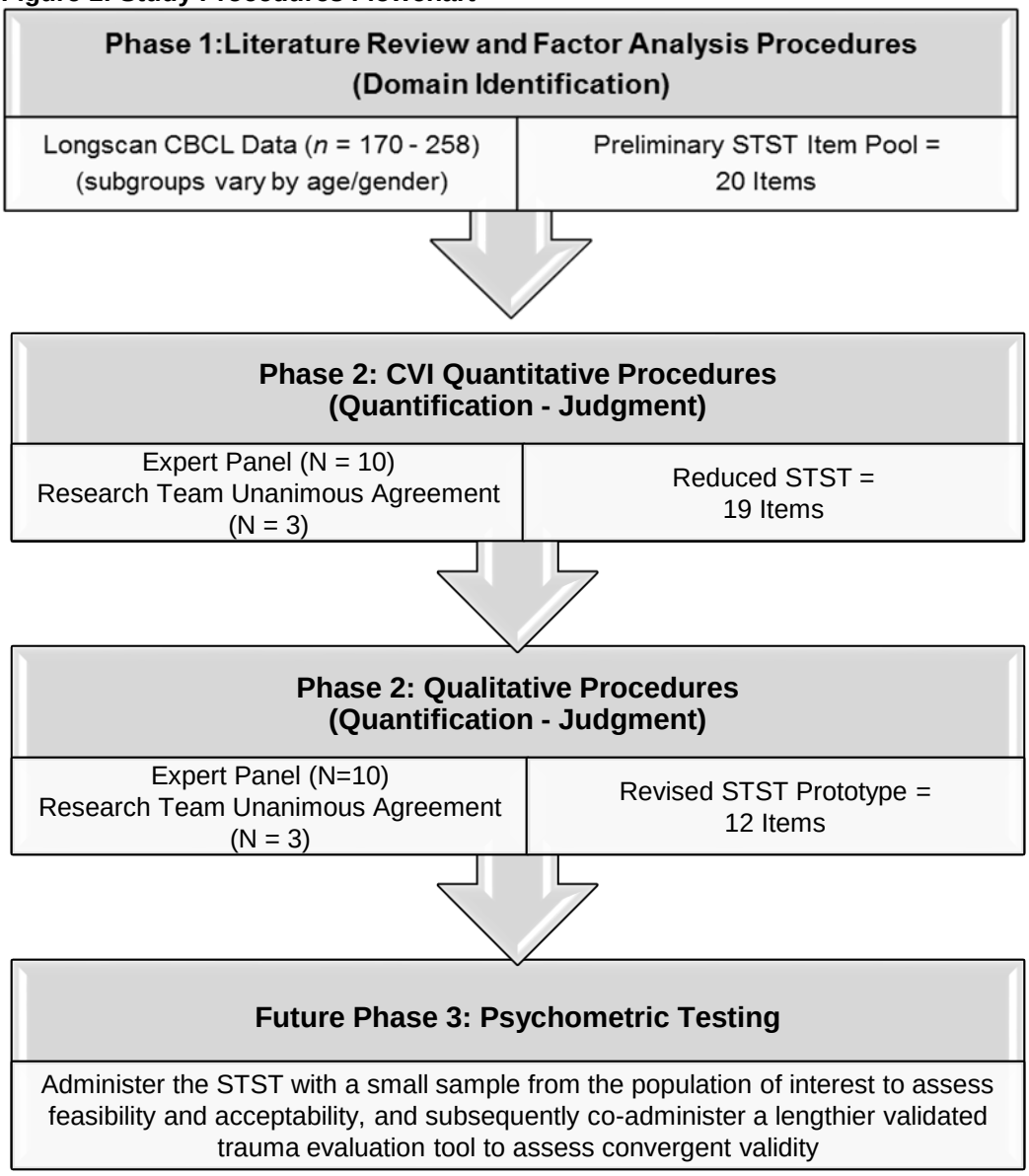
Therefore, the purpose of the present study was to identify symptom domain variables common to child trauma and adapt a limited number of items from commonly used well-established trauma assessment tools to create a prototype short trauma screening tool (STST) intended for use in pediatric medical settings. Once developed, the prototype STST is to be administered to child primary caregivers (e.g., biological, adoptive, and foster parents) by pediatric medical providers in outpatient medical clinic settings. Study aims were to: (1) conduct initial exploratory factor analysis to identify major symptom domain variables associated with child trauma; (2) generate a preliminary STST item pool that operationalizes the symptom domain variables of child trauma; and (3) conduct content validity index (CVI) quantitative and qualitative assessment of the preliminary STST item pool to inform the retention, elimination, modification, and addition of items to a shortened revised prototype STST.

METHODS

Study Design

This present study consists of the first two phases of an on-going prospective mixed-method instrument development study (see Figure 1). This article describes the process undertaken to develop a prototype short trauma screening tool (STST) to aid the identification of child trauma symptoms experienced by children exposed to interpersonal trauma.

Figure 1: Study Procedures Flowchart



The goal of Phase 1 exploratory factor analysis was to identify major symptom domain variables of child trauma and generate the preliminary STST item pool. Phase 1 factor analysis was conducted with Longitudinal Studies on Child Abuse and Neglect[23] (LONGSCAN; www.iprc.unc.edu/longscan/) publicly available de-identified archived data obtained from the National data Archive on Child Abuse and Neglect (NDCAN). LONGSCAN data contains data collected, by interview and phone survey, on over 1300 children with varying levels of risk and

exposure, and their families, from a compendium of prospective cohort research studies examining the cause and effect of child maltreatment. LONGSCAN data represents a multi-site national sample of children selected from: (1) pediatric clinics serving low income, inner-city children; (2) children deemed at-risk following a child protective services report; (3) children in out-of-home foster care placement; and (4) children identified as high-risk at birth by a state public health agency.

Exploratory factor analysis using orthogonal varimax rotation was conducted on LONGSCAN Child Behavior Checklist – school-aged version (CBCL)[18] data and Trauma Symptom Checklist for Children (TSCC)[19] data.

The 113-item CBCL is a caregiver-report questionnaire designed to measure various internalizing and externalizing behavioral and emotional symptoms endorsed by children with trauma exposure. For each item, (e.g., destroys things belonging to his/her family and others; not liked by other kids), the caregiver rates the frequency with which the statement pertains to their child on a 3-point scale ranging from 0 (not true) to 2 (very true). The 54-item TSCC is a self-report instrument designed to evaluate abuse and trauma-related symptomatology in children aged 8-16. For each item, (e.g., feeling mad; feeling like nobody likes me), the child rates the frequency with which the statement pertains to them on a 4-point scale ranging from 0 (never) to 3 (almost all the time).

During Phase 2 of the study, Content Validity Index (CVI) procedures, following the two-step process (development and judgment-quantification) described by Lynn[24], were conducted with the 20-item preliminary STST item pool to inform item reduction and modification. Content validity scores were calculated for each STST item (I-CVI) as well as for the overall STST scale (S-CVI). The CVI process involved convening a panel of content experts to judge the relevance of proposed instrument items, and the overall instrument, with the symptom domain variables. Each expert was asked to rate how relevant each proposed item was to the child trauma symptoms domains. Phase 2 CVI processes incorporated both quantitative and qualitative data collection. Quantitative CVI data collection involved having experts rate individual proposed items for clarity and relevance on a 4-point scale; 0 = not relevant, 1 = somewhat relevant, 2 = mostly relevant, and 3 = very relevant. Because the expert panel consisted of 10 experts, guidelines for calculating CVI with six or more judges described by Lynn were followed, which recommend items should only considered relevant when I-CVI scores are greater than 0.78 (maximum 2 disagreements).

Qualitative CVI data collection included open-ended questions for experts to write-in their free-text responses describing item clarity, item relevance, and overall suggestions for revision. Phase 2 expert panel qualitative data were used to inform revision of the STST. However, it was decided, *a priori*, that the research team would retain final say in deciding whether an item was revised, retained, or eliminated in the STST prototype. Phase 2 quantitative CVI procedures reduced the preliminary STST item pool to 19 items and qualitative content analysis further informed the development of the 12-item prototype STST.

PHASE 1

Factor Analysis Procedures

Following IRB approval (UMass IRB H00010864) and a comprehensive review of the literature, Phase 1 factor analysis, using orthogonal varimax rotation, was conducted on a split sample (N = 554) of LONGSCAN Child Behavior Checklist data collected from boys and girls ages 6, 8, 10, 12, 14 & 16.

Because the STST is intended to assist pediatric medical providers with identifying more subtle symptoms of child trauma rather than overt symptoms of florid psychosis or suicidality, Child Behavior Checklist items related to psychosis and suicidality (n = 5) were excluded prior to factor analysis. Factor analyses were performed, by one member of the research team (JA), on the remaining Child Behavior Checklist items (n = 109) using the Stata software package (Statacorp; College Station, Texas, USA).

Because Child Behavior Checklist symptom domain variables were suspected to be dissimilar, in order to identify the number of factors represented in the LONGSCAN Child Behavior Checklist data, researchers elected to use orthogonal varimax factor rotation. Orthogonal varimax rotation, a mathematical transformation procedure, was used to increase the clarity of how like-items fell together to enhance the presence (or absence) of clustered symptom domain variables. When symptom domain variables were identified, a distinct descriptive name was assigned. Child Behavior Checklist items with factor loadings less than .40 were deleted from analyses, to eliminate those items accounting for the least amount variance in the LONGSCAN Child Behavior Checklist data. The research team then reviewed the content of symptom clusters represented by the highest-loading items for each of the latent variables (factors), and those items which best reflected child trauma symptoms (based on content expertise) were retained. This resulted in the 20 items from the Child Behavior Checklist that were used in phase 2.

Study researchers then conducted the same series of exploratory factor analyses, using orthogonal varimax rotation, on LONGSCAN[23] Trauma Symptom Checklist for Children[19] gender and age specific datasets. Researchers quickly determined results of Trauma Symptom Checklist for Children analysis compared equally with the symptom domain variables already identified by earlier Child Behavior Checklist factor analysis. Because preliminary analyses of Trauma Symptom Checklist for Children datasets showed low yield for new trauma symptom domain information, further analyses of this checklist were discontinued.

Factor Analysis Results

The interpretation of Phase 1 factor analysis was guided by considerable clinical experience (50+ practice years) of the research team, in light of current child trauma literature. Applying consensus agreement, the three-member multi-disciplinary team (HF, LM, and EH) retained the Child Behavior Checklist items demonstrating the highest factor loadings and best representing child trauma symptom domain variables. For aim 1, phase 1 exploratory factor analyses of LONGSCAN Child Behavior Checklist datasets led to the identification of the following eight proposed major symptom domain variables of child trauma: (1) aggression/anger; (2) anxiety/fear; (3) sexual concerns; (4) elimination concerns; (5) somatic concerns; (6) depression; (7) dissociation; and (8) physical acting out. These symptom domain variables informed development of the preliminary STST item pool (see Table 1).

For aim 2, phase 1 factor analysis generated a 20-item preliminary STST item pool (see Table 1). Each of the proposed STST symptom domain variables were operationalized with 2-4 items from the preliminary pool. Once fully developed, the STST will be administered to primary caregiver's who will be asked to rate the degree to which their child has demonstrated these symptoms within a specific time period (e.g. prior 6 months) using a Likert scale ranging from 0 (never) to 3 (always).

PHASE 2

Content Validity Index (CVI) Procedures

During the Phase 2 judgment-quantification step, following Institutional Review Board approval (UMass IRB H00011772) study researchers convened a panel of national experts to validate the content of the preliminary STST item pool using content validity index (CVI). A cover letter explaining the purpose, concepts, symptom domain variables, instructions for rating the preliminary STST item pool, and the preliminary

STST quantitative and qualitative data collection form, were sent, via e-mail, to a purposively selected panel of experts. Three items (#12, 19, and 21) that

Table 1. The preliminary STST item pool consisted of 20* proposed items, representing eight symptom domain variables. Each item relates to one of eight major child trauma symptom domain variables.

Trauma Symptom Domain Variables	***Item #***	***20 Proposed Preliminary STST Items***
Aggression / anger	3	Is your child disobedient at home or school?
	4	Does your child lie, cheat or seem secretive?
	6	Is your child stubborn, sullen or irritable?
Anxiety / fear	8	Is your child nervous, anxious, high-strung, or tense?
	9	Is your child fearful or often worried?
Sexual concerns	15	Does your child have sexual problems, think about sex too much, or talk about sex too much?
	16	Does your child play with his sex parts too much or in public?
Elimination Concerns	13	Does your child have problems with toileting accidents?
	14	Does your child smear or play with stools?
Somatic concerns	11	Does your child often have headaches or stomachaches?
	23	Is your child having trouble sleeping or seem overtired?
Depression	10	Does your child feel worthless or inferior?
	17	Does your child seem unhappy, sad or depressed?
	18	Does your child complain no one loves him/her?
Dissociation	20	Does your child stare blankly or seem lost in their own thoughts?
	22	Does your child seem to be in a fog or confused?
Physical acting out	1	Does your child destroy or vandalize his/her own things or those of others?
	2	Is your child cruel, a bully, or mean toward others?
	5	Does your child have a hot temper or tantrums?
	7	Does your child talk too much, scream a lot, or is he/she loud?

** Items 12, 19, and 21 were three intentionally irrelevant control items included to assess panel expertise.*

were intentionally irrelevant to child trauma were purposefully added to the preliminary STST item pool. For example, item #12 read, “Is your child comfortable using more than one type of learning technology?”. Inclusion of these validation items provided developers a method for assessing expertise of the panelists via their demonstrated ability distinguishing irrelevance of these items. Following completion of the item-level CVI assessment, participating experts were asked to submit qualitative responses to the following four open-ended questions: (1) “Do you think any areas of behavior impacted by trauma have been overlooked in the STST?”; (2) “Do you think the STST would be useful in a primary care setting?”; (3) “Do you think primary care providers would use the STST?”; and (4) “Would you use the STST?. Content validity indices for individual items (I-CVI) and the entire scale (S-CVI) were calculated. Open-response feedback was analyzed employing data immersion and qualitative directed content analysis.[25] Qualitative content analysis is a common research method employed for the subjective interpretation of textual data, following a systematic process of coding and thematic categorization.

Content Validity Index (CVI) Expert Sample

The research team convened a purposively selected expert panel (*N* = 10) to conduct CVI procedures. Each multi-disciplinary expert was specifically invited to participate based upon their widely varying clinical, academic, and/or lived experience with child trauma. The panel included a heterogeneous group of pediatric medical providers, child protection and foster care pediatricians, trauma-trained mental health providers, adults with experience providing custodial caregiving to trauma-exposed youth, and an adult with youth experience in foster care. Characteristics of the expert panelists are presented in Table 2.

Content Validity Index (CVI) Data Collection

Individual item relevance was assessed using average item-level content validity index (I-CVI). The item-level CVI (I-CVI) was calculated by summing all experts’ relevance scores for each individual item then dividing by the total number of experts. Following guidelines provided by Lynn (1986) to ensure content validation was not merely due to chance agreement, individual proposed preliminary STST items were considered relevant only if eight of 10 experts rated the individual item as 2 or 3 on the relevance scale (0 = not relevant, 1 = somewhat relevant, 2 = mostly relevant, and 3 = very relevant). Thus, individual items were required to attain a minimum I-CVI score ≥ 0.78 in order to be retained in the revised

prototype STST. All retained items were further assessed for presence or absence of clarity.

Table 2. Expert Panelist Characteristics (*N* = 10).

Characteristics		*n* = (%)
Gender	Female	9 (90%)
	Male	1 (10%)
Race	Caucasian	10 (100%)
Ethnicity	White (non-Hispanic or Latino)	9 (90%)
	American Indian/Alaskan Native	1 (10%)
Nature of expert experience	Adult previously exposed to child trauma as a youth	1 (10%)
	Primary care provider (MD/NP) caring for child trauma-exposed youth	1 (10%)
	Mental health provider caring for child trauma-exposed youth	2 (20%)
	Health care provider specializing in care of child trauma-exposed youth	6 (60%)
Years of experience in expert role	5-10 years	3 (30%)
	11-15 years	2 (20%)
	11-15 years	1 (10%)
	>20 years	4 (40%)
U.S. Residency	Eastern Standard Time Zone	6 (60%)
	Central Standard Time Zone	3 (30%)
	Pacific Standard Time Zone	1 (10%)
Experience administering trauma screens	Yes	6 (60%)
	No	4 (40%)

Scale-level content validity (S-CVI) was also computed, whereby the I-CVI for each item was first calculated, then the individual averages per item (I-CVI/Ave) across all experts were calculated. Finally, the overall average of all these averages were calculated to provide a content validity index average (S-CVI/Ave)[26] total for the entire scale.

Content Validity Index (CVI) Results

For aim 3, experts rated 19 of the 20 proposed individual preliminary STST items as relevant with the required I-CVI ≥ .78, which aided developers with reducing the preliminary item-pool by only one item (item #7). Item #7, "Does your child talk too much, scream a lot, or is he/she loud?", received an I-CVI score of 0.30, well below the acceptable minimum of 0.78, resulting in that item's elimination. Nine of 10 experts rated the entire 20-item scale as relevant with an overall S-CVI of ≥ .80. The S-CVI average rating for all experts combined = 0.90 (see Table 3). All experts correctly identified the three control items (#12, 19, and 21) as not relevant to child trauma.

STST Item Review Qualitative Data Collection

During CVI assessment, experts provided qualitative responses relating to item-level clarity (*n* = 50); item-level relevance (*n* = 38); three open-ended questions regarding STST usefulness and use (*n* = 11); and a final open-ended question regarding areas overlooked by the STST (*n* = 7).

STST Item Review Qualitative Findings

Content analysis of item-level relevance data revealed the most frequently issued expert recommendation related to rewording items to increase their specificity for trauma (*n* = 22; nearly 60%). Increased specificity occurs when the true presence of the trauma symptom is more likely associated with a positive item response. Experts advised increasing an item's contextual detail to better differentiate trauma symptoms from other non-traumatic developmentally appropriate behaviors. For example, when commenting on relevance of item # 16, 'Does your child play with his sex parts too much or in public?', two experts responded:

> *"One would have to place this in the context of the child's age and developmental status, but this would almost always be cause for concern… Need to watch … developmentally appropriate behavior (e.g. 4 yo boy with hands in his pants)."*

Content analysis of item-level clarity data revealed the two most frequently issued expert recommendations related to: (1) rewording items, and the entire tool, to lower the reading level and enhance health literacy (*n* = 12; > 20%); and (2) reframing items using the language of resilience (*n* = 9; nearly 20%), rather than symptom-based language.

Table 3. Content Validity Index (CVI) of STST Items

Item #	Rater 1	Rater 2	Rater 3	Rater 4	Rater 5	Rater 6	Rater 7	Rater 8	Rater 9	Rater 10	I-CVI
Aggression / anger											
3	+	+	+	+	+	+	+	+	+	+	1.00
4	+	+	+	+	+	+	+	+	+	+	1.00
6	+	+	✗	+	+	+	+	+	+	+	0.90
Anxiety / fear											
8	+	+	+	✗	+	+	+	+	+	+	0.90
9	+	+	+	+	+	+	+	+	+	+	1.00
Sexual Concerns											
15	+	+	+	+	+	+	+	+	+	+	1.00
16	+	+	+	+	+	+	+	+	+	+	1.00
Elimination Concerns											
13	+	+	✗	+	+	+	+	✗	+	+	0.80
14	+	+	+	+	+	+	+	✗	+	+	0.90
Somatic Concerns											
11	+	+	+	+	+	+	+	+	+	+	1.00
23	+	+	+	✗	+	+	+	+	+	+	0.90
Depression											
10	+	✗	+	+	+	+	+	+	+	+	0.90
17	+	+	+	+	+	+	+	+	+	+	1.00
18	+	+	✗	+	+	+	✗	+	+	+	0.80
Dissociation											
20	+	+	+	✗	+	+	+	+	+	+	0.90
22	+	+	+	+	+	+	+	+	+	+	1.00
Physically acting out											
1	+	+	+	+	+	+	+	✗	+	+	0.90

2	+	+	+	+	+	+	+	+	+	+	1.00
5	+	+	☒	+	+	+	+	+	+	+	0.90
7	☒	☒	☒	+	☒	☒	☒	+	+	☒	0.30
SCVI-UA =	0.95	0.90	0.75	0.85	0.95	0.95	0.90	0.80	1.00	0.95	
Overall CVI =											0.90

Note: + indicates item deemed relevant, ☒ indicates item deemed not relevant.

When speaking to concerns for the STST reading level, experts provided the following comments:

> *"Would suggest reading level decreases across the board… Need a lower reading level word than 'vandalize'…. 'Disobedient' may be health literacy issue…. Sullen may be a poor word choice for caregiver with low literacy level…. [Child feeling worthless or inferior] may need lower reading level: e.g. feel bad about him/herself".*

Furthermore, when speaking to concerns for reframing items, and the entire tool, using language of resilience, experts provided the following comments:

> *"I think the question is clear, but I prefer to phrase things looking for resilience…. I would want a tool to highlight strengths… [The] exclusive focus on negatively written behaviors… may be less than informative"*

PRELIMINARY STST ITEM POOL REVISION

Preliminary STST Item Reduction

As previously noted, quantitative CVI scoring reduced the length of the preliminary STST by only a single item**.** In order to achieve aim 3, the final phase in the analysis process involved the research team assimilating this study's qualitative clarity and relevance findings to guide on-going item elimination (see Table 4), retention and modification decision-making (see Table 5). All decision-making regarding inclusion or exclusion of any item in the revised final version prototype STST required consensus agreement of the three-member phase 2 research team (HF, LM, and PPF). Disagreement, if present, was resolved through prolonged data immersion and negotiated group discussion.

Preliminary STST Item Retention

First, the research team evaluated item-level expert responses for each of the remaining 19-items. Researchers compared data for like-items within their symptom domain variable groupings, determining that three items (# 4, 17 and 20) were described highly-favorably by experts, and these three items were retained (see Table 5).

Preliminary STST Item Elimination

Next, to eliminate redundant or non-specific items within each symptom domain variable group, the research team evaluated item-level expert data of the remaining 16 potential items. Items described less desirably by experts due to: (1) overlap with same domain like-items; or (2) their lack of

Table 4. Justification for Elimination of Preliminary Items

Proposed Item	Relevance I-CVI	Clarity I-CVI	Rationale for Elimination
AGGRESSION / ANGER VARIABLE *(Overlaps with item #4; panel preferred)*			
#3: Is your child disobedient at home or school?	1.00	0.80	**Lacks specificity:** *"This needs to be 2 questions, home vs school… foster caregiver might not know answer for school…Defiance… is relevant, disobedience sounds a bit milder"*
#6: Is your child stubborn, sullen or irritable?	0.90	0.80	**Lacks specificity:** *"Overlap(s) with normal development… Many kids without trauma are stubborn"*
SEXUAL CONCERN VARIABLE *(Overlaps with item #15; panel modified & preferred)*			
#16: Does your child play with his sex parts too much or in public?	1.00	1.00	***Developmental differentiation concerns****: "[Must] place in context of developmentally appropriate behavior… Need to watch age level"*
ELIMINATION CONCERN VARIABLE *(Overlaps with item #13; panel modified & preferred)*			
#14: Does your child smear or play with stools?	1.00	0.90	***Literacy and developmental differentiation concerns****: "Need to watch age and developmental level… lower reading level"*
DEPRESSION VARIABLE *(Overlaps with item #17; panel preferred)*			
#10: Does your child feel worthless or inferior?	0.90	0.80	**Lacks specificity:** *"May not be trauma-related… [a symptom] which many caregivers may miss"*
#18: Does your child complain no one loves him/her?	0.80	1.00	**Lacks specificity:** *"Would be relevant if the child complained often… or had other symptoms, e.g. sadness"*

DISSOCIATION VARIABLE *(Overlaps with item #20; panel modified & team preferred)*			
#22: Does your child seem to be in a fog or confused?	1.00	1.00	**Lacks specificity:** *"Similar to question 20… Requir[es] some thought to determine… [if] medical reason"*
PHYSICAL ACTING OUT VARIABLE *(Overlap with item #5; panel modified)*			
#1: Does your child destroy or vandalize his/her own things or those of others?	0.90	1.00	***Literacy concerns and reframe for resilience:*** *"Might need a lower reading level word than 'vandalize… I prefer to phrase things looking for resilience".*
#2: Is your child cruel, a bully, or mean toward others?	1.00	0.90	***Reframe for resilience:*** *"I usually phrase this as 'Does your child get along well with others – [Do they] treat [their] friends and siblings well?"*

Table 5. The Proposed 12-item Prototype STST. Each item operationalizes a symptom associated with one of nine major child-trauma symptom domain variables. Caregivers will likely respond using a Likert scale ranging from 0 (almost never) to 3 (almost always).

Trauma Symptom Domain Variables	***12 Proposed Prototype STST Items***
ITEMS RETAINED IN ORIGINAL FORM	
Depression	Does your child seem unhappy, sad or depressed?
Dissociation	Does your child stare blankly, "zone out", or seem lost in their own thoughts?
Aggression / anger	Does your child lie, cheat or seem secretive?
ITEMS RETAINED FOLLOWING MODIFICATION	
Anxiety / fear	Is your child nervous, anxious, or tense? Is your child fearful or worried?
Sexual concerns	Does your child seem more sexualized in words or behavior than other children their age?
Elimination concerns	Does your child have poop accidents in their underwear or bed?
Somatic concerns	Does your child complain of headaches, stomachaches, or other aches and pains?

	Does your child have trouble sleeping?
Physical acting out	Does your child have a hot temper or frequent tantrums (falling out, flipping out, or melting down)?
ITEMS NEWLY ADDED FOLLOWING QUALITATIVE ANALYSIS	
Dysregulation	Does your child have concerning eating behaviors (eat too much, hoarding, food rituals)?
	Does your child seem hyperactive or impulsive in their behavior?

trauma-specificity, were eliminated (see Table 4). Items, assessed by the three-member research team as overlapping or lacking specificity, with unclear expert determination of desirability, could also be eliminated with unanimous agreement of the research team. This iterative process of assimilation of phase 2 findings, and unanimous agreement of the research team, allowed developers to cull the remaining item pool by nine more items. Thereby another seven items were retained and added to the three previously retained items. This resulted in a total of 10 of the original preliminary STST items, thought to best operationalize each of the eight symptom domain variables, being identified in Phase 2.

Preliminary STST Item Modification

Next, the remaining 10 original items were individually evaluated to assess whether expert-recommended modifications were needed. This process resulted in the rewording, or addition of contextual data, to seven items (see Table 5). These modifications were made in response to expert recommendations to lower health literacy level and increase differentiation of symptoms from developmentally appropriate behaviors. Wording of seven of the 10 items was modified based upon expert recommendations, and qualitative content analysis findings. For example, Item #15, 'Does your child have sexual problems, think about sex too much, or talk about sex too much?', was modified to read, "Does your child seem more sexualized in words or behavior than other children their age?". This modification occurred in response to expert recommendations, which included:

> *"Current youth generation is significantly more sexualized than the generation of people… answering these questions", and "[Rewording as] sexualized behavior might be better than sexual problems".*

Likewise, Item #13, "Does your child have problems with toileting accidents?", was modified to, "Does your child have poop accidents in their underwear or bed?". This modification occurred in response to expert recommendations, which included:

> *"May want to specify bedwetting beyond 6 years old, daytime accidents rather than 'toileting'… add… in clothing, outside of toilet…. I think some people might not include nocturnal enuresis in the term 'toileting accident' since the child is asleep… you might have to ask if the child ever wets or soils their underwear or bed".*

Similarly, Item #5, "Does your child have a hot temper or tantrums?", was modified to, "Does your child have a hot temper or frequent tantrums (falling out, flipping out, or melting down)?". These modifications were made to acknowledge regional dialectical differences. Experts suggested adding contextual detail, commenting:

> *"[These symptoms are] Indicative of trauma or poor self-regulation… 'tantrum' is not familiar to some… so adding the other term is helpful… Falling out is the most common description I hear."*

Phase 2 STST Open-ended Question Qualitative Findings

When responding to questions related to the STST usefulness and use, all 10 experts (100%) endorsed that the STST would be useful in a primary care setting. Seven of 10 experts (70%) endorsed that primary care providers would use the STST. Six of 10 experts (60%) reported "Yes" when asked, "Would you use the STST?". Experts who responded they would not use the STST reported:

> *"Most of my population has [known] trauma, not a good population to screen… We are a subspecialty clinic already us[ing] the CBCL…. Only has negatively [sic] focus…I wish you had offered a third choice, I would have said 'I'm not sure' ".*

Of note, four of 10 expert panelists reported never having administered trauma screening measures in their work. Of those never having administered measures, three experts responded they would use the STST, and one expert responded they would not.

Content analysis of the qualitative responses to the open-ended question "Do you think any areas of behavior impacted by trauma have been overlooked in the STST?" revealed strongly clustered responses. The frequency and similarity of expert recommendations prompted the research team to add two new items regarding disordered eating and hyperactivity/impulsivity. These two items represent the newly identified

ninth child trauma symptom domain variable, named dysregulation. The first new STST item, "Does your child have concerning eating behaviors (eat too much, hoarding, food rituals)?" was added in response to expert remarks, which included:

> *"[Areas overlooked by the STST include] disordered eating (hyperphagia, pouching, self-induced emesis)… Food hoarding or strange eating habits…. Eating behaviors…. Hoarding behaviors"*

The second new STST item, "Does your child seem hyperactive or impulsive in their behavior?", was added in response to expert remarks, which included:

> *"[Areas overlooked by the STST include] Hyperactivity, inattention… impulsivity, symptoms that appear to be hyperactive, always on the go, unable to sit still to learn, impulsive (act before they think)… Attention problems – seeming hyperactive, impulsive… Disruptive at home or school"*

The resultant prototype STST is a 12-item tool representing a total of nine child trauma symptom domain variables.

DISCUSSION

Summary of Main Findings

A current criticism of pediatric care of the traumatized patient is that child trauma symptoms are too often unrecognized, overlooked, or misdiagnosed. Thereby, efforts to develop the Prototype STST were inspired by significant clinical need. Developers of the prototype STST seek to alleviate occurrences of clinical oversight and appropriately provide trauma-focused evidence-based treatment referrals for children exhibiting measurable trauma symptoms.

Convening an expert panel that represented a heterogeneous community of interest was a strength of this study. Ten of eleven invited experts eagerly accepted participation and completed all required activities (>90% response rate). The expert panel included pediatric medical providers with a breadth of knowledge and experience related to child trauma. While convening a diverse, experienced, nationally-representative panel strengthens this study's internal validity, it also introduced the potential threat of selection bias. Therefore, it is important to consider that the opinions expressed by this study's expert panel may underrepresent the opinions of experts who were not invited to participate.

Early in the process, the research team determined that medical providers already have access to screening and evaluation tools to identify

the clinical needs of overtly psychotic or suicidal behaving patients. Thus, all Child Behavior Checklist items related to psychotic or suicidal features (e.g., hears sounds or voices that aren't there; sees things that aren't there; strange behavior; strange ideas; talks about killing self) were intentionally removed from the Phase 1 factor analysis of the LONGSCAN data. Thereby, it is an important limitation of this study that the prototype STST is not intended for use with patients with significant mental illness such as psychotic or suicidal features.

Quantitative CVI results from the panel of experts yielded a score of 0.90 for the overall scale, where 0.70 represents average agreement; 0.80 represents adequate agreement; and 0.90 represents good agreement.[24] Quantitative CVI results yielded each expert rating 19 of the proposed 20 items as relevant to the symptom domain variables, with only Item # 7, "Does your child talk too much, scream a lot, or is he/she loud?", with a CVI score of 0.30, being judged not relevant to the symptom domain variable. It was hoped that quantitative CVI scoring alone would have better informed the research team with reduction of the preliminary item pool. Consequently, this required the research team to employ greater reliance upon clinical judgment, and consensus agreement, when critically evaluating qualitative data during the iterative process of item reduction/revision. Subsequently, the quantification-judgment phase of CVI allowed for elimination of an additional nine items from the preliminary item pool.

Content analysis of qualitative data resulted in the addition of two new items: disordered eating/hoarding and hyperactivity/impulsivity. These two items correspond with symptoms previously underrepresented in our preliminary STST item pool, also denoting a ninth symptom domain variable; dysregulation. Behavioral dysregulation refers to reactions that are poorly modulated and fall outside of the conventional expectation of behavioral responses. In those impacted by child trauma, dysregulation is commonly demonstrated by satiety and impulse control concerns.[27,28] While the dysregulation symptom domain variable was not identified in the initial factor analysis, Phase 2 qualitative findings supported dysregulation as a symptom domain variable commonly observed in clinical practice. Likewise, contemporary child trauma literature[8,29] supports the addition of this ninth domain.

Clinical Implications

Screening tools need to be appropriate to the discipline and setting in which they are used. Attempts to administer mental health tools within pediatric settings have met limited success, perhaps because of the

unfamiliar psychiatrically based lexicon and tone present in many mental health questionnaire items. Administering mental health tools may thrust pediatric medical providers outside of their comfort zone, making it difficult to decide how best to respond and intervene to “psychiatric” concerns raised with the use of a mental health tool.

A strength of this study is that STST items are written in terminology consistent with pediatric, rather than mental health practice. The majority of expert panel members, all of whom contributed to item modifications, were pediatric care providers. Thus, the wording and tone of items included in the prototype STST reflect basic pediatric somatic and behavioral concerns (e.g., fear, sadness, tantrums), and common topics frequently discussed between child caregivers and their pediatricians (e.g., toileting, eating, tantrums). Inspired by clinical need for a short practical tool, careful consideration was exercised in the development of the STST as a pediatric, rather than psychiatric, tool.

Indeed, the need to address semantic concerns represented a significant part of the CVI qualitative recommendations, and Phase 2 work of the research team. When revising prototype STST items, in response to CVI findings, careful attention was paid to consider item: (1) literacy level; (2) regional dialectical variation; and (3) suitability for a variety of youth developmental stages. In an attempt to shorten the STST as much as possible, clinically-informed, pragmatic decisions were made to include items most specific to child trauma symptoms and exclude redundant items.

Accordingly, consistent with aim 2, the prototype STST is simply worded and brief. Items were evaluated for readability using Flesch-Kincaid reading level tests[30] and the items attained a Flesch Reading Ease score of 78.7, or fairly easy to read, (scale = 0 - 100, with higher scores indicating greater reading ease). Items received a Flesch-Kincaid Grade Level score of 5.1, indicating students in the 5th grade should be able to read and understand the text.

It is important to address one expert recommendation for item modification that could not be successfully incorporated into the revised prototype STST. Pediatric healthcare is practiced from a resilience framework, yet the prototype STST items are worded in symptom-based language. Two content experts strongly encouraged modifying STST prototype items to better reflect a framework of resilience. Despite multiple attempts, items were not able to be successfully rewritten using the language of resilience. For example, developers were unable to reword the item, “Does your child lie, cheat or seem secretive?” to be modified to, “Is your child honest, honorable, and open?”. Ultimately, it

was decided that re-wording items for resilience increased ambiguity of the item, lessening its clarity, and rendering the item less useful for a short tool designed for rapid and accurate screening.

This study's findings support content validity of the prototype STST, also supporting its continued development. When asked the question, "Do you think the STST would be useful in a pediatric primary care setting?", all the experts responded "Yes", with one expert emphasizing the importance of medical providers having an intervention available for responding to a positive screen. Children symptomatic for child trauma benefit from appropriate evaluation and referral to trauma-focused evidence-based mental health therapies. Once fully developed, the STST will provide pediatric medical providers an additional resource to guide in office interventions to address trauma and how best to triage a patient's referral to mental health services.

Research Implications

Study findings informed research team members with shortening and revising the preliminary STST item pool to an updated prototype STST. A strength of this study is that the STST prototype is a brief, non-proprietary, empirically derived screening tool that features 12 items representing nine domains of child trauma symptoms. Each item was systematically culled through extensive quantitative and qualitative processes and is thought to best represent the constellation of symptom domains associated with child trauma.

To assess whether the prototype STST's brevity impacts its psychometric properties, and to determine how well the prototype STST measures child trauma symptoms in the population for which it was designed, future reliability and validity testing is needed. Phase 3 STST development will include conducting a small feasibility study with the population of interest to assess and report psychometric properties of the prototype STST. Psychometric testing will also include co-administration of the STST with a well-established, lengthier, validated trauma symptom evaluation tool to assess the tool's convergent validity and inform development of its scoring algorithm.

Caregiver report is the most common way that pediatric medical providers collect historical information and identify child health concerns. Therefore, the STST has been developed to be administered to child primary caregivers by pediatric medical providers. Therefore, it is a limitation of Phase 2 of this study that CVI procedures focused on the input of primary care and mental health experts, except for one former consumer of foster care. Consequently, the third phase of STST

development will include an assessment of instrument acceptability targeting the populations of interest: active child caregivers and pediatric medical providers. Phase 3 researchers will collect “Think Aloud” cognitive interview qualitative data from caregivers completing the STST, in real time, to assess caregiver’s interpretation of STST items as they are completing them. Caregivers completing the STST will be asked to discuss the ease of STST use, comprehension of the STST items, and whether emotional burden of responding to items exists.

It is important to consider that primary caregivers may be challenged with recalling or recognizing symptoms of child trauma in younger children having limited verbal ability, or in older children who have difficulty communicating and expressing their own complex emotions. These two concerns must be explored further in Phase 3 development. It will be important to appropriately determine the best timeframe in which caregivers should report, a minimum age level (e.g., school-aged) for STST administration, and consider whether a young child-report version may impact usefulness of the STST with older children.

Conclusion

Few tools are available to assist the pediatric provider to identify the impact of trauma in children, and those that do exist are not intended for use in pediatric medical outpatient settings. Using factor analysis, and content validity assessment, this study identified nine child trauma symptom domain variables that are consistent with the range of symptoms associated with child trauma described in the literature. These domains include: (1) aggression/anger; (2) anxiety/fear; (3) sexual concerns; (4) elimination concerns; (5) somatic concerns; (6) depression; (7) dissociation; (8) physical acting out; and (9) dysregulation. Phase 1 study findings led to the development of a 20-item empirically derived preliminary STST. Phase 2 findings guided the development of a revised 12-item prototype STST. The 12-item prototype STST operationalizes the nine major symptom domain variables of child trauma. Phase 3 psychometric testing of the prototype STST is the next important step toward further developing a non-proprietary short trauma screening tool that can be comfortably administered in a pediatric setting. It is hoped that the STST will aid pediatric providers with rapid and accurate identification of patients demonstrating child trauma symptoms, whether trauma history is known or unknown, to better guide office-based treatments and referral for specialized mental health care.

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