

A Risk Assessment Tool to Predict Sustained PTSD Symptoms Among Women Reporting Abuse

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Abstract

Background: Nationally and worldwide, 30% or more of women are likely to have experienced intimate partner violence. Maternal mental health symptoms predict child function. When mothers have sustained posttraumatic stress disorder (PTSD), their children are at risk for growth and developmental delays and poor behavioral outcomes that may adversely affect the course of their lives. While many who experience trauma will recover without intervention, a significant proportion will experience PTSD, with negative consequences for their personal lives and the lives of their families. Early identification of those at high risk for PTSD symptoms will support early interventions to prevent PTSD and its negative consequences.

Methods: This paper describes the development of a tool that can predict PTSD symptoms at 8 months in mothers who are primarily of low socioeconomic status and primarily members of underrepresented groups. The tool consists of four key measures.

Conclusions: Using this tool to identify mothers at high risk for sustained PTSD and entering them into early intervention programs may protect mothers and their children from negative outcomes and promote their health and wellbeing.

Introduction

IDENTIFYING SURVIVORS OF TRAUMA who are at risk for chronic posttraumatic stress disorder (PTSD) is a National Institute of Mental Health (NIMH) priority. PTSD risk prediction is important because while many who experience trauma will recover without further intervention, a significant proportion will experience PTSD, with negative consequences for their personal lives and their children's lives. Being able to identify those at high-risk for PTSD will allow researchers to evaluate early interventions to prevent PTSD and its negative consequences.¹ This paper describes the development and validation of a tool for predicting PTSD symptoms in mothers who are primarily of low socioeconomic status and primarily members of underrepresented groups. This study uses data collected in a 7-year longitudinal study of 300 mother—child dyads.

Nationally and worldwide, 30% or more of women are likely to have experienced intimate partner violence (IPV).^{2,3} While many of those women will not experience chronic PTSD symptoms,^{4,5} a substantial number will. Johnson and

Zlotnick,⁴ in a prospective study, found that 46.8% of 147 residents of a shelter had PTSD symptoms 6 months after seeking assistance, associated with more severe baseline PTSD symptoms and fewer personal and social resources. Similarly, Glass et al.⁶ found that tangible support moderated the relationship between lifetime trauma experience and PTSD ($n = 76$). Ham-Rowbottom et al.⁷ found that of women who were at least 6 months post stays in women's shelters ($n = 81$), more than 70% had intrusion and avoidance scores indicating clinical levels of PTSD. In their sample, PTSD was associated with family of origin sexual abuse and higher current levels of financial difficulties. Koci et al.⁸ reported that 12 months after seeking a restraining order from a District Attorney's office or safe shelter in a woman's shelter, 39.2% of women had clinical level PTSD symptom scores.

Maternal mental health symptoms predict child function and therefore when mothers have PTSD their children are at risk for growth and developmental delays and poor behavioral outcomes that may adversely affect the course of their lives. In the 7-year study McFarlane and colleagues⁹ found that of mothers ($n = 300$ mothers and 300 children) who, for

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the first time, sought a protection order through the District Attorney's office or safety at a woman's shelter, those with depression and anxiety were 7 times as likely to have children with similar internalizing problems and mothers with aggression and hostility were 4.5 times as likely to have children with similar externalizing problems. In the same population, 24 months after the mothers sought assistance, data indicates that maternal mental health status remained a strong predictor of child behavioral problems. Maternal PTSD may put children at greater risk of ongoing exposure to violence. In the same sample, PTSD was one of eight risk factors predicting return to the abuser within 24 months of first seeking help.¹⁰

Panter-Brick et al.,¹¹ in a study of mother-child dyads living in conflict or refugee settings ($n=331$ dyads), found that maternal (or prime caregiver) clinical PTSD had the same effect on child function as the child experiencing one or two traumatic events. Enlow et al.¹² found that maternal PTSD symptoms predicted infants' emotion regulation at 6 months of age. At 13 months of age, by mothers' report, maternal PTSD predicted infant externalizing, internalizing, and dysregulation symptoms. Yehuda and Bierer's¹³ findings suggest that infants of mothers with PTSD may have reduced salivary cortisol beginning in infancy. Identifying those mothers at greatest risk for PTSD and providing early interventions may reduce their children's likelihood of experiencing lifelong problems stemming from their mothers' PTSD symptoms. There is evidence that PTSD can be predicted in individuals who experience trauma. Kessler et al.¹⁴ conducted analysis of World Health Organization data ($=47,466$ from 24 counties, 4% positive for *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition [DSM-IV] PTSD) to evaluate how well PTSD can be predicted in those who experience trauma, not limited by type or location. It is noteworthy that 10% of exposures to traumatic experiences resulted in 95.6% of the PTSD cases. Individuals with a prior history of PTSD, along with either the experience of having a loved one die unexpectedly or previous sexual trauma, were more likely to have PTSD. Being a woman (odds ratio [OR] 1.5–1.6), experiencing rape (OR 3.2–3.5), childhood physical abuse (1.5–1.8), or being beaten by a spouse/partner (1.5–1.8), and having certain prior lifetime mental health diagnoses including PTSD (27.2) were all associated with increased risk for PTSD. Kessler et al.¹⁴ noted that 3.5% of the traumatic experiences were by respondents with prior PTSD and these resulted in 40.5% of the PTSD diagnoses. They concluded that the findings support the possibility that high-risk individuals can be identified from trauma type and pre-trauma predictors. They also state that "different predictors will almost certainly be found to be important in different populations" (p. 273).

The impact of maternal PTSD on both the mothers and their children indicates a need to identify survivors of abuse who are at risk for PTSD so that intervention can begin, reducing the effects of abuse for mothers and children. Despite the existence of known risk factors for PTSD, we did not identify an existing tool that researchers and front-line social and health professionals can use to predict survivors of partner violence who are most likely to experience PTSD. The purpose of this paper is to describe the development of such a predictive tool using data from a 7-year prospective study of a sample of 300 urban mothers who reported partner violence.

Methods

Procedure

Data was collected as part of a 7-year prospective study. Eligibility criteria for the parent study included speaking English or Spanish, having at least one child between the ages of 18 months and 15 years, and seeking partner violence related support for the first time, either through the justice system by applying for a protective order through the district attorney's (DA) office, or through a stay in a safe shelter for abused women. Of the 330 mothers who were eligible to participate, nineteen declined and 11 left the shelter or DA's office prior to contact with researchers. The final sample (Table 1) was 150 mothers from each group.¹⁵ Following giving informed consent participants were interviewed in a private location by bilingual (Spanish and English) researchers.

Measures

At each interview, mothers completed a series of measures related to maternal mental health functioning, child behavioral functioning, resiliency factors, and severity of abuse and danger.¹⁵ To ensure that implementation of the tool is cost effective, only measures (potential predictors) that do not require royalty payments were included in the statistical analysis for the development of the PTSD symptom predictor tool.

Posttraumatic Stress Disorder Symptom Scale. This seven-item symptom scale screens for PTSD. The seven items were empirically derived in an epidemiological study

TABLE 1. DESCRIPTIVES OF FINAL SAMPLE

	n	%	
Group			
Shelter	140	48.4	
DA	149	51.6	
Ethnicity			
Non-Hispanic	112	38.8	
Hispanic	177	61.2	
Immigrant Status			
U.S. born	185	36.0	
Immigrant	104	36.0	
Child gender			
Boy	146	50.5	
Girl	143	49.5	
Education			
Less than high school	95	32.9	
High school/GED	55	19.0	
Some college	121	41.9	
College degree	18	6.2	
	n	mean	SD
Woman's age	289	30.76	7.70
Number of people in household	289	3.71	1.72
Length of relationship (months)	289	87.07	69.25
Number of children	289	1.93	1.09
Child age	287	6.89	4.23

DA, district attorney's office; SD, standard deviation.

of PTSD in an urban area.¹⁶ One item asks, “Do you avoid being reminded of the abuse by staying away from certain places, people, or activities?” Respondents rate each item as “yes” or “no.” The score is the sum of the “yes” responses. A score of 4 or more identified cases of PTSD with sensitivity of 78%, specificity of 97%, positive predictive value of 75%, and negative predictive value of 98%. The percentage of correctly classified respondents was 96%.¹⁷ For this study, PTSD scores were dichotomized based on the critical value of 4 indicating either a positive or negative screen for PTSD.

Safety Behavior Checklist. This seven-item safety survey assesses abused women’s present use of safety behaviors and charts future adoption. It was initially published by the March of Dimes¹⁸ and subsequently updated.^{19,20} Content validity was established.^{21,22} One question is “Have you hidden an extra set of house and car keys?” Depending of the relevance of a given item to a participant, scoring is “adjusted” for purposes of interpretation and comparison. The adjusted total scores range from 0 to 7, with higher scores indicating higher levels of self-protective behaviors.

Koci Marginality Index (KMI). This five-item Likert scale is an abbreviated version of the KMI-95 and KMI-70. It assesses women’s marginality—their perception of living on the periphery of the social center. Women answer five questions with responses from strongly disagree to strongly agree. Scores range from 5 to 25, with higher scores indicating being more marginalized. One question states, “Meeting new people is hard for me”. Internal consistency (Cronbach alpha coefficient) of the KMI-70 was 0.96 ($n = 244$).²³

General Self-Efficacy Scale. This 10-item instrument assesses a general sense of perceived self-efficacy to predict coping and adaptation after stressful life events. Responses to each item are on a four-point scale from 1 (not at all true) to 4 (exactly true). One item is “I am confident that I could deal efficiently with unexpected events.” Responses are summed. The possible range of scores is 10 to 40. Criterion-related validity is well documented. In samples from 23 countries, Cronbach’s alphas ranged from 0.76 to 0.90, with the majority in the high 0.80s.²⁴

Norbeck Social Support Questionnaire. The six-item instrument measures functional properties of social support (e.g., emotional and tangible support) and network properties (e.g., stability of relationships, frequency of contact) and the amount of support from specific sources (e.g., relatives, friends). Respondents indicate the support they perceive from each person on their network list using a five-point rating scale, with a range from 0 for no support through 4 for lot of support. Construct and concurrent validity are established on samples of employed adults. Internal consistency was established with Pearson correlations.^{25–27} After completion of the standard questions, we added a question asking if the abused mother had shared the violence with the individual.

Danger Assessment Scale. This 19-item questionnaire, with a yes/no response format, assesses potential risk for becoming a femicide victim. All items refer to risk factors that have been associated with murder in situations involving

abuse. One question is, “Has the physical violence increased in severity or frequency?” Convergent construct validity of the instrument is supported by correlations in the moderately strong range, with instruments measuring severity and/or frequency of abuse.²⁸ Validity, in terms of differentiating groups, is supported by the finding of different means in seven groups of women with different histories of abuse.²⁸ Initial reliability was 0.71²⁹ and ranged from 0.60 to 0.86 in five subsequent studies.²⁸ Weighted scoring results in four ranges of danger: a score of < 8 indicates variable danger; 8–13, increased danger; 14–17, severe danger; and ≥ 18 , extreme danger.

Severity of violence against women scale. This 47-item instrument measures threats of abuse (19 items) and physical abuse (28 items). Physical abuse items include 6 items on sexual abuse, scored separately. One example of behavior that represents threat is “How often has (name of abuser) threatened to hurt you?” A four-point scale indicates how often the behavior occurred (1 = never; 2 = once; 3 = two to three times; and 4 = four or more times). Initial consistency reliability estimates ranged from 0.92 to 0.96.³⁰ Subsequent estimates were 0.89 to 0.91 for threats of abuse and 0.91 to 0.94 for assault.^{31,32} For this study, coefficient alpha was 0.95 for the total scale, 0.90 for Threats of Abuse Subscale, 0.93 for Physical Abuse Subscale, and 0.84 for Sexual Abuse Subscale.

Adverse Childhood Experiences (ACE). The ACE module is a 10-item scale that measures a variety of negative household experiences, including childhood abuse (sexual and physical), domestic violence, and household drug and alcohol abuse. Participants are asked whether they have experienced a particular event as a child. Higher scores indicate a greater number of adverse childhood experiences.^{33,34}

Statistical analysis

A set of potential predictors were selected a priori to be tested to examine if they could significantly predict a positive screen for PTSD at 8 months following entry to the study. The variables chosen were consistent with prior analyses that found links between PTSD severity and severity of abuse, danger for murder, depression, anxiety, social support, and resiliency factors.⁴ The relationship between each predictor variable and clinical levels of PTSD symptoms at 8 months were assessed by univariable categorical regression (Table 2). Continuous variables were modeled using nonmonotonic cubic spline scaling with 4–5 interior knots based on preliminary inspection of receiver operating characteristic (ROC) curve analysis showing nonlinear relationships between the continuous predictors and outcomes.³⁵ Beta weights associated with simple nonmonotonic categorical regression are shown in order to provide standardized values that can be assessed as a measure of effect size and to aid in comparison with the continuous variables. Consistent with methods recommended by numerous authors, potential predictors were not eliminated based on the significance level of univariable analysis.^{36–38} Instead, in order to identify the subset of predictors with the highest prognostic ability for long-term PTSD symptoms, categorical regression using optimal scoring and lasso (L_1) penalization was employed.³⁹

TABLE 2. DESCRIPTIVE STATISTICS AND BIVARIATE ANALYSES FOR SUSTAINED POSTTRAUMATIC STRESS DISORDER AT EIGHT MONTHS

	<i>Negative screen</i>		<i>Positive screen</i>		p	<i>Beta</i>	p
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>			
ACE total score	3.97	2.81	5.21	2.53	***	0.278	***
Threats score	40.15	12.95	44.18	13.39	*	0.237	***
Physical abuse score	35.21	13.14	37.78	14.34	++	0.147	***
Sexual abuse score	8.29	3.67	8.97	4.51	++	0.165	***
Danger assessment	15.26	6.75	17.20	7.00	*	0.145	***
Woman's age	29.91	7.54	32.06	7.80	*	0.165	***
Emotional support	3.50	0.48	3.18	0.75	***	0.198	***
Tangible support	3.20	0.79	2.99	0.90	*	0.152	***
Support regarding abuse	3.32	1.00	3.11	1.19	++	0.124	***
Safety behaviors	3.31	1.63	3.80	1.66	*	0.162	***
General self-efficacy	31.78	5.98	30.04	5.77	*	0.199	***
Marginalization	12.82	5.18	13.98	5.55	+	0.155	***
PTSD symptomatology	4.54	1.87	5.97	1.40	***	0.423	***
	n	%	n	%	p	<i>Beta</i> ^a	p
Childhood physical abuse	60	34.5	57	50.4	**	0.159	***
CSA – touched	61	35.1	59	52.2	**	0.170	***
CSA – forced to touch	37	21.3	42	37.2	***	0.174	***

Bivariate relationships were assessed linearly (using Mann-Whitney U tests due to non-normal distributions) for continuous variables (shown as median [interquartile range]). For categorical variables, bivariate relationships were assessed using crosstabs with chi-squared tests and are shown as *n* (%). Betas are shown for simple categorical regression with nonmonotonic cubic spline scaling with three interior knots for continuous variables, and for categorical variables, nominal dummy coding was used.

[†]*p* < 0.20, ^{††}*p* < 0.10, **p* < 0.05; ***p* < 0.05, ****p* < 0.001.

ACE, Adverse Childhood Experiences module; CSA, Childhood Sexual Abuse; PTSD, Post-traumatic stress disorder.

L₁-penalizing methods shrink the estimates of the regression coefficients toward 0 relative to the maximum likelihood estimates in order to reduce over fitting arising from small samples, collinearity, and high dimensionality. The amount of shrinkage is determined by the tuning parameter λ₁, which is progressively increased to the value that shrinks all regression coefficients to 0. The least absolute shrinkage and selection method allows assessment of the relevance and robustness of individual explanatory variables but produces biased estimates for the regression coefficients. Therefore, once the optimal selected predictors were obtained using the lasso with 0.632 bootstrap (100 samples), final model coefficients and scoring were conducted using categorical regression with optimal scoring.

Next, standard multiple logistic regression was used to obtain the predicted probability of a positive screen for PTSD at 8 months from the score obtained from combining the set of optimal predictors into a regression equation. Model discrimination was assessed by the area under the curve (AUC) and the discrimination slope. Model calibration was assessed using the Hosmer-Lemeshow test and by assessing the stratification capacity.⁴⁰ Within sample model validation was addressed by bootstrapping the AUC and reporting the values and 95% confidence interval (CI) along with estimated minimum and maximum values to maximize statistical efficiency.⁴¹ Out-of-sample validation was conducted by predicting PTSD at 16 months. The stratification capacity of the out-of-sample is reported along with the Hosmer-Lemeshow test and the AUC (with bootstrapping). Analyses were completed using both IBM SPSS version 22 and Medcalc version 13.

Predictors were further examined using CATREG optimization in order to create the most parsimonious predictor tool to account for the greatest amount of significance while being mindful of number of items, scoring simplicity, and availability to reproduce survey items. All 16 predetermined predictor variables were entered into each categorical regression with optimal scoring and lasso (L₁) penalization.⁴⁰ All predictors were allowed to be nonmonotonic and cubic splines were used for continuous predictors. Knots were placed by the CATREG program in IBM® SPSS® Statistics 21, which uses procedure-determined placement of the interior knots.⁴² The predictors identified in the optimal model (determined by applying iterative λ₁ penalizations using 0.632 bootstrap and identifying the iteration with the smallest estimate for the expected prediction error in the standardized data, as described in the methods section) were retained. A second round of modeling was done using the same procedure with only the variables from the optimal model in order to determine if a more parsimonious optimal model could be found. Once a stable set of predictors was established, continuous variables were discretized into groups with uniform distribution in order to create categories that could be scored in a tool developed for front-line providers. The number of categories ranged from four to six based on the number of categories that optimized that R² of the overall model. The final predictors were then entered into a categorical regression with no penalization. Both the categorical predictors and discretized continuous variables were entered nonmonotonically. Beta weights and the optimal scores for each category of each predictor were multiplied in order to create a regression equation for each model. These

values were linearly transformed in the final tools in order to eliminate negative values and decimal places $\{[(\text{quantification score} \times \beta) + 1] \times 100\}$.

Results

Sample

Data was collected at baseline and 8 months and 16 months later. A total of 289 (96%, 140 shelter; 149 DA) mothers were retained to 16 months. Ages at baseline ranged from 18 to 52 years (mean 30.76; standard deviation 7.70). Over half of the sample identified as Spanish or Hispanic (61.2%) and 36% of the sample were immigrants to the United States (Table 1).

Model development

Preliminary analyses found no differences in the relationships between predictor variables and screening positive for PTSD 8 months following initial contact with service providers across groups (e.g., DA, Shelter), and a single model was developed to create a rapid assessment tool for prolonged PTSD symptomatology. A summary of the simple bivariate relationships and descriptors of key predictors is outlined in Table 2. As shown, the majority of predictors tested were associated with a positive screen for PTSD at 8 months with significance levels ranging from approaching significance (e.g., $p < 0.20$) to highly significant ($p < 0.001$).

A summary of the final predictors is outlined in Table 3. As shown, the final predictor tool consists of 4 key measures: adverse childhood experiences, emotional support, general self-efficacy, and total PTSD symptom counts at baseline. The final scores after transformation are shown in the final rapid assessment tool (see Fig. 1). Final model beta coefficients and associated model statistics, including the AUC, are presented in Table 3. The AUC predicting a positive screen for PTSD at 8 months was high (0.804) good model discrimination. After 2000 cycles of bootstrapping, the average reduction in AUC was 0.002 (95% CI change < 0.01), suggesting very minimal overfitting. Furthermore, the dis-

TABLE 3. MODEL COEFFICIENTS AND PERFORMANCE

	Beta	SE	p
ACE	0.20	0.05	***
Emotional support	0.16	0.05	***
General self-efficacy	0.16	0.04	***
PTSD symptomatology	0.34	0.06	***

Model Summary

F	6.65***
R ²	0.271
Adjusted R ²	0.231
Hosmer-Lemeshow chi-squared (p)	4.69 (0.790)
AUC (95% CI)	0.804 (0.751, 0.856)
Bootstrap AUC (95% CI) ^a	0.802 (0.748, 0.853)

Coefficients are standardized, estimate of SE (bootstrap 1,000).

^aBootstrap sample = 2,000, random seed. Web program developed by Skalská and Freylich⁴¹ was used.

*** $p < 0.001$.

AUC, area under the curve; CI, confidence interval; PTSD, posttraumatic stress disorder; SE, standard error of the mean.

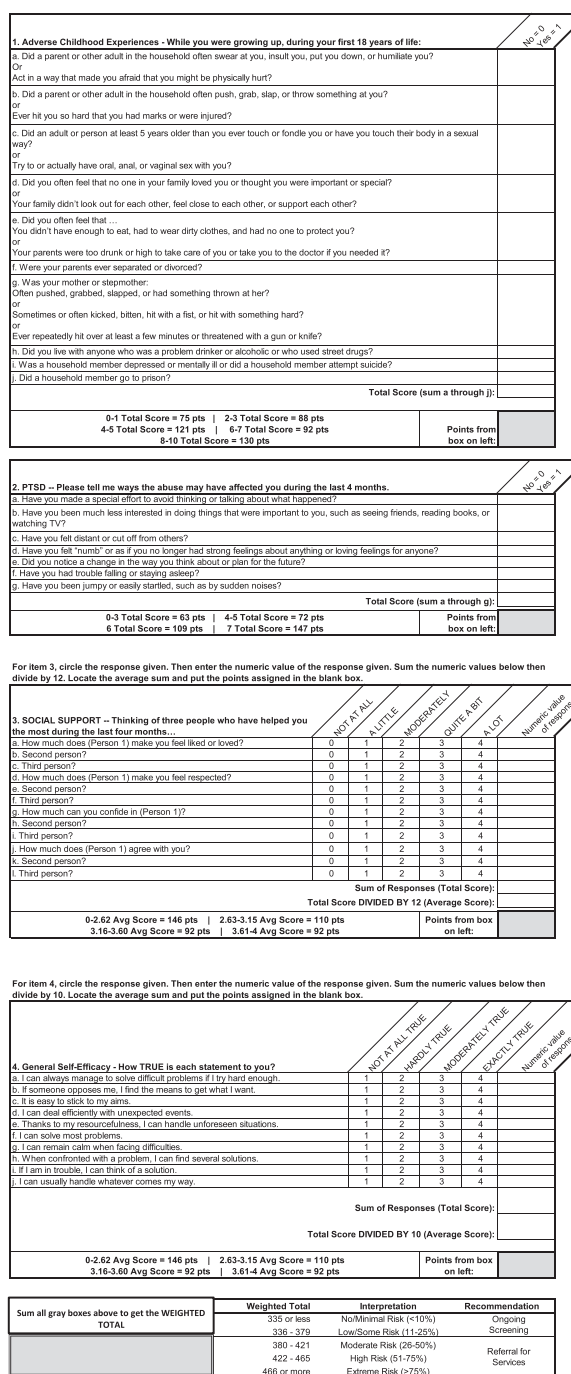


FIG. 1. Rapid Assessment Tool to predict risk for sustained PTSD symptoms.

crimination coefficients, or in other words, the absolute difference in the average prediction for positive and negative PTSD screens at 8 months was 27.3% (standard error [SE]=2.9%, $p < 0.001$). Mothers with sustained PTSD had significantly higher average predicted probabilities than mothers who did not have clinical level PTSD symptoms.

As shown in Table 4, the final model predicted a positive PTSD screen at 8 months into clinically relevant risk categories, indicating good model calibration. As shown, none of the mothers who had a low predicted probability (<10%) had a positive screen for PTSD. Conversely, 91% of mothers who

TABLE 4. RISK STRATIFICATION TABLE ASSESSING MODELS BY PREDICTED PROBABILITIES

Predicted probabilities	n (%)	Positive screen, n (%)	Negative screen, n (%)	Sensitivity % (LR+)	Specificity % (LR-)
8 Months					
<10%	23 (8.0%)	0 (0%)	23 (100.0%)	–	–
10%–25%	79 (27.3%)	14 (17.7%)	65 (82.3%)	100 (1.17)	14.29 (0)
26%–50%	63 (21.8%)	23 (36.5%)	40 (63.5%)	86.54 (1.91)	54.66 (1.91)
51%–75%	65 (22.5%)	38 (58.5%)	27 (41.5%)	64.42 (3.14)	79.50 (.45)
>75%	35 (12.1%)	29 (82.9%)	6 (17.1%)	27.88 (7.48)	96.27 (.75)
16 Months (validation)					
<10%	23 (8.0%)	2 (8.7%)	21 (91.3%)	–	–
10%–25%	79 (27.3%)	9 (11.4%)	70 (88.6%)	97.65 (1.11)	11.67 (.20)
26%–50%	63 (21.8%)	24 (38.1%)	39 (61.9%)	87.06 (1.76)	50.56 (.26)
51%–75%	65 (22.5%)	29 (44.6%)	36 (55.4%)	58.82 (2.12)	72.22 (.57)
>75%	35 (12.1%)	21 (60.0%)	14 (40.0%)	24.71 (3.18)	92.22 (.82)

LR+, positive likelihood ratio; LR-, negative likelihood ratio.

were classified as being high risk (predicted probability >75%) had a positive screen for PTSD at 8 months following initial contact.

Model validation

In order to validate the newly developed rapid assessment tools, obtained predicted probability from the tool were used to predict a positive PTSD screen at 16 months following initial contact. ROC analysis indicated that scores from the developed screening tool could significantly predict a positive PTSD screen at 16 months (AUC = 0.730, *p* < 0.001). Additionally, after 2,000 cycles of bootstrapping, the average reduction in AUC was 0.001 (95% CI change < 0.01), suggesting minimal overfitting of the model. The Hosmer-Lemeshow test demonstrated adequate calibration ($\chi^2(10) = 10.57, p = 0.227$). As also shown in Table 4, only 2 of the 23 mothers classified as low risk (predicted probability < 10%) screened positive for PTSD at 16 months following initial contact (8.7%). Additionally, 60.0% of the 35 mothers who were classified into the highest risk category (predicted probability > 75%) screened positive for PTSD at 16 months. Overall the validation model suggests excellent sensitivity and specificity for mothers who screen as lower risk (predicted probability of < 10%, 10%–25%, and 26%–50%). For mothers who screen higher risk (51%–75% and > 75%) the model slightly overestimates the mother’s risk of sustained PTSD. Finally, the discrimination coefficient for positive and negative PTSD screens at 16 months was 20.4% (SE = 3.2%, *p* < 0.001). Mothers with sustained PTSD had significantly higher average predicted probabilities than mothers who did not have clinical level PTSD symptoms.

Scale administration

Professionals and trained para-professionals can easily administer, score, and interpret the final screening tool (Fig. 1). To administer, each question should be read aloud by the person administering the tool and responses noted and scored on the provided scoring sheet. Within each set of items, scores should be summed or averaged as described, and then interpreted according to the range of weighted values provided. To create a total score, sum the weighted value of each subscale. Recommendations are provided based on total scores.

Results

This study outlined the development of a new rapid-assessment screening tool to predict prolonged PTSD (defined as a positive screen for PTSD 8 months following initial contact with either a shelter or the DAs office) among a sample of mothers seeking abuse-related support for the first time. Additionally, the newly developed tool was validated on the same sample across a different time point, indicating that the rapid assessment tool appears to be capable of accurately predicting long-term PTSD symptoms up to at least 16 months following initial contact with services providers.

Discussion

The PTSD predictor tool, consisting of 4 scales that can be used without payment, will allow for the assessment of mothers when they first seek assistance for intimate partner violence. Once identified those at greatest risk for clinical level PTSD symptoms many months after the trauma can be referred for intervention to prevent or treat PTSD. This tool contributes to meeting the need identified by the NIMH¹ to identify survivors of trauma at greatest risk for sustained PTSD.

While the participants of this study were a group of mothers who sought assistance for intimate partner violence for the first time it is likely that this predictor tool may be useful in other populations, for instance those who are identified through screenings rather than self-identified, and in settings other than DAs offices and women’s shelters. The Institute of Medicine Committee Report titled *Clinical Preventive Services for Women* (Recommendation 5.7)⁴³ recommendation that healthcare providers screen all women for interpersonal and domestic violence raises the issue of what to do when women screen positive for violence. The PTSD symptom predictor tool may help providers to determine who should be referred for intervention services, particularly mental health services.

Limitations include that the tool has only been tested in one population. There is a need for ongoing evaluation and possibly refinement of the tool. A second limitation is that a gold standard for measuring PTSD, such as the Clinician-Administered PTSD Scale for DSM-5,⁴⁴ was not used to measure PTSD. However the Post-Traumatic Stress Disorder

Scale¹⁶ has been widely used and has established reliability and validity. Despite limitations, the tool provides researchers and front-line social and health professionals with a way to identify those at highest risk for sustained PTSD, as recommended by the NIMH workgroup¹. It responds to Kessler et al.'s call to develop and test predictor tools in specific populations.¹⁴ Using this tool to identify mothers at high risk for sustained PTSD and entering them into intervention programs may protect mothers and children from negative outcomes and promote health and wellbeing. Recommendations for future research include evaluating the tool using a gold standard measure of PTSD and evaluating it in other populations.

To our knowledge, this is the first tool that predicts PTSD based on data collected when mothers first seek assistance. The predictors identified in the tool are consistent with risk factors for PTSD identified by experts in the NIMH workgroup¹ and others. For example, Ham-Rowbottom et al. and Kessler et al. also found that sustained PTSD was associated with a history of childhood abuse.^{6,14} Kessler et al. found that previous PTSD was associated with sustained PTSD following new trauma.¹⁴ The consistency with these research findings, and with others not alluded to for reasons of parsimony, adds to our confidence that this tool will be effective in identifying those most at risk for sustained PTSD. Additional strengths are that the tool was developed using longitudinal data and that it was tested over two time periods. Finally, this tool may contribute to the implementation of the Affordable Care Act requirement that free screening and brief counseling for partner violence be provided to women as part of preventive services. Miller et al.⁴⁵ outline a systems approach to screening and counseling and identify the need for evidence-informed IPV screening. Implementation of this tool may be one part of providing evidence-informed IPV screening in a cost effective manner that supports quality care. We hope that implementing the tool will result in mothers receiving needed services that improve their lives and the lives of their children.

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Author Disclosure Statement

No competing financial interests exist.

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