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Posttraumatic Stress Symptoms and the Quality of Maternal-Child Interactions in Mothers of Preterm Infants

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Abstract

Objective: To examine associations between maternal trauma exposure, posttraumatic stress symptoms, and directly observed maternal-child interactions among a diverse cohort of mother-preterm infant dyads at 12-months corrected age.

Methods: We conducted a retrospective cohort study. Maternal trauma exposure and posttraumatic stress symptoms were measured using the Modified Posttraumatic Stress Disorder Symptom Scale at baseline, 6, and 12 months. The primary outcome was directly observed maternal-child interactions at 12 months corrected age, using the Coding Interactive Behavior Manual. We used linear regression models to estimate the associations between trauma exposure, posttraumatic stress symptoms (and symptom clusters), and observer-rated maternal-child interactions.

Results: Among the 236 participants, 89 (37.7%) self-reported as Black and 98 (41.5%) as Latina; mean gestational age of the infants was 31.6 weeks (SD 2.6). Mothers with posttraumatic stress symptoms demonstrated greater maternal sensitivity ($\beta = 0.32$; 95% CI, 0.06 to 0.58; standardized effect size = 0.39) and greater dyadic reciprocity ($\beta = 0.39$; 95% CI, 0.04 to 0.73; standardized effect size = 0.36) compared to those not exposed to trauma; however, we did not observe significant differences between trauma-exposed but asymptomatic women and those not exposed to trauma. Across symptoms clusters, differences in maternal sensitivity and dyadic reciprocity were most pronounced for mothers with avoidance and re-experiencing symptoms, but not hyperarousal symptoms.

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Conclusions: Maternal posttraumatic stress symptoms appear to be associated with the quality of maternal-child interactions at one year of age among a cohort of urban, mother-preterm infant dyads. These findings have implications for strengths-based intervention development.

Clinical Trial Registration: The study is registered at clinicaltrials.gov (NCT01892982).

INTRODUCTION

Nearly half of women in urban communities have been exposed to trauma, and over a third endorse posttraumatic stress symptoms.[1] Among low-income urban women, lifetime rates of posttraumatic stress disorder (PTSD) are as high as 30%.[2] Women of color face a disproportionately higher lifetime risk of PTSD compared to white women.[3] Although nearly three-quarters of women with PTSD are mothers,[4] the impact of trauma and posttraumatic stress symptoms on parenting is not fully understood. The paucity of research on how maternal trauma symptoms impact parenting contrasts to the large amounts of data and understanding concerning maternal depression, parenting, and child outcomes.[5] Given the high prevalence of trauma exposure – and rates of PTSD in certain populations that approach rates of major depressive disorder[6] – there is a need to understand the impact of traumatic experiences and posttraumatic stress symptoms on parenting and children in high-risk communities. Such understanding is necessary to develop effective interventions to support mother-child wellbeing and bolster long-term child outcomes.

The existing literature on maternal PTSD and parenting suggests that parents with posttraumatic stress symptoms experience multiple parenting challenges.[7,8] These challenges include lower parenting satisfaction[9] and insecure parent-child attachment,[10] the latter of which may lead to subsequent child internalizing behavior problems such as depression and anxiety, and externalizing behaviors such as aggression.[8] This literature, however, has been limited by small sample sizes and reliance on self-report measures, which are susceptible to reporting bias from those whose symptoms likely impact how they describe interactions with their children.[11] Among the few investigations that have examined associations between maternal PTSD and objectively observed maternal-child interactions, correlations between trauma symptoms and maternal interaction styles are inconsistent. While some studies indicate that mothers with greater PTSD symptoms are less responsive,[12] others have found no association between maternal trauma symptoms and parent child interactions.[13,14] In certain cases, evidence even points to the possibility that mothers exposed to trauma demonstrate greater sensitivity and warmth during interactions with their children.[15,16] It is critical to gain better understanding of the quality of maternal-child interactions in the setting of maternal trauma symptoms, given the importance of fostering positive interactions to promote child development and mitigate risk of future psychopathology for children.[17]

We conducted a retrospective cohort study to address the inconsistencies in the literature. Previous work from our group suggested a high prevalence of trauma exposure among

mothers with preterm infants.[18] Given this high prevalence, we sought to examine the association between maternal trauma exposure, posttraumatic stress symptoms, and directly observed maternal-child interactions among a cohort of diverse, urban mother-preterm infant dyads at 12-months corrected infant age. We hypothesized that the most likely direction of association would be that trauma exposure, and related symptoms, would both be independently associated with less optimal maternal-child interactions.

METHODS

Study Design

We embedded a retrospective cohort study of 236 mother-child dyads within pre-existing data from a randomized control trial investigating the effects of a depression prevention intervention among mothers whose preterm infants were hospitalized in neonatal intensive care units (NICUs) within a single metropolitan area. Research staff assessed eligibility and obtained written informed consent. The Boston University Medical Center Institutional Review Board approved the study. In the embedded cohort study, families were followed from the birth of the infant through 12-months corrected age. Details of the problem-solving education (PSE) intervention studied in the parent trial have been previously published.[19]

Sample.—The parent trial enrolled Medicaid-eligible (200% of the federal poverty level in Massachusetts) English or Spanish speaking mothers of singleton or twin gestation infants, born between 26 and 34 weeks gestation. The parent study enrolled this sample from four level III NICUs within academic medical centers. Exclusion criteria among the mothers were current major depressive episode, psychosis, cognitive limitation, suicidal ideation, active substance use, or likely loss of custody of the infant(s) per judgement of the NICU attending. We further excluded families of triplets or higher number gestations, and families of critically ill infants – as determined by the Score for Neonatal Acute Physiology, Perinatal Extension-II (SNAPPE-II), a 9-item chart abstraction instrument highly predictive of illness severity and mortality.[20] Study recruitment occurred from August 2013 to May 2017; follow-up continued through May 2018. Potentially eligible mothers were identified by medical and nursing staff, who informed mothers of the study during inpatient postpartum stays and visits to their hospitalized newborns. Mothers were eligible to enroll during the first two weeks post-partum. A total of 325 dyads were enrolled in the parent trial. Among all eligible participants, mothers enrolled in the study were similar to those unenrolled with respect to age, race, ethnicity, insurance, type of delivery, and gestational age of infant. For the parent trial, randomization occurred in strata defined by medical center and infant gestational age. The PSE intervention was delivered in the early postpartum period and completed within 3 months of enrollment. The mean number of PSE sessions delivered was 3.12 (SD 2.25). The analytic sample for the current study included all dyads who completed assessments of maternal-child interactions at 12-months corrected age (N=236).

Measures and Outcomes

Maternal exposure to trauma and posttraumatic stress symptoms were measured using the Modified PTSD Symptom Scale (MPSS), a psychometrically valid 17-item scale of both frequency and severity of PTSD symptoms in the past two weeks. The MPSS

includes a single stem question asking respondents to describe a referent trauma for the symptoms.[21] The scale does not specifically measure timing or chronicity of trauma(s). Trained research assistants administered the scale at baseline, and again at 6 and 12-months post randomization (corresponding to 6 and 12-months infant chronological age); they also recorded interim traumatic events via the stem question. Since the MPSS was designed to be consistent with Diagnostic and Statistical Manual of Mental Disorders Fourth Edition (DSM-IV) criteria for PTSD, DSM-IV (rather than DSM-V) criteria were applied to delineate trauma symptomatology in clinical categories corresponding to avoidance, re-experiencing, and hyperarousal symptoms.

The primary outcome of interest for this study was maternal-child interactions at 12-months corrected infant age, assessed using the Coding Interactive Behavior (CIB) Manual.[22] The CIB is a collection of 43 codes that aggregate into psychometrically sound composites, validated in preterm populations.[23] The CIB uses a 5-point scale for rating mother, infant, and dyadic behaviors that are likely to promote or inhibit emotional regulation in the child and dyad, and has shown sensitivity to variations in maternal and child interactive behavior related to social-emotional risks including anxiety, depression, and trauma.[24]

Ten-minute mother-infant free play sessions were videotaped in the home and microcoded by master-coders masked to intervention arm. To prevent unblinding of examiners, the free play interaction videos were sent to master-coders with no affiliation to the overall study team. The master coders were trained to research reliability, supervised directly by the developer of the scale, and blinded to treatment assignment and other subject information. Master coders assessed the following composites: maternal sensitivity, which comprises codes related to mother's adaptation to infant signals, vocal warmth, continuous gaze, range of affect, style consistency, and supportive presence; intrusive maternal interactions, which comprises individual codes related to overriding behavior, physical manipulation, hostility and mother-led exchanges; maternal withdrawn behavior which comprises codes for maternal depressed mood and positive affect; child social involvement, which comprises codes for infant alertness, fussiness, social initiation, vocalization, gaze maintenance and affect; child positive emotionality, which comprises codes related to positive affect; and dyadic reciprocity, which includes measures of synchronous dyadic interaction.

Additional data on sample descriptors and potential confounders were collected through verbal survey administration and included mothers' age, education, insurance status, presence of a partner living in the home, number of children, race, and ethnicity. Medical record abstraction was used to ascertain infant gestational age and birth weight, and infant severity of illness via the SNAPPE-II. Social support was ascertained at baseline, 6, and 12 months using the Medical Outcomes Survey Social Support.[25] We calculated an overall social support index for the present analysis by averaging social support scores over the study period. We assessed depressive symptoms at baseline and bimonthly through 12 months with the Quick Inventory of Depressive Symptomatology (QIDS), and defined moderate depressive symptomatology as a QIDS score of 11 or greater (the most commonly used cutpoint for the instrument).[26] Mental health service use during the study period was measured using the services section of the Collaborative Psychiatric Epidemiology Survey,[27] which was administered bimonthly.

Statistical Analysis

We conducted our analyses using SAS version 9.4 (SAS Institute, Cary, NC). We categorized all mothers into three mutually exclusive categories: those not exposed to trauma, those exposed to trauma but asymptomatic, and those exposed to trauma and symptomatic. We defined participants as trauma-exposed if they identified a traumatic exposure via the MPSS stem question. Among participants with trauma exposure, we defined participants as symptomatic if they met symptom criteria for any symptom cluster (e.g., re-experiencing, avoidance, or hyperarousal symptoms) as defined by DSM-IV during the course of the study (baseline, 6-months, or 12-month assessments). To assess the associations of specific symptom clusters with maternal-child interactions, we disaggregated data into symptom clusters and repeated the analysis.

We used linear regression models to estimate the association between trauma exposure, posttraumatic stress symptoms, and mother-child interaction scores. We defined the trauma unexposed group as the referent group. We identified covariates for multivariable models based on clinical relevance (e.g., prematurity), and previous literature that suggested potential associations between trauma exposure, symptoms, and outcomes. These covariates included infant gestational age as well as maternal education (less than high school graduate vs high school graduate), single parent household, first-time mother, maternal depression (QIDS score   11), and maternal mental health services use (since birth of the infant). We included social support given its relevance to maternal mental health and child outcomes.[28] We also included randomized intervention arm from the parent trial in all our models. We used infant gestational age as a proxy for severity of child illness due to missing SNAPPE-II data among 23 participants. As a confirmatory check, we reran all our multivariable models with SNAPPE-II data. We calculated standardized effect sizes as the adjusted difference between groups divided by the pooled standard deviation. To communicate our findings to a clinical audience, we classified standardized effect sizes as small (standardized effect size =0.2), medium (standardized effect size = 0.5), or large (standardized effect size = 0.8) following established standards.[29]

Given prior research that having a preterm birth can be experienced as a traumatic event,[30] we conducted supplementary analyses that presupposed that there were no trauma unexposed mothers. To operationalize that, we combined trauma exposed asymptomatic mothers with those reporting to be unexposed into a single asymptomatic exposure group. We used linear regression models with the same set of covariates to estimate the association between trauma symptoms and mother-child interaction scores.

Because the sample size for the present analysis was determined by parent trial, we performed no a priori power calculations. Instead of providing post hoc power calculations, we provide point estimates and 95% confidence intervals for all our regressions. It should be noted that our sample is significantly larger than prior studies we found that used the CIB among preterm populations.[23,31]

RESULTS

Sample Characteristics

Our sample included 236 dyads with complete baseline data enrolled in the parent trial. The mean maternal age was 30.3 years (SD 6.4); 89 mothers (37.7%) self-reported as Black and 98 (41.5%) as Latina. Of the full cohort of women at baseline, 104 (44.8%) reported history of trauma exposure and 65 (28.0%) were symptomatic with posttraumatic stress symptoms in at least one of the three symptom clusters (Table 1). Trauma exposure and posttraumatic stress symptoms were also assessed when infants were 6 and 12 months of age. Across these two time points, an additional 34 (14.4%) participants, over and above baseline, were symptomatic in at least one symptom cluster, resulting in a total of 99 (41.9%) participants symptomatic at any assessment. The final proportion of symptomatic mothers by symptom cluster was 48 (20.3%) with avoidance symptoms, 92 (39.0%) with re-experiencing symptoms, and 60 (25.4%) with hyperarousal symptoms. A total of 260 unique traumatic events were endorsed by the 157 (66.5%) mothers reporting lifetime exposure to trauma. The most commonly reported traumas included pregnancy related complications, death of a family member, history of child maltreatment, and intimate partner violence (Table 2). The number of traumatic experiences endorsed by participants ranged from 1 to 4 with an interquartile range of 1.

CIB

Among all participants, mean scores and standard deviations for the CIB composites were as follows: maternal sensitivity 3.84 (0.83); maternal intrusiveness 2.28 (0.94); mother withdrawal 1.77 (0.86); child social involvement 3.30 (0.52); child positive emotionality 3.50 (0.95); and dyadic reciprocity 3.22 (1.10). The CIB scales showed good internal consistency in the sample (maternal sensitivity α=0.93; intrusiveness α=0.77; withdrawn maternal interactions α= 0.83; child social involvement α=0.66; child positive emotionality α= 0.77; dyadic reciprocity α=0.98). Mean composite scores and internal consistency are similar to previous studies utilizing the CIB among preterm populations.[24]

Maternal Trauma Exposure, Overall Posttraumatic Stress Symptoms, and Maternal-Child Interactions

In bivariate comparisons, trauma-exposed symptomatic mothers demonstrated greater maternal sensitivity (3.97 vs. 3.67, p=.01) and greater dyadic reciprocity (3.43 vs. 3.06, p=.03) compared to trauma unexposed mothers. There were no significant differences in maternal-child interactions between trauma-exposed, asymptomatic mothers and trauma unexposed mothers.

In the multivariable models, trauma-exposed symptomatic mothers demonstrated greater maternal sensitivity (β = 0.32; 95% CI, 0.06 to 0.58; small to medium standardized effect size, 0.39) and greater dyadic reciprocity (β = 0.39; 95% CI, 0.04 to 0.73; small to medium standardized effect size, 0.36) (Table 3) compared to trauma unexposed mothers. We found no statistically significant differences in maternal-child interactions between trauma-exposed, asymptomatic mothers and trauma unexposed mothers.

Maternal Trauma Exposure, Posttraumatic Stress Symptom Clusters, and Maternal-Child Interactions

In bivariate comparisons, mothers reporting avoidance symptoms demonstrated greater maternal sensitivity (4.17 vs. 3.67, p <.001), decreased maternal intrusiveness (1.98 vs. 2.38, p= .02) and greater dyadic reciprocity (3.68 vs. 3.06, p=.002) compared to trauma unexposed mothers. Mothers reporting re-experiencing symptoms also demonstrated greater maternal sensitivity (4.02 vs. 3.67, p=.005) and greater dyadic reciprocity (3.49 vs. 3.06, p=.009) compared to trauma unexposed mothers. There were no significant differences in maternal-child interactions between mothers reporting hyperarousal symptoms and trauma unexposed mothers. Across all three symptom clusters, there were no significant differences between trauma-exposed, asymptomatic mothers and trauma unexposed mothers.

In multivariable models, mothers reporting avoidance symptoms demonstrated greater maternal sensitivity (β = 0.52; 95% CI, 0.20 to 0.84; medium to large standardized effect size, 0.65), decreased maternal intrusiveness (β = −0.44; 95% CI, −0.81 to −0.07; small to medium standardized effect size, −0.47), and greater dyadic reciprocity (β = 0.64; 95% CI, 0.22 to 1.07; medium to large standardized effect size, 0.60) compared to trauma unexposed mothers (Table 4a). Mothers reporting re-experiencing symptoms also demonstrated greater maternal sensitivity (β = 0.37; 95% CI, 0.10 to 0.63; small to medium standardized effect size, 0.45) and greater dyadic reciprocity (β = 0.46; 95% CI, 0.11 to 0.81; small to medium standardized effect size, 0.43) compared to trauma unexposed mothers (Table 4b). There were no statistically significant differences between mothers reporting hyperarousal symptoms and trauma unexposed mothers (Table 4c). Across symptom clusters, we found no statistically significant differences in maternal-child interactions between trauma-exposed, asymptomatic mothers and trauma unexposed mothers (Tables 4a, 4b. 4c). Full regression models for all multivariable models are included (Supplemental Tables 1 and 2, Supplementary Digital Content 1 and 2). Of note, intervention arm was not significant in any of the models.

Maternal Posttraumatic Stress Symptoms and Maternal-Child Interactions

In supplementary analyses with trauma unexposed and trauma exposed asymptomatic mothers combined into a single asymptomatic group, mothers with any posttraumatic stress symptoms demonstrated greater maternal sensitivity (β = 0.25; 95% CI, 0.02 to 0.48; small to medium standardized effect size; 0.31) and greater dyadic reciprocity (β = 0.37; 95% CI, 0.07 to 0.67; small to medium standardized effect size, 0.35) compared to trauma unexposed/asymptomatic mothers. Among symptom clusters, mothers with avoidance symptoms demonstrated greater maternal sensitivity (β = 0.42; 95% CI, 0.14 to 0.70; medium to large standardized effect size; 0.52), decreased maternal intrusiveness (β = −0.40; 95% CI, −0.72 to −0.07; small to medium standardized effect size; −0.42), and greater dyadic reciprocity (β = 0.57; 95% CI, 0.20 to 0.94; medium to large standardized effect size; 0.54) compared to trauma unexposed/asymptomatic mothers. Mothers with re-experiencing symptoms demonstrated greater maternal sensitivity (β = 0.31; 95% CI, 0.08 to 0.54; small to medium standardized effect size; 0.38), decreased maternal intrusiveness (β = −0.27; 95% CI, −0.53 to −0.01; small to medium standardized effect size; −0.29), greater child social involvement (β = 0.17; 95% CI, 0.03 to 0.32; small to medium standardized

effect size; 0.33) and greater dyadic reciprocity (β = 0.46; 95% CI, 0.16 to 0.76; small to medium standardized effect size; 0.43) compared to trauma unexposed/asymptomatic mothers. There were no statistically significant differences between mothers reporting hyperarousal symptoms and trauma unexposed/asymptomatic mothers (Supplemental Table 3, Supplemental Digital Content 3).

DISCUSSION

In our sample of mother-preterm infant dyads, mothers with posttraumatic stress symptoms demonstrated increased sensitivity and reciprocity with their infants at 12 months corrected age, compared to mothers with no trauma history. These findings applied when posttraumatic stress symptoms were aggregated across symptom clusters but were most pronounced among those with avoidance and re-experiencing symptoms. Notably, there were no differences in maternal-child interactions between trauma-exposed, asymptomatic mothers and trauma unexposed mothers.

Collectively, these results suggest that in a biologically vulnerable population of preterm infants born to mothers experiencing social adversity, maternal posttraumatic stress symptoms are associated with the quality of maternal-child interactions at one year of age. The standardized effect sizes demonstrated in the present study are consistent with differences in magnitude found in prior work that compared mothers with and without severe addiction,[32] and would be conventionally classified as a medium effect size.[29]

While these results may be viewed as counterintuitive, it is important to note that our findings are consistent with previous findings suggesting possible associations between trauma exposure and parenting strengths.[15,16] There are several possible explanations for these findings. While there is an abundance of research on the negative effects of trauma, there is emerging theory and empiric evidence on the phenomenon of "posttraumatic growth" – personal growth and positive psychological changes following traumatic experiences, which include increased compassion and prosocial behavior.[33] In particular, there is increasing interest in the relationship between traumatic experiences and elevated empathy[34] given evidence that traumatic experiences may increase an individual's attention to emotion.[35] Extending this thinking to the present study, it is possible that mothers who experience symptoms associated with trauma are also more attuned to their infants' cues, leading to increased sensitivity and reciprocity on objective measures of dyadic interaction.

Moreover, research on posttraumatic growth has highlighted that the presence of posttraumatic stress symptoms, and in particular avoidance symptoms,[36] following trauma exposure is associated with posttraumatic growth.[37] These results and the present study underscore the importance of moving beyond binary categories of trauma-exposed versus unexposed towards assessment of posttraumatic stress symptoms and symptom clusters to advance our understanding of parenting and posttraumatic growth. In our sample, avoidance and intrusive symptoms clusters, but not hyperarousal symptoms, were associated with positive maternal child interactions. It is possible that active avoidance of trauma-related stimuli is protective in the context of maternal child interactions and that intrusive symptoms may be more episodic in nature as compared to hyperarousal states.

Although our robust sample size and use of directly observed measures are both strengths, our study has several limitations. The first is that we conducted our study in a population of preterm infants at the specific time of 12 months corrected age, and our findings cannot be extrapolated to other populations of infants and toddlers at other times in the life course. Further, our study was embedded within a randomized control trial of a depression prevention intervention. Thus studying the association between trauma and posttraumatic stress symptoms and maternal child interactions was not the principal purpose of the original study. To account for this, we adjusted all models for the randomly assigned intervention arm and in all those models, as expected, intervention arm was not significant. Moreover, while our study enrolled a representative sample of subjects, the generalizability of findings from randomized control trial participants remains an important concern.

The present study included mothers with heterogeneous trauma backgrounds. While this may increase the generalizability of our findings, it may also contribute to a possible bias towards the null when comparing trauma exposure to outcomes. Although this does not affect the association between symptoms and outcomes, it remains possible that certain traumatic exposures, even in the absence of symptoms, could be associated with differences in maternal-child interactions. Further, while we obtained trauma histories from a valid and reliable PTSD instrument, we did not probe specifically for multiple traumas, timing of exposure, or recurrence. The relationship between timing, chronicity, types of traumatic exposures, and maternal child interactions warrants future study. It should also be noted that our measure of trauma symptoms, the MPSS, was designed to be consistent with DSM-IV criteria and does not reflect current DSM-V diagnostic criteria.

Our findings require confirmation; but should they be replicated, they suggest a potentially promising framework for understanding – and supporting – maternal and child wellbeing among families of trauma-exposed women. Evidence suggests that the intergenerational impact of trauma and adversity on developing neural and physiologic systems begins prior to conception, continues in-utero, and extends into the first years of life.[17,38] Although the underlying mechanisms responsible for intergenerational effects of trauma are not well understood, poor maternal mental health during the first years of life is thought to be linked to negative child outcomes through various risk mechanisms including decreased quality of parent-child interactions, inconsistency of parenting, high stress and family conflict, and low social support.[28] While trauma exposure and its related symptomatology likely exert negative impacts across these mechanisms, accumulating evidence has highlighted the importance of caregiving quality.[39] Our findings therefore suggest a potential point of resiliency in the first year of life for mothers with trauma symptoms. Given that responsive parent interactions can buffer the negative impact of psychosocial adversity on neurodevelopmental outcomes, our findings have implications for developing strengths-based interventions for mothers who have experienced trauma. By recognizing and fostering the sensitive caregiving already provided by mothers experiencing trauma symptoms, programs can build upon existing strengths to promote responsive parent-child interactions and improve children's long-term well-being.

CONCLUSIONS

Our study contributes to the emerging literature on maternal posttraumatic stress symptoms and maternal-child interactions. Given the high prevalence of trauma exposure and related symptoms, these findings have important implications for intervention development.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations:

CIB	Coding Interactive Behavior
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition
DSM-V	Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
MPSS	Modified PTSD Symptom Scale
NICU	neonatal intensive care unit
PTSD	Posttraumatic Stress Disorder

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Table 1.

Baseline Mother and Child Characteristics, n=236

Maternal demographic characteristics	
Age, mean (SD), yr	30.3 (6.4)
First time mother, No. (%)	80 (33.9)
Maternal Race, No. (%)	
Black	89 (37.7)
Asian	1 (0.4)
White	69 (29.2)
Other, including multiracial	77 (32.6)
Latina, No. (%)	98 (41.5)
High School Graduate, No. (%)	207 (87.7)
Single-parent household, No. (%)	78 (33.1)
Social Support[a]	4.3 (0.7)
Maternal mental health measures	
Trauma exposure, No. (%)[b]	104 (44.8)
Trauma exposed and symptomatic, No. (%)[c]	65 (28.0)
Trauma exposed and symptomatic, by symptom cluster, No. (%)	
Avoidance Symptoms	28 (12.1)
Re-experiencing Symptoms	60 (25.9)
Hyperarousal	39 (16.8)
Maternal Depression[d]	30 (12.8%)
Receipt of mental health services, no. (%)[e]	29 (12.3)
Infant Characteristics	
Gestational age, mean (SD) weeks	31.6 (2.3)
Illness severity, mean (SD)[f]	7.9 (9.9)
Low birth weight (1500 grams)	79 (33.5)
Twin Set	37 (15.7)
Intervention Arm, No. (%)	119 (50.4)

[a]Medical Outcomes Survey Social Support (MOS-SS); Overall social support index represents mean of all items, possible score range 1-5, with higher scores indicating more social support

[b] Modified Posttraumatic Stress Disorder Symptom Scale, Stem Question

[c] Modified Posttraumatic Stress Disorder Symptom Scale, Symptom Thresholds

[d] Quick Inventory of Depressive Symptoms Score ≥ 11

[e] Seen by a mental health professional, psychologist, therapist, or mental health social worker in the month preceding delivery

[f] Score for Neonatal Acute Physiology, Perinatal Extension-II (SNAPPE-II), a 9-item chart abstraction instrument for predicting illness severity and mortality; higher scores indicate more severe illness; data were missing for 23 participants

Table 2.

Lifetime exposure to traumatic events (N = 260 events)

Trauma	Frequency (%)
Rape/sexual assault as an adult	12 (4.6)
Intimate partner violence	26 (10.0)
Physical assault as an adult	10 (3.8)
History of child maltreatment, inclusive of physical and sexual assault	26 (10.0)
Witnessed domestic violence as a child	5 (1.9)
Learned traumatic events of relative, close friend (including assault, homicide)	21 (8.1)
Death of a child	6 (2.3)
Death of a family member	35 (13.5)
Pregnancy related complications, including miscarriage	35 (13.5)
Accident, fire, or natural disaster	13 (5.0)
Witnessing someone shot, killed, or seriously injured	21 (8.1)
Do not wish to disclose	15 (5.8)
Other	35 (13.5)

Note: Among our total sample of 236 participants, 157 participants endorsed traumatic events. The number of traumatic experiences ranged from 1 to 4 with an interquartile range of 1.

Table 3:

Maternal-Child Interactions, Trauma Exposure, and Posttraumatic Stress Symptoms

Composite		Trauma Unexposed N=79	Trauma Exposed, Asymptomatic N=58	Trauma Exposed, Symptomatic N=99
Maternal Sensitivity	Mean (Std Dev)	3.67 (0.84)	3.83 (0.85)	3.97 (0.78)
	β (95% CI)	Ref Group	0.15 (−0.13 to 0.44)	0.32 (0.06 to 0.58)
Maternal Intrusiveness	Mean (Std Dev)	2.38 (0.99)	2.37 (1.00)	2.15 (0.86)
	β (95% CI)	---	−0.01 (−0.34 to 0.31)	−0.26 (−0.56 to 0.04)
Mother Withdrawal	Mean (Std Dev)	1.87 (0.92)	1.63 (0.84)	1.77 (0.83)
	β (95% CI)	---	−0.23 (−0.54 to 0.07)	−0.13 (−0.41 to 0.15)
Child Social Involvement	Mean (Std Dev)	3.29 (0.54)	3.24 (0.56)	3.35 (0.49)
	β (95% CI)	---	−0.04 (−0.22 to 0.14)	0.11 (−0.05 to 0.28)
Child Positive Emotionality	Mean (Std Dev)	3.59 (0.93)	3.47 (0.98)	3.45 (0.95)
	β (95% CI)	---	−0.07 (−0.40 to 0.25)	−0.05 (−0.36 to 0.25)
Dyadic Reciprocity	Mean (Std Dev)	3.06 (1.09)	3.09 (1.11)	3.43 (1.07)
	β (95% CI)	---	0.03 (−0.34 to 0.41)	0.39 (0.04 to 0.73)

Table 4:

Maternal-Child Interactions, Trauma Exposure, and Posttraumatic Stress Symptom Clusters

a: Maternal-Child Interactions, Trauma Exposure, and Posttraumatic Stress Avoidance Symptoms

Composite		Trauma Unexposed N=79	Trauma Exposed, Asymptomatic N=109	Trauma Exposed, Symptomatic N=48
Maternal Sensitivity	Mean (Std Dev)	3.67 (0.84)	3.81 (0.82)	4.17 (0.73)
	β (95% CI)	Ref Group	0.16 (−0.08 to 0.40)	0.52 (0.20 to 0.84)
Maternal Intrusiveness	Mean (Std Dev)	2.38 (0.99)	2.34 (0.96)	1.98 (0.77)
	β (95% CI)	---	−0.07 (−0.34 to 0.21)	−0.44 (−0.81 to −0.07)
Mother Withdrawal	Mean (Std Dev)	1.87 (0.92)	1.76 (0.85)	1.64 (0.80)
	β (95% CI)	---	−0.14 (−0.40 to 0.12)	−0.28 (−0.62 to 0.07)
Child Social Involvement	Mean (Std Dev)	3.29 (0.54)	3.27 (0.55)	3.39 (0.44)
	β (95% CI)	---	0.01 (−0.15 to 0.17)	0.17 (−0.03 to 0.38)
Child Positive Emotionality	Mean (Std Dev)	3.59 (0.93)	3.43 (0.99)	3.53 (0.88)
	β (95% CI)	---	−0.10 (−0.39 to 0.18)	0.07 (−0.30 to 0.44)
Dyadic Reciprocity	Mean (Std Dev)	3.06 (1.09)	3.14 (1.08)	3.68 (1.03)
	β (95% CI)	---	0.11 (−0.21 to 0.43)	0.64 (0.22 to 1.07)

b: Maternal-Child Interactions, Trauma Exposure, and Posttraumatic Stress Re-Experiencing Symptoms

Composite		Trauma Unexposed N=79	Trauma Exposed, Asymptomatic N=65	Trauma Exposed, Symptomatic N=92
Maternal Sensitivity	Mean (Std Dev)	3.67 (0.84)	3.78 (0.88)	4.02 (0.74)
	β (95% CI)	Ref Group	0.11 (−0.16 to 0.39)	0.37 (0.10 to 0.63)
Maternal Intrusiveness	Mean (Std Dev)	2.38 (0.99)	2.38 (1.00)	2.13 (0.84)
	β (95% CI)	---	−0.02 (−0.33 to 0.29)	−0.28 (−0.58 to 0.02)
Mother Withdrawal	Mean (Std Dev)	1.87 (0.92)	1.68 (0.91)	1.75 (0.78)
	β (95% CI)	---	−0.18 (−0.48 to 0.11)	−0.17 (−0.45 to 0.12)
Child Social Involvement	Mean (Std Dev)	3.29 (0.54)	3.22 (0.56)	3.37 (0.48)
	β (95% CI)	---	−0.06 (−0.23 to 0.12)	0.14 (−0.02 to 0.31)
Child Positive Emotionality	Mean (Std Dev)	3.59 (0.93)	3.44 (0.99)	3.47 (0.94)
	β (95% CI)	---	−0.11 (−0.43 to 0.20)	−0.02 (−0.32 to 0.29)
Dyadic Reciprocity	Mean (Std Dev)	3.06 (1.09)	3.04 (1.13)	3.49 (1.03)

a: Maternal-Child Interactions, Trauma Exposure, and Posttraumatic Stress Avoidance Symptoms

Composite		Trauma Unexposed N=79	Trauma Exposed, Asymptomatic N=109	Trauma Exposed, Symptomatic N=48
	β (95% CI)	---	−0.01 (−0.32 to 0.35)	0.46 (0.11 to 0.81)

c: Maternal-Child Interactions, Trauma Exposure, and Posttraumatic Stress Hyperarousal Symptoms

Composite		Trauma Unexposed N=79	Trauma Exposed, Asymptomatic N=97	Trauma Exposed, Symptomatic N=60
Maternal Sensitivity	Mean (Std Dev)	3.67 (0.84)	3.92 (0.81)	3.93 (0.82)
	β (95% CI)	Ref Group	0.25 (0.00 to 0.51)	0.24 (−0.06 to 0.53)
Maternal Intrusiveness	Mean (Std Dev)	2.38 (0.99)	2.28 (0.93)	2.15 (0.90)
	β (95% CI)	---	−0.12 (−0.40 to 0.17)	−0.24 (−0.58 to 0.10)
Mother Withdrawal	Mean (Std Dev)	1.87 (0.92)	1.64 (0.79)	1.85 (0.89)
	β (95% CI)	---	−0.24 (−0.51 to 0.02)	−0.04 (−0.35 to 0.28)
Child Social Involvement	Mean (Std Dev)	3.29 (0.54)	3.27 (0.51)	3.36 (0.53)
	β (95% CI)	---	0.01 (−0.15 to 0.17)	0.13 (−0.05 to 0.32)
Child Positive Emotionality	Mean (Std Dev)	3.59 (0.93)	3.44 (0.95)	3.50 (0.97)
	β (95% CI)	---	−0.09 (−0.38 to 0.20)	−0.01 (−0.35 to 0.33)
Dyadic Reciprocity	Mean (Std Dev)	3.06 (1.09)	3.25 (1.09)	3.39 (1.11)
	β (95% CI)	---	0.20 (−0.13 to 0.54)	0.31 (−0.08 to 0.70)