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## **The role of posttraumatic stress and depression symptoms in mother-infant bonding**

Full-length research paper

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## Abstract

**Background:** There is some evidence posttraumatic stress disorder (PTSD) following childbirth may impact on the mother-infant bond. However, the evidence is inconsistent over whether PTSD or co-morbid depressive symptoms are primarily related to impaired bonding. This study therefore aimed to examine the relationship between PTSD symptoms, depressive symptoms and mother-infant bonding.

**Methods:** A cross-sectional online study included 603 mothers of infants aged 1 to 12 months. Measures were taken of PTSD (City Birth Trauma Scale, Ayers et al., 2018) which has two subscales of birth-related PTSD symptoms and general PTSD symptoms; depression (Edinburgh Postnatal Depression Scale, Cox et al., 1987) and mother-infant bonding (Postpartum Bonding Questionnaire, Brockington et al., 2001).

**Results:** Impaired bonding was related to both dimensions of PTSD symptoms and depressive symptoms in bivariate analysis. Path analysis testing the model of whether depressive symptoms mediated the effect of PTSD symptoms on mother-infant bonding found a differential role of birth-related and general PTSD symptoms. Birth-related PTSD symptoms did not have any effect on bonding or depressive symptoms. In contrast, general PTSD symptoms had a direct effect on bonding and an indirect effect on bonding via depressive symptoms.

**Limitations:** Self-report measures of PTSD and depression symptoms were used.

**Conclusions:** Further research regarding different aspects of postpartum PTSD, depression and other disorders in the context of mother-infant bonding are needed. Future preventive programs should focus on diminishing symptoms of postpartum PTSD and depression so that the mother-infant bonding remains optimal.

## Introduction

Poor parental mental health is one of the main risk factors for disrupted parent-infant interactions that may have adverse effect on bonding (Parfitt and Ayers, 2009), child's attachment (Tomlinson et al., 2005; Wan and Green, 2009), socio-emotional and cognitive development (e.g. Grace et al., 2003; Murray et al., 1996; Westbrook and Harden, 2010). It is necessary to distinguish bonding from attachment, where bonding refers to maternal emotions and thoughts toward the child (Dubber et al., 2015), while attachment refers to child's relationship toward mother (or another caregiver) who represents a secure base (Waters and Cummings, 2000).

Psychological distress and mental health disorders are quite prevalent among postpartum women. A disorder that develops as a direct consequence of a traumatic birth is posttraumatic stress disorder (PTSD) following childbirth. Recent reviews showed that the PTSD is present among 3-4% of postpartum women, but the prevalence is 4-5 times higher in samples which are at-risk, such as mothers who had traumatic birth, emergency caesarean section or preterm delivery (Dikmen Yildiz et al., 2017; Grekin and O'Hara, 2014).

McKenzie-McHarg et al. (2015) emphasize that the impact of PTSD following childbirth on families and infant is an important area of research. Studies looking at adverse effects of PTSD on infant outcomes showed that maternal PTSD symptoms were significant predictors of infant's emotional regulation at six months (Bosquet Enlow et al., 2011), less optimal cognitive development at 17 months (Parfitt et al., 2014), and poor socio-emotional development at 2 years (Garthus-Niegel et al., 2017). Case studies and qualitative studies also suggest women with PTSD following childbirth may experience problems with bonding, for example with the initial rejection of the infant and delayed bonding (Ayers et al., 2006; Ballard et al., 1995). However, a review of 21 studies of postpartum PTSD and child outcomes concluded that there is inconsistent evidence for an effect of PTSD on mother-

infant interaction, the mother-infant relationship or child development, and that studies conducted in this area were heterogeneous and limited methodologically (Cook et al., 2018).

PTSD symptoms are frequently comorbid with depression (Alcorn et al., 2010; Denis et al., 2011). Between 7 and 13% of women have depression postpartum (Gaynes et al., 2005; O'Hara and Swain, 1996). Adverse effects of maternal depression on child socio-emotional and cognitive functioning have been documented in toddlers, pre-school and middle childhood (Beck, 1998; Murray et al., 2001, 1999; Pawlby et al., 2008). Research suggests depressed parents show less positive and more negative responses toward their children (Lovejoy et al., 2000; Wilson and Durbin, 2010). Depressed mothers describe their infant as more demanding, report much more crying and other problems with daily habits (Righetti-Veltima et al., 2002). In some instances, depressed mothers may also accept their maternal role more negatively and passively, neglect their child more, and express more aggressive parental behavior (Sagami et al., 2004).

Research on PTSD symptoms and the couple's relationship (quality and satisfaction) suggests that this relationship is fully mediated by depressive symptoms (Garthus-Niegel et al., 2018; Parfitt and Ayers, 2009). However, the association of both PTSD and depression following childbirth with the mother-infant relationship has not been widely examined. In particular, it is not clear what the relative importance of either PTSD or depression symptoms are in impaired bonding. For example, in a sample of women with a high prevalence of a history of childhood maltreatment, postpartum PTSD was a significant predictor of impaired bonding, only if it was combined with depression (Muzik et al., 2017; Seng et al., 2013). Similarly, a study on these associations specifically for PTSD following childbirth showed that PTSD symptoms had only an indirect effect on bonding via depression, but there was no direct effect (Blažević et al., 2019; Williams et al., 2016). Conversely, another study showed

that depressive symptoms did not have a direct effect on bonding, while PTSD symptoms had (Parfitt and Ayers, 2009).

There are a number of possible reasons for these inconsistent findings. First, some studies measure PTSD symptoms in relation to pre-existing traumas that are not birth related (Muzik et al., 2017; Seng et al., 2013). Given that after a traumatic birth the infant may be a reminder of trauma (Bailham and Joseph, 2003), it can be speculated that the association between PTSD and the mother-infant bond may be different in PTSD following childbirth. Second, different measures of PTSD have been used, including diagnostic measures such as the Posttraumatic Stress Diagnostic Scale (Foa, 1995), and non-diagnostic measures such as the Impact of Event Scale-Revised (Horowitz et al., 1979). Most commonly used measures of childbirth-related PTSD were designed for assessment of a wide range of traumatic experiences, according to the DSM-IV criteria for PTSD (American Psychiatric Association, 1994). Specific measures of PTSD following a traumatic birth have been predominantly non-diagnostic, such as Traumatic Event Scale (Wijma et al., 1997). However, the City Birth Trauma Scale (Ayers et al., 2018) was recently developed to follow the DSM-5 criteria for PTSD (American Psychiatric Association, 2013). Psychometric analyses of the City Birth Trauma Scale suggest PTSD symptoms after childbirth have two factors: Birth-related PTSD symptoms and General PTSD symptoms (Nakić Radoš et al., 2020). It is possible that these different aspects of PTSD might have a differential role in parenting. For example, a study of male war veterans found intrusions and hyperarousal dimensions were not related to parenting satisfaction, while avoidance symptoms were related to parenting satisfaction (Samper et al., 2004). However, the differential role of distinct symptoms of PTSD following childbirth has not been examined in relation to depression and mother-infant bonding.

The aim of this study was therefore to examine the relationship between PTSD symptoms following childbirth (Birth-related and General symptoms), depressive symptoms

and mother-infant bonding. We expected that higher levels of PTSD symptoms would be associated with higher levels of depressive symptoms. However, based on inconsistent findings in the literature, we could not hypothesize whether PTSD symptoms or depressive symptoms would be related to bonding.

## Methods

### *Participants*

Mothers of 1-12-month old infants participated in the study ( $N = 603$ ). Participants were an average of 31 years old, and the majority were married or cohabiting, graduated from college or university, and of average socioeconomic status (Table 1). Of the sample, 7.8% reported a history of psychiatric treatment. Mothers gave birth on average six months ago. The majority were primiparous (61.0%) and had unassisted vaginal births (75.1%), which is in line with Croatian national statistics (Rodin et al., 2018).

### *Measures*

*City Birth Trauma Scale* (Ayers et al., 2018) measures postpartum PTSD according to DSM-5 criteria (APA, 2013) so can be used as a diagnostic measure. The Scale has 29 items; 20 of which evaluate PTSD symptoms from four clusters of symptoms (Criteria B to E): *intrusions*, *avoidance*, *negative cognitions and mood*, and *arousal*. These items are rated on a 4-point scale for how often they occurred in the last week (0 - *not at all*, 1 - *once*, 2 - *2-4 times*, and 3 - *5 or more times*). The remaining nine items evaluate all other DSM-5 criteria. The 20 symptoms form two factors of (i) *Birth-related PTSD symptoms* (10 items) referring to intrusion (e.g. *Recurrent unwanted memories of the birth that you can't control*), avoidance (e.g. *Trying to avoid thinking about the birth*), and negative cognitions and mood-related to birth (e.g. *Feeling strong negative emotions about the birth*); and (ii) *General PTSD*

*symptoms* (10 items) referring to negative alterations in cognition and mood (e.g. *Feeling detached from other people*) and arousal (e.g. *Feeling tense and on edge*). The scale was translated and validated in Croatian with the same two-factor structure (Nakić Radoš et al., 2020). In the current study Cronbach's  $\alpha$  was .93.

*Edinburgh Postnatal Depression Scale* (EPDS; Cox et al., 1987) measures symptoms of depression during the postpartum period. Its advantage over other measures of depression is that it does not include somatic symptoms which are normal during postpartum. The EPDS has ten items where each item is scored on a 4-point scale (from 0 to 3) for the total score of 0 to 30, where higher scores refer to higher levels of depressive symptoms. The cut-off score of  $\geq 13$  was proposed with a sensitivity of 86%, the specificity of 78%, and positive predictive value of 73%. The EPDS was validated in Croatian sample (Nakić Radoš et al., 2013a). In the current study Cronbach's  $\alpha$  was .90.

*Postpartum Bonding Questionnaire* (PBQ; Brockington et al., 2001) measures a mother's emotions, thoughts, and reactions toward her infant. The PBQ has 25 items which are evaluated on a 6-point scale (0 - *always* to 5 - *never*). Possible scores range from 0 to 125 with higher scores refer to higher levels of difficulties in bonding. The PBQ has four subscales: General factor, Rejection and anger, Anxiety about care, and Risk of abuse (Brockington et al., 2006, 2001); however, some studies showed one-factor structure (Reck et al., 2006). The cut-off for the full scale of  $\geq 26$  for impaired bonding has a sensitivity of 84%, the specificity of 74%, and positive predictive value of 79% (Brockington et al., 2006). In the current study one-factor structure was obtained, and Cronbach's  $\alpha$  was .94.

*Demographic and obstetric data.* This comprised a set of questions on maternal age, marital status, education level, socioeconomic status, and history of psychiatric treatment. The obstetric part included questions on parity, mode of delivery, time since birth, and breastfeeding status (0 = no, 1 = yes).

### ***Procedure***

Ethical approval was obtained from the Ethical Committee of the [removed for blind review]. The participants were recruited by a snow-balling technique via social networks and groups for mothers and infant, and through personal contacts during November and December 2018. All participants gave their informed consent before anonymously completing questionnaires.

### ***Statistical analysis***

Associations between variables were examined by Pearson's correlation coefficients with SPSS Statistics 21.0 for Windows. To test direct and indirect pathways between PTSD symptoms and bonding via depressive symptoms, path analysis was performed with Mplus 8.1 software (Muthén and Muthén, n.d.). Bootstrapping was used to estimate standard errors and 95% confidence intervals for all direct and indirect effects. Due the high variability of infants age, all analyses were conducted separately for younger (up to 6 months) and older infants (7-12 months). Differences in proportion of elevated PTSD, depression symptoms and bonding problems in mothers with younger and older infants were tested with chi-square test.

## **Results**

### ***Descriptive data***

Descriptive data for all psychological variables is presented in Table 2. PTSD and depression symptoms were somewhat positively skewed, with more women in the range of lower scores. However, indices for skewness and kurtosis were below 3 and 10, as proposed by Kline (2011). The average level of bonding was also within the lower range, indicating high bonding in this sample.

In this sample, 11.8% (71/603) of women fulfilled all criteria for PTSD following childbirth, of whom 57.8% (41/71) had probable comorbid depression measured as a score on EPDS above the cut-off  $\geq 13$ . In the whole sample, 24.9% (150/603) had probable depression, out of whom 27.3% (41/150) fulfilled PTSD criteria. Also, 12.3% (74/603) had a score above the cut-off  $\geq 26$  on the PBQ full scale for impaired bonding. Finally, of women with PTSD, 39.4% (28/71) had bonding problems; while of women with probable depression, 35.3% (53/150) had bonding problems. We found no difference between mothers with younger and older infants in the prevalence of either PTSD (10.5% vs. 13.5%;  $\chi^2(1) = 1.32; p = .250$ ), depression (23.0% vs. 27.4%;  $\chi^2(1) = 1.56; p = .211$ ), or bonding problems (10.5% vs. 14.7%;  $\chi^2(1) = 2.43; p = .119$ ).

#### ***Associations between the variables***

Sociodemographic and obstetric variables were not significantly associated with bonding ( $r$  range:  $-.05$  to  $.06$ ,  $p = n. s.$ ), except for marital status ( $r = .10$ ,  $p = .011$ ) where cohabiting and single women reported higher levels of bonding difficulties than married women. Also, breastfeeding was not correlated with bonding ( $r = .01$ ,  $p = .907$ ). All psychological variables were significantly intercorrelated. Depressive symptoms had a moderate positive correlation with Birth-related PTSD symptoms and a large correlation with General PTSD symptoms . Bonding had a moderate positive correlation with Birth-related PTSD symptoms , and large correlations with General PTSD symptoms) and depressive symptoms . In other words, more impaired bonding was related to higher levels of PTSD and depressive symptoms. The same pattern of correlations was observed in mothers with younger and older infants (Table 3).

#### ***Direct and indirect effects of PTSD symptoms on bonding***

A model with PTSD symptoms as predictors, depressive symptoms as mediator and bonding as the outcome was tested. We conducted a multigroup analysis which differentiates between younger (1-6 months) and older infants (7-12 months). The model was saturated and fitted the data perfectly. Estimates of paths with standard errors and confidence intervals are presented in Table 4 and direct and indirect paths in Figure 1. The model explained 32.6% and 52.1% of bonding variance with younger infants and older infants, respectively. The same pattern of relationships was obtained in both groups of infants. There was a significant direct path from General PTSD symptoms on bonding ( $\beta_y = .21, p < .01$ ;  $\beta_o = .12, p < .05$ ) and a significant indirect effect via depressive symptoms ( $\beta_y = .25, p < .01$ ;  $\beta_o = .43, p < .01$ ). On the other hand, Birth-related PTSD symptoms did not have a direct ( $\beta_y = .05, p = .34$ ;  $\beta_o = .03, p = .58$ ) nor indirect effect on bonding ( $\beta_y = .04, p = .08$ ;  $\beta_o = .03, p = .34$ ). Furthermore, Birth-related PTSD symptoms did not predict depressive symptoms ( $\beta_y = .11, p = .06$ ;  $\beta_o = .05, p = .35$ ).

### Discussion

In this study we examined the relationship between symptoms of PTSD and depression with mother-infant bonding. Path analysis revealed the differential role of Birth-related PTSD symptoms and General PTSD symptoms. While Birth-related PTSD symptoms did not have any effect on either bonding or depression symptoms, the General PTSD symptoms had a direct effect on bonding and an indirect effect via depressive symptoms.

These findings may explain why previous literature is inconsistent in terms of the association between postpartum PTSD and bonding, where some studies showed that only PTSD symptoms, but not depressive symptoms, effected bonding (Parfitt and Ayers, 2009), whilst other studies showed that PTSD was only a predictor of bonding if combined with depression (Muzik et al., 2017; Seng et al., 2013). The finding of the current study that both PTSD and depression symptoms contribute to impaired bonding but that different dimensions

of PTSD have a differential role may explain these inconsistencies. More specifically, General PTSD symptoms had a direct effect on bonding and indirect effect via depression symptoms. These symptoms include *arousal* and most symptoms of *negative cognitions and mood*. They refer to feeling irritable and tense, having problems concentrating and feeling detached from other people. It is possible that feelings of detachment are critical in affecting the mother-infant bond, especially if they feel detached from their infant. Other General PTSD symptoms, such as arousal and reactivity, may also be related to anger and impulsivity (Contractor et al., 2015) which may interfere with bonding (Brockington et al., 2006). A qualitative study with mothers and fathers showed that parental anger is related to more negative descriptions of the infants, more impulses to harm the infant when confronted with difficulties in their behavior, and postponed feelings of love toward the infant (Parfitt and Ayers, 2012).

General symptoms were also highly associated with depression. Previous research has established that postpartum depression is consistently associated with a poorer mother-infant bond and mother-infant interaction (Slomian et al., 2019). To some extent, the relationship between General PTSD symptoms and poor bond may therefore reflect shared variance and/or co-morbidity between the depression and PTSD. For example, negative cognitions and mood are symptoms of both depression and PTSD. It is also possible the relationship between General PTSD symptoms and depression is due to other common factors. For example, Handelzalts et al. (2019) found that neuroticism and low optimism were strongly associated with both postpartum depression and General PTSD symptoms, but had only small associations with Birth-related PTSD symptoms.

In contrast to General PTSD symptoms, Birth-related PTSD symptoms did not have direct paths to bonding or depression symptoms. Birth-related PTSD symptoms include the core PTSD symptoms of *re-experiencing*, *avoidance*, and two of the items from *negative*

*cognitions and mood* that directly refer to the birth (blame about things that happened during birth, and strong negative emotions about the birth). In other words, symptoms such as unwanted memories of birth through flashbacks and bad dreams, trying to avoid thinking about the birth, and feeling strong negative emotions about the birth were not related to bonding. These findings are broadly consistent with another study which found that Birth-related PTSD symptoms were associated with a small improvement in the mother-baby bond (Handelzalts et al., 2019).

These findings are interesting and significant for a number of reasons. First, they highlight the importance of measurement in understanding the relationship between postpartum mental health and the mother-infant relationship. Two studies using the City Birth Trauma Scale both find that General PTSD symptoms are associated with a poorer bond, but that Birth-related PTSD symptoms have no effect or are associated with a better bond (Handelzalts et al., 2019). The opposing relationships between the different symptom clusters and bonding means studies examining total PTSD symptoms may find no relationship or some relationship depending on the balance of General and Birth-related symptoms in the sample.

Second, these findings suggest that birth trauma and Birth-related PTSD symptoms may not affect the mother-infant bond, or may even be associated with an improved bond. Possible reasons for this are unknown at this stage. However, it could be speculated that if a woman perceives a severe threat to herself or her baby during birth, she is likely to be more protective of the baby and bond more strongly. For example, a qualitative study of women following traumatic birth found that women reported being either over-anxiously attached or avoidant of their baby (Ayers, Eagle & Waring, 2006). More research is therefore needed to explore the relationship between type of threat, different PTSD symptom clusters and the

mother-infant bond. It is also important to see whether the differential effects of PTSD symptom clusters on the mother-infant bond are replicated in other samples.

In the current sample there was a high incidence of PTSD (11.8%), depressive symptoms (24.9%), and bonding impairment (12.3%). These figures are much higher than those reported in other studies of PTSD following childbirth, which is estimated at 3-4% (Dikmen Yildiz et al., 2017; Grekin and O'Hara, 2014), for depression which is usually around 10-13% (Gaynes et al., 2005; O'Hara and Swain, 1996), and 6% for bonding problems in non-depressed mothers (Reck et al., 2006). However, in a previous study with the community sample of Croatian postpartum women, there was a similar prevalence of elevated depression measured by EPDS (22.4%) (Nakić Radoš et al., 2013a). However, in the latter study, the lower EPDS cut-off of 8/9 was used, while in the current study the cut-off of 12/13 was applied, implying that the prevalence in the current sample would be even higher with the lower cut-off. These differences are probably due to our study sampling strategy of recruiting women online and through social media. This has been noted to result in almost ten times higher incidence of PTSD following childbirth in online samples, compared to community samples (Ayers et al., 2009). Online recruitment provides an opportunity to obtain larger sample of participants, and to recruit more women who experience postpartum PTSD or depression, which is useful when studying patho-mechanisms of bonding problems. However, further research is needed with community samples and clinical samples.

Although the same pattern of relationships between PTSD, depression symptoms and bonding was obtained in women with younger and older infants, it is interesting to point out that these variables explained 20% of bonding variance more in mothers of older infants compared to those with younger infants (52.5% vs. 32.7%). This finding implies that mental health problems have larger effect on bonding in mothers with older infants. This could not be due to the more elevated problems of mental health because the difference in prevalence of

mental health and bonding between mothers of older and younger infants was insignificant. From the literature it is known that bonding is a process that develops within first postpartum year (Moehler et al., 2006; Muzik et al., 2013). Bonding impairment is higher early in postpartum and decreases at 4 and 6 months postpartum. Moehler et al. (2006) suggests this is due to early adjustment problems and colic in the first months, and stronger motor development and infant mobility after that period. There is a lack of evidence in the literature about the relationship between bonding, PTSD, and depression after 6 months postpartum. It could be speculated that mothers with chronic depression and General PTSD symptoms tend to have more bonding difficulties, but prospective studies are needed to examine this.

Moreover, several other methodological issues should be considered before drawing conclusions. Self-report measures of PTSD and depression symptoms were used rather than clinical interviews. It may be that different results would be obtained with clinical samples and it would be useful to examine the associations between PTSD symptoms, depressive symptoms, and bonding in subsamples of mothers with PTSD only, with depression only, with comorbid PTSD and depression; or with traumatic birth experience but no PTSD; and mothers without any symptoms.

Furthermore, as bonding refers to maternal feelings and thoughts about her infant (Dubber et al., 2015), self-report is a meaningful measure of bonding. However, future studies would benefit from including observation of mother-infant interactions and infant temperament. Also, as this was a cross-sectional study, conclusions about causality cannot be drawn. Although we are able to describe direct and indirect effects from the path analysis, only a longitudinal study would enable insight into the casual direction of these effects. Namely, the examined sequela of depressive symptoms following PTSD is only one possible explanation of the association between the two. It could be that depression began before childbirth and thus exacerbated PTSD symptoms, or that depression started along with PTSD

symptoms as a consequence of birth (Lyons, 1998). However, given that there was a higher comorbidity of PTSD with probable depression (57.8%) than vice versa (27.3%), which is consistent with previous studies (Nakić Radoš et al., 2018; Parfitt and Ayers, 2009), we can speculate that there is a higher probability of PTSD preceding depression. Nevertheless, it would be useful to measure PTSD and depression symptoms on several occasions throughout the peripartum period with postpartum measurement of bonding.

In conclusion, this study found that both PTSD and depressive symptoms following childbirth were related to bonding. However, the two dimensions of PTSD symptoms had a differential role, where Birth-related PTSD symptoms did not affect bonding, while General PTSD symptoms had a direct effect on bonding and an indirect effect via depressive symptoms. As a relatively new measure of PTSD following childbirth using DSM-5 criteria, the City Birth Trauma Scale proved useful given that it provides information on different PTSD symptom clusters which appear to have different consequences for mothers and their infants. Future studies should further investigate the consequences of different aspects of postpartum PTSD in order to identify the mothers at specific risk. Knowing the adverse effects of maternal health issues on child outcomes, systematic preventive and intervention programs are needed. Such programs should concern diminishing symptoms of postpartum PTSD and depression so that the mother-infant bonding remains optimal.

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Table 1

*Sample characteristics for the main demographic variables (N=603)*

	<i>M (SD)</i>
Mother's age	30.64 (4.68)
Infant age (in months)	6.12 (3.39)
	<i>n (%)</i>
<i>Marital status</i>	
Married	498 (82.6)
Cohabiting	101 (16.7)
Single	4 (0.7)
<i>Education</i>	
Primary school	4 (0.7)
Secondary school	176 (29.2)
College	95 (15.7)
University or higher	328 (54.4)
<i>Socioeconomic status</i>	
Below average	68 (11.3)
Average	291 (48.2)
Above average	244 (40.5)
<i>Parity</i>	
1 child	368 (61.0)
2 children	166 (27.6)
3 children	52 (8.6)
≥ 4 children	17 (2.8)
<i>Mode of delivery</i>	
Vaginal delivery	453 (75.1)
Instrumental vaginal delivery	12 (2.0)
Emergency caesarean section	91 (15.1)
Planned caesarean section	47 (7.8)

Table 2

*Descriptive data for PTSD and depressive symptoms, and mother-infant bonding (N = 603)*

	<i>M (SD)</i>	Range	
		Observed	Possible
City Birth Trauma Scale	14.65 (13.03)	0-60	0-60
Birth-related PTSD symptoms	5.45 (7.11)	0-30	0-30
General PTSD symptoms	9.21 (8.23)	0-30	0-30
Edinburgh Postnatal Depression Scale	8.80 (6.24)	0-30	0-30
Postpartum Bonding Questionnaire	13.13 (13.78)	0-107	0-125

Table 3

*Correlations between psychological variables in mothers of younger (n = 259) and older infants (n = 344)*

	1.	2.	3.	4.
1. Birth-related PTSD symptoms	-	.46**	.41**	.30**
2. General PTSD symptoms	.41**	-	.70**	.50**
3. Edinburgh Postnatal Depression Scale	.34**	.72**	-	.55**
4. Postpartum Bonding Questionnaire	.29**	.58**	.72**	-

*Note.* \*\* $p < .01$ ; Correlations for mothers of younger infants are presented above diagonal, and for older below diagonal.

Table 4

*Model estimates: PTSD symptoms and bonding via depressive symptoms on younger (N = 344) and older infants (N = 259)*

	younger infants					older infants				
	(1-6 months)					(7-12 months)				
	Path estimates	SE	<i>p</i>	Lower 95% CI	Upper 95% CI	Path estimates	SE	<i>p</i>	Lower 95% CI	Upper 95% CI
<i>Direct effects</i>										
Birth-related PTSD symptoms → bonding	0.05	0.06	0.336	-0.06	0.16	0.03	0.06	0.577	-0.09	0.15
General PTSD symptoms → bonding	0.21	0.07	0.003	0.07	0.34	0.12	0.06	0.031	0.01	0.23
EPDS → bonding	0.38	0.07	0.000	0.24	0.51	0.62	0.06	0.000	0.50	0.72
Birth-related PTSD symptoms → EPDS	0.11	0.06	0.064	-0.01	0.22	0.05	0.06	0.350	-0.06	0.16
General PTSD symptoms → EPDS	0.65	0.04	0.000	0.56	0.73	0.70	0.04	0.000	0.61	0.78
<i>Indirect effects via depressive symptoms</i>										
Birth-related PTSD symptoms → bonding	0.04	0.02	0.084	0.00	0.09	0.03	0.03	0.339	-0.04	0.10
General PTSD symptoms → bonding	0.25	0.05	0.000	0.16	0.34	0.43	0.06	0.000	0.33	0.55

*Note:* Standardized coefficients are presented. EPDS – Edinburgh Postnatal Depression Scale, CI – confidence interval, SE – standard error.

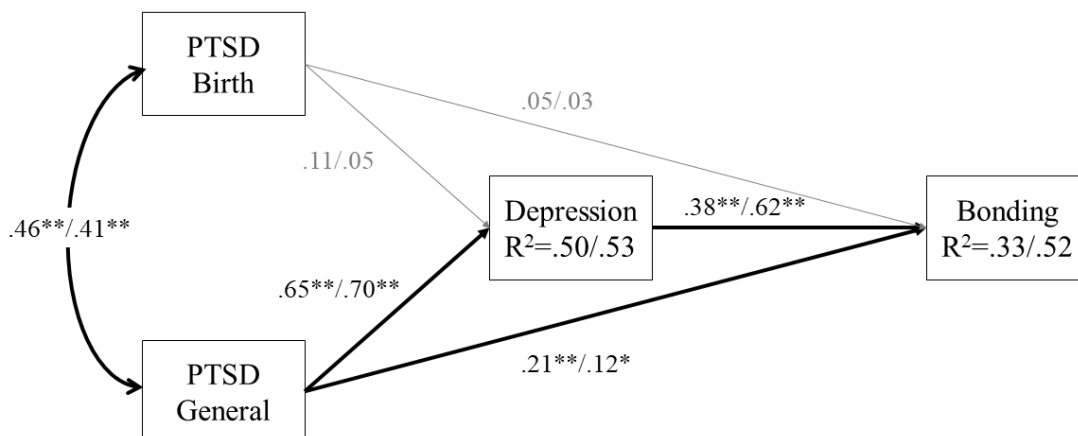


Figure 1. Model paths predicting mother-infant bonding from Birth-related PTSD symptoms and General PTSD symptoms via depressive symptoms. *Note.* All coefficients are standardized. Path coefficients for young infants are presented on the left, and for the older infants on the right. \* $p < .05$ ; \*\* $p < .01$

## Highlights

- Both PTSD and depressive symptoms are related to impaired mother-infant bonding.
- A differential role of birth-related and general PTSD symptoms was found.
- Birth-related PTSD symptoms did not have effect on bonding or depressive symptoms.
- General PTSD symptoms had an indirect effect on bonding via depressive symptoms.