Sexual & Reproductive Healthcare 38 (2023) 100920

Contents lists available at ScienceDirect

Sexual & Reproductive Healthcare

journal homepage: www.elsevier.com/locate/srhc

Birth related PTSD and its association with the mother-infant relationship: A meta-analysis

Lucy J. Frankham *, Einar B. Thorsteinsson, Warren Bartik

Faculty of Medicine and Health, School of Psychology, University of New England, Armidale, NSW 2351, Australia

ARTICLE INFO

Keywords:
Posttraumatic stress disorder
Trauma
Birth
Infant mental health
Maternal mental health
Mother-infant relationship

ABSTRACT

Objective: There is a growing body of research showing that birth related posttraumatic stress disorder (PTSD) symptoms may impact the mother-infant relationship. The present study assessed the strength of the association between birth related PTSD symptoms and the mother-infant relationship.
Method: A total of twelve studies (5,572 participants) were included based on database searches using PubMed, EBSCO and ProQuest.
Results: The findings showed that greater levels of birth related PTSD symptoms were associated with poorer mother-infant relationship, $r = -0.36$, 95% CI: [−0.43 - −0.28], random effects model. The outcomes appeared to be heterogeneous ($Q(11) = 81.63$, $p < .001$, $tau^2 = 0.0123$, $I^2 = 80.73\%$), despite all outcomes being in the same direction as the overall outcome.
Conclusions: The results indicated that birth related PTSD symptoms are negatively associated with the mother-infant relationship. Further investigation into the prevention of birth related trauma is suggested. Improving birthing experiences for mothers is likely to contribute to improved infant mental health, thereby reducing overall social and economic costs.

Introduction

The issue of birth trauma is quickly gaining traction among researchers as a significant public health concern [1]. Birth trauma can be described as "The emergence of a baby from its mother in a way that involves events or care which cause deep distress or psychological disturbance, which may or may not involve physical injury, but resulting in psychological distress of an enduring nature." [2, p. 23]. That is, even when there are no physical injuries or harm to the infant or mother, women may experience severe emotional distress after a traumatic birth. Some women who experience a traumatic birth may develop symptoms consistent with Posttraumatic Stress Disorder (PTSD) as defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-V-TR) [3]. While most research has focused on identifying risk and vulnerability factors for developing symptoms of birth related PTSD, there is less research on the consequences of a traumatic birth on mothers, infants, and families. As more attention is being given to birth related PTSD, it is becoming increasingly clear that a traumatic birth can have serious and long-lasting effects on the physical and mental health of mothers, as well as on the development of their infants [4,5].

Birth related PTSD is characterized by the same set of symptoms as listed in the DSM-V-TR [3], which comprises of four symptom clusters: re-experiencing; avoidance and numbing; hyperarousal symptoms; and, negative cognitions and mood. This may include intrusive thoughts or images about the birth, nightmares and sleep disturbance, extreme distress caused by reminders of the birth, avoidance of reminders of the birth and negative alterations in mood and cognition, such as self-blame and anhedonia [3]. Research has found that following birth, 3–4% of women will meet diagnostic criteria for PTSD following birth [6,7], 15% in high risk groups [6], 16.8% at sub-clinical levels [8], and around one third will describe their birth as traumatic [9–12]. With the current world population rate, this translates to millions of women each year experiencing birth related PTSD symptoms. Trauma is also typically not part of routine screening postnatally and many women with birth related PTSD may be misdiagnosed as having postnatal depression [13,14], so prevalence estimates are likely to be higher than current estimates suggest.

* Corresponding author.
E-mail address: lfrankh3@myune.edu.au (L.J. Frankham).

https://doi.org/10.1016/j.srhc.2023.100920
Received 18 May 2023; Received in revised form 2 August 2023; Accepted 8 October 2023
Available online 15 October 2023

Theories of birth related PTSD

The specific mechanisms through which PTSD develops are not entirely understood, and no theory adequately accounts for and explains all the phenomena involved in PTSD, including birth related PTSD [15]. There are three main theories that attempt to explain PTSD phenomena: Emotional processing theory [16], dual representation theory [17], and Ehlers and Clark [18] cognitive theory. Emotional processing theory posits that PTSD arises when traumatic memories are not fully processed and remain fragmented, leading to the persistence of distressing emotions and intrusive re-experiencing [16], while dual representation theory suggests that traumatic events are encoded in two separate memory systems: a verbally accessible, narrative representation and a non-verbal sensory representation, leading to potential dissociation between the two, impacting trauma processing and memory recall [17]. Ehlers and Clark's cognitive theory emphasizes the role of negative appraisals and memory fragmentation in the maintenance of post-traumatic stress disorder, proposing that intrusive re-experiencing occurs when trauma-related stimuli trigger unprocessed memories and lead to distressing emotions [18]. Each of these models are thought to overlap to some degree and are able to incorporate explanations for factors influencing memory encoding and memory function, as well as cognitive aspects including appraisals, coping strategies, and prior beliefs [17]. The ideas posited in these theories can be applied to traumatic birth in the same way they are applied to other trauma [19].

Researchers have also offered other explanations more specifically focused on birth trauma. Ayers et al. [20] synthesised research on risk and vulnerability factors for birth related PTSD and proposed a diathesis-stress model, suggesting that coping and stress related factors may contribute the development of birth related PTSD. Consistent with this model, the subjective appraisal of women's childbirth experience has been found to be more important than the objective complications of the event [8]. Findings of other studies [e.g., [20,21-24]] also indicate that while obstetric complications and medical interventions (e.g., emergency caesarean, forceps delivery) are risk factors for birth related PTSD, medical status seems to be less important than subjective factors, such as loss of control, perceived support, fear of birth and extreme pain. Both individual and systematic issues are thought to contribute and influence whether a birth is ultimately experienced as traumatic.

While the stress-diathesis model provides a good explanation of the individual factors that may contribute to symptoms of birth related PTSD, a potentially broader model to explain both individual factors and systemic issues that contribute to the development of birth related PTSD is the Power Threat Meaning Framework (PTMF) developed by the British Psychological Society [25]. The Power Threat Meaning Framework offers a holistic and empowering approach to understanding and addressing the impact of power imbalances caused by social, cultural, and political factors. The PTMF moves away from traditional psychiatric models, instead understanding mental distress as part of what has happened to an individual (power), how it affects them (threat), what this means to them (meaning), and how they survived or coped (response to threat) [25,26]. The model has been used both to conceptualize and understand distress in relation to oppressed groups including women [27] and women during pregnancy [26], as well as a host of other circumstances where mental and emotional distress arises.

Ordinarily, women are more likely than men to be diagnosed with mental disorders [28,29] and more likely to be diagnosed with PTSD [30]. That is, women are not fundamentally flawed or biologically geared towards mental distress, they simply experience more oppression, and this is most evident during childbearing [31–33]. Degrading treatment, obstetric violence, loss of dignity and autonomy during birth is known to contribute to birth being experienced as traumatic and the development of PTSD symptoms in women [32,34,35]. Obstetric violence is a form of gender-based violence that involves bullying, coercion, abuse and mistreatment of women giving birth that can be both physical and psychological [31,32,36]. It occurs across the world and across all sociodemographic levels [35]. Society conditions women to place trust in their caregivers' expertise and authority, making the power dynamic in the birth space particularly vulnerable to abuse [33]. This abuse can result in a loss of control and confusion that often leads to birth being experienced as traumatic and increased rates of birth related PTSD [37,38]. The development of PTSD symptoms in this system-based context can be understood using the PTMF. Hence, the aetiology of birth related PTSD using the PTMF can be explained with both individual and systemic factors in mind.

Another important theory is Beck's [4] theory of traumatic birth, which seeks to explain the consequences and chronic impact of traumatic birth and the rippling effect on partners, clinicians and infants. Beck developed the theory by combining a series of studies on the topic into a whole to create a higher, more abstract-level middle range theory. According to the theory, just a short time in labour and delivery can result in chronic PTSD symptoms. The theory derives nine important axioms to explain the wider consequences of traumatic birth: (1) birth related trauma can lead to PTSD, (2) PTSD symptoms are a result of birth related trauma and can vary in intensity and duration, (3) birth related trauma can have long term chronic consequences, (4) birth related trauma can lead to lashing out at clinicians and significant others, (5) PTSD symptoms can interfere with mother-infant interactions, (6) birth related trauma can lead to breastfeeding problems, (7) PTSD symptoms may flare up at the anniversary, (8) subsequent births increase anxiety, and (9) not all subsequent births are healing.

The impact of birth related PTSD on infant health

The effect of traumatic birth experiences goes beyond maternal trauma and distress, there are also direct effects on infant health. As well as the impact on mothers, birth related PTSD has been shown to affect infant development [39–42]. While the current body of research examining the implications of birth trauma on infants is largely correlational and lacking emphasis on the intergenerational transmission of trauma, there is substantial evidence that the stress on infants extends far beyond the immediate birth events, encompassing ongoing healthcare and social costs. During infancy, maternal stress has particularly immediate consequences for the infant's developing stress response systems and overall development, as compared to later ages [42]. Maternal mental health problems not only adversely affect the mother, but the impact on the developing infant can also be severe, especially for those with prolonged or severe symptoms [39]. Early infancy is a sensitive period where rapid brain development occurs [40]. It is well known that infants are directly affected by their environment and the quality of care they receive. If the mothers ability to take care of her baby is compromised, the survival and development of the infant is jeopardised [43]. The impact of poor maternal mental health on infants is known to adversely affect physical, cognitive, social, behavioural and emotional development of children [43].

For birth related PTSD, there is evidence that it may negatively affect the mother-infant relationship and thereby increase the risk of behavioural, cognitive, and emotional difficulties in young children [4,5,44–46]. Although these associations have been identified, there is still limited research available on the association with birth related PTSD compared with other conditions such as postnatal depression. One systematic review that explored child outcomes found perinatal PTSD (not childbirth related) to also be associated with lower breastfeeding rates, sleep issues and poor weight gain [47]. In relation to birth related PTSD, studies have reported an association between feeding and sleep difficulties [4,47–52]. Birth related trauma can affect breastfeeding and milk supply [4] and may even extend past early infancy with one study suggesting that posttraumatic reactions could partly predict sleeping and eating problems eighteen months after the birth [48]. A systematic review exploring various child outcomes found that there is some evidence suggesting an association between birth related PTSD and infant outcomes such as feeding difficulties, sleep problems, and behavioural

issues [5]. However, they found the evidence is limited and inconsistent.

We also know that women who access residential support services for feeding and sleep difficulties are more likely to have experienced higher rates of medical intervention during birth and have poorer perinatal mental health [49,50]. There is evidence that postnatal PTSD is associated with low birth weight [53–55] and there is some evidence of an association between infant cognitive development and birth related PTSD [46,56]. Further, we know that infants of mothers with postnatal depression are more likely to have poorer physical, cognitive, social, behavioural and emotional development, Attention Deficit Hyperactivity Disorder, asthma and respiratory problems, reduced immune system responses and neurodevelopmental issues [57,58]. Given that birth related PTSD is often misdiagnosed as postnatal depression and that there is overlapping symptomatology, it is reasonable to suspect some of these risks may also exist for infants of mothers with birth related PTSD symptoms.

Birth related PTSD and the mother-infant relationship

One of the axioms identified in Beck's [4] theory of traumatic birth is that PTSD symptoms can interfere with the mother-infant relationship. The mother-infant relationship refers to the unique and intimate bond between a mother and her baby during the early stages of the child's life. It is a broad term often used to describe both bonding and attachment. Bonding primarily pertains to a caregiver's emotions toward their baby, while attachment refers to the infants' connection with their caregiver [59,60]. For the purpose of this study, the term mother-infant relationship specifically denotes infant bonding.

Immediately after birth mothers begin to coordinate their social behaviours with their infant's state [61]. These behaviours have been observed to be triggered by activation of brain networks, affiliative hormones, and autonomic responses, creating a connection between the mother and newborn's physiology and behaviour [61]. These maternal behaviours play a crucial role in the development of mother-infant relationship and are known to predict an infant's future cognitive and social-emotional skills [62]. However, in cases of depressed and anxious mothers, cortisol levels have been found to be higher than non-depressed or anxious mothers, and maternal depression has been associated with lower oxytocin levels in both mother and infant. Feldman et al. [61] suggests that this 'endocrine synchrony' between a mother and infant, underscores the interactional transfer of mother-infant neurobiology [63].

Whilst much research has focussed on deficiencies in the mother-infant relationship of mothers with postnatal depression, there is a growing body of research finding that birth related PTSD is associated with poorer mother-infant relationships [12,44–46,64–69]. The concepts proposed in the Dual Representation Theory [17] (DRT) of PTSD can provide insights into how birth trauma may impact a mothers' ability to relate to their baby. Based on DRT, after experiencing a traumatic birth, mothers may develop vivid and distressing memories of the event, involving sensory experiences. These intrusive trauma memories can trigger flashbacks or nightmares, potentially hindering the mother's emotional presence and attunement to her baby. Furthermore, the traumatic birth may disrupt the integration of the trauma into a coherent verbal narrative. In response to the distressing memories and emotions associated with the traumatic event, mothers who have experienced birth trauma might engage in avoidance behaviours and attempt to disconnect from their own emotional responses to the experience. According to DRT, when trauma memories remain unprocessed and disconnected from the verbal narrative, emotional numbing or detachment may occur, which may make it difficult for the mother to form a secure emotional bond with her baby.

In line with DRT, the current body of research suggests mothers with PTSD symptoms are indeed, less sensitive, less warm towards their infants and, more invasive and prone to negative evaluations of the infant [44,65,70–74], suggesting this 'endocrine synchrony' proposed by Feldman et al. [61], in mother-infant dyads may also be interrupted when mothers are affected by PTSD symptoms. A review by Beck [4] found mothers who have experienced birth trauma report 'numbing' and difficulties connecting closely to others, including their infant. They also have a tendency, consistent with DSM-V-TR PTSD criteria, to avoid reminders of the traumatic birth, which may include actively avoiding or disconnecting from their own infant. Consistent with the notion of neurobiological synchronicity as a mechanism for the development of the mother-infant relationship, findings from a recent qualitative systematic review by Van Sieleghem et al. [5] suggested a significant negative association between birth related PTSD and the mother-infant relationship, although the authors concluded that study results were inconsistent and sometimes contradictory.

Aim

While there is substantial evidence around the issues of birth related PTSD, the evidence around the association between birth related PTSD and the mother-infant relationship is still evolving. Qualitative evaluation of the research indicates a strong negative association. Building on the findings of van Sieleghem et al., [5] the purpose of this study is to determine the strength of the association between birth related PTSD symptoms and the mother-infant relationship to add a quantitative perspective to the current body of research.

Method

Data sources

An electronic search was performed in January 2023 using the databases PubMed, EBSCO and ProQuest going back as far as the different databases allowed. Additional manual literature searches were conducted employing Google Scholar, secondary references, and citation.

Search strategy

Keywords were chosen to identify studies that included a measure of PTSD symptoms in relation to birth and the mother-infant relationship. The terms posttraumatic stress disorder and birth were included, as well as a range of keywords to capture the mother-infant relationship including the words 'mother' and 'parent' with combinations of 'infant' and 'baby' and 'bond', 'relationship' or 'attachment'. To assist with capturing a broad range of studies, the authors chose to recognise that the terms 'bond', 'relationship' and 'attachment' are different concepts that are sometimes used interchangeably when describing the relationship between a mother and infant, even though they are not the same concepts, therefore each of these terms were included in search. Study selection was examined by all authors and data extraction was performed by the first author. The final search terms are shown in Table 1.

Eligibility criteria

Studies were included if they reported a level of association between birth related PTSD symptoms and the mother-infant relationship in first 12 months postnatally and used a measure with published validity.

Table 1
Search terms to identify articles examining birth related PTSD and the mother-infant relationship.

("posttraumatic stress disorder") AND (birth) AND ("mother infant bond*" OR "mother infant attachment" OR "mother infant relationship" OR "parent infant bond*" OR "parent infant attachment" OR "parent infant relationship" OR "mother baby bond*" OR "mother baby attachment" OR "mother baby relationship")

Note. When an asterisk (*) is included as part of a search term it searches for variations of the word.

Studies were not required to report PTSD symptoms at a diagnostic level. Studies that referred to PTSD symptoms not related to birth or parenting stress, did not have appropriate analysis or methodology, were not in English or were measured at greater than 12 months postnatal were excluded.

The literature search procedure followed the PRISMA guidelines for reporting systematic reviews and meta-analyses [75], see Fig. 1 for overview of search procedure. A total of 70 articles were identified for initial screening. Forty-two duplicates (i.e., two or more of the same paper) were removed. The titles and abstracts of the remaining 28 articles were read to identify whether they contained the variables of interest. At this stage, ten were removed because they did not measure one or more of the key variables (reason 1) and three were removed because there was no appropriate analysis or measures reported (reason 2). Five of the seventeen studies conducted quantitative analyses but did not report *r* values (reason 3). The authors from those five were contacted to request if there was an *r* value available, two authors responded and were able to provide this additional information. One study (Feeley) used an observational measure (Emotional Availability Scales – Sensitivity) and was considered to meet the criteria for inclusion in the current meta-analysis due to its reported discriminant and convergent validity [76,77] and because the investigators used videotaping and trained coders. The final number of included studies was $k = 12$, see Table 2 for sample characteristics of these studies. A description of the measures and abbreviations used in each study can be found in supplement A1. Excluded studies are listed in supplement A2.

Statistical analysis

The analysis was conducted and interpreted using the computer software jamovi version 2.3.21 [81,82] using the Fisher r-to-z transformed correlation coefficient as the outcome measure. A random-effects model was employed to analyse the data due to the heterogeneity of the effect sizes in the studies. The amount of heterogeneity (tau^2), was estimated using the restricted maximum-likelihood estimator [83]. In addition to the estimate of tau^2, the Q-test for heterogeneity [84] and the I^2 statistic were reported. A prediction interval for the tau2 outcomes was also provided to assess heterogeneity (i.e., tau2 greater than 0, regardless of the results of the Q-test). Studentized residuals and Cook's distances were used to examine whether studies may be outliers and/or influential in the context of the model. Studies with a studentized residual larger than the $100 \times (1–0.05/(2 \times k))$ percentile of a standard normal distribution are considered potential outliers (using a Bonferroni correction with two-sided alpha = 0.05 for *k* studies included in the meta-analysis). Studies with a Cook's distance larger than the median plus six times the interquartile range of the Cook's distances are likely to have a significant impact on the regression model's estimates and should be examined closely [81].

Results

A total of $k = 12$ studies (N = 5572) were included in the analysis. The observed Fisher r-to-z transformed correlation coefficients ranged

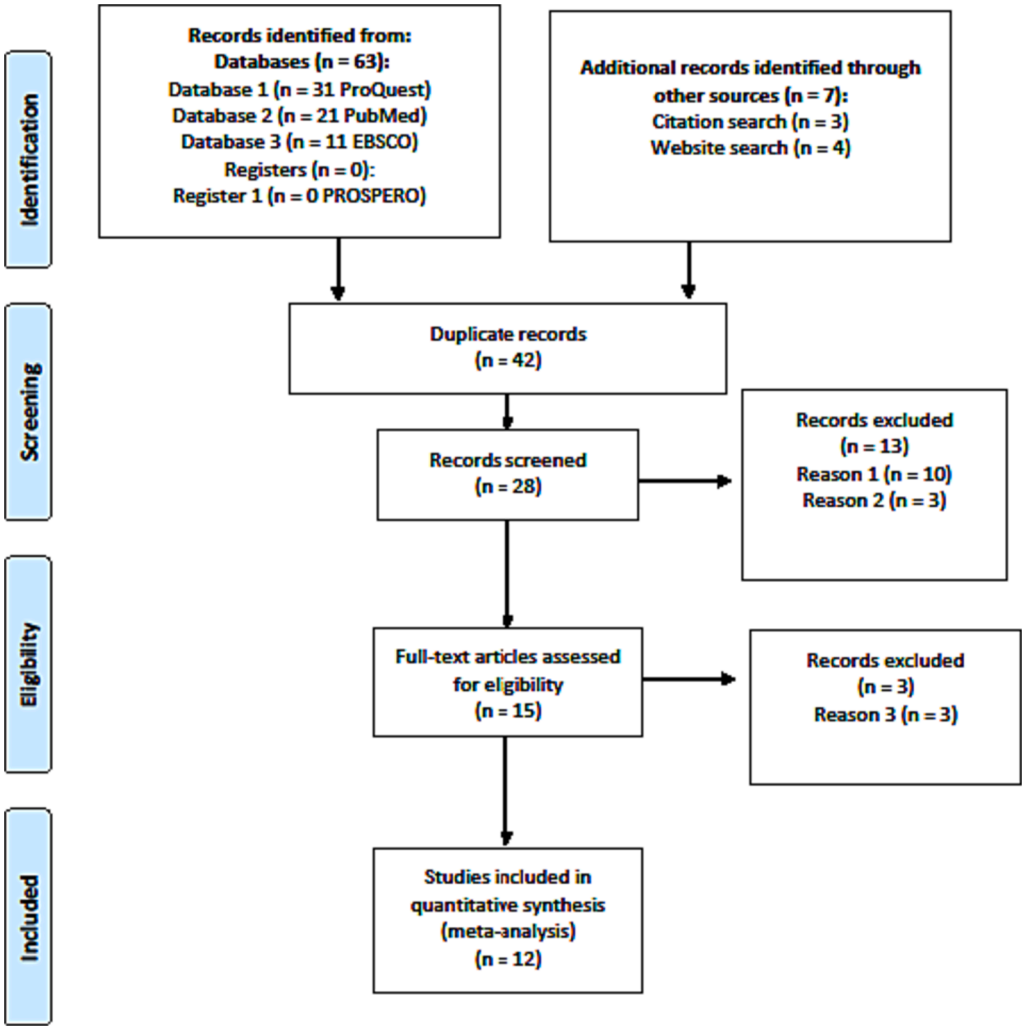

Fig. 1. PRISMA Flow diagram based on [78] and [75].

Table 2
Sample characteristics of studies included in the present meta-analysis.

Study Number	Citation	Publication Year	Sample Size	Measures • *Relationship* • *Trauma*	Country
1	Davies, J., Slade, P., Wright, I., & Stewart, P. (2008). Posttraumatic stress symptoms following childbirth and mothers' perceptions of their infants. *Infant Mental Health Journal, 29*, 537–554.	2008	211	MPAS PTSDQ	UK
2	Feeley, N., Zelkowitz, P., Cormier, C., Charbonneau, L., Lacroix, A., & Papageorgiou, A. (2011). Posttraumatic stress among mothers of very low birthweight infants at 6 months after discharge from the neonatal intensive care unit. *Applied Nursing Research, 24*, 114–117.	2011	21	EAS PPQ	Canada
3	Hairston, I. S., Handelzalts, J., Assis, C., & Kovo, M. (2018). Postpartum bonding difficulties and adult attachment styles: The mediating role of postpartum depression and childbirth-related PTSD. *Infant Mental Health Journal, 39*, 198–208.	2018	114	PBQ PPQ	Israel
4	[80]. The association of attachment style, postpartum PTSD and depression with bonding-A longitudinal path analysis model, from childbirth to six months. *Journal of Affective Disorders, 280*, 17–25.	2021	210	PBQ BiTS	Israel
5	[79]. A paradoxical role of childbirth related posttraumatic stress disorder (PTSD) symptoms in the association between personality factors and mother-infant bonding: A cross-sectional study. *Psychological Trauma*.	2019	504	PBQ BiTS	Israel
6	Parfitt, Y. M., & Ayers, S. (2009). The effect of post-natal symptoms of post-traumatic stress and depression on the couple's relationship and parent–baby bond. *Journal of Reproductive and Infant Psychology, 27*, 127–142.	2009	148	PBQ PDS	UK
7	Parfitt, Y., Ayers, S., Pike, A., Jessop, D. C., & Ford, E. (2014). A prospective study of the parent–baby bond in men and women 15 months after birth. *Journal of Reproductive and Infant Psychology, 32*, 441–456.	2014	58	PBQ PDS	UK
8	Radoš, S. N., Matijaš, M., Anđelinović, M., Čartolovni, A., & Ayers, S. (2020). The role of posttraumatic stress and depression symptoms in mother-infant bonding. *Journal of Affective Disorders, 268*, 134–140.	2020	259	PBQ BiTS	Croatia
9	Stuijfzand, S., Garthus-Niegel, S., & Horsch, A. (2020). Parental birth related PTSD symptoms and bonding in the early postpartum period: a prospective population-based cohort study. *Frontiers in Psychiatry, 11*, 570727.	2020	105	MIBS PDS	Switzerland
10	Smorti, M., Ponti, L., Ghinassi, S., & Rapisardi, G. (2020). The mother–child attachment bond before and after birth: The role of maternal perception of traumatic childbirth. *Early human development, 142*, 104956.	2020	488	MPAS PPQ	Italy
11	Williams, C., Patricia Taylor, E., & Schwannauer, M. (2016). A web-based survey of mother–infant bond, attachment experiences, and metacognition in posttraumatic stress following childbirth. *Infant Mental Health Journal, 37*, 259–273.	2016	448	MPAS IES-R	UK
12	Kjerulff, K. H., Attanasio, L. B., Sznajder, K. K., & Brubaker, L. H. (2021). A prospective cohort study of post-traumatic stress disorder and maternal-infant bonding after first childbirth. *Journal of psychosomatic research, 144*, 110424.	2021	3006	PBQ TSQ	USA

from -0.60 to -0.17, with 100% of estimates being negative, indicating posttraumatic stress disorder were related to poorer mother-infant relationships. The estimated average Fisher r-to-z transformed correlation coefficient based on the random-effects model was r = -0.36 (95% CI: −0.43 to −0.28). Therefore, the average outcome differed significantly from zero ($z = -9.19$, $p < .001$). According to the Q-test, the outcomes appear to be heterogeneous ($Q(11) = 81.63$, p less than 0.001, $tau^2 = 0.0123$, $I^2 = 80.73\%$). A 95% prediction interval for the true outcomes is given by −0.59 to −0.13. Hence, even though there is some heterogeneity, the true outcomes of the studies are all in the same direction as the estimated average outcome. An examination of the studentized residuals revealed that none of the studies had a value larger than ±2.87 and hence there was no indication of outliers in the context of this model. According to the Cook's distances, the study by Rados et al. [59] (BiTS & PBQ) could be considered to be overly influential. Neither the rank correlation nor the regression test indicated any funnel plot asymmetry ($p = .84$ and $p = .14$, respectively). The analysis was also run without the Feeley et al. [53] study to check if the difference of the observational measure used in that study was important. The difference observed running the analysis without the Feeley study remained significant ($r = -0.35$) and the overall difference to the analysis was negligible, therefore the original decision to include it was retained.

Despite the heterogeneity observed, based on a fail-safe N of 1703.00 ($p < .001$), it can be concluded with a high level of confidence that the results obtained from the analysis are statistically significant, indicating that posttraumatic stress disorder symptoms are strongly associated with poorer mother-infant relationship. The fail-safe N value indicates the number of additional non-significant studies that would be required to nullify the findings, and in this case, the high value suggests that the results are robust and unlikely to be influenced by publication bias [85]. A forest plot of the summary estimates and effects sizes is shown in Fig. 2.

Moderator analysis

Despite the robust finding, due to the heterogeneity observed, subgroup analysis was explored to test if there were any moderators influencing the association between birth related trauma and the mother-infant relationship. There was insufficient variation across age of mother to consider age as a potential moderator. Age of infant varied across studies and was split into two categories of less than and greater than six months of age. The Postpartum Bonding Questionnaire was favoured by most studies with seven of the twelve using it, while the other five studies used three other scales between the five studies to measure mother-infant relationship, mother-infant relationship scale was therefore included as a potential moderator. The scales measuring symptoms of posttraumatic stress disorder were too varied to test as moderators to obtain a meaningful result as there were six scales spread across the twelve studies with no scale used more than three times. Based on the above, age of baby (less than 6 months [$k = 6$], greater than 6 months [$k = 6$]) and mother-infant relationship scale (Postpartum Bonding Questionnaire [$k = 7$] and other scale [$k = 5$]) were then tested

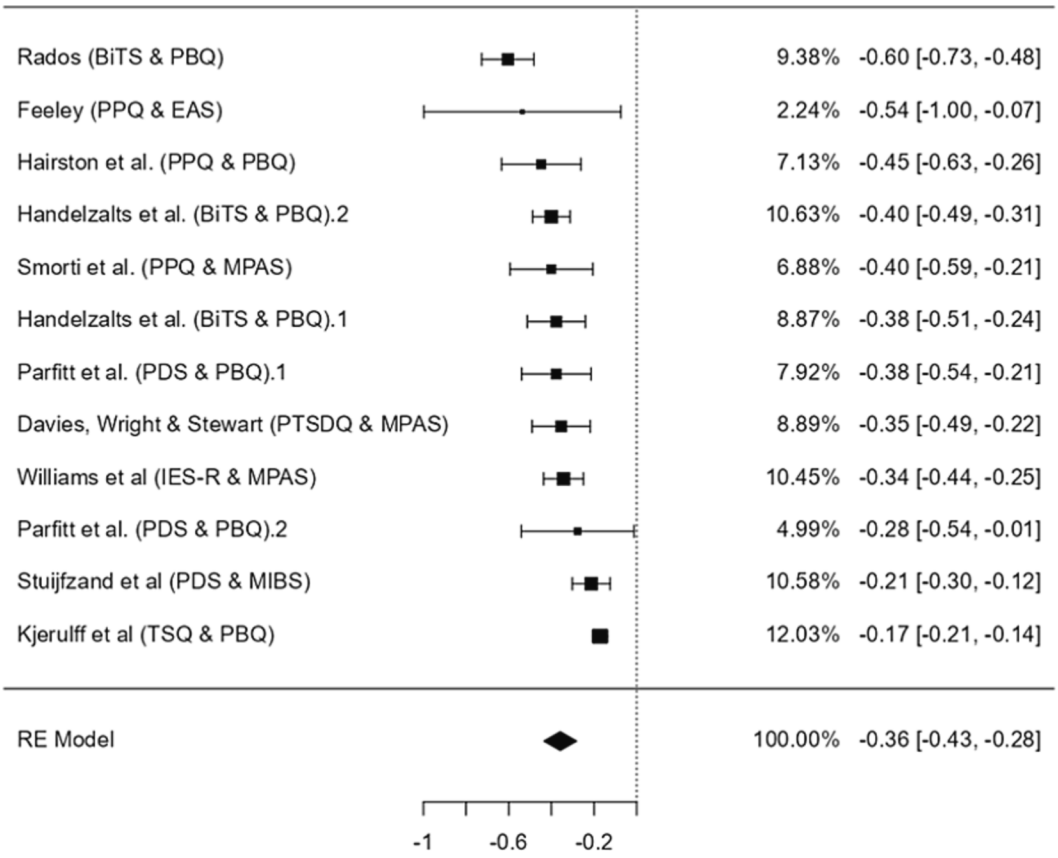

Fig. 2. Forest plot summarizing the meta-analysis results with summary estimate and model fitting weights. *Note*. The summary estimate (combined effect size) is represented by the diamond at the bottom, while the squares represent the effect size estimates of individual studies. The size of each square is proportional to the study's weight in the analysis, based on the model fitting weights. Percentage refers to contribution of each individual study. Abbreviations for each trauma scale and mother-infant relationship are displayed in brackets after author names. BiTS: City Birth Trauma Scale; PBQ: Postpartum Bonding Questionnaire; PPQ: Perinatal PTSD Questionnaire; EAS: Emotional Availability Scales; MIBS: Mother to Infant Bonding Scale; PDS: Posttraumatic Stress Diagnostic Scale; MPAS: Maternal Postnatal Attachment Scale; PTSDQ: Posttraumatic Stress Disorder Scale; IES-R: Impact of Events Scale- Revised; TSQ: Trauma Screening Questionnaire.

as moderators.

For age of baby, while the overall effect size remained negative and statistically significant, the moderator coefficient of −0.03 indicated that the effect of the moderator variable (age of baby) on the relationship between the predictor and the outcome variable was not statistically significant (p =.76). Similarly, for the moderator variable mother-infant relationship scale, the overall effect size remained negative and statistically significant however the moderator coefficient of −0.04 was not significant (p =.59). The results of the moderator analyses implies that the strength and direction of the relationship between the predictor and the outcome variable were consistent across the levels of both moderator variables. Therefore, it can be concluded that the moderator variables do not have a significant impact on the relationship between the predictor and the outcome variable, and the overall effect size is robust and reliable for the moderators in question.

Discussion

In the present study, we conducted a meta-analysis to examine the level of association between birth related PTSD symptoms and the mother-infant relationship. The meta-analysis showed that a robust negative association between birth related PTSD and the mother-infant relationship exists. One hundred percent of estimates were negative indicating not only a significant finding but also consistency in the direction of the relationship. According to the strength of the results of the meta-analysis conclusions drawn from this study may be considered robust when making decisions or recommendations about birth related PTSD and the mother-infant relationship [81]. The findings are consistent with the concepts presented in in both the Dual Representation Theory of PTSD [17] and Beck's Theory of Traumatic Birth [4], indicating that childbirth can be experienced as a traumatic event that may have adverse effects on the mother's ability to provide warm and sensitive caregiving, consequently affecting the mother-infant relationship.

Clinical implications

The study's findings have important implications for healthcare professionals who work with new mothers and their infants, as they highlight the need to screen and treat birth related PTSD symptoms, as well as provide appropriate support and interventions to improve the mother-infant relationship. Prevention of birth related trauma is an important area of research and clinical practice where more needs to be understood about causes, risks and vulnerability factors. There are certain individual vulnerabilities (e.g., previous trauma, antenatal depression) and systemic issues (e.g., obstetric violence, medical paternalism) that need to be addressed more broadly. Further research is still needed to understand more about individual risk factors including childbirth self-efficacy and personality. The systemic issues need to be researched further in order to present a solid case for change to policy makers. Overall, we need better education for mothers, health workers and policy makers, as the problem of birth trauma needs multipronged solutions.

Intervention studies for birth related PTSD are scarce. de Graaff et al., [86] conducted a systematic review on interventions for birth related PTSD and traumatic birth experiences. The authors found

thirteen possible studies suitable for review. All of the studies reviewed were secondary interventions for the treatment of birth related PTSD symptoms and no research had been conducted on primary prevention at that stage. Of the intervention studies reviewed these included various approaches such as, debriefing, skin to skin contact, direct breastfeeding, structured psychological interventions and expressive writing. Based on the results of this review, the authors concluded there was insufficient evidence that the interventions would be effective on unselected groups of women and that still no research had been conducted on how to prevent a traumatic birth.

Furuta et al. [87] also conducted a review, their review explored trauma focused treatments (exposure therapy, trauma-focused cognitive behavioural therapy, eye movement desensitization and reprocessing and other psychological approaches) for birth related PTSD. Their review concluded that trauma focused therapy was effective for the treatment of birth related PTSD however they were unable to conclude if any particular type of trauma focused therapy was superior for any specific subgroup of women. Another study by Horsch et al. trialed a novel intervention for preventing onset of PTSD symptoms by having women play the well known game 'Tetris' for at least ten minutes following an emergency caesarean. The study found women in the intervention group reported fewer intrusive symptoms than those who were in the control group [88]. These studies show emerging evidence that targeted treatments may ameliorate or even prevent symptoms of PTSD following a traumatic birth.

Since mothers with PTSD are likely to have a range of difficulties with their parenting including being less warm and less attuned to their baby, intervention studies that include a focus on treating and supporting the mother-infant dyad may be worthy of investigation. Further research could also examine the specific mechanisms or components of birth related PTSD that influence the mother-infant relationship. This could include exploring the role of mother-infant synchronicity [61] in shaping the dynamics of the mother-infant relationship when PTSD is present and also the role avoidance and disconnect proposed in the DRT model [17]. Understanding the pathways involved may assist to better target interventions.

Strengths and limitations

Attachment and bonding are terms often used interchangeably to describe the relationship between mothers and infants. Bonding is thought to be more about a caregiver's feelings towards their baby whereas attachment relates to infants' relationship with their caregiver [59,60]. Hence, they focus on different sides of the mother-infant relationship. In this study, all measures captured mother to infant bonding. This may be an important distinction given that it is the attachment relationship that is so important for future health. It is possible that impairments could exist from mother to baby but not baby to mother or that the manifests differently. This would be a useful nuance to explore in future.

Parity was another consideration for sub-group analysis, however, only two studies in this analysis focused solely on a primiparous sample and none exclusively focused on multiparous samples. With the studies available it was not possible to analyse potential differences between the experiences of primiparous and multiparous mother-infant dyads. It has been suggested that parity may be important, indeed one study has shown that it may potentially moderate the association between birth related PTSD and infant outcomes [89] and is therefore worthy of further exploration.

How we measure and operationalise trauma is an important consideration. First, of the studies included three utilised a measure (BiTS) that relates back to DSM-V criteria for PTSD, while the remaining nine studies used measures that related back to DSM-IV criteria. The criteria for PTSD changed quite substantially between the fourth and fifth edition of the DSM, while the current version of the DSM, DSM-V-TR includes the same criteria as the DSM-V with only a minor change for children in the latest version. In the DSM-IV an event was classed as a traumatic if it involved "actual or threatened death or serious injury, or a threat to the physical integrity of self or others" (criterion A1) and the person responded to this with intense fear, helplessness, or horror (criterion A2) [90]. The DSM-IV criteria for PTSD comprised of three clusters of symptoms: re-experiencing, avoidance and numbing, and hyperarousal. In the DSM-V criterion A2 and emotional numbing were removed, eight of the original 17 symptoms were edited, and a further three symptoms added to create a fourth cluster of symptoms of negative cognitions and mood [91,92]. Because the changes were so substantial it poses a challenge for researchers collating and interpreting data that has used a combination of DSM-IV and DSM-V criteria. Our findings should be interpreted with this in mind. Further, in this review, only the total PTSD symptoms were examined in relation to the mother-infant relationship. From a clinical perspective, it would also be useful to explore whether any particular symptom clusters are more strongly associated with the mother-infant relationship. Second, rates of birth related PTSD are around 3–4%, whereas around one third of women report birth as traumatic [6,7,9–12]. This study focused on birth related PTSD symptoms, however, given that some birth trauma may be related to disempowerment or experiences of oppression, measurements that rely on DSM PTSD criteria may not capture the full spectrum of experiences. Consistent with the Power Threat Meaning Framework [27], the Indicative Trauma Impact Manual [93], for example, explains over five hundred trauma responses and coping mechanisms without linking them to any mental health issues or disorders. It is entirely possible, we are just not capturing all the signs and symptoms of birth trauma if we rely on DSM criteria alone, particularly when it comes to such a unique type of traumatic experience. Nonetheless, using a strict DSM approach indicates there is a significant problem in the birthing world that needs attention.

Measurement of the mother-infant relationship is another consideration. This study included eleven studies that relied on self-report measures and one observational study. The *meta*-analysis was run with and without the study that utilised the observational measurement, with results indicating no meaningful difference and therefore the study was retained in the main analysis. Self-report measures of mother-infant relationship may lack capacity to measure nuanced mother-infant interactions. These interactions involve a dynamic interplay of emotions, behaviours, and nonverbal cues, which might be difficult to capture adequately through self-report questionnaires alone and may restrict the depth of understanding regarding the intricacies of any problems in mother-infant relationship. Results from this study should be interpreted with this in mind.

Finally, this study focused on the first year postnatally. Future studies may want to examine the impact of birth related PTSD on the mother-child relationship beyond the first year to determine what ongoing consequences, if any, exist across time, as well as have the capacity to explore a broader range of potential child outcomes.

Conclusion

Psychological distress following a traumatic birth experience appears to be problematic to the extent it interferes negatively with the mother-infant relationship. Explanations for the development of birth related PTSD are diverse and numerous and may be better viewed from the perspectives of the Power Threat Meaning Framework [27]. Using the PTMF, we can incorporate both individual and system-based factors, which would give us a more holistic understanding of the problem, as opposed to multiple competing theories. Given that the mother-infant relationship is fundamental to infant health and child outcomes, further research is still needed to understand why so many women are experiencing birth as traumatic. Interventions that prevent birth trauma that are both individually focused and system focused need urgent attention.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.srhc.2023.100920.

References

[1] Beck CT, Watson S, Gable RK. Traumatic childbirth and its aftermath: Is there anything positive? J Perinat Educ 2018;27:175–84. https://doi.org/10.1891/1058-1243.27.3.175.
[2] Greenfield M, Jomeen J, Glover L. What is traumatic birth? A concept analysis and literature review. Br J Midwifery 2016;24:254–67. https://doi.org/10.12968/bjom.2016.24.4.254.
[3] American Psychiatric Association. Diagnostic and statistical manual of mental disorders (text rev, 5 ed.); 2022. doi: 10.1176/appi.books.9780890425787.
[4] Beck CT. Middle range theory of traumatic childbirth: The ever-widening ripple effect. Global Qualitative Nursing Res 2015;2:1–13. https://doi.org/10.1177/2333393615575313.
[5] Van Sieleghem S, Danckaerts M, Rieken R, Okkerse JM, de Jonge E, Bramer WM, et al. Childbirth related PTSD and its association with infant outcome: A systematic review. Early Hum Dev 2022;105667. https://doi.org/10.1016/j.earlhumdev.2022.105667.
[6] Ayers S, McKenzie-McHarg K, Slade P. Post-traumatic stress disorder after birth. J Reprod Infant Psychol 2015;33:215–8. https://doi.org/10.1080/02646838.2015.1030250.
[7] Yildiz PD, Ayers S, Phillips L. The prevalence of posttraumatic stress disorder in pregnancy and after birth: A systematic review and meta-analysis. J Affect Disord 2017;208:634–45. https://doi.org/10.1016/j.jad.2016.10.009.
[8] Dekel S, Stuebe C, Dishy G. Childbirth induced posttraumatic stress syndrome: A systematic review of prevalence and risk factors. Front Psychol 2017;8:560. https://doi.org/10.3389/fpsyg.2017.00560.
[9] Alcorn KL, O'Donovan A, Patrick JC, Creedy D, Devilly GJ. A prospective longitudinal study of the prevalence of post-traumatic stress disorder resulting from childbirth events. Psychol Med 2010;40:1849–59. https://doi.org/10.1017/S0033291709992224.
[10] Ayers S, Harris R, Sawyer A, Parfitt Y, Ford E. Posttraumatic stress disorder after childbirth: analysis of symptom presentation and sampling. J Affect Disord 2009;119:200–4. https://doi.org/10.1016/j.jad.2009.02.029.
[11] Baptie G, Andrade J, Bacon AM, Norman A. Birth trauma: the mediating effects of perceived support. Br J Midwifery 2020;28:724–30. https://doi.org/10.12968/bjom.2020.28.10.724.
[12] Rados SN, Matijas M, Kuhar L, Andelinovic M, Ayers S. Measuring and conceptualizing PTSD following childbirth: Validation of the City Birth Trauma Scale. Psychol Trauma 2020;12:147–55. https://doi.org/10.1037/tra0000501.
[13] Cheung SLF. Impact of maternal childbirth trauma on mother-child bonding, ptsd and depression. Hong Kong: Alliant International University; 2018 [Doctoral Dissertation].
[14] Slade P, Murphy A, Hayden E. Identifying Post-traumatic stress disorder after childbirth. BMJ 2022;377. https://doi.org/10.1136/bmj-2021-067659.
[15] Schubert S, Lee CW. Adult PTSD and its treatment with EMDR: A review of controversies, evidence, and theoretical knowledge. J EMDR Pract Res 2009;3:117–32. https://doi.org/10.1891/1933-3196.3.3.117.
[16] Foa EB, Huppert JD, Cahill SP. Emotional processing theory: An update. In: Rothbaum BO, editor. Pathological anxiety: Emotional processing in etiology and treatment. New York: The Guilford Press; 2006. p. 3–24.
[17] Brewin CR, Holmes EA. Psychological theories of posttraumatic stress disorder. Clin Psychol Rev 2003;23:339–76. https://doi.org/10.1016/S0272-7358(03)00033-3.
[18] Ehlers A, Clark DM. A cognitive model of posttraumatic stress disorder. Behav Res Ther 2000;38:319–45. https://doi.org/10.1016/S0005-7967(99)00123-0.
[19] Ayers S, Radoš SN, Balouch S. Narratives of traumatic birth: Quality and changes over time. Psychol Trauma Theory Res Pract Policy 2015;7:234. https://doi.org/10.1037/a0039044.
[20] Ayers S, Bond R, Bertullies S, Wijma B. The aetiology of post-traumatic stress following childbirth: a meta-analysis and theoretical framework. Psychol Med 2016;46:1121–34. https://doi.org/10.1017/S0033291715002706.
[21] Ford E, Ayers S. Support during birth interacts with prior trauma and birth intervention to predict postnatal post-traumatic stress symptoms. Psychol Health 2011;26:1553–70. https://doi.org/10.1080/08870446.2010.533770.
[22] Garthus-Niegel S, von Soest T, Vollrath ME, Eberhard-Gran M. The impact of subjective birth experiences on post-traumatic stress symptoms: a longitudinal study. Arch Womens Ment Health 2013;16:1–10. https://doi.org/10.1007/s00737-012-0301-3.
[23] Harris R, Ayers S. What makes labour and birth traumatic? A survey of intrapartum 'hotspots'. Psychological Health 2012;27:1166–77. https://doi.org/10.1080/08870446.2011.649755.
[24] Soderquist J, Wijma B, Thorbert G, Wijma K. Risk factors in pregnancy for post-traumatic stress and depression after childbirth. BJOG 2009;116:672–80. https://doi.org/10.1111/j.1471-0528.2008.02083.x.
[25] Read J, Harper DJ. The Power Threat Meaning Framework: Addressing Adversity, Challenging Prejudice and Stigma, and Transforming Services. J Constr Psychol 2022;35:54–67. https://doi.org/10.1080/10720537.2020.1773356.
[26] Reid C, McKenzie JE, Brennan SE, Bennetts SK, Clark Y, Mensah F, et al. Interventions during pregnancy or up to two years after birth for parents who are experiencing complex trauma or have experienced maltreatment in their childhood (or both) to improve parenting capacity or socio-emotional well-being. Cochrane Database Syst Rev 2021. https://doi.org/10.1002/14651858.CD014874.
[27] Johnstone L, Boyle M. The power threat meaning framework: An alternative nondiagnostic conceptual system. J Humanist Psychol 2018;0022167818793289. https://doi.org/10.1177/0022167818793289.
[28] Taylor J. Sexy But Psycho: How the Patriarchy Uses Women's Trauma Against Them. Hachette UK; 2022.
[29] Global Health Data Exchange. GDB Results Tool. Seattle: Institute for Health Metrics and Evaluation; 2019. Retrieved April 11 2023 from https://vizhub.healthdata.org/gbd-results/.
[30] Koenen K, Ratanatharathorn A, Ng L, McLaughlin K, Bromet E, Stein D, et al. Posttraumatic stress disorder in the world mental health surveys. Psychol Med 2017;47:2260–74. https://doi.org/10.1017/S0033291717000708.
[31] Sadler M, Santos MJ, Ruiz-Berdún D, Rojas GL, Skoko E, Gillen P, et al. Moving beyond disrespect and abuse: addressing the structural dimensions of obstetric violence. Reprod Health Matters 2016;24:47–55. https://doi.org/10.1016/j.rhm.2016.04.002.
[32] Diaz-Tello F. Invisible wounds: obstetric violence in the United States. Reprod Health Matters 2016;24:56–64. https://doi.org/10.1016/j.rhm.2016.04.004.
[33] Keedle H, Keedle W, Dahlen HG. Dehumanized, violated, and powerless: an Australian survey of women's experiences of obstetric violence in the past 5 years. Violence Against Women 2022;10778012221140138. https://doi.org/10.1177/10778012221140138.
[34] Beck CT. Birth trauma: in the eye of the beholder. Nurs Res 2004;53:28–35. https://doi.org/10.1097/00006199-200401000-00005.
[35] Šimonović D. A human rights-based approach to mistreatment and violence against women in reproductive health services with a focus on childbirth and obstetric violence. Note / by the Secretary-General 2019.
[36] Mena-Tudela D, Cervera-Gasch A, Alemany-Anchel MJ, Andreu-Pejó L, González-Chordá VM. Design and validation of the PercOV-S questionnaire for measuring perceived obstetric violence in nursing, midwifery and medical students. Int J Environ Res Public Health 2020;17:8022. https://doi.org/10.3390/ijerph17218022.
[37] Souza KJD, Rattner D, Gubert MB. Institutional violence and quality of service in obstetrics are associated with postpartum depression. Revista de saude publica 2017;51:69. https://doi.org/10.1590/s1518-8787.2017051006549.
[38] Martinez-Vázquez S, Rodríguez-Almagro J, Hernández-Martínez A, Martínez-Galiano JM. Factors associated with postpartum post-traumatic stress disorder (PTSD) following obstetric violence: a cross-sectional study. J Personalized Med 2021;11:338. https://doi.org/10.3390/jpm11050338.
[39] World Health Organisation. Intrapartum care for a positive birth experience. World Health Organisation; 2018. https://www.who.int/reproductivehealth/publications/intrapartum-care-guidelines/en/.
[40] Sethna V, Pote I, Wang S, Gudbrandsen M, Blasi A, McCusker C, et al. Mother–infant interactions and regional brain volumes in infancy: an MRI study. Brain Struct Funct 2017;222:2379–88. https://doi.org/10.1007/s00429-016-1347-1.
[41] Lyons S. A prospective study of post traumatic stress symptoms 1 month following childbirth in a group of 42 first-time mothers. J Reprod Infant Psychol 1998;16:91–105. https://doi.org/10.1080/02646839808404562.
[42] Lyons-Ruth K, Todd MJ, Von Klitzing K, Tamminen T, Emde R, Fitzgerald H, et al. The worldwide burden of infant mental and emotional disorder: Report of the task force of the world association for infant mental health. Infant Ment Health J 2017;38:695–705. https://doi.org/10.1002/imhj.21674.
[43] World Health Organisation. Maternal mental health and child health development in low and middle income families; 2008.
[44] Davies J, Slade P, Wright I, Stewart P. Posttraumatic stress symptoms following childbirth and mothers' perceptions of their infants. Infant Ment Health J 2008;29:537–54. https://doi.org/10.1002/imhj.20197.
[45] Parfitt YM, Ayers S. The effect of post-natal symptoms of post-traumatic stress and depression on the couple's relationship and parent–baby bond. J Reprod Infant Psychol 2009;27:127–42. https://doi.org/10.1080/02646830802350831.
[46] Parfitt Y, Ayers S, Pike A, Jessop DC, Ford E. A prospective study of the parent–baby bond in men and women 15 months after birth. J Reprod Infant Psychol 2014;32:441–56. https://doi.org/10.1080/02646838.2014.956301.
[47] Cook N, Ayers S, Horsch A. Maternal posttraumatic stress disorder during the perinatal period and child outcomes: A systematic review. J Affect Disord 2018;225:18–31. https://doi.org/10.1016/j.jad.2017.07.045.
[48] Pierrehumbert B, Muller-Nix C, Forcada-Guex M, Ansermet F. Parental post-traumatic reactions after premature birth: Implications for sleeping and eating

problems in the infant. Arch Dis Child Fetal Neonatal Ed 2003;88. https://doi.org/10.1136/fn.88.5.F400.
[49] Priddis HS, Keedle H, Dahlen H. The perfect storm of trauma: The experiences of women who have experienced birth trauma and subsequently accessed residential parenting services in australia. Women Birth 2018;31:17–24. https://doi.org/10.1016/j.wombi.2017.06.007.
[50] Dahlen HG, Thornton C, Fowler C, Mills R, O'Loughlin G, Smit J, et al. Characteristics and changes in characteristics of women and babies admitted to residential parenting services in New South Wales, Australia in the first year following birth: A population-based data linkage study 2000–2012. BMJ Open 2019;9:e030133.
[51] Garthus-Niegel S, Horsch A, Graz MB, Martini J, von Soest T, Weidner K, et al. The prospective relationship between postpartum PTSD and child sleep: a 2-year follow-up study. J Affect Disord 2018;241:71–9. https://doi.org/10.1016/j.jad.2018.07.067.
[52] Mayopoulos GA, Ein-Dor T, Dishy GA, Nandru R, Chan SJ, Hanley LE, et al. COVID-19 is associated with traumatic childbirth and subsequent mother-infant bonding problems. J Affect Disord 2021;282:122–5. https://doi.org/10.1016/j.jad.2020.12.101.
[53] Feeley N, Zelkowitz P, Cormier C, Charbonneau L, Lacroix A, Papageorgiou A. Posttraumatic stress among mothers of very low birthweight infants at 6 months after discharge from the neonatal intensive care unit. Appl Nurs Res 2011;24:114–7. https://doi.org/10.1016/j.apnr.2009.04.004.
[54] Ferri CP, Mitsuhiro SS, Barros MC, Chalem E, Guinsburg R, Patel V, et al. The impact of maternal experience of violence and common mental disorders on neonatal outcomes: a survey of adolescent mothers in Sao Paulo, Brazil. BMC Public Health 2007;7:209. https://doi.org/10.1186/1471-2458-7-209.
[55] Lipkind HS, Curry AE, Huynh M, Thorpe LE, Matte T. Birth outcomes among offspring of women exposed to the September 11, 2001, terrorist attacks. Obstet Gynecol 2010;116:917–25. https://doi.org/10.1097/AOG.0b013e3181f2f6a2.
[56] Parfitt Y, Pike A, Ayers S. Infant developmental outcomes: A family systems perspective. Infant Child Dev 2014;23:353–73. https://doi.org/10.1002/icd.1830.
[57] Gidget Foundation. The cost of perinatal depression and anxiety in Australia; (2019, November 7). Retrieved January 21 from https://gidgetfoundation.org.au/wp-content/uploads/2019/11/Cost-of-PNDA-in-Australia_-Final-Report.pdf.
[58] Murray L, Fiori-Cowley A, Hooper R, Cooper P. The impact of postnatal depression and associated adversity on early mother-infant interactions and later infant outcome. Child Dev 1996;67:2512–26. https://doi.org/10.2307/1131637.
[59] Radoš SN, Matijaš M, Anđelinović M, Čartolovni A, Ayers S. The role of posttraumatic stress and depression symptoms in mother-infant bonding. J Affect Disord 2020;268:134–40. https://doi.org/10.1016/j.jad.2020.03.006.
[60] Powell B, Cooper G, Hoffman K, Marvin B. The circle of security intervention: Enhancing attachment in early parent-child relationships. Guilford publications; 2013.
[61] Feldman R. Bio-behavioral synchrony: A model for integrating biological and microsocial behavioral processes in the study of parenting. Parenting 2012;12:154–64. https://doi.org/10.1080/15295192.2012.683342.
[62] Feldman R, Eidelman AI. Biological and environmental initial conditions shape the trajectories of cognitive and social-emotional development across the first years of life. Dev Sci 2009;12:194–200. https://doi.org/10.1111/j.1467-7687.2008.00761.x.
[63] Feldman R, Bakermans-Kranenburg MJ. Oxytocin: a parenting hormone. Curr Opin Psychol 2017;15:13–8. https://doi.org/10.1016/j.copsyc.2017.02.011.
[64] Handelzalts JE, Hairston IS, Muzik M, Matatyahu TA, Levy S. A paradoxical role of childbirth-related posttraumatic stress disorder (PTSD) symptoms in the association between personality factors and mother–infant bonding: A cross-sectional study. Psychol Trauma Theory Res Pract Policy 2019. https://doi.org/10.1037/tra0000446.
[65] Hairston ISE, Handelzalts J, Assis C, Kovo M. Postpartum bonding difficulties and adult attachment styles: The mediating role of postpartum depression and childbirth-related PTSD. Infant Mental Health J 2018;39:198–208. https://doi.org/10.1002/imhj.21695.
[66] Smorti M, Ponti L, Ghinassi S, Rapisardi G. The mother-child attachment bond before and after birth: The role of maternal perception of traumatic childbirth. Early Hum Dev 2020;142:104956. https://doi.org/10.1016/j.earlhumdev.2020.104956.
[67] Stuijfzand S, Garthus-Niegel S, Horsch A. Parental birth-related PTSD symptoms and bonding in the early postpartum period: a prospective population-based cohort study. Front Psych 2020;11:570727. https://doi.org/10.3389/fpsyt.2020.570727.
[68] Williams C, Patricia TE, Schwannauer M. A web-based survey of mother–infant bond, attachment experiences, and metacognition in posttraumatic stress following childbirth. Infant Ment Health J 2016;37:259–73. https://doi.org/10.1002/imhj.21564.
[69] Kjerulff KH, Attanasio LB, Sznajder KK, Brubaker LH. A prospective cohort study of post-traumatic stress disorder and maternal-infant bonding after first childbirth. J Psychosom Res 2021;144:110424. https://doi.org/10.1016/j.jpsychores.2021.110424.
[70] Allen S. A qualitative analysis of the process, mediating variables and impact of traumatic childbirth. J Reprod Infant Psychol 1998;16:107–31. https://doi.org/10.1080/02646839808404563.
[71] Ballard C, Stanley A, Brockington I. Post-traumatic stress disorder (PTSD) after childbirth. Br J Psychiatry 1995;166:525–8.
[72] Fones C. Posttraumatic stress disorder occurring after painful childbirth. J Nerv Ment Dis 1996;184:195–6. https://doi.org/10.1097/00005053-199603000-00012.
[73] Nicholls K, Ayers S. Childbirth-related post-traumatic stress disorder in couples: A qualitative study. Br J Health Psychol 2007;12:491–509. https://doi.org/10.1348/135910706X120627.
[74] Dekel S, Thiel F, Dishy G, Ashenfarb AL. Is childbirth-induced PTSD associated with low maternal attachment? Archive of Women's Mental Health 2019;22:119–22. https://doi.org/10.1007/s00737-018-0853-y.
[75] Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group* t. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Ann Intern Med 2009;151:264–9. https://doi.org/10.7326/0003-4819-151-4-200908180-00135.
[76] Biringen Z, Brown D, Donaldson L, Green S, Krcmarik S, Lovas G. Adult Attachment Interview: Linkages with dimensions of emotional availability for mothers and their pre-kindergarteners. Attach Hum Dev 2000;2:188–202. https://doi.org/10.1080/14616730050085554.
[77] Biringen Z, Derscheid D, Vliegen N, Closson L, Easterbrooks MA. Emotional availability (EA): Theoretical background, empirical research using the EA Scales, and clinical applications. Dev Rev 2014;34:114–67. https://doi.org/10.1016/j.dr.2014.01.002.
[78] Haddaway NR, Page MJ, Pritchard CC, McGuinness LA. PRISMA2020: An R package and Shiny app for producing PRISMA 2020-compliant flow diagrams, with interactivity for optimised digital transparency and Open Synthesis. Campbell Syst Rev 2022;18:e1230.
[79] Handelzalts JE, Hairston IS, Muzik M, Matatyahu TA, Levy S. A paradoxical role of childbirth-related posttraumatic stress disorder (PTSD) symptoms in the association between personality factors and mother-infant bonding: A cross-sectional study. Psychol Trauma 2019. https://doi.org/10.1037/tra0000521.
[80] Handelzalts JE, Levy S, Molmen-Lichter M, Ayers S, Krissi H, Wiznitzer A, et al. The association of attachment style, postpartum PTSD and depression with bonding-A longitudinal path analysis model, from childbirth to six months. J Affect Disord 2021;280:17–25. https://doi.org/10.1016/j.jad.2020.10.068.
[81] jamovi. The jamovi project: 2022. Retrieved March 24 from https://www.jamovi.org.
[82] R Core Team. R: A Language and environment for statistical computing; 2021. Retrieved March 24 from https://cran.r-project.org.
[83] Viechtbauer W. Conducting meta-analyses in R with the metafor package. J Stat Softw 2010;36:1–48. https://doi.org/10.18637/jss.v036.i03.
[84] Cochran WG. The combination of estimates from different experiments. Biometrics 1954;10:101–29. 2307/3001666.
[85] Francis G. Replication, statistical consistency, and publication bias. J Math Psychol 2013;57:153–69. https://doi.org/10.1016/j.jmp.2013.02.003.
[86] de Graaff LF, Honig A, van Pampus MG, Stramrood CAI. Preventing post-traumatic stress disorder following childbirth and traumatic birth experiences: a systematic review. Acta Obstetrecia et Gynecologica Scandinavica 2018;97:648–56. https://doi.org/10.1111/aogs.13291.
[87] Furuta M, Horsch A, Ng ES, Bick D, Spain D, Sin J. Effectiveness of trauma-focused psychological therapies for treating post-traumatic stress disorder symptoms in women following childbirth: a systematic review and meta-analysis. Front Psych 2018;9:591. https://doi.org/10.3389/fpsyt.2018.00591.
[88] Horsch A, Vial Y, Favrod C, Harari MM, Blackwell SE, Watson P, et al. Reducing intrusive traumatic memories after emergency caesarean section: A proof-of-principle randomized controlled study. Behav Res Ther 2017;94:36–47. https://doi.org/10.1016/j.brat.2017.03.018.
[89] Grekin R, O'Hara MW. Prevalence and risk factors of postpartum posttraumatic stress disorder: a meta-analysis. Clin Psychol Rev 2014;34:389–401. https://doi.org/10.1016/j.cpr.2014.05.003.
[90] American Psychiatric Association. Diagnostic and statistical manual of mental disorders, 4th ed.; 1994.
[91] American Psychiatric Association. Diagnostic and statistical manual of mental disorders, (5 th ed.; (2013), doi: 10.1176/appi.books.9780890425787.
[92] Ayers S, Wright DB, Thornton A. Development of a measure of postpartum ptsd: The city birth trauma scale. Front Psychiatry 2018;9:409. https://doi.org/10.3389/fpsyt.2018.00409.
[93] Taylor J, Shrive J. Indicative Trauma Impact Manual: ITIM for Professionals, 1st ed. Independent; 2023.