

Dyadic analyses on the prospective association between birth experience and parent-child-bonding: The role of postpartum depression, anxiety, and childbirth-related posttraumatic stress disorder

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ARTICLE INFO

Keywords:

Birth experience
Parent-child-bonding
Postpartum
Dyadic analysis
DREAM study

ABSTRACT

Objective: Negative birth experiences are associated with postpartum mental health difficulties in parents. However, research considering the long-term impact of a negative birth experience on parent-child-bonding and the interdependence between parents is rare. This study aimed to investigate actor as well as partner effects for the association between parents' birth experience and parent-child-bonding and whether this association is mediated by postpartum psychiatric symptoms.

Method: A community sample of couples ($N = 743$) completed questionnaires during pregnancy, 2, and 14 months after birth.

Results: Applying Actor-Partner Interdependence Mediation Models, structural equation modeling showed that parents' own negative birth experience predicted a poorer bond to their child 14 months postpartum. Compared to mothers, this association was twice as strong for partners and was mediated by symptoms of postpartum depression (mothers and partners), anxiety (partners), and childbirth-related posttraumatic stress disorder (mothers). Negative birth experiences of one parent were not related to the other parent's bonding with the child.

Conclusion: Results underline the importance of parents' positive birth experience for their postpartum mental health and secure bond to their child. The other parent's birth experience or postpartum mental health does not seem to affect one's own bond to the child in the long term.

1. Introduction

The birth of a child is a life-changing experience for both the mother and her partner. Still, while there is a multitude of studies on the birth experience of the mother, the partner's experience has been largely neglected. This is despite the fact that today most partners in Western Europe are expected to attend the birth of their child and also wish to do so to support the mother and witness this unique moment (Awad &

Bühling, 2011). Although the majority of parents describe their birth experience as positive, 7–34 % of mothers (Ghanbari-Homayi et al., 2019) and up to 26 % of partners (Johansson et al., 2012) perceive it as negative or even traumatic. As partners take on a growing number of responsibilities regarding childcare, it is equally important to investigate the long-term impact of mothers' and partners' negative birth experiences on the emotional bond a parent develops towards the child, which is referred to as parent-child-bonding. Although many researchers

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<https://doi.org/10.1016/j.janxdis.2023.102748>

Received 1 July 2022; Received in revised form 10 July 2023; Accepted 20 July 2023

Available online 23 July 2023

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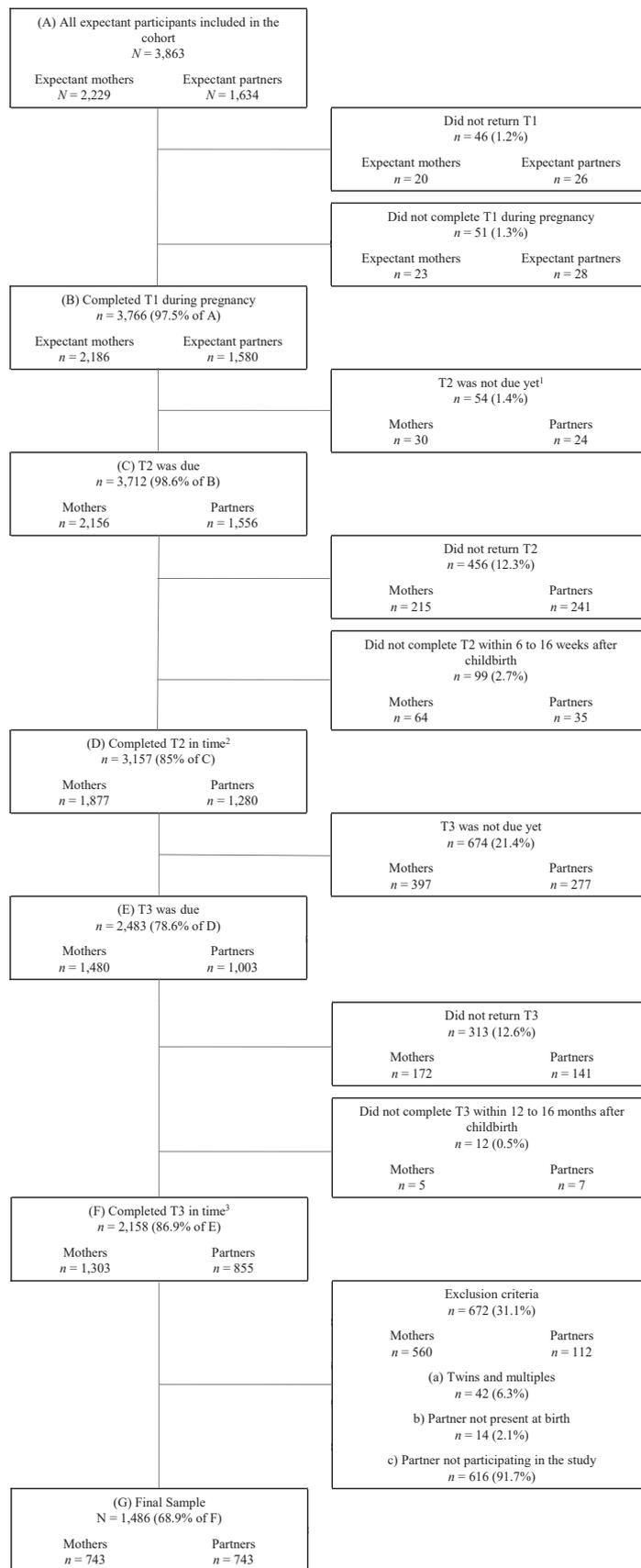


Fig. 1. Flowchart of the study's retention. Note. T1 = during pregnancy, T2 = 2 months after the anticipated birth date, T3 = 14 months after childbirth. ¹Only parents whose child was old enough to complete the respective questionnaires were included in the final sample. ²Parents' birth experience, postpartum symptoms of depression, anxiety, and CB-PTSD were measured at this time point. ³Parent-child-bonding was measured at this time point.

have used the term ‘attachment’ as a synonym for bonding, these two concepts need to be distinguished (Bowlby, 1982, p. 377; Walsh, 2010), because attachment refers to the relationship a child establishes with its caregivers (Bowlby, 1969). Therefore, we will use ‘parent-child-bonding’ throughout the manuscript to describe parents’ affective tie to their children.

So far, the association between birth experience and parent-child-bonding has only been examined by few quantitative studies. The results of a previous study indicate that a negative maternal birth experience predicts poorer mother-child-bonding up to 14 months postpartum (Seefeld, Weise et al., 2022). Research on the partners’ experiences suggests that their involvement in the birth and the emotional quality of the birth experience are positively associated with later bonding between the partner and the child (Bowen & Miller, 1980; Brandão & Figueiredo, 2012; Peterson et al., 1979). Nevertheless, as most of these studies are more than 40 years old and the role of partners in birth and childcare has changed considerably since then, more research is needed to investigate the impact of parents’ birth experiences on parent-child-bonding in the short- and long-term. As a negative birth experience can often be prevented by offering respectful, person-centered intrapartum care (Bell et al., 2018; Chabbert et al., 2020), as well as preparing parents for potential birth outcomes and thereby preventing a mismatch between expectations and actual experiences (Webb et al., 2021), identifying an association between a negative birth experience and poorer parent-child-bonding would further stress the importance of parents’ subjective birth experience for the health of the whole family. In particular, poor parent-child-bonding has been linked to impaired emotional, behavioral, and cognitive development of the child (DeKlyen & Greenberg, 2008; Fuchs et al., 2016) and affective disorders in adulthood (Kidd et al., 2022).

Our study focuses on the mother and partner as a dyad, because the transition to parenthood can be conceptualized as a period of dyadic stress, in which parents need to cope with the challenges of becoming a parent together (Seefeld, Buyukcan-Tetik et al., 2022). According to the family stress theory (Peterson, 2015), stress within families psychologically affects not only the individual, but also has an impact on relationships on the family systems level. A recent study supports this notion, finding a link between a negative birth experience for the mother and increased parenting stress in both mothers and partners (Holopainen et al., 2020). In turn, parental stress may affect the whole family: stress after a negative birth experience may not only spill over to the parent’s own bond to the child, but it may also cross over to the partner, thereby affecting the partner’s bond to the child as well (Bodemann et al., 2016; Ponnet et al., 2013).

Nevertheless, the ABC-X model (Hill, 1949), on which the family stress theory is based, proposes that while a stressor (e.g., negative birth experience) has the *potential* to cause change at a systemic level, parents’ resources and vulnerabilities as well as the way they interpret the stressor determine the impact of the stressor on family relationships (Peterson, 2015). Parents who experience poor postpartum mental health may have reduced capacity to effectively cope with such stressors, highlighting its significance as a potential factor in the potential association between birth experience and parent-child-bonding. A negative birth experience has been shown to increase the risk for postpartum depression (Bradley & Slade, 2011), anxiety (Bell et al., 2016), and childbirth-related posttraumatic stress disorder (CB-PTSD; Garthus-Niegel et al., 2013), which in turn are associated with parent-child-bonding (Bieleninik et al., 2021; Stuijzand et al., 2020; Tolja et al., 2020). Previous research on postpartum depression suggests that poorer mother-child-bonding in affected mothers could be explained by lower emotional involvement with the baby (Slomian et al., 2019). The few existing studies on partners suggest that postpartum depression is also associated with poorer partner-child-bonding, but the reasons are less clear (Nasreen et al., 2021). In the case of postpartum anxiety, some studies indicate that anxious mothers show less sensitivity, are more intrusive and critical, and therefore show

poorer mother-child-bonding (Tietz et al., 2014). However, they often also suffer from comorbid depressive symptoms, which explain the bonding difficulties in some studies (Tietz et al., 2014; Tolja et al., 2020). In fathers, there may be a direct association between postpartum anxiety and father-child-bonding, but this relationship is also mediated by paternal non-responsiveness and stress (Bieleninik et al., 2021; Nakić Radoš, 2021). Results regarding the link between CB-PTSD and parent-child-bonding indicate that mothers with CB-PTSD symptoms seem to have more negative representations of their infant and experience more distress, mediating the relationship with mother-child-bonding (Stuijzand et al., 2020), whereas there might be no association with father-child-bonding (Stuijzand et al., 2020).

Further research is needed to clarify whether symptoms of postpartum depression, anxiety, and CB-PTSD in both mothers and partners serve as mediators in the link between birth experience and parent-child-bonding. This investigation is crucial since establishing mediation would indicate that parents with a negative birth experience should receive additional support and close monitoring to prevent potential postpartum mental health difficulties which may adversely affect the parent-child relationship. Due to the parents’ interdependence, it is likely that one parent’s postpartum psychiatric symptoms could impact the association between the other parent’s birth experience and parent-child-bonding. Fathers, for example, appear to be influenced by mothers’ negative mood and emotional state (Matthey et al., 2001), and likewise, partners’ symptoms of postpartum depression, anxiety, and CB-PTSD have been linked to impaired maternal bonding (Nasreen et al., 2021; Stuijzand et al., 2020). However, no such association was found between maternal CB-PTSD symptoms and father-child-bonding (Stuijzand et al., 2020).

The aim of this study is to examine the association between mothers’ and partners’ birth experiences and parent-child-bonding 14 months postpartum. We hypothesize that a more negative birth experience of the mother will predict poorer mother-child-bonding and a more negative birth experience of the partner will predict poorer partner-child-bonding. Moreover, we hypothesize that the mother’s birth experience will predict partner-child-bonding and the partner’s birth experience will predict mother-child-bonding. Additionally, the potential mediating role of parents’ symptoms of postpartum depression, anxiety, and CB-PTSD for these associations will be investigated.

2. Method

2.1. Design

This study is based on data from the prospective cohort study DREAM. Recruitment started in 2017 and was finished at the end of 2020. Three measurement points were included in the current study: T1 during pregnancy, T2 2 months after the anticipated birth date, and T3 14 months after birth. The age of the children ranged from 6 to 16 weeks at T2 and from 12 to 16 months at T3. Participants comprised a community sample of couples from Dresden, Germany, and the surrounding area who were expecting a child and were mainly recruited at obstetrical clinics. For more detailed information on the DREAM study, see the study protocol (Kress et al., 2019).

2.2. Sample

The present study is based on version 8 of the quality-assured data files of the DREAM study, which were collected and managed using Research Electronic Data Capture (REDCap) (Harris et al., 2009, 2019). A total of 2229 mothers and 1634 partners were included in the cohort (Fig. 1). Inclusion criteria were having a partner who participates in the study, expecting one child only, having participated at T1, T2, and T3, and for partners having attended the birth. Data of couples with twins or multiples were excluded from all analyses, because of the statistical interdependency introduced by collecting multiple responses per family.

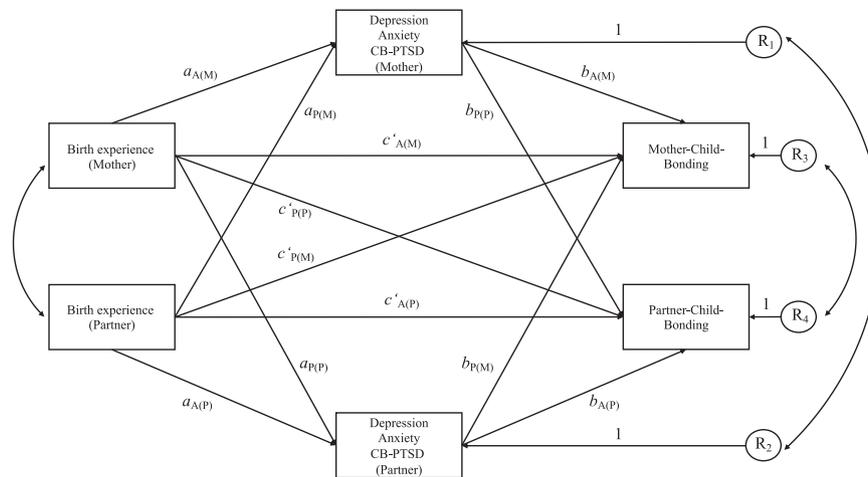


Fig. 2. The conceptual model for the association between birth experience and parent-child-bonding. Note. T2 = 2 months after the anticipated birth date, CB-PTSD = childbirth-related posttraumatic stress disorder, R_{1-4} = residuals of the mediators and outcomes, A(M) = actor effect of the mother, A(P) = actor effect of the partner, P(M) = partner effect of the mother, P(P) = partner effect of the partner.

To assure that data were collected at relatively homogeneous timeframes at each study time point, data from the DREAM study are usually excluded when surveys were completed earlier than 6 weeks or later than 16 weeks postpartum at T2 and when data were completed earlier than 12 months or later than 16 months postpartum at T3. As previous research has shown that the rating of the birth experience and parent-child-bonding may vary depending on the time-point of the questionnaire (Tichelman et al., 2019; Waldenström, 2003), this study adopted the same procedure. The final sample consisted of 743 couples (737 heterosexual and 6 same gender couples).

2.3. Measures

Birth experience was measured at T2 using the German version of the 20-item Salmon's Item List (SIL; Stadlmayr et al., 2001), which was validated for mothers (Stadlmayr et al., 2001) and fathers (Gawlik et al., 2015) and comprises four dimensions: fulfilment, physical discomfort, good emotional adaptation, and (negative) emotional experience. Response options are rated on a scale from 1 to 7, encompassing opposing anchoring points for each item that represent positive and negative valences (e.g., disappointed vs. not disappointed; good experience vs. bad experience). The SIL mostly consists of basic emotional statements and even the items of the physical discomfort dimension (painful vs. not painful; easy vs. not easy; exhausted vs. not exhausted) can easily be answered by partners as well, because they relate to the uncomfortable feelings, which the partners experienced themselves while attending the birth, making it a useful and valid measure for both parents (Gawlik et al., 2015). The total score is generated by the sum of all items, ranging from 0 to 120. Higher scores indicate a more positive birth experience. The reliability of the SIL was excellent (Cronbach's $\alpha = .90$).

Parents' depressive symptoms were measured at T1 and T2 using the German version of the Edinburgh Postnatal Depression Scale (EPDS; Bergant et al., 1998), which assesses symptoms of depression during the past week and has been validated for mothers and fathers (Matthey et al., 2001). The EPDS is a 10-item questionnaire with four response options, which are scored from 0 to 3. Sum scores were computed, ranging from 0 to 30, with higher scores indicating more severe depressive symptoms. The reliability of the EPDS was high at both T1 ($\alpha = .83$) and T2 ($\alpha = .82$).

Parents' anxiety symptoms were measured at T1 and T2 using the German version of the 10-item 'anxiety' subscale of the Symptom Checklist SCL-90-R (Franke, 2002). The couples were asked to rate how much they had been burdened by anxiety symptoms during the last

seven days. Response options range from 'not at all' (0) to 'extremely' (4). The total score of the subscale ranges from 0 to 40, with higher scores indicating more anxiety. The reliability of the scale was acceptable ($\alpha = .79$ at T1 and $.76$ at T2).

Parents' CB-PTSD symptoms were measured at T2 using the German version of the Impact of Event Scale – Revised (IES-R; Maercker & Schützwohl, 1998). Parents were asked how much distress they experienced due to difficulties related to childbirth during the last seven days. The questionnaire consists of 22 items which measure the symptom clusters of 'intrusion', 'avoidance', and 'hyperarousal' and answers range from 'not at all' (0) to 'often' (5), generating a total score of 0–110. Higher scores represent more severe CB-PTSD symptoms. The reliability of the IES-R was high ($\alpha = .81$).

Parent-child-bonding was assessed at T3 using the German version of the Postpartum Bonding Questionnaire (PBQ; Reck et al., 2006). The questionnaire screens for bonding disorders and encompasses 25 items on the four subscales 'impaired bonding', 'rejection & anger', 'anxiety about care', and 'risk of abuse'. Parents are supposed to think of the most difficult time with their child and state how often they experienced each situation. Response options range from 'never' (0) to 'always' (5), resulting in a total score of 0–125. Higher scores indicate more bonding difficulties. The reliability of the PBQ was high ($\alpha = .89$).

All but five parents completed the T2 questionnaires before the first lockdown of the COVID-19 pandemic in Germany. Moreover, 679 parents completed the T3 questionnaire after the first lockdown. To rule out the possibility that the pandemic influenced the results, we compared parents' PBQ scores at T3 depending on whether these were assessed before or during the pandemic, but found no statistically significant differences between the two groups, $t(1441) = 1.28, p = .22$.

Since previous studies indicate that parental age, parental education, status as first-time parents, and mental health during pregnancy are associated with parent-child bonding (Farré-Sender et al., 2018; Motegi et al., 2020; Rossen et al., 2016; Tichelman et al., 2019), we included these parental characteristics as confounders in all analyses. Parents' education was assessed at T1 and was dichotomized (bachelor's degree or higher vs. no university education). Status as first-time parents was assessed by contrasting parents who participated in the study with their first child with those who already had one or more children. Mental health during pregnancy was assessed using the EPDS and the subscale anxiety of the SCL-90-R. At T2, parents were asked whether they currently had a PTSD diagnosis with an onset of more than 2 months ago, indicating PTSD due to an event other than the recent birth. Additionally, we controlled for parents' neuroticism in robustness checks to rule out the potential effect of nonspecific negative affectivity.

Table 1
Sample characteristics.

	Mothers (<i>n</i> = 743) ^a	Partners (<i>n</i> = 743) ^a
	<i>n</i> (%)	
Country of birth		
Germany	709 (95.8)	721 (97.7)
Other	31 (4.2)	17 (2.3)
Education		
University degree	435 (58.6)	412 (56.3)
No university degree	307 (41.4)	320 (43.7)
First-time parents		
Yes	613 (83.2)	583 (80.2)
No	124 (16.8)	144 (19.8)
	<i>M</i> ± <i>SD</i> (Range)	
Age at T1 (in years)	29.9 ± 3.6 (20–41)	32.4 ± 4.9 (21–56)
Birth experience (SIL score; T2)	79.7 ± 20.1 (22–120)	92.9 ± 15.1 (23.3–120)
Depression (EPDS score)		
During pregnancy (T1)	5.2 ± 4.0 (0.0–23.0)	3.8 ± 3.6 (0.0–23.0)
Postpartum (T2)	5.5 ± 3.8 (0.0–24.0)	3.5 ± 3.3 (0.0–25.0)
Anxiety (SCL-90-R, subscale anxiety score)		
During pregnancy (T1)	2.5 ± 3.1 (0.0–22.0)	1.8 ± 2.8 (0.0–27.0)
Postpartum (T2)	1.7 ± 2.7 (0.0–29.0)	1.3 ± 2.1 (0.0–20.0)
CB-PTSD (IES-R score; T2)	14.3 ± 11.0 (0.0–73.0)	11.1 ± 8.8 (0.0–65.0)
Parent-child-bonding difficulties (PBQ score, T3)	13.4 ± 9.7 (0.0–102.0)	13.1 ± 8.4 (0.0–68.0)

Note. SIL = Salmon's Item List; EPDS = Edinburgh Postnatal Depression Scale; SCL-90-R = Symptom Checklist 90 Revised; CB-PTSD = childbirth-related posttraumatic stress disorder; IES-R = Impact of Event Scale - Revised; PBQ = Postpartum Bonding Questionnaire; T1 = during pregnancy; T2 = 2 months after the anticipated birth date; T3 = 14 months after childbirth.

^a *n* varies slightly due to missing data. Valid percentages are displayed.

Neuroticism was measured at T2 using the 3-item Neuroticism subscale of the Big Five Inventory-SOEP (Schupp & Gerlitz, 2008), with response options on a 7-point Likert scale.

2.4. Data analysis

All descriptive analyses and intercorrelations were computed using IBM SPSS Statistics (Version 28.0). The Actor-Partner Interdependence Model (APIM; Kenny et al., 2006) was used to investigate the association between parents' birth experience, postpartum psychiatric symptoms, and parent-child-bonding. The most important components of the APIM are actor effects and partner effects, labelled A(M) and P(M) for mothers, and A(P) and P(P) for partners; see Fig. 2. Actor effects are defined as "the effects of a person's own characteristics on his or her own outcomes, and partner effects are defined as the effects of a partner's characteristics on a person's outcome" (Cook & Kenny, 2005, p. 103). By including actor and partner effects in the model simultaneously, actor effects are estimated controlling for partner effects, and partner effects are estimated controlling for actor effects. The residuals of the mediators and the dependent variables represent the extent to which these variables are not explained by either of the predictors and are correlated to control for additional sources of nonindependence such as family effects (Cook & Kenny, 2005). We used a variant of the APIM that combines estimation of actor and partner effects with mediation analyses, termed the Actor-Partner Interdependence Mediation Model (APIMeM; Ledermann et al., 2011) for distinguishable dyad members (e.g., mothers and partners). In this model, eight indirect effects ($a_{A(M)}^*b_{A(M)}$; $a_{A(P)}^*b_{A(P)}$; $a_{P(P)}^*b_{P(M)}$; $a_{P(M)}^*b_{P(P)}$; $a_{A(M)}^*b_{P(P)}$; $a_{A(P)}^*b_{P(M)}$; $a_{P(P)}^*b_{A(P)}$ in Fig. 2) are estimated simultaneously.

We used structural equation modeling (SEM) to test all actor and partner effects simultaneously in Mplus version 8 (Muthén & Muthén,

2017). Maximum likelihood estimation was used and full-information maximum likelihood estimation was employed to handle missing data. All variables were standardized prior to SEM analyses using the mean and standard deviation calculated across both mothers and partners (Kenny et al., 2006, p. 179). The regression coefficients can as such be interpreted as standardized regression coefficients. We used a level of significance of $p < .05$ and all associations were regarded as statistically significant if 95 % confidence intervals (CI) using bootstrapping with $k = 5000$ samples did not include 0. When estimating all parameters within the APIMeM, the model is just identified with zero degrees of freedom, resulting in a perfect fit (Kenny & Ledermann, 2010). Therefore, no fit statistics are reported in this article.

2.5. Power analysis

We conducted post-hoc power analyses by means of Monte Carlo simulations. In line with suggestions in the literature (Ledermann et al., 2022), we used the simsem package (Pornprasertmanit et al., 2021) in RStudio Version 2022.12.0 for these analyses with 10,000 random samples. Analyses showed that with small to medium sized correlations in the population of $r = .19$ among predictors (i.e., birth experience), mediators (i.e., postpartum psychiatric symptoms), and outcomes (i.e., parent-child-bonding), an APIMeM with the current sample size of 743 couples had a power of .91 or higher to identify significant associations between all estimated regression coefficients in the model, and a power of .83 or higher to identify significant mediation effects. The APIMeM was as such highly powered to detect small to medium sized actor and partner effects, and mediation mechanisms.

2.6. Attrition analyses

Attrition analyses were performed to contrast parents included in the present study ($n = 1486$) with parents who did not return T3 ($n = 128$). The two groups were compared regarding their age, country of birth, education, status as first-time parents, birth experience, symptoms of depression, anxiety, and CB-PTSD. Compared to completers, non-completers were more likely to have no university degree (55.6 % vs. 42.5 %; $\chi^2(1) = 8.00, p < .01$) and not be first-time parents (27.3 % vs. 18.3 %; $\chi^2(1) = 6.24, p < .05$), but did not differ in any other observed variables.

3. Results

As shown in Table 1, the majority of parents was born in Germany (95.8 % of mothers, 97.7 % of partners), had attained a university degree (58.6 % of mothers, 56.3 % of partners), and had their first child (83.2 % of mothers, 80.2 % of partners). Mothers and partners had a mean age of 29.9 ($SD = 3.6$) and 32.4 ($SD = 4.9$) years during pregnancy, respectively. On average, mothers had a more negative birth experience than partners, although both mean scores indicated an overall positive birth experience. Mothers also had slightly more CB-PTSD symptoms than their partners ($M_M = 14.3, M_P = 11.1$). Furthermore, the parents in our sample were characterized by low depression ($M_M = 5.5, M_P = 3.5$) and anxiety scores ($M_M = 1.7, M_P = 1.3$), with mothers having higher mean scores than partners. Finally, the majority of parents showed strong bonding to their children 14 months after childbirth ($M_M = 13.4, M_P = 13.1$).

3.1. Associations between birth experience, postpartum depression, anxiety, CB-PTSD, and parent-child-bonding

First, correlations between all study variables were estimated (Table 2). Parents' own negative birth experience was significantly correlated with their own elevated symptoms of postpartum depression ($r_M = -.19, p < .001$; $r_P = -.20, p < .001$), anxiety ($r_M = -.11, p < .01$; $r_P = -.20, p < .001$), and CB-PTSD ($r = -.21, p < .001$ for both mothers

Table 2
Correlation matrix of predictors, mediators, and outcomes.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Birth experience (T2, mother)									
2. Depression (T2, mother)	-.19***								
3. Anxiety (T2, mother)	-.11**	.56***							
4. CB-PTSD (T2, mother)	-.21***	.40***	.33***						
5. Parent-child-bonding difficulties (T3, mother)	-.19***	.33***	.14***	.12**					
6. Birth experience (T2, partner)	.44***	-.05	-.04	-.09*	-.07				
7. Depression (T2, partner)	-.06	.21***	.14***	.14***	.05	-.20***			
8. Anxiety (T2, partner)	-.05	.18***	.15***	.13***	.05	-.20***	.59***		
9. CB-PTSD (T2, partner)	-.09*	.08*	.08*	.24***	.04	-.21***	.37***	.35***	
10. Parent-child-bonding difficulties (T3, partner)	-.10*	.09*	.02	.03	.20***	-.29***	.32***	.21***	.11**

Note. CB-PTSD = childbirth-related posttraumatic stress disorder, T1 = during pregnancy, T2 = 2 months after the anticipated birth date, T3 = 14 months after childbirth.

* $p < .05$. ** $p < .01$. *** $p < .001$

and partners), as well as a poorer bond to their child ($r_M = -.19$, $p < .001$; $r_P = -.29$, $p < .001$). Additionally, it was significantly correlated to their partners' elevated CB-PTSD symptoms ($r = -.09$, $p < .05$ for both mothers and partners) and the mother's negative birth experience was significantly correlated to poorer partner-child-bonding ($r_M = -.10$, $p < .05$).

Next, three APIMeM (one for each mediator) were modelled using SEM. We controlled for parents' age, education, status as first-time parents, and symptoms of depression or anxiety during pregnancy in all analyses. We did not control for prior PTSD, because only three mothers and none of the partners indicated that they had a pre-existing PTSD diagnosis before birth.

APIMeM results showed that a more negative birth experience of the mother predicted poorer mother-child-bonding, but not partner-child bonding, whereas a more negative birth experience of the partner predicted poorer partner-child-bonding, but not mother-child bonding (see Fig. 3, Panels A, B, and C and Tables 3 to 5). Wald tests suggested that in all three models, the partners' direct effect from birth experience on parent-child-bonding differed significantly from that of the mothers and was approximately twice as large ($ps < .05$).

Panel A in Fig. 3 and Table 3 present results for the APIMeM with postpartum depressive symptoms included as a mediator. Parents' negative birth experiences predicted their own depressive symptoms ($b_M = -0.127$, $p < .001$; $b_P = -0.173$, $p < .001$) but were not related to depressive symptoms of their partners ($b_M = -0.004$, $p = .932$; $b_P = 0.011$, $p = .696$). In turn, parents' depressive symptoms predicted their own poorer bonds to the child ($b_M = 0.288$, $p < .001$; $b_P = 0.266$, $p < .001$), but not their partners' bonds to the child ($b_M = -0.011$, $p = .842$; $b_P = 0.034$, $p = .338$). The association between mothers' birth experiences and mother-child-bonding was mediated by mothers' postpartum depressive symptoms, indicated by the significant indirect effect, $a_{A(M)} * b_{A(M)} = -0.037$, 95 % CI [-0.062; -0.016], which accounted for 23.1 % of the total effect. A significant mediation effect was also observed among partners, where the indirect effect between partners' birth experiences and depressive symptoms accounted for 13.8 % of the total effect, $a_{A(P)} * b_{A(P)} = -0.046$, 95 % CI [-0.079; -0.024].

When postpartum anxiety symptoms were included as a potential mediator (Fig. 3, Panel B and Table 4), negative birth experiences of mothers neither predicted mothers' ($b = -0.051$, $p = .264$) nor their partners' postpartum anxiety symptoms ($b = -0.028$, $p = .629$). Mothers' anxiety symptoms in turn did not predict mother-child-bonding ($b = 0.065$, $p = .163$) or partner-child-bonding ($b = -0.011$, $p = .842$). A more negative birth experience of the partner predicted more postpartum anxiety symptoms only in partners ($b = -0.165$, $p = .001$), which in turn predicted poorer partner-child-bonding ($b = 0.240$, $p < .001$) but not mother-child-bonding ($b = -0.004$, $p = .868$). The association between partners' birth experience and partner-child-bonding was mediated by partners' postpartum anxiety symptoms, indicated by the significant indirect effect, which accounted for 11.4 %

of the total effect, $a_{A(P)} * b_{A(P)} = -0.040$, 95 %-CI [-0.073; -0.017]. However, if the control variables (i.e., parents' age, academic degrees, status as first-time parents, and anxiety during pregnancy) were removed from the model, mothers' birth experiences predicted more postpartum anxiety symptoms in mothers ($b = -0.124$, $p = .023$), which in turn predicted poorer mother-child-bonding ($b = 0.114$, $p = .001$; see Table A2 in the Appendix).

In the model with the potential mediator CB-PTSD symptoms, a more negative birth experience of the mother predicted more CB-PTSD symptoms of the mother ($b = -0.232$, $p < .001$) but not the partner ($b = 0.001$, $p = .993$), while a more negative birth experience of the partner predicted more CB-PTSD symptoms of the partner ($b = -0.244$, $p < .001$) but not the mother ($b = 0.008$, $p = .792$; Fig. 3, Panel C and Table 5). Mothers' CB-PTSD symptoms predicted poorer mother-child-bonding ($b = 0.090$, $p = .017$); however, this was not the case for partners ($b = 0.071$, $p = .113$). The association between mothers' birth experiences and mother-child-bonding was mediated by CB-PTSD symptoms of the mother, which accounted for 10.4 % of the total effect, $a_{A(M)} * b_{A(M)} = -0.021$, 95 %-CI [-0.044; -0.005].

In addition, a number of robustness checks were computed. First, all models were estimated with and without the three couples with pre-existing PTSD, which resulted in only slight changes of the path coefficients of the a-paths, but no changes in the significance of any path. Therefore, results including these couples are reported. Second, all models were re-run without data from the six same gender couples, resulting in only very minor changes of the effect sizes and no changes in significance of any path. Third, models were re-run without control variables, with very similar results in terms of significance and size of the effects (see Tables A1-A3 in the appendix). The only exception were the results for mothers' postpartum anxiety, which are discussed above. Last, models were re-run with the additional covariate neuroticism, which also resulted in very similar results in terms of significance and size of the effects, with the exception of the effect of mothers' CB-PTSD symptoms on mother-child-bonding, which was no longer significant ($b = 0.056$, $p = .125$), which also resulted in the mediation effect being no longer significant.

4. Discussion

This study aimed to examine the association between mothers' and partners' birth experiences and parent-child-bonding and the potential mediating role of parents' symptoms of postpartum depression, anxiety, and CB-PTSD. Results showed that parents' own negative birth experiences predicted a poorer bond to their child 14 months postpartum. For mothers, this association was mediated by symptoms of postpartum depression and CB-PTSD. For partners, it was mediated by symptoms of postpartum depression and anxiety.

For both parents, a more negative birth experience predicted poorer parent-child-bonding 14 months postpartum. This finding aligns with

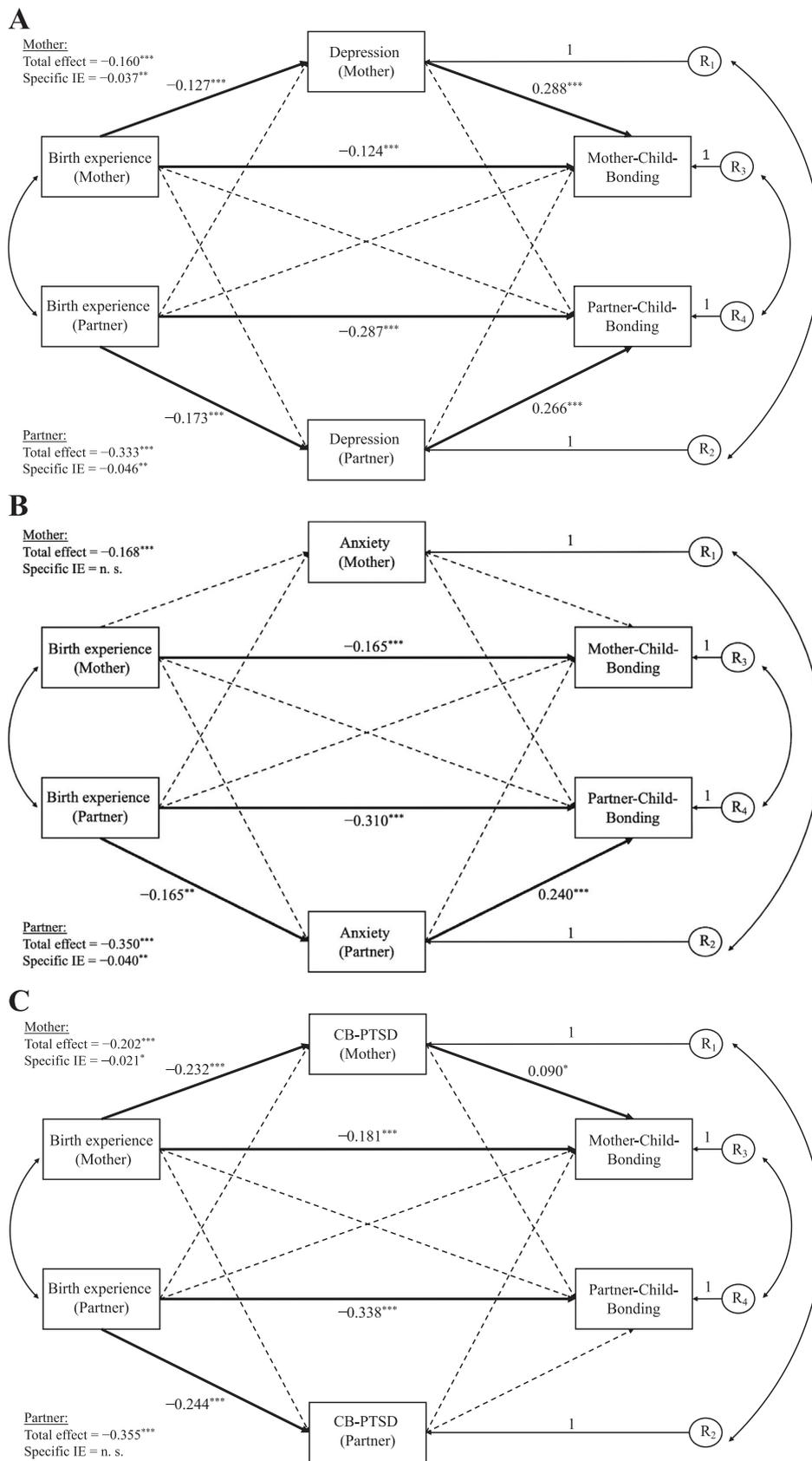


Fig. 3. APIMeM of the association between birth experience and parent-child-bonding. Note. Standardized path coefficients for the association between parents' birth experience and parent-child-bonding within the Actor-Partner Interdependence Mediation Model. Panel A shows results for the mediator postpartum depression. Panel B shows results for the mediator postpartum anxiety. Panel C shows results for the mediator CB-PTSD = childbirth-related posttraumatic stress disorder. Dotted lines denote non-significant associations. Specific IE = specific indirect effect from birth experience to parent-child-bonding, R_{1-4} = residuals of the mediators and dependent variables. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3

Effects of the APIMeM testing the association between birth experience, depression, and parent-child-bonding, while controlling for parents' age, education, status as first-time parents, and depression during pregnancy.

	Effect label (M)	$b_{M/P}$	95 %-CI _{M/P}	SE _{M/P}	$p_{M/P}$
Direct					
X → Med.					
Actor	$a_{A(M)}$	-0.127/ - 0.173	-0.195;- 0.057/ -0.268;- 0.094	0.035/ 0.044	.000
Partner	$a_{P(P)}$	-0.004/ 0.011	-0.102;0.085/ -0.046;0.069	0.048/ 0.029	.932/ .696
Med. → Y					
Actor	$b_{A(M)}$	0.288/ 0.266	0.194;0.382/ 0.160;0.379	0.049/ 0.056	.000
Partner	$b_{P(P)}$	-0.011/ 0.034	-0.125;0.093/ -0.035;0.106	0.056/ 0.035	.842/ .338
X → Y					
Actor	$c'_{A(M)}$	-0.124/ - 0.287	-0.226;- 0.037/ -0.382;- 0.190	0.047/ 0.049	.008/ .000
Partner	$c'_{P(P)}$	0.015/ 0.023	-0.096;0.132/ -0.051;0.096	0.058/ 0.037	.799/ .541
Indirect					
Actor					
Total	$a_{A(M)}b_{A(M)}$ $+ a_{P(P)}b_{P(M)}$ $+ c'_{A(M)}$	-0.160/ - 0.333	-0.260;- 0.075/ -0.428;- 0.237	0.046/ 0.049	.001/ .000
Total	$a_{A(M)}b_{A(M)}$ $+ a_{P(P)}$	-0.037/ - 0.046	-0.063;- 0.016/ -0.080;- 0.023	0.012/ 0.014	.002/ .001
Indirect					
Actor-	$a_{A(M)}b_{A(M)}$	-0.037/ - 0.046	-0.062;- 0.016/ -0.079;- 0.024	0.012/ 0.014	.002/ .001
Partner-	$a_{P(P)}b_{P(M)}$	0.000	-0.006;0.002/ -0.007;0.004	0.002	.943/ .953
Partner					
Total	$a_{A(P)}b_{P(M)}$ $+ a_{P(P)}$ $+ a_{A(M)}b_{A(M)}$ $+ c'_{P(M)}$	0.016/ 0.021	-0.095;0.140/ -0.055;0.100	0.059/ 0.038	.792/ .579
Total	$a_{A(P)}b_{P(M)}$ $+ a_{P(P)}$	0.001/ - 0.001	-0.034;0.032/ -0.020;0.018	0.017/ 0.010	.964/ .892
Indirect					
Actor-	$a_{A(P)}b_{P(M)}$	0.002/ - 0.004	-0.016;0.024/ -0.016;0.004	0.010/ 0.005	.847/ .373
Partner-	$a_{P(M)}b_{A(M)}$	-0.001/ 0.003	-0.031;0.025/ -0.012;0.020	0.014/ 0.008	.933/ .704
Actor	(M)				

Note. X = birth experience; Med. = Depression; Y = Parent-Child-Bonding. M = Mother. P = Partner. Effect labels are given exemplary for mothers due to better readability.

the few previous quantitative studies which have reported detrimental effects of parents' negative subjective birth experiences on the parent-child-bond (Döblin et al., 2023; Peterson et al., 1979; Seefeld, Weise et al., 2022). Parents who perceived the birth of their child as negative, may exhibit lower parental sensitivity, as their focus may be directed towards processing their own emotions (Hoffenkamp et al., 2015). They might even avoid engaging with the baby, due to the triggering of memories and re-experiencing the birth (Ayers et al., 2006). Moreover, if the birth did not fulfill their expectations, mothers as well as partners might experience feelings of failure, which can further diminish their emotional availability toward the baby (Bogolyubova & Pleshkova, 2013), thus complicating the process of parent-child-bonding.

Interestingly, the size of the direct effect of birth experiences on parent-child-bonding was approximately twice as large for partners, indicating that birth experiences seem to be a more important factor for partner-child-bonding compared to mother-child-bonding. While mothers have already had the opportunity to bond with their child prenatally, partners often feel more disconnected from the fetus (Kaur & Sagar, 2017). Therefore, the moment of the birth and how this experience impacts the first weeks with the infant may be more influential for the partner's long-term bond to the child. Given that partners often

Table 4

Effects of the APIMeM testing the association between birth experience, anxiety, and parent-child-bonding, while controlling for parents' age, education, status as first-time parents, and anxiety during pregnancy.

	Effect label (M)	$b_{M/P}$	95 %-CI _{M/P}	SE _{M/P}	$p_{M/P}$
Direct					
X → Med.					
Actor	$a_{A(M)}$	-0.051/ - 0.165	-0.148;0.035/ -0.277;- 0.074	0.046/ 0.051	.264/ .001
Partner	$a_{P(P)}$	-0.028/ 0.028	-0.138;0.088/ -0.024;0.084	0.058/ 0.027	.629/ .313
Med. → Y					
Actor	$b_{A(M)}$	0.065/ 0.240	-0.031;0.156/ 0.134;0.374	0.047/ 0.061	.163/ .000
Partner	$b_{P(P)}$	-0.011/ - 0.004	-0.122;0.100/ -0.055;0.047	0.056/ 0.026	.842/ .868
X → Y					
Actor	$c'_{A(M)}$	-0.165/ - 0.310	-0.256;- 0.080/ -0.407;- 0.215	0.045/ 0.050	.000
Partner	$c'_{P(P)}$	0.044/ 0.012	-0.071;0.165/ -0.062;0.087	0.059/ 0.037	.461/ .747
Indirect					
Actor					
Total	$a_{A(M)}b_{A(M)}$ $+ a_{P(P)}b_{P(M)}$ $+ c'_{A(M)}$	-0.168/ - 0.350	-0.260;- 0.085/ -0.451;- 0.255	0.045/ 0.050	.000
Total	$a_{A(M)}b_{A(M)}$ $+ a_{P(P)}$	-0.004/ - 0.040	-0.015;0.003/ -0.073;- 0.016	0.004/ 0.014	.396/ .006
Indirect					
Actor-	$a_{A(M)}b_{A(M)}$	-0.003/ - 0.040	-0.015;0.002/ -0.073;- 0.017	0.004/ 0.014	.384/ .005
Partner-	$a_{P(P)}b_{P(M)}$	0.000	-0.007;0.003/ -0.002;0.006	0.002	.882/ .945
Partner					
Total	$a_{A(P)}b_{P(M)}$ $+ a_{P(P)}$ $+ a_{A(M)}b_{A(M)}$ $+ c'_{P(M)}$	0.044/ 0.019	-0.070;0.168/ -0.057;0.098	0.060/ 0.039	.467/ .625
Total	$a_{A(P)}b_{P(M)}$ $+ a_{P(P)}$	0.000/ 0.007	-0.022;0.021/ -0.006;0.023	0.011/ 0.007	.999/ .333
Indirect					
Actor-	$a_{A(P)}b_{P(M)}$	0.002/ 0.000	-0.017;0.021/ -0.002;0.005	0.010/ 0.002	.846/ .897
Partner-	$a_{P(M)}b_{A(M)}$	-0.002/ 0.007	-0.017;0.005/ -0.005;0.023	0.005/ 0.007	.716/ .336
Actor	(M)				

Note. X = birth experience; Med. = Anxiety; Y = Parent-Child-Bonding. M = Mother. P = Partner. Effect labels are given exemplary for mothers due to better readability.

question the rightfulness of their negative feelings regarding the birth, as they were not the ones experiencing it physically (Etheridge & Slade, 2017), they might not talk about it as much as mothers and hence have a greater risk of their negative emotions affecting the relationship with their child.

However, contrary to our hypotheses, only the bivariate correlation analyses revealed a significant association between birth experience and the partner's bond to the child, and this was only the case for mothers' birth experience. No such association was found between the mothers' birth experience and partner-child-bonding in the APIMeM, and the partners' birth experience did not predict mother-child-bonding. Thus, when accounting for the other parent's birth experience, it appears that how the other parent experienced the birth does not affect one's own bond with the child. This finding is reassuring for children's well-being, as it implies that, even if one parent is distressed, the other parent's bond with the child may not be affected, thus providing the child with at least one stable relationship and potentially reducing the risk for developmental abnormalities (Fuchs et al., 2016).

Parents' own depressive symptoms 2 months postpartum mediated the association between their birth experiences and parent-child-bonding for mothers and partners. These results are supported by

Table 5

Effects of the APiMeM testing the association between birth experience, CB-PTSD, and parent-child-bonding, while controlling for parents' age, education, and status as first-time parents.

	Effect label (M)	$b_{M/P}$	95 %-CI _{M/P}	SE _{M/P}	$p_{M/P}$
Direct					
X → Med.					
Actor	$a_{A(M)}$	-0.232/ - 0.244	-0.330;- 0.133/ -0.372;- 0.128	0.050/ 0.063	.000
Partner	$a_{P(P)}$	0.001/ 0.008	-0.124;0.119/ -0.052;0.073	0.062/ 0.032	.993/ .792
Med. → Y					
Actor	$b_{A(M)}$	0.090/ 0.071	0.018;0.167/ -0.014;0.158	0.038/ 0.045	.017/ .113
Partner	$b_{P(P)}$	0.021/ 0.005	-0.065;0.112/ -0.056;0.069	0.045/ 0.032	.640/ .865
X → Y					
Actor	$c'_{A(M)}$	-0.181/ - 0.338	-0.293;- 0.092/ -0.437;- 0.241	0.051/ 0.050	.000
Partner	$c'_{P(P)}$	0.043/ 0.020	-0.077;0.178/ -0.059;0.100	0.065/ 0.040	.510/ .622
Indirect					
Actor					
Total	$a_{A(M)}b_{A(M)} + a_{P(P)}b_{P(P)} + c'_{A(M)}$	-0.202/ - 0.355	-0.319;- 0.111/ -0.454;- 0.259	0.052/ 0.050	.000
Total	$a_{A(M)}b_{A(M)} + a_{P(P)}$	-0.021/ - 0.017	-0.044;- 0.005/ -0.043;0.002	0.010/ 0.011	.039/ .122
Actor-Partner					
Actor-Partner	$a_{A(M)}b_{A(M)}$	-0.021/ - 0.017	-0.044;- 0.005/ -0.042;0.001	0.010/ 0.011	.035/ .118
Partner-Partner	$a_{P(P)}b_{P(P)}$	0.000	-0.002;0.006/ -0.004;0.004	0.002	.912/ .999
Total	$a_{A(P)}b_{P(P)} + a_{P(P)}b_{A(M)} + c'_{P(M)}$	0.037/ 0.019	-0.077;0.167/ -0.056;0.096	0.061/ 0.038	.542/ .616
Total	$a_{A(P)}b_{P(P)} + a_{P(P)}$	-0.005/ - 0.001	-0.032;0.018/ -0.018;0.014	0.013/ 0.008	.686/ .935
Indirect					
Actor-Partner	$a_{A(P)}b_{P(P)}$	-0.005/ - 0.001	-0.029;0.015/ -0.017;0.013	0.011/ 0.008	.646/ .868
Partner-Partner	$a_{P(M)}b_{A(M)}$	0.000/ 0.001	-0.012;0.013/ -0.003;0.007	0.006/ 0.003	.994/ .816

Note. X = birth experience; Med. = CB-PTSD; Y = Parent-Child-Bonding. M = Mother. P = Partner. Effect labels are given exemplary for mothers due to better readability.

previous research, which has shown an increased risk for postpartum depression in parents with a negative birth experience (Bradley & Slade, 2011) and poorer parent-child-bonding in parents with even mild postpartum depression (Slomian et al., 2019).

In comparison to postpartum depressive symptoms, own anxiety symptoms 2 months postpartum mediated the association between birth experience and parent-child-bonding for partners only. Previous literature has suggested a negative association between these two constructs for both mothers and fathers, either directly or indirectly through responsiveness or stress (Bieleninik et al., 2021; Nakić Radoš, 2021; Nicol-Harper et al., 2007). Partners may experience less parental self-efficacy, which is defined as “the expectation caregivers hold about their ability to parent successfully” (Jones & Prinz, 2005, p. 342), because they often spend less time with their children compared to mothers (Biehle & Mickelson, 2011). This lack of parental self-efficacy has in turn been linked to parents' anxiety in a bi-directional manner (Kunsele et al., 2014; Pinto et al., 2016) and also appears to be connected to impaired partner-child-bonding (Albanese et al., 2019). Therefore, especially for partners who experienced the birth as negative, the interaction between postpartum anxiety and parental self-efficacy may play an important role in whether partners successfully transition

Table A1

Effects of the APiMeM testing the association between birth experience, depression, and parent-child-bonding.

	Effect label (M)	$b_{M/P}$	95 %-CI _{M/P}	SE _{M/P}	$p_{M/P}$
Direct					
X → M					
Actor	$a_{A(M)}$	-0.199/ - 0.242	-0.277;- 0.119/ -0.344;- 0.150	0.040/ 0.050	.000
Partner	$a_{P(P)}$	0.059/ 0.032	-0.042;0.160/ -0.032;0.100	0.052/ 0.033	.254/ .332
M → Y					
Actor	$b_{A(M)}$	0.321/ 0.274	0.242;0.408/ 0.190;0.364	0.043/ 0.044	.000
Partner	$b_{P(P)}$	-0.022/ 0.032	-0.095;0.054/ -0.024;0.092	0.039/ 0.029	.575/ .267
X → Y					
Actor	$c'_{A(M)}$	-0.137/ - 0.292	-0.248;- 0.052/ -0.390;- 0.195	0.049/ 0.050	.006/ .000
Partner	$c'_{P(P)}$	0.008/ 0.033	-0.103;0.134/ -0.034;0.102	0.060/ 0.034	.889/ .342
Indirect					
Actor					
Total	$a_{A(M)}b_{A(M)} + a_{P(P)}b_{P(M)} + c'_{A(M)}$	-0.202/ - 0.356	-0.321;- 0.112/ -0.458;- 0.261	0.052/ 0.050	.000
Total	$a_{A(M)}b_{A(M)} + a_{P(P)}$	-0.065/ - 0.064	-0.099;- 0.037/ -0.101;- 0.035	0.016/ 0.017	.000
Indirect					
Actor-Partner	$a_{A(M)}b_{A(M)}$	-0.064/ - 0.066	-0.098;- 0.037/ -0.103;- 0.039	0.015/ 0.016	.000
Partner-Partner	$a_{P(P)}b_{P(P)}$	-0.001/ 0.002	-0.008;0.001/ -0.001;0.011	0.002/ 0.003	.709/ .499
Total	$a_{A(P)}b_{P(P)} + a_{P(P)}b_{A(M)} + c'_{P(M)}$	0.032/ 0.035	-0.084;0.162/ -0.035;0.108	0.061/ 0.036	.597/ .335
Total	$a_{A(P)}b_{P(P)} + a_{P(P)}$	0.024/ 0.002	-0.013;0.063/ -0.020;0.026	0.019/ 0.011	.209/ .832
Indirect					
Actor-Partner	$a_{A(P)}b_{P(P)}$	0.005/ - 0.006	-0.013;0.026/ -0.020;0.004	0.010/ 0.006	.592/ .285
Partner-Partner	$a_{P(M)}b_{A(M)}$	0.019/ 0.009	-0.013;0.053/ -0.008;0.029	0.017/ 0.009	.260/ .345

Note. X = birth experience; Med. = CB-PTSD; Y = Parent-Child-Bonding. M = Mother. P = Partner. Effect labels are given exemplary for mothers due to better readability.

to parenthood and bond with their children. However, it remains unclear why this study found no association between postpartum anxiety and parent-child-bonding for mothers. One possible explanation could be that prior studies did not account for anxiety levels during pregnancy and it is primarily this pre-existing anxiety, which influences mother-child-bonding, rather than anxiety triggered or exacerbated by a negative birth experience. This assumption is supported by the significant association between mothers' postpartum anxiety and mother-child-bonding in the analyses excluding the control variable prenatal anxiety. It is conceivable that mothers, despite experiencing postpartum anxiety, still maintain a sense of confidence and connection with their child, possibly due to the substantial amount of time they spend together, compared to partners.

Finally, own CB-PTSD symptoms 2 months postpartum mediated the association between birth experience and parent-child-bonding only for mothers. A negative birth experience of the partner predicted more CB-PTSD symptoms of the partner, but these in turn did not predict partner-child-bonding. These results are in line with some previous research suggesting a negative association between birth experience and CB-PTSD symptoms for both mothers and partners (Bradley et al., 2008; Nakić Radoš et al., 2021), but an association between CB-PTSD

Table A2
Effects of the APIMeM testing the association between birth experience, anxiety, and parent-child-bonding.

	Effect label (M)	$b_{M/P}$	95%-CI _{M/P}	SE _{M/P}	$p_{M/P}$
Direct					
X → M					
Actor	$a_{A(M)}$	-0.124/ - 0.232	-0.245;- 0.027/ -0.350;- 0.135	0.054	.023/ .000
Partner	$a_{P(P)}$	0.022/ 0.033	-0.098;0.145/ -0.026;0.100	0.061/ 0.032	.722/ .302
M → Y					
Actor	$b_{A(M)}$	0.114/ 0.179	0.057;0.190/ 0.091;0.294	0.035/ 0.052	.001
Partner	$b_{P(P)}$	0.038/ - 0.007	-0.036;0.127/ -0.051;0.041	0.042/ 0.023	.367/ .765
X → Y					
Actor	$c'_{A(M)}$	-0.188/ - 0.314	-0.306;- 0.100/ -0.417;- 0.219	0.052/ 0.050	.000
Partner	$c'_{P(P)}$	0.039/ 0.027	-0.080;0.172/ -0.042;0.099	0.063/ 0.036	.541/ .445
Indirect					
Actor					
Total	$a_{A(M)}b_A$ (M) + a_P (P) $b_{P(M)}$ + $c'_{A(M)}$	-0.201/ - 0.355	-0.320;- 0.112/ -0.457;- 0.260	0.052/ 0.050	.000
Total	$a_{A(M)}b_A$ (M) + a_P (P) $b_{P(M)}$	-0.013/ - 0.042	-0.028;- 0.001/ -0.080;- 0.019	0.007/ 0.015	.054/ .006
Indirect					
Actor-	$a_{A(M)}b_A$	-0.014/ - 0.042	-0.028;- 0.004/ -0.080;- 0.019	0.006/ 0.015	.021/ .006
Partner-	$a_{P(P)}b_P$	0.001/ 0.000	-0.001;0.010/ -0.005;0.002	0.002/ 0.001	.582/ .919
Partner					
Total	$a_{A(P)}b_P$ (M) + a_P (M) $b_{A(M)}$ + $c'_{P(M)}$	0.033/ 0.034	-0.083;0.163/ -0.037;0.108	0.061/ 0.036	.596/ .353
Total	$a_{A(P)}b_P$ (M) + a_P (M) $b_{A(M)}$	-0.006/ 0.007	-0.034;0.015/ -0.005;0.023	0.012/ 0.007	.610/ .323
Indirect					
Actor-	$a_{A(P)}b_P$	-0.009/ 0.001	-0.034;0.007/ -0.004;0.009	0.010/ 0.003	.395/ .782
Partner-	$a_{P(M)}b_A$	0.002/ 0.006	-0.012;0.016/ -0.004;0.022	0.007/ 0.006	.727/ .338

Note. X = birth experience; Med. = CB-PTSD; Y = Parent-Child-Bonding. M = Mother. P = Partner. Effect labels are given exemplary for mothers due to better readability.

symptoms and parent-child-bonding only for mothers (Stuijzand et al., 2020). As mothers themselves experience the birth's pain and possible interventions and might fear for their own life, while partners only experience this as a witness (van Steijn et al., 2020), the effects of a traumatic birth may last longer for mothers compared to partners and therefore more likely to impact mothers' bond to their children (Butterworth, 2020). However, these differential effects could also be due to gender differences in CB-PTSD symptom presentation, as mothers tend to have more avoidant and intrusive symptoms compared to fathers (Salomè et al., 2022), which may especially interfere with bonding. Importantly, mothers' CB-PTSD symptoms no longer predicted mother-child-bonding, when the analyses were adjusted for neuroticism, suggesting that nonspecific negative affectivity may explain part of this association. Clearly, more research is needed to explain the association between CB-PTSD symptoms and parent-child-bonding, to identify important moderators and mediators for this relationship, and to further investigate this issue for partners.

When examining the effects of parents' birth experience on their partners' postpartum psychiatric symptoms, we only found evidence for such associations in correlation analyses, but not in APIMeM. Parents' birth experience did not predict their partners' postpartum symptoms of

Table A3
Effects of the APIMeM testing the association between birth experience, CB-PTSD, and parent-child-bonding.

	Effect label (M)	$b_{M/P}$	95%-CI _{M/P}	SE _{M/P}	$p_{M/P}$
Direct					
X → M					
Actor	$a_{A(M)}$	-0.228/ - 0.225	-0.324;- 0.134/ -0.353;- 0.110	0.049/ 0.063	.000
Partner	$a_{P(P)}$	0.021/ 0.003	-0.100;0.141/ -0.058;0.067	0.061/ 0.032	.728/ .922
M → Y					
Actor	$b_{A(M)}$	0.080/ 0.059	0.009;0.159/ -0.025;0.147	0.038/ 0.044	.034/ .180
Partner	$b_{P(P)}$	0.009/ 0.001	-0.073;0.102/ -0.060;0.065	0.045/ 0.032	.840/ .986
X → Y					
Actor	$c'_{A(M)}$	-0.183/ - 0.342	-0.300;- 0.096/ -0.442;- 0.245	0.051	.000
Partner	$c'_{P(P)}$	0.033/ 0.034	-0.085;0.171/ -0.039;0.113	0.064/ 0.038	.608/ .368
Indirect					
Actor					
Total	$a_{A(M)}b_A$ (M) + a_P (P) $b_{P(M)}$ + $c'_{A(M)}$	-0.201/ - 0.355	-0.321;- 0.112/ -0.457;- 0.260	0.052/ 0.050	.000
Total	$a_{A(M)}b_A$ (M) + a_P (P) $b_{P(M)}$	-0.018/ - 0.013	-0.040;- 0.003/ -0.039;0.005	0.009/ 0.011	.052/ .209
Indirect					
Actor-	$a_{A(M)}b_A$	-0.018/ - 0.013	-0.040;- 0.003/ -0.039;0.004	0.009/ 0.010	.050/ .194
Partner-	$a_{P(P)}b_P$	0.000	-0.003;0.004/ -0.004;0.004	0.001/ 0.002	.985/ .996
Partner					
Total	$a_{A(P)}b_P$ (M) + a_P (M) $b_{A(M)}$ + $c'_{P(M)}$	0.033/ 0.034	-0.082;0.163/ -0.036;0.108	0.062/ 0.036	.595/ .344
Total	$a_{A(P)}b_P$ (M) + a_P (M) $b_{A(M)}$	0.000	-0.024;0.021/ -0.016;0.014	0.012/ 0.008	.976/ .993
Indirect					
Actor-	$a_{A(P)}b_P$	-0.002/ 0.000	-0.024;0.017/ -0.015;0.014	0.010/ 0.007	.842/ .987
Partner-	$a_{P(M)}b_A$	0.002/ 0.000	-0.007;0.016/ -0.004;0.006	0.005/ 0.002	.756/ .935

Note. X = birth experience; Med. = CB-PTSD; Y = Parent-Child-Bonding. M = Mother. P = Partner. Effect labels are given exemplary for mothers due to better readability.

depression, anxiety, or CB-PTSD. To the best of our knowledge, this is the first study examining the association between parents' birth experiences and their partners' postpartum mental health. Our results suggest that parents' mental health after birth mostly depends on their own experience during birth, not their partners'. Especially in the first 2 months after birth, mothers and partners may find themselves in distinct emotional states. While mothers undergo substantial hormonal and physical changes (Hendrick et al., 1998), partners often feel excluded, helpless, and may struggle adapting to their new parental role (Goodman, 2005; Scism & Cobb, 2017; Shorey et al., 2018). Consequently, both mothers and partners might become preoccupied with their own emotions, making it challenging to fully engage with the other parent's birth experience during this period (Butterworth, 2020). Our results suggest that if only one of the parents experienced the birth as negative, the other parent's mental health is unlikely to be affected by this negative experience alone, which has hopeful implications for children's health and development.

Furthermore, parents' postpartum symptoms of depression, anxiety, or CB-PTSD did not predict their partners' bond to the child. These findings diverge from previous research, which has found negative associations between paternal symptoms of postpartum depression,

anxiety, and CB-PTSD and mother-child-bonding on the one hand (Kerstis et al., 2016; Nasreen et al., 2021; Stuijzand et al., 2020), and maternal symptoms of postpartum depression and father-child-bonding on the other hand (Kerstis et al., 2016). At this point, it is not clear why our results differentiate from earlier studies. Possible reasons include culturally diverse samples, no adjustment for mental health during pregnancy in some studies, and differences in methodological or statistical approaches. Our results suggest that parents' own mental health plays a more important role in their bond to the child than their partners' mental health. This observation is also supported by Kerstis et al. (2016), who found that parents' postpartum depression had a greater impact on their own bonding with the child than on their spouses' bonding.

The present study has several strengths. First, data from the cohort study DREAM allowed us to prospectively investigate a large sample of parents up to 14 months postpartum. Second, we computed dyadic analyses using the APIMeM, which has not been used previously in this specific context, even though the interdependent data of parents requires it. Third, our study focused on the outcomes of a negative birth experience, which have been studied less in relation to postpartum mental health and parent-child-bonding than CB-PTSD, although they are far more common. However, several limitations should be acknowledged. First, the sample for this study comprised rather privileged and healthy participants, as the majority of parents had a university degree, low levels of postpartum depression, anxiety, and CB-PTSD, and established a stable bond with their children. It is unclear, whether results would be similar for less educated and more distressed parents who face higher levels of daily challenges. Furthermore, our sample predominantly consisted of parents expecting their first child, and results may differ for more experienced parents. Second, parents' birth experience was measured retrospectively at the same timepoint as their mental health. Therefore, we cannot entirely dismiss the possibility that parents' postpartum symptoms of depression, anxiety, or CB-PTSD may have influenced their recall of the birth experience. Finally, we refrained from including postpartum depression, anxiety, and CB-PTSD in a single model, as it would substantially increase the complexity of the APIMeM. Similarly, we did not control for postpartum psychiatric symptoms at T3 and can therefore not rule out the possibility that concurrent symptoms or other unmeasured confounding factors rather than psychiatric symptoms at T2 impacted parent-child-bonding at T3.

Future research should further explore on the outcomes associated with both parents' negative birth experiences. When examining parent-child-bonding, it would be particularly interesting to investigate the underlying mechanisms which make the birth experience a more influential factor for partners than for mothers in their bond to the child. Moreover, more dyadic research is needed to clarify the mixed findings regarding the effect parents have on their partners' postpartum mental health and their bond with the child. Examining the couple relationship in these analyses may be helpful to further reveal how family dynamics affect the mental health of parents and their children in the postpartum period. Regarding parents' postpartum mental health, future studies should continue to explore the differences between mothers and partners. Finally, it is essential to replicate these results in more diverse samples.

Implications for practice include providing support to expecting parents in ways that promote positive birth experiences for both mothers and their partners. Moreover, in the days following the birth, it is crucial to inquire about the subjective birth experience of mothers and partners. This enables the identification of parents who are at risk of postpartum mental health problems and bonding impairment and might need additional support. Mental health professionals can help parents in recognizing and using their internal (e.g., self-care or self-efficacy) and external resources (e.g., social support) to mitigate the stress of a negative birth experience and foster coping mechanisms where possible (Brown et al., 2022). During the postpartum period, mothers and their partners should be screened for mental health problems and difficulties

in bonding with the child. This might be especially important for parents who have had a negative birth experience. Moreover, specialized care for partners may be needed, as our findings demonstrate that negative birth experiences may have an even stronger impact on their bonds with the child compared to mothers.

In summary, our results suggest that parents' own negative birth experience predicts a poorer bond with their child 14 months postpartum. Compared to mothers, this association was twice as large for partners, underlining the importance of including partners in birth-related research. For mothers, the association between birth experience and parent-child-bonding was mediated by symptoms of postpartum depression and CB-PTSD, although the latter effect disappeared when adjusting for mothers' neuroticism. For partners, it was mediated by symptoms of postpartum depression and anxiety. However, contrary to previous studies, parents' postpartum mental health and bonds with their children were not affected by their partners' birth experiences or mental health. Therefore, these conflicting results need to be investigated further. Generally, the parental couple as a dyad should be moved more into the focus of research in perinatal psychology, without neglecting individual differences between mothers and partners.

Ethical statement

All parts of the study were approved by the Ethics Committee of the Technische Universität Dresden (No: EK 278062015). The parents were informed about the aims and procedures of the DREAM study, the pseudonymization of their data (using a personalized code generated by the participants), and their right to withdraw from the study at any time. All participants provided written informed consent.

Funding

The DREAM study was funded by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG; Grant Numbers GA 2287/4-1 and GA 2287/4-2).

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.

Data availability

The authors do not have permission to share data.

Acknowledgements

We would like to thank all (expectant) parents for supporting our study. Furthermore, we would like to thank all cooperating hospitals and midwives for providing access to potential participants, all colleagues and (doctoral) students performing the recruitment, and Hannah Baumeister for providing feedback during the revision of the manuscript. We would like to acknowledge that study data were collected and managed using Research Electronic Data Capture (REDCap). REDCap is a secure, web-based application for capturing data within research studies and is hosted at the "Koordinierungszentrum für Klinische Studien" at the Faculty of Medicine of the Technische Universität Dresden (Harris et al., 2009, 2019). This paper contributes to the EU COST Action CA18211: DEVoTION: Perinatal Mental Health and Birth-Related Trauma: Maximising best practice and optimal outcomes, where LS, PD-Y, and SG-N are (management committee) members.

Appendix A

See Appendix Tables A1–A3 here.

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