Contents lists available at ScienceDirect

Journal of Affective Disorders

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

Research paper

Shadows of the past – Hierarchical regression analyses on the role of childhood maltreatment experiences for postpartum depression

Lea Vogel [a,b,c,*], Johanna Löchner [d,e], Ansgar Opitz [a], Thomas Ehring [b,c], Ulrike Lux [a], Christoph Liel [a], Carmen Henning [f], Caroline Seiferth [f,g], Charlotte E. Wittekind [b,c]

[a] Department of Families and Family Policies, National Center for Early Prevention, German Youth Institute, Munich, Germany
[b] Department of Psychology, LMU Munich, Munich, Germany
[c] DZPG (German Center for Mental Health), Munich, Germany
[d] DZPG (German Center for Mental Health), Tuebingen, Germany
[e] Department of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy, University Hospital of Psychiatry and Psychotherapy, Tuebingen, Germany
[f] Institute of Psychology, University of Bamberg, Bamberg, Germany
[g] Department of Clinical Psychology and Psychotherapy, Freie Universität Berlin, Berlin, Germany

ARTICLE INFO

ABSTRACT

Background: Postpartum depression (PPD) is one of the most common mental disorders in parents after birth. To develop tailored preventive programs, it is necessary to identify risk factors for PPD in parents. This study aimed to examine the impact of parental childhood maltreatment (CM) as a risk factor for PPD.
Methods: Data from a German study comprising $n = 349$ mothers and $n = 46$ fathers were used. Hierarchical regression models were performed to examine CM, educational background, single parenthood, emotion regulation and attachment style as predictors of symptoms of PPD. In exploratory analyses, potential mediators (i.e., parenting stress and emotion regulation) were investigated via a path model.
Results: CM, low level of education, difficulties in emotion regulation, and attachment anxiety were significant predictors for maternal PPD [$R^2 = 0.52$, $F (6, 305) = 57.99$, $p < .001$]. For fathers, difficulties in emotion regulation were identified as a predictor [$R^2 = 0.43$, $F (6, 24) = 4.78$, $p < .01$]. In exploratory analyses, emotion regulation served as a mediator for the link between CM and PPD as well as for the link between CM and parenting stress.
Limitations: The study design is cross-sectional and based on self-report questionnaires. Despite our attempts, only few fathers participated in the study, resulting in an underpowered sample for the regression analyses.
Conclusions: The study confirmed the assumption that CM experiences represent a risk factor for the development of maternal PPD. Emotion regulation might provide a pivotal target for interventions with parents at-risk.

1. Introduction

Due to the numerous challenges and changes during the transition to parenthood (i.e., sleep deprivation, role changes), the postpartum phase represents a critical period for the development of psychopathology in life (Saxbe et al., 2018). With a prevalence of 17 % worldwide (Wang et al., 2021), postpartum depression (PPD) is one of the most common mental disorders in women during the first year postpartum. In addition, the prevalence of PPD is also high in fathers with almost 10 % three to six months postpartum (Rao et al., 2020). Being depressed right after giving birth does not only have a negative impact on the physical and emotional well-being of the parent (Huizink et al., 2017; Reck et al., 2016; Vismara et al., 2016), including suicidality (Chen et al., 2023), but interferes significantly with a healthy development of the new-born regarding parent-child-relationship, emotion regulation, and socio-emotional development (Erickson et al., 2019; Slomian et al., 2019). Given the high prevalence and the far-reaching potential consequences for those affected and their offspring, early detection of and the

development of suitable preventive interventions for parental PPD are essential (Avalos et al., 2019). As part of this effort, identifying risk factors for PPD as potential targets for prevention programs is crucial.

Earlier research revealed a variety of social risk factors such as single parenthood (Wang et al., 2021), a low level of education (Cena et al., 2021), and economic deprivation (Ban et al., 2012) which can exacerbate (parenting) stress during the transition to parenthood and therefore increase the risk of developing depressive symptoms (Cornish et al., 2006; Vismara et al., 2016). Besides these recognized social risk factors, psychological factors may additionally elevate the risk of PPD by increasing parents' vulnerability. Insecure attachment – characterized by attachment avoidance and anxiety – represents a risk factor for maladaptive emotion regulation and psychopathology including PPD (Bifulco et al., 2004; Ikeda et al., 2014; Mikulincer and Shaver, 2016). Studies revealed heterogeneous findings regarding the associations between attachment anxiety, avoidance and PPD with some studies identifying links between both types and PPD, while others report associations specifically between attachment anxiety and PPD (Bifulco et al., 2004; Warfa et al., 2014). In addition, dysfunctional emotion regulation also appears to elevate the risk for PPD, influencing how individuals cope with emotional distress and challenges (Aldao et al., 2010; Gross and Muñoz, 1995; Loechner et al., 2020). Earlier studies showed that maternal dysfunctional emotion regulation plays a key role in the etiology and maintenance of maternal PPD (Cardoso and Fonseca, 2023; Edwards et al., 2017; Haga et al., 2012). Alongside the aforementioned risk factors, childhood maltreatment (CM) comprising experiences of sexual, emotional and physical abuse as well as physical and emotional neglect during the parents' own childhood has been shown to be a serious risk factor for the development of depression across the lifespan (Felitti et al., 1998; Nelson et al., 2017). Parents with a history of CM may perceive more intense stress (McLaughlin et al., 2010; Thakkar and McCanne, 2000), have fewer coping strategies and therefore might be particularly vulnerable to develop PPD. In line with these findings, earlier research has identified early adverse childhood experiences (ACE; i.e., childhood maltreatment, parental mental illness, household dysfunction) as a risk factor for maternal PPD (Racine et al., 2021; Souch et al., 2022).

In sum, uncovering risk factors for PPD can be expected to be a crucial step enabling the development and further improvement of targeted prevention programs for high-risk groups during the transition to parenthood (Paul et al., 2023). In line with this perspective, international treatment guidelines recommend the systematic identification of parents at risk (NICE, 2014). Although it is conceivable that particularly parents who experienced CM have a high risk to develop PPD, there is still limited evidence for the association between CM and PPD, as the majority of studies assessed ACE in general instead of focusing specifically on CM. Moreover, no studies to date have investigated psychological mechanisms mediating the link between CM and symptoms of PPD. Previous studies primarily investigated the relationship between maternal CM and depression during the antenatal period (Racine et al., 2021; Souch et al., 2022) with only few studies exploring the postpartum period (Nagl et al., 2017). Social factors as described above could also influence the relationship between CM and PPD (Metzler et al., 2017), and were not considered in previous studies investigating the link between CM and PPD. Additionally, to the best of our knowledge, no study has examined the relationship between CM and PPD in fathers.

To address the aforementioned limitations, the present study simultaneously explores the interaction between CM, psychological mechanisms (emotion regulation and attachment), social factors (i.e., educational level, single parenthood) and symptoms of maternal and paternal PPD. The study advances our understanding of the association between CM and PPD as both mothers and fathers are included in the present study.

Based on previous findings, we hypothesized that

(1) higher levels of CM are associated with more severe PPD symptoms.
(2) a lower level of education and being a single parent is associated with more severe PPD symptoms.
(3) greater difficulties in emotion regulation and insecure attachment (anxiety and avoidance) are associated with more severe PPD symptoms.

Lastly, we hypothesize that CM significantly contributes to the explanation of the variance in PPD, even after controlling for risk factors like being a single parent, having a low level of education, difficulties in emotion regulation, and insecure attachment style.

2. Methods

The current manuscript represents a secondary analysis of pooled data from two randomized controlled trials (RCTs) conducted within the project "I-PREGNO" (trial I: Henning et al., 2023; trial II: Vogel et al., 2023). The common aim of the RCTs was to test the efficacy of a mobile health intervention to prevent unhealthy weight gain and psychosocial stress. Detailed procedural information is available in the study protocols for each trial (Henning et al., 2023; Vogel et al., 2023). The RCTs received ethical approval from the ethical committee of the University in Bamberg (nr. 2022–02/09). Both trials were registered at the German register for clinical trials (DRKS; DRKS00031067, DRKS00029673). The analyses and hypotheses of this paper were preregistered in the Open Science Framework (OSF; *https://osf.io/s28n7*).

2.1. Participants & procedure

Mothers and fathers were recruited for the trials from September 2022 to August 2023 in Germany. In trial I, parents were recruited via social media and advertisements in daycare centers and medical practices. Inclusion criteria were owning a smartphone and having a child at the age between 0 and 12 months. Trial II was designed to recruit psycho-socially burdened parents. We therefore recruited mothers via healthcare professionals who work within an early childhood home-visiting program of the Federal Foundation for Early Childhood Intervention in Germany. For trial II, eligibility criteria were the experience of at least one psychosocial burden factor (see Vogel et al., 2023), receiving support from the home-visiting program for a minimum of 12 weeks, and owning a smartphone. In both trials, when the mother was registered and eligible for participation, fathers were also encouraged to participate. Exclusion criteria for both trials were: (1) < 16 years, (2) chronic condition influencing behavior related to energy balance such as diabetes, (3) lack of sufficient proficiency in German hindering app usage and questionnaire completion, and (4) acute mental health issues hindering participation (e.g., acute suicidality, mania). A lifetime history of or a current mental disorder were not criteria for exclusion. Participants received 20 Euros after the second assessment.

2.2. Measures

All included variables were assessed online via Limesurvey (LimeSurvey Project Team / Carsten Schmitz, 2012) during the baseline-assessment (t_0) with one exception. Attachment style was assessed in the post-assessment questionnaire (t_1) 12 weeks after t_0.

2.2.1. Childhood maltreatment

CM was assessed using the Childhood Trauma Screener (CTS), a validated German short form of the Childhood Trauma Questionnaire (Bernstein et al., 2003; Grabe et al., 2012). The questionnaire consists of five items, each covering one form of CM (emotional, physical, and sexual abuse as well as emotional and physical neglect) on a 5-point-Likert scale ranging from 1 (*not at all*) to 5 (*very frequently*). The evaluation of the CTS is based on the sum score of the five items. In our sample,

Cronbach's α was satisfactory (α = 0.74). Cut-off values were specified for the individual maltreatment experiences in order to assess the presence of CM subtypes: emotional and physical abuse ≥3, sexual abuse ≥2, and emotional and physical neglect ≥4 (Glaesmer et al., 2013). Due to a technical issue within the baseline assessment, physical neglect had to be assessed in a follow-up survey.

2.2.2. Postpartum depressive symptoms

To assess parental postpartum depressive symptoms, we used the German version of the Edinburgh-Postnatal-Depression-Scale (EPDS; Cox et al., 1987). The EPDS represents a 10-item self-report questionnaire that screens for PPD symptoms in mothers and fathers. Each item is rated on a 4-point Likert scale ranging from 0 to 3. A sum score higher than 9.5 indicates a diagnosis of PPD (Bergant et al., 1998; Cox et al., 1987). The questionnaires' psychometric properties have been found to be satisfactory (Cox et al., 1987; Massoudi et al., 2013). Analyses of our data indicated good internal consistency (α = 0.87).

2.2.3. Sociodemographic factors

Sociodemographic variables, including age, gender, education, and single parenthood, were measured through self-generated questions. For our analyses, we used dummy-coded variables for educational level and single parenthood (being a single parent = 1, high education = 1). High education was defined as a degree qualifying for university or university degree.

2.2.4. Emotion regulation

The German short form of the Difficulties in Emotion Regulation Scale (DERS) assesses emotional regulation strategies (Ehring et al., 2013; Gratz and Roemer, 2004). The questionnaire includes six subscales (*non-acceptance of emotional responses, difficulty in engaging in goal-directed behavior, impulse control difficulties, lack of emotional awareness, limited access to emotion regulation strategies, and lack of emotional clarity*). Each subscale comprises two to four items, making a total of 18 items, all of which are rated on a 5-point Likert scale, ranging from 1 (*almost never*) to 5 (*almost always*). The sum score of all subscales was used in the present analyses. Overall, the DERS has shown good psychometric properties (Victor and Klonsky, 2016). In our sample, internal consistency was good (α = 0.81).

2.2.5. Attachment style

The short form of the Experiences in Close Relationships-Revised questionnaire (ECR-R; Brennan et al., 1998; Ehrenthal et al., 2009) measures attachment style in adult partnerships on two dimensions (*attachment anxiety* and *attachment avoidance*). The questionnaire consists of eight items. Participants rate statements about their behavior in close relationships on a 7-point Likert scale, with 1 (*strongly disagree*) to 7 (*strongly agree*). For the evaluation, the mean values of the items were calculated for each of the two subscales. The psychometric properties are reported as good (Ehrenthal et al., 2009). In our sample both subscales showed good internal consistencies (anxiety: α = 0.83; avoidance: α = 0.83).

2.2.6. Parenting stress

The adapted German version of the Parenting Stress Index – Short Form (PSI; Abidin et al., 2006; German: Tröster, 2011) was conducted to assess parenting stress during the postpartum period. The questionnaire consists of 28 items divided into seven subscales with 4 items each (*general health, role restriction, isolation, competence, attachment, partnership quality, and depression*). Each subscale comprises four items rated on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), with higher scores indicating higher levels of stress. For the general parenting stress, a sum score of all subscales was calculated. We decided to exclude the subscale *partnership quality*, as this was only available from participants with a partnership. The studies indicate good psychometric properties (Abidin et al., 2006; Reitman et al., 2002;

Tröster, 2011). Analyses of our sample indicated an excellent internal consistency (α = 0.91).

2.3. Data analytical strategy

Analyses were performed using SPSS 29 and RStudio version 2023.9.1.494. Two multiple hierarchical regression models (separate for mothers and fathers) were conducted with SPSS to examine whether parental CM predicted PPD during the first-year postpartum accounting for social and psychological variables. Both analyses involved three steps, with CM entered in step 1. Afterwards, dummy coded social variables (level of education and single parenthood) were added in a second step and psychological variables (difficulties in emotion regulation, attachment anxiety and attachment avoidance) added in the third step (see Fig. 1). For the interpretation of our results we used the coefficient of determination (adjusted R^2), estimated regression coefficients (*B*), and - to compare the different coefficients – standardized regression coefficients (*β*). A priori power analysis was performed for the multiple hierarchical regression models using G*Power 3.1 (Faul et al., 2009). The required sample size was 354 participants, assuming an effect size of $f^2 = 0.06$ (see Racine et al., 2021) and aiming for a power of $1-\beta = 0.95$ (α = 0.05). When aiming for a power of $1-\beta = 0.80$ (α = 0.05) the required sample size resulted in 234 participants.

In addition, a multiple regression with the five subtypes of CM (items of the CTS) was conducted as predictors for postpartum depressive symptoms. In exploratory analyses, a path-analysis using the lavaan package in RStudio (v0.6–16) was performed to examine emotion regulation as a potential mediator for the association between CM and parenting stress, predicting the onset of PPD (Rosseel, 2012). Unfortunately, the sample size of fathers was too low for this kind of analyses. Fig. 2 shows the assumed path model with the defined variables and paths.

3. Results

Altogether, *n* = 349 mothers and *n* = 46 fathers were included in the analyses. Due to missing data, a total of 343 participants ($n_{(mothers)}$ = 312; $n_{(fathers)}$ = 31) were included in the final regression models. On average, mothers were *M* = 32.63 (*SD* = 5.24) years and fathers *M* = 36.48 (*SD* = 4.93) years old. The baseline assessment was conducted at *M* = 5.11 (*SD* = 3.37) months postpartum. The frequencies, means, and standard deviations for all variables used in the analyses are reported in Table 1. In the sample, *n* = 102 (33 %) mothers and *n* = 7 (23 %) fathers had an elevated sum score on the EPDS (> 9.5), which indicates a diagnosis of PPD (Bergant et al., 1998).

3.1. Hierarchical multiple regression analyses

In both analyses of mothers and fathers, CM significantly predicted postpartum depressive symptoms (Step 1), even when including social factors (Step 2). Overall, the model of step 3 explained the most of the variance. For mothers, the change in R^2 was statistically significant in every step (see Table 2), indicating that the inclusion of level of education and psychological variables significantly improved the predictive power of the model. While a low level of education, difficulties in emotion regulation and attachment anxiety were significant predictors of depressive symptoms, single parenthood and attachment avoidance were not. The final model, including all predictors, explained 52 % of the variance in postpartum depressive symptoms.

For fathers, the change in R^2 was only significant in Step 3 (see Table 3), indicating that the inclusion of difficulties in emotion regulation and attachment style, but not level of education and single parenthood increased the predictive power of the model. More specifically, only difficulties in emotion regulation were a significant predictor in the final model, which explained 43 % of the variance in depressive symptoms.
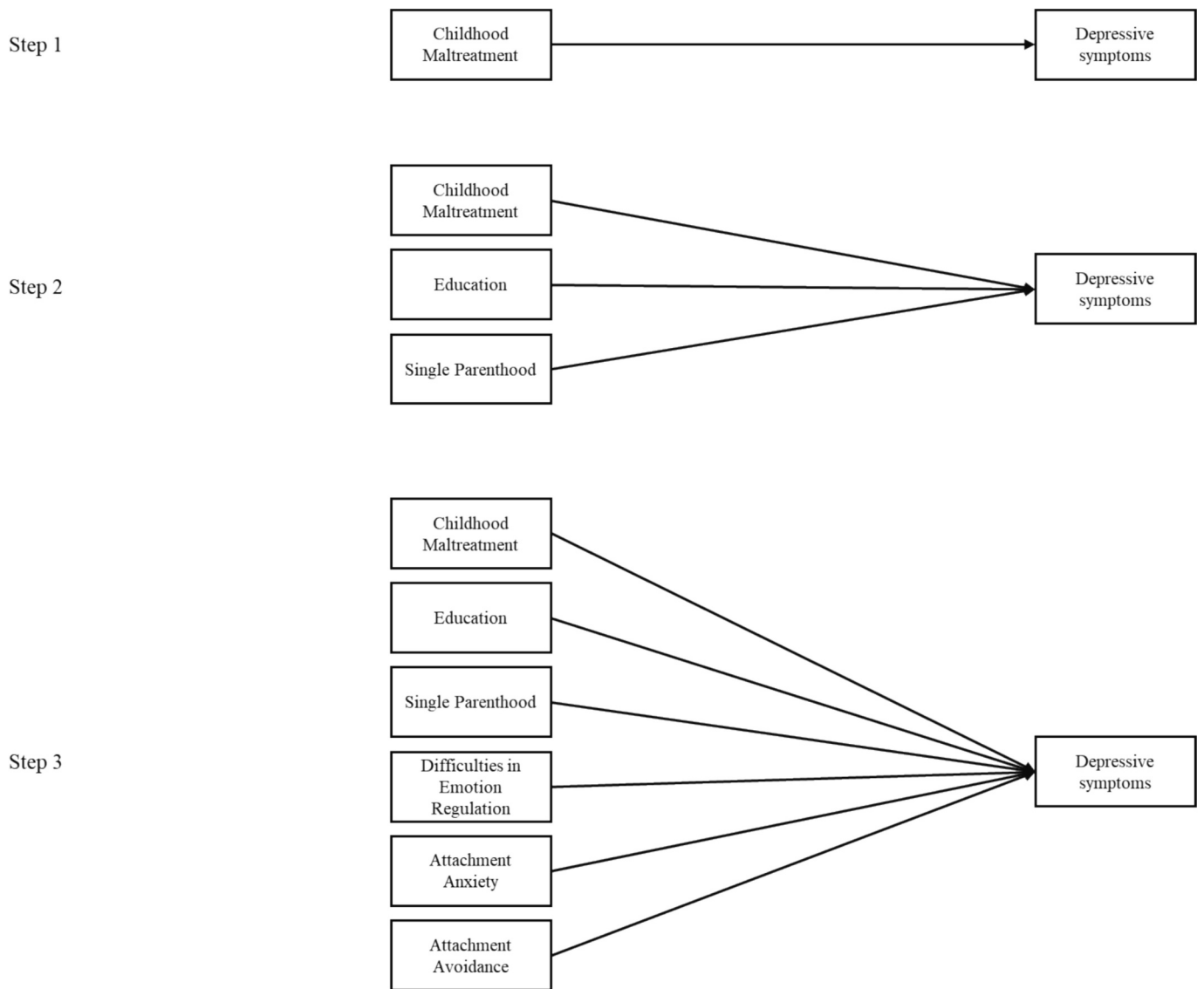
Fig. 1. Step 1–3 of the hierarchical regression models.
Note: Hierarchical regression analyses were performed separately for mothers ($n = 312$) and fathers ($n = 31$).
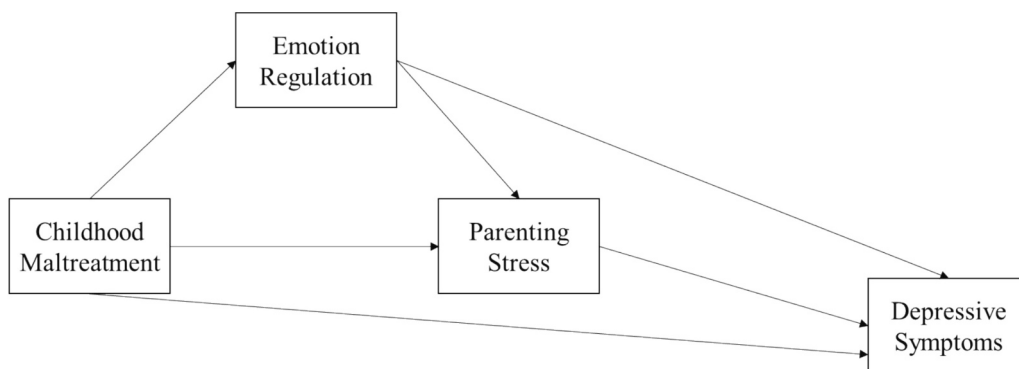

Fig. 2. Path model with emotion regulation and parenting stress as mediators for the link between childhood maltreatment and postpartum depression.
Note: The path model was only performed for mothers ($n = 312$).

3.2. In-depth analysis of CM subtypes and psychological mechanisms

The exploratory analyses revealed that emotional abuse and emotional neglect in childhood served as significant predictors for higher scores in EPDS in mothers whereas physical neglect, physical abuse, and sexual abuse did not, $R^2 = 0.13$, $F (5, 306) = 10.31$, $p < .001$

Table 1
Overview about the sociodemographic variables and social and psychological variables used for the analyses.

	Mothers	Fathers
	n (%)	*n* (%)
Citizenship		
German	273 (88 %)	2 (94 %)
Other citizenship	39 (13 %)	29 (7 %)
Education		
High	235 (75 %)	24 (77 %)
Low	77 (25 %)	7 (23 %)
Social welfare benefit	33 (11 %)	1 (3 %)
Single parenthood	32 (10 %)	1 (3 %)
Unplanned pregnancy	62 (20 %)	3 (10 %)
Primiparous parent	199 (64 %)	19 (61 %)
CM experiences (CTS items)		
Emotional Neglect	32 (10 %)	4 (13 %)
Physical Abuse	34 (11 %)	0
Emotional Abuse	69 (22 %)	5 (16 %)
Sexual Abuse	52 (17 %)	1 (3 %)
Physical neglect	10 (3 %)	1 (3 %)
	M (SD)	*M (SD)*
Total CM (CTS)	7.71 (3.32)	7.03 (1.89)
Depressive symptoms (EPDS)	7.82 (5.56)	5.87 (4.65)
Difficulties in emotion regulation (DERS)	36.04 (11.89)	34.39 (8.51)
Attachment		
Attachment anxiety (ECR-R)	2.84 (1.56)	2.66 (1.20)
Attachment avoidance (ECR-R)	2.52 (1.23)	2.28 (1.17)
Parenting stress (PSI)	69.51 (17.44)	68.68 (14.71)

Note. High education = degree qualifying for university or university degree; CM = Childhood maltreatment; CTS = Childhood trauma screener; EPDS = Edinburgh-Postnatal-Depression-Scale; DERS = Difficulties in emotion regulation scale; ECR-R = Experiences in close relationships – revised; PSI = parenting stress index.

(see Table S1 in supplemental material).

The results of the path model are presented in Fig. 3. Results showed a significant indirect effect of difficulties in emotion regulation mediating the link between CM and parenting stress, indicating a complete mediation of difficulties in emotion regulation between CM and parenting stress. Furthermore, we found a significant indirect effect with parenting stress mediating the link between emotion regulation and depression. The results indicate a partial mediation of parenting stress for the relationship between emotion regulation and depression. Controlled for the aforementioned paths, indirect effect of parenting stress mediating the link between CM and depression was not significant, and the path between CM and PPD stayed significant. Overall, the path model explained 38 % of the variance in parenting stress, 56 % of the variance in depression and 9 % of the variance in difficulties in emotion regulation.

4. Discussion

The current study aimed to examine experiences of CM as a predictor for symptoms of maternal and paternal PPD. In addition, we investigated the role of social factors (i.e., low education, single parenthood) and psychological mechanisms (i.e., emotion regulation, attachment) in this relationship. Furthermore, in in-depth analyses, we examined which subtypes of CM are associated with PPD and then investigated emotion regulation as a mediator for the relationship between CM and parenting stress leading to increased symptoms of PPD.

For mothers, our results confirmed the significant impact of CM on depressive symptoms during the first year after giving birth. Consistent with our hypotheses, low education, higher attachment anxiety, and greater difficulties in emotion regulation were associated with higher levels of depressive symptoms, with emotion regulation emerging as the predictor with the greatest influence on PPD ($\beta = 0.59$). Further, the findings imply that despite controlling for social and psychological risk factors, experiences of CM affect maternal depressive symptoms during the first year postpartum. The results of the path model emphasize these findings, as the path between CM and PPD cannot be fully explained by the mediators (parenting stress and emotion regulation). Contrary to our hypothesis and existing studies, single parenthood and attachment avoidance were not associated with PPD. For fathers, we only found dysfunctional emotion regulation to be positively associated with the severity of symptoms of PPD, indicating that maladaptive emotion regulation strategies do have an impact on the development of symptoms of PPD in fathers after birth. However, due to the very low sample for fathers ($n = 31$) and the low prevalence rates of CM in this group, results need to be interpreted with great caution.

Overall, our study underscores the significance of the relationship between CM and depression during the postpartum period and thus contributes to the body of research focusing on CM as a risk factor for psychopathology in adulthood (Kessler et al., 2010). In line with most earlier studies investigating the association between ACE and PPD, our results confirmed CM as a risk factor for PPD (Racine et al., 2021; Souch

Table 2
Results of hierarchical analyses in mothers with symptoms of postpartum depression as dependent variable.

		B	95 % CI for B		SE B	β	t	R²	Δ R²
			LL	UL					
Step 1								0.13	N/A
	Constant	3.19	1.72	4.65	0.75				
	Childhood maltreatment	0.60	0.43	0.78	0.09	0.36	6.78***		
Step 2								0.14	0.02*
	Constant	5.34	3.06	7.61	1.16				
	Childhood maltreatment	0.53	0.34	0.72	0.10	0.32	5.49***		
	High education	−1.88	−3.39	−0.36	0.78	−0.15	−2.43*		
	Single parenthood	−1.64	−3.64	0.37	1.02	−0.09	−1.61		
Step 3								0.52	0.39***
	Constant	−3.78	−5.87	−1.69	1.06				
	Childhood maltreatment	0.20	0.06	0.35	0.08	0.12	2.76**		
	High education	−1.67	−2.81	−0.52	0.58	−0.13	−2.87**		
	Single parenthood	−1.47	−3.03	0.09	0.79	−0.08	−1.86		
	Difficulties in emotion regulation	0.28	0.24	0.32	0.02	0.59	13.56***		
	Attachment anxiety	0.39	0.04	0.74	0.18	0.11	2.18*		
	Attachment avoidance	0.13	−0.30	0.57	0.22	0.03	0.59		

Note. Postpartum depression was measured through the Edinburgh-Postnatal-Depression-Scale. Childhood maltreatment was measured through the childhood trauma screener, difficulties in emotion regulation through difficulties in emotion regulation scale, attachment style through questionnaire experiences in close relationships-revised. High education and single parenthood were implemented as dummy-coded variables. High education = degree qualifying for university or university degree. *B* = *estimated regression coefficient;* CI = confidence interval; *LL* = lower limit; *UL* = upper limit; *SE B* = standard error of B; β = standardized regression coefficient; *t* = t-value of *t*-test; *R²* = adjusted *R²*; *ΔR²* = change in *R²*. *p < .05. **p < .01. ***p < .001.

Table 3
Results of hierarchical regression analyses for fathers with symptoms of postpartum depression as dependent variable.

	B	95 % CI for B		SE B	β	t	R²	Δ R²
		LL	UL					
Step 1							0.17	*N/A*
Constant	−1.90	−7.98	4.19	2.98				
Childhood maltreatment	1.10	0.27	1.94	0.41	0.45	2.70*		
Step 2							*0.11*	0.001
Constant	−1.85	−10.86	7.17	4.39				
Childhood maltreatment	1.10	0.13	2.07	0.48	0.45	2.32*		
High education	0.02	−4.31	4.35	2.11	0.002	0.01		
Single parenthood	−0.77	4.49	−0.03	4.49	−0.03	−0.17		
Step 3							0.43	0.34**
Constant	−7.74	−15.99	0.52	4.00				
Childhood maltreatment	0.87	−0.002	1.74	0.42	0.35	2.06		
High education	−1.73	−5.33	1.86	1.74	−0.16	−1.00		
Single parenthood	−3.55	−11.34	4.24	3.78	−0.14	−0.94		
Difficulties in emotion regulation	0.29	0.10	0.47	0.09	0.53	3.21**		
Attachment anxiety	−0.98	−2.34	0.37	0.66	−0.25	−1.50		
Attachment avoidance	0.73	−0.72	2.18	0.70	0.18	1.04		

Note. Postpartum depression was measured through the Edinburgh-Postnatal-Depression-Scale. Childhood maltreatment was measured through the childhood trauma screener, difficulties in emotion regulation through difficulties in emotion regulation scale, attachment style through questionnaire experiences in close relationships-revised. High education and single parenthood were implemented as dummy-coded variables. High education = degree qualifying for university or university degree. B = estimated regression coefficient; CI = confidence interval; LL = lower limit; UL = upper limit; $SE\ B$ = standard error of B; β = standardized regression coefficient; t = t-value of t-test; R^2 = adjusted R^2; ΔR^2 = change in R^2. *$p < .05$. **$p < .01$. ***$p < .001$.
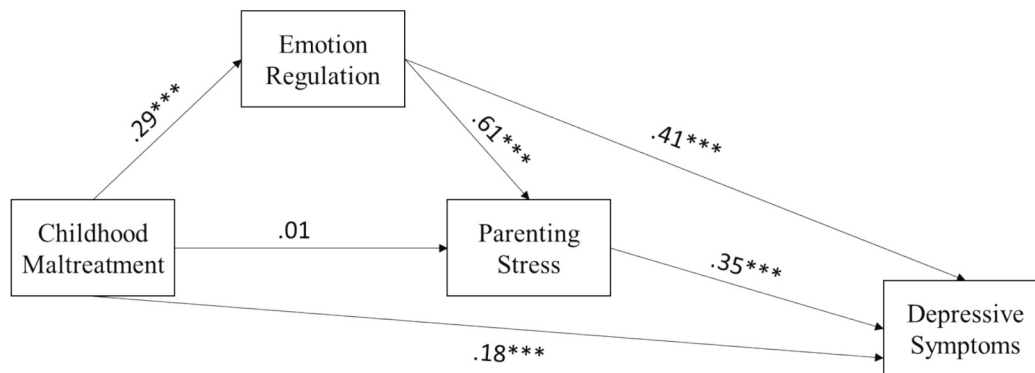

Fig. 3. Results of the performed path model: emotion regulation and parenting stress as mediators for the link between childhood maltreatment and postpartum depression.
Note: $N = 311$ mothers. Depressive symptoms were measured through the Edinburgh-Postnatal-Depression-Scale. Childhood Maltreatment was measured through the childhood trauma screener, difficulties in emotion regulation through difficulties in emotion regulation scale, attachment style through questionnaire experiences in close relationships-revised. High education and single parenthood were implemented as dummy-coded variables. High education = degree qualifying for university or university degree.

et al., 2022).Yet, whereas earlier research has mostly used the broader concept of ACE, our results extend these findings by showing that CM in particular is associated with more severe symptoms of PPD. Hence, integrating systematic screening for CM in prenatal care could help identify vulnerable mothers. In contrast to other studies showing associations between PPD and sexual and physical abuse (Nagl et al., 2017; Souch et al., 2022), in-depth analyses conducted in our sample indicated that only emotional abuse and neglect were significantly associated with PPD. This is in line with a meta-analysis investigating the link of CM and major depression in which emotional abuse and neglect emerged as predominant factors (Nelson et al., 2017). Future studies should investigate the association between different CM subtypes and PPD more in depth with longitudinal study designs.

Contrary to our hypothesis that single parents have an increased risk of PPD (Wang et al., 2021), our results did not confirm this assumption. One explanation for the increased risk for PPD in single parents may represent the lack of social support which could lead to an increase in depressive symptoms (Hitzler et al., 2022). Yet, since the majority of single mothers in our sample received help from an early childhood home-visiting prevention program, the effect of single parenthood on

PPD could have been buffered by the received support. This assumption is in line with another study that investigated the effect of young maternal age and single status on maternal mental health (Agnafors et al., 2019). The authors point out that in the case of a single mother, the child's father or another caregiver who shares responsibility for the child is likely to reduce maternal stress, which in turn could lead to fewer symptoms of PPD in mothers. Furthermore, the number of single mothers was small ($n = 32$). A study with a greater number of single mothers and social support, and quality of relationships as control variables could provide more insight.

Regarding attachment style, our results support findings of previous studies showing that anxious attachment increases the risk for PPD in mothers (Bifulco et al., 2004). While evidence is mixed with respect to attachment avoidance, our results contribute to a larger group of studies showing no association between attachment avoidance and PPD (Warfa et al., 2014). An insecure attachment style is associated with less effective stress regulation and more difficulties to build, maintain and benefit from supportive relationships, which in turn might increase the likelihood of developing depressive symptoms. In times of heightened stress (e.g., during the transition to parenthood), where fears regarding

the child and one's role as a parent possibly may exacerbate previous insecurities, individuals with more anxious attachment might feel more helpless and depressed. Our findings suggest that both CM and maternal anxious attachment independently predict the risk of PPD, with CM, especially emotional abuse and neglect, maintaining a significant association with PPD even when attachment style is added to the model.

This study found difficulties in emotion regulation to be highly associated with depressive symptoms during the first year postpartum for mothers as well as fathers. This aligns with research identifying dysfunctional emotion regulation strategies as a common risk factor for mental disorders (Gross and Muñoz, 1995) and initial studies investigating the link between difficulties in emotion regulation and PPD (Cardoso and Fonseca, 2023; Haga et al., 2012). In a longitudinal study from Haga et al. (2012), mothers who scored higher on emotion regulation strategies such as self-blame, rumination, and catastrophizing showed more severe symptoms of PPD, and women who tended to use more positive reappraisal and planning scored lower on measures of PPD. With respect to our findings, we assume that parents with dysfunctional emotion regulation strategies may be likely to have fewer resources coping with stress, which may result in an increase of depressive symptoms during the transition to parenthood. Consequently, our findings emphasize the assumption that dysfunctional emotion regulation should be considered as a key mechanism for the onset of PPD, which should be targeted in treatment and preventive interventions for PPD. In our path analysis examining the relationships between CM, emotion regulation, parenting stress, and PPD in mothers, we found several significant pathways. The path model indicates that mothers with CM experience more difficulties in emotion regulation. Difficulties in emotion regulation lead to increased parenting stress, which in turn is associated with higher levels of postpartum depressive symptoms. These results imply that experiences of CM in mothers might play a role in shaping emotion regulation strategies, which in turn influences their mental well-being during the first year after birth of their own child. Hence, emotion dysregulation may not only be a general risk factor for PPD, but even serves as mediator in the relationship between CM and PPD. In line with our findings, individuals with CM were shown to have greater difficulties in emotion regulation (Heleniak et al., 2016). Results of previous studies showed that CM leads to disruptions in multiple processes involved in emotion regulation, including heightened emotional reactivity and increased maladaptive response focused emotion regulation strategies (e.g., rumination, suppression) to distress, which in turn function as vulnerability factors for internalizing and externalizing psychopathology in childhood, adolescence and adulthood (Heleniak et al., 2016; Weissman et al., 2019). With respect to these findings, our results of the current manuscript provide evidence for difficulties in emotion regulation representing an intrapersonal key mechanism for the link between CM and postpartum depression (Heleniak et al., 2016; Klumparendt et al., 2019; Weissman et al., 2019). Since we observed a partial mediation between relationship of CM and PPD, it remains unclear which other psychological mechanisms might mediate this relationship.

4.1. Strengths and limitations

The present study has some noteworthy limitations. First, we used self-report questionnaires, which introduces the possibility of response bias and may not fully capture the complexities of the assessed constructs. Due to the conceptualization of the study, the attachment style was assessed 12 weeks later than the other variables within the analyses. As adult attachment is considered to be a stable construct (Pinquart et al., 2013), we decided to include the variable in our analyses. Second, the cross-sectional nature of the data restricts causal inferences and emphasizes the need for longitudinal studies. Third, we were not able to include all possible risk factors for PPD in our analyses (e.g., family history of psychiatric disorders, other significant life events), as these variables were not collected in the studies we used for the analyses.

Although we pursued a holistic and dyadic approach in I-PREGNO, we did not succeed in recruiting many fathers for the studies. This is comparable with other research projects that focus on the transition to parenthood (Stahlschmidt et al., 2013; Yaremych and Persky, 2023). Since the power was very low, the results of the regression analysis with fathers should only be considered preliminary. However, the attempted and partially successful inclusion of fathers in the study represents a significant advancement in recognizing their role in child development and family dynamics, enhancing the comprehensiveness of the findings, even though we reached not enough fathers to perform full powered analyses.

The study possesses notable strengths that contribute to its importance. Firstly, the inclusion of a high-risk sample (psychosocial burdened parents) provides valuable insights into research neglecting populations facing heightened challenges. This is remarkable, since parents with high psychosocial stressors represent a particular hard-to-reach group, despite the need for understanding their burden and providing support. However, we cannot rule out whether this might overestimate the correlation between risk factors and PPD compared to the general population. Additionally, to our knowledge this is the first study disentangling the role of CM, as well as most salient social and psychological factors for PPD. The exploration of specific CM and mediation analysis of emotion regulation, CM and parenting stress for PPD are further novelties leading to important practical implications for parents-to-be.

4.2. Implications

The interpretation of the results from this study underscores several key points with clinical implications. First, the findings highlight the importance of parental mental well-being for preventive strategies for families during the transition to parenthood. Particularly, preventive interventions may benefit from enhancing emotion regulation skills to cope with the up-coming parenting stress in this period. Moreover, interventions aiming an early detection of postpartum depression (e.g., machine learning techniques; Paul et al., 2023) should not only screen for social and physical risk factors, but also for psychological risk factors including CM experiences, and difficulties in emotion regulation. Importantly, it is beneficial to extend support throughout the first year postpartum and not limit help to the late stages of pregnancy and the immediate postpartum period.

Based on the results of the path analyses, future research should examine CM and emotion regulation before birth, followed by postpartum parenting stress and PPD. If these findings are replicated in longitudinal studies, enhancing emotion regulation could serve as a significant preventive strategy. While the current study examined attachment and emotion regulation as mechanisms that influence parental PPD, it is advantageous to include other mechanisms discussed in the literature, such as the role of social support (Hitzler et al., 2022; Racine et al., 2020). Furthermore, future research would benefit from the involvement of fathers.

5. Conclusion

The current study confirmed that experiences of CM, low education, and attachment anxiety can be considered as a risk factors for maternal PPD. Mothers with experiences of CM should be recognized as mothers at-risk for PPD in the perinatal healthcare system. Furthermore, the results suggest that dysfunctional emotion regulation strategies might play a fundamental role in the development of maternal and paternal PPD. Emotion regulation offers a suitable tool for psychological interventions during the postpartum period. If findings can be confirmed in longitudinal studies, research should develop interventions focusing on enhancing emotion regulation strategies in parents during the transition to parenthood and investigate further mechanisms of PPD in parents with CM.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jad.2024.11.045.

CRediT authorship contribution statement

Lea Vogel: Writing – original draft, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Johanna Löchner:** Writing – review & editing, Supervision, Project administration, Funding acquisition, Conceptualization. **Ansgar Opitz:** Writing – review & editing, Project administration, Methodology, Data curation. **Thomas Ehring:** Writing – review & editing, Supervision, Conceptualization. **Ulrike Lux:** Writing – review & editing. **Christoph Liel:** Writing – review & editing. **Carmen Henning:** Writing – review & editing, Data curation. **Caroline Seiferth:** Writing – review & editing, Data curation. **Charlotte E. Wittekind:** Writing – review & editing, Supervision, Conceptualization.

Ethical statement

The project received ethical approval from the ethical committee of the University in Bamberg (nr. 2022-02/09).

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT in order to improve the grammar, readability and language of the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Funding

Declaration of competing interest

Authors have no conflict of interest to report.

Acknowledgements

Data availability

Due to ongoing analyses, data will not be publicly available prior to the year 2026. In 2026, the I-PREGNO data will be published on the OSF platform as part of the I-PREGNO project. If there is a legitimate interest in the data in advance, the data can be requested from the corresponding author.

References

Abidin, R., Flens, J.R., Austin, W., G., 2006. The parenting stress index. In: Archer, R.P. (Ed.), Forensic Uses of Clinical Assessment Instruments. Lawrence Erlbaum Associates Publishers, pp. 297–328.

Agnafors, S., Bladh, M., Svedin, C.G., Sydsjö, G., 2019. Mental health in young mothers, single mothers and their children. BMC Psychiatry 19 (1), 112. https://doi.org/10.1186/s12888-019-2082-y.

Aldao, A., Nolen-Hoeksema, S., Schweizer, S., 2010. Emotion-regulation strategies across psychopathology: a meta-analytic review. Clin. Psychol. Rev. 30 (2), 217–237. https://doi.org/10.1016/j.cpr.2009.11.004.

Avalos, L.A., Flanagan, T., Li, D.K., 2019. Preventing perinatal depression to improve maternal and child health—a health care imperative. JAMA Pediatr. 173 (4), 313–314.

Ban, L., Gibson, J.E., West, J., Fiaschi, L., Oates, M.R., Tata, L.J., 2012. Impact of socioeconomic deprivation on maternal perinatal mental illnesses presenting to UK general practice. Br. J. Gen. Pract. 62 (603), e671–e678. https://doi.org/10.3399/bjgp12X656801.

Bergant, A.M., Nguyen, T., Heim, K., Ulmer, H., Dapunt, O., 1998. Deutschsprachige Fassung und Validierung der "Edinburgh postnatal depression scale". DMW - Deutsche medizinische Wochenschrift 123 (3), 35–40. https://doi.org/10.1055/s-2007-1023895.

Bernstein, D.P., Stein, J.A., Newcomb, M.D., Walker, E., Pogge, D., Ahluvalia, T., Stokes, J., Handelsman, L., Medrano, M., Desmond, D., Zule, W., 2003. Development and validation of a brief screening version of the Childhood Trauma Questionnaire. Child Abuse Negl. 27 (2), 169–190. https://doi.org/10.1016/s0145-2134(02)00541-0.

Bifulco, A., Figueiredo, B., Guedeney, N., Gorman, L.L., Hayes, S., Muzik, M., Glatigny-Dallay, E., Valoriani, V., Kammerer, M.H., Henshaw, C.A., 2004. Maternal attachment style and depression associated with childbirth: preliminary results from a European and US cross-cultural study. Br. J. Psychiatry 184 (46), 31–37. https://doi.org/10.1192/bjp.184.46.s31.

Brennan, K.A., Clark, C.L., Shaver, P.R., 1998. Self-report measurement of adult attachment: an integrative overview. Attachment Theory and Close Relationships 46, 76.

Cardoso, C., Fonseca, A., 2023. Mothers at-risk for postpartum depression: mental health and emotion regulation throughout the postpartum period. Curr. Psychol. 42 (15), 12988–13002. https://doi.org/10.1007/s12144-021-02435-7.

Cena, L., Mirabella, F., Palumbo, G., Gigantesco, A., Trainini, A., Stefana, A., 2021. Prevalence of maternal antenatal and postnatal depression and their association with sociodemographic and socioeconomic factors: a multicentre study in Italy. J. Affect. Disord. 279, 217–221. https://doi.org/10.1016/j.jad.2020.09.136.

Chen, C., Okubo, R., Okawa, S., Hagiwara, K., Mizumoto, T., Higuchi, N., Nakagawa, S., Tabuchi, T., 2023. The prevalence and risk factors of suicidal ideation in women with and without postpartum depression. J. Affect. Disord. 340, 427–434. https://doi.org/10.1016/j.jad.2023.08.051.

Cornish, A.M., McMahon, C.A., Ungerer, J.A., Barnett, B., Kowalenko, N., Tennant, C., 2006. Maternal depression and the experience of parenting in the second postnatal year. J. Reprod. Infant Psychol. 24 (2), 121–132. https://doi.org/10.1080/02646830600644021.

Cox, J.L., Holden, J.M., Sagovsky, R., 1987. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. Br. J. Psychiatry 150 (6), 782–786. https://doi.org/10.1192/bjp.150.6.782.

Edwards, E.S., Holzman, J.B., Burt, N.M., Rutherford, H.J.V., Mayes, L.C., Bridgett, D.J., 2017. Maternal emotion regulation strategies, internalizing problems and infant negative affect. J. Appl. Dev. Psychol. 48, 59–68. https://doi.org/10.1016/j.appdev.2016.12.001.

Ehrenthal, J.C., Dinger, U., Lamla, A., Funken, B., Schauenburg, H., 2009. Evaluation der deutschsprachigen Version des Bindungsfragebogens "Experiences in Close Relationships–Revised" (ECR-RD). PPmP-Psychotherapie· Psychosomatik· Medizinische Psychologie 59 (6), 215–223. https://doi.org/10.1055/s-2008-1067425.

Ehring, T., Svaldi, J., Tuschen-Caffier, B., Berking, M., 2013. Validierung der Difficulties in Emotion Regulation Scale–deutsche Version (DERS-D). Unveröffentlichtes Manuskript. Universität Münster.

Erickson, N., Julian, M., Muzik, M., 2019. Perinatal depression, PTSD, and trauma: impact on mother-infant attachment and interventions to mitigate the transmission of risk. Int. Rev. Psychiatry 31 (3), 245–263. https://doi.org/10.1080/09540261.2018.1563529.

Faul, F., Erdfelder, E., Buchner, A., Lang, A.-G., 2009. Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses. Behav. Res. Methods 41 (4), 1149–1160.

Felitti, V.J., Anda, R.F., Nordenberg, D., Williamson, D.F., Spitz, A.M., Edwards, V., Koss, M.P., Marks, J.S., 1998. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: the adverse childhood experiences (ACE) study. Am. J. Prev. Med. 14 (4), 245–258. https://doi.org/10.1016/s0749-3797(98)00017-8.

Glaesmer, H., Schulz, A., Häuser, W., Freyberger, H., Brähler, E., Grabe, H.-J., 2013. Der Childhood Trauma Screener (CTS) - Entwicklung und Validierung von Schwellenwerten zur Klassifikation. Psychiatr. Prax. 40 (04), 220–226. https://doi.org/10.1055/s-0032-1321481.

Grabe, H.J., Schulz, A., Schmidt, C.O., Appel, K., Driessen, M., Wingenfeld, K., Barnow, S., Spitzer, C., John, U., Berger, K., Wersching, H., Freyberger, H.J., 2012. Ein Screeninginstrument für Missbrauch und Vernachlässigung in der Kindheit: der Childhood Trauma Screener (CTS). Psychiatr. Prax. 39 (3), 109–115. https://doi.org/10.1055/s-0031-1298984.

Gratz, K.L., Roemer, L., 2004. Multidimensional assessment of emotion regulation and dysregulation: development, factor structure, and initial validation of the difficulties in emotion regulation scale. J. Psychopathol. Behav. Assess. 26 (1), 41–54. https://doi.org/10.1023/B:JOBA.0000007455.08539.94.

Gross, J.J., Muñoz, R.F., 1995. Emotion regulation and mental health. Clin. Psychol. Sci. Pract. 2 (2), 151–164. https://doi.org/10.1111/j.1468-2850.1995.tb00036.x.

Haga, S.M., Ulleberg, P., Slinning, K., Kraft, P., Steen, T.B., Staff, A., 2012. A longitudinal study of postpartum depressive symptoms: multilevel growth curve analyses of emotion regulation strategies, breastfeeding self-efficacy, and social support. Arch. Womens Ment. Health 15 (3), 175–184. https://doi.org/10.1007/s00737-012-0274-2.

Heleniak, C., Jenness, J.L., Stoep, A.V., McCauley, E., McLaughlin, K.A., 2016. Childhood maltreatment exposure and disruptions in emotion regulation: a transdiagnostic pathway to adolescent internalizing and externalizing psychopathology. Cogn. Ther. Res. 40 (3), 394–415. https://doi.org/10.1007/s10608-015-9735-z.

Henning, C., Wolstein, J., Boehlke, E., Fischer, U.C., Liel, C., Lux, U., Opitz, A., Seiferth, C., Van Poppel, M.N.M., Vogel, L., Löchner, J., 2023. A cognitive behavioural mHealth intervention for families in the postpartum period to enhance weight management, mental well-being and resilience–a study protocol for a randomised controlled trial (I-PREGNO). Open Research Europe 190 (3), 190.

Hitzler, M., Behnke, A., Gündel, H., Ziegenhain, U., Kindler, H., Kolassa, I.-T., Zimmermann, J., 2022. Sources of social support for postpartum women with a history of childhood maltreatment: consequences for perceived stress and general mental health in the first year after birth. Child Abuse Negl. 134, 105911. https://doi.org/10.1016/j.chiabu.2022.105911.

Huizink, A.C., Menting, B., Moor, M.H.M. de, Verhage, M.L., Kunseler, F.C., Schuengel, C., Oosterman, M., 2017. From prenatal anxiety to parenting stress: a longitudinal study. Arch. Womens Ment. Health 20 (5), 663–672. https://doi.org/10.1007/s00737-017-0746-5.

Ikeda, M., Hayashi, M., Kamibeppu, K., 2014. The relationship between attachment style and postpartum depression. Attach Hum. Dev. 16 (6), 557–572. https://doi.org/10.1080/14616734.2014.941884.

Kessler, R.C., McLaughlin, K.A., Green, J.G., Gruber, M.J., Sampson, N.A., Zaslavsky, A. M., Aguilar-Gaxiola, S., Alhamzawi, A.O., Alonso, J., Angermeyer, M., Benjet, C., Bromet, E., Chatterji, S., Girolamo, G. de, Demyttenaere, K., Fayyad, J., Florescu, S., Gal, G., Gureje, O., et al., 2010. Childhood adversities and adult psychopathology in the WHO World Mental Health Surveys. Br. J. Psychiatry 197 (5), 378–385. https://doi.org/10.1192/bjp.bp.110.080499.

Klumparendt, A., Nelson, J., Barenbrügge, J., Ehring, T., 2019. Associations between childhood maltreatment and adult depression: a mediation analysis. BMC Psychiatry 19 (1), 1–11. https://doi.org/10.1186/s12888-019-2016-8.

LimeSurvey Project Team / Carsten Schmitz, 2012. LimeSurvey: An Open Source Survey Tool. LimeSurvey Project. http://www.limesurvey.org.

Loechner, J., Sfärlea, A., Starman, K., Oort, F., Thomsen, L.A., Schulte-Körne, G., Platt, B., 2020. Risk of depression in the offspring of parents with depression: the role of emotion regulation, cognitive style, parenting and life events. Child Psychiatry Hum. Dev. 51 (2), 294–309. https://doi.org/10.1007/s10578-019-00930-4.

Massoudi, P., Hwang, C.P., Wickberg, B., 2013. How well does the Edinburgh Postnatal Depression Scale identify depression and anxiety in fathers? A validation study in a population based Swedish sample. J. Affect. Disord. 149 (1–3), 67–74. https://doi.org/10.1016/j.jad.2013.01.005.

McLaughlin, K.A., Conron, K.J., Koenen, K.C., Gilman, S.E., 2010. Childhood adversity, adult stressful life events, and risk of past-year psychiatric disorder: a test of the stress sensitization hypothesis in a population-based sample of adults. Psychol. Med. 40 (10), 1647–1658. https://doi.org/10.1017/S0033291709992121.

Metzler, M., Merrick, M.T., Klevens, J., Ports, K.A., Ford, D.C., 2017. Adverse childhood experiences and life opportunities: shifting the narrative. Child Youth Serv. Rev. 72, 141–149. https://doi.org/10.1016/j.childyouth.2016.10.021.

Mikulincer, M., Shaver, P.R., 2016. Attachment in Adulthood: Structure, Dynamics, and Change, 2nd ed. The Guilford Press.

Nagl, M., Lehnig, F., Stepan, H., Wagner, B., Kersting, A., 2017. Associations of childhood maltreatment with pre-pregnancy obesity and maternal postpartum mental health: a cross-sectional study. BMC Pregnancy Childbirth 17 (1), 391. https://doi.org/10.1186/s12884-017-1565-4.

Nelson, J., Klumparendt, A., Doebler, P., Ehring, T., 2017. Childhood maltreatment and characteristics of adult depression: meta-analysis. Br. J. Psychiatry 210 (2), 96–104. https://doi.org/10.1192/bjp.bp.115.180752.

NICE, 2014. Antenatal and Postnatal Mental Health: Clinical Management and Service Guidance. NICE. https://www.nice.org.uk/guidance/cg192/resources/antenatal-and-postnatal-mental-health-clinical-management-and-service-guidance-pdf-35109869806789.

Paul, A., Pragada, S.D., Murthy, D.N., Shruthi, M.L.J., Gurugopinath, S., 2023. Performance comparison of machine learning techniques for early detection of postpartum depression using PRAMS dataset. In: 2023 IEEE 15th International Conference on Computational Intelligence and Communication Networks (CICN), pp. 310–315. https://doi.org/10.1109/CICN59264.2023.10402321.

Pinquart, M., Feußner, C., Ahnert, L., 2013. Meta-analytic evidence for stability in attachments from infancy to early adulthood. Attach Hum. Dev. 15 (2), 189–218. https://doi.org/10.1080/14616734.2013.746257.

Racine, N., Zumwalt, K., McDonald, S., Tough, S., Madigan, S., 2020. Perinatal depression: the role of maternal adverse childhood experiences and social support. J. Affect. Disord. 263, 576–581. https://doi.org/10.1016/j.jad.2019.11.030.

Racine, N., Devereaux, C., Cooke, J.E., Eirich, R., Zhu, J., Madigan, S., 2021. Adverse childhood experiences and maternal anxiety and depression: a meta-analysis. BMC Psychiatry 21 (1), 1–10. https://doi.org/10.1186/s12888-020-03017-w.

Rao, W.-W., Zhu, X.-M., Zong, Q.-Q., Zhang, Q., Hall, B.J., Ungvari, G.S., Xiang, Y.-T., 2020. Prevalence of prenatal and postpartum depression in fathers: a comprehensive meta-analysis of observational surveys. J. Affect. Disord. 263, 491–499. https://doi.org/10.1016/j.jad.2019.10.030.

Reck, C., Zietlow, A.-L., Müller, M., Dubber, S., 2016. Perceived parenting stress in the course of postpartum depression: the buffering effect of maternal bonding. Arch. Womens Ment. Health 19 (3), 473–482. https://doi.org/10.1007/s00737-015-0590-4.

Reitman, D., Currier, R.O., Stickle, T.R., 2002. A critical evaluation of the parenting stress index-short form (PSI-SF) in a head start population. J. Clin. Child Adolesc. Psychol. 31 (3), 384–392.

Rosseel, Y., 2012. lavaan: an R package for structural equation modeling. J. Stat. Softw. 48, 1–36.

Saxbe, D., Rossin-Slater, M., Goldenberg, D., 2018. The transition to parenthood as a critical window for adult health. Am. Psychol. 73 (9), 1190–1200. https://doi.org/10.1037/amp0000376.

Slomian, J., Honvo, G., Emonts, P., Reginster, J.-Y., Bruyère, O., 2019. Consequences of maternal postpartum depression: a systematic review of maternal and infant outcomes. Women Health 15, 1–55. https://doi.org/10.1177/1745506519844044.

Souch, A.J., Jones, I.R., Shelton, K.H.M., Waters, C.S., 2022. Maternal childhood maltreatment and perinatal outcomes: a systematic review. J. Affect. Disord. 302, 139–159. https://doi.org/10.1016/j.jad.2022.01.062.

Stahlschmidt, M.J., Threlfall, J., Seay, K.D., Lewis, E.M., Kohl, P.L., 2013. Recruiting fathers to parenting programs: advice from dads and fatherhood program providers. Child Youth Serv. Rev. 35 (10), 1734–1741. https://doi.org/10.1016/j.childyouth.2013.07.004.

Thakkar, R.R., McCanne, T.R., 2000. The effects of daily stressors on physical health in women with and without a childhood history of sexual abuse. Child Abuse Negl. 24 (2), 209–221. https://doi.org/10.1016/s0145-2134(99)00129-5.

Tröster, H., 2011. Eltern-Belastungs-Inventar: EBI; deutsche Version des Parenting Stress Index (PSI) von RR Abidin. Hogrefe.

Victor, S.E., Klonsky, E.D., 2016. Validation of a brief version of the difficulties in emotion regulation scale (DERS-18) in five samples. J. Psychopathol. Behav. Assess. 38 (4), 582–589. https://doi.org/10.1007/s10862-016-9547-9.

Vismara, L., Rollè, L., Agostini, F., Sechi, C., Fenaroli, V., Molgora, S., Neri, E., Prino, L. E., Odorisio, F., Trovato, A., Polizzi, C., Brustia, P., Lucarelli, L., Monti, F., Saita, E., Tambelli, R., 2016. Perinatal parenting stress, anxiety, and depression outcomes in first-time mothers and fathers: a 3- to 6-months postpartum follow-up study. Front. Psychol. 7, 938. https://doi.org/10.3389/fpsyg.2016.00938.

Vogel, L., Färber, T., Hölzl, I., Deliens, T., Henning, C., Liel, C., Löchner, J., Lux, U., Opitz, A., Seiferth, C., Versele, V., Wolstein, J., van Poppel, M.N.M., 2023. I-PREGNO - prevention of unhealthy weight gain and psychosocial stress in families during pregnancy and postpartum using an mHealth enhanced intervention: a study protocol of two cluster randomized controlled trials. BMC Pregnancy Childbirth 23 (1), 1–15. https://doi.org/10.1186/s12884-023-05735-x.

Wang, Z., Liu, J., Shuai, H., Cai, Z., Fu, X., Liu, Y., Xiao, X., Zhang, W., Krabbendam, E., Liu, S., Liu, Z., Li, Z., Yang, B.X., 2021. Mapping global prevalence of depression among postpartum women. Transl. Psychiatry 11 (1), 543. https://doi.org/10.1038/s41398-021-01663-6.

Warfa, N., Harper, M., Nicolais, G., Bhui, K., 2014. Adult attachment style as a risk factor for maternal postnatal depression: a systematic review. BMC Psychology 2 (1), 56. https://doi.org/10.1186/s40359-014-0056-x.

Weissman, D.G., Bitran, D., Miller, A.B., Schaefer, J.D., Sheridan, M.A., McLaughlin, K. A., 2019. Difficulties with emotion regulation as a transdiagnostic mechanism linking child maltreatment with the emergence of psychopathology. Dev. Psychopathol. 31 (3), 899–915. https://doi.org/10.1017/S0954579419000348.

Yaremych, H.E., Persky, S., 2023. Recruiting fathers for parenting research: an evaluation of eight recruitment methods and an exploration of fathers' motivations for participation. Parenting, Science and Practice 23 (1), 1–32. https://doi.org/10.1080/15295192.2022.2036940.