Comprehensive Psychiatry 108 (2021) 152248

Contents lists available at ScienceDirect

Comprehensive Psychiatry

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

Differences in interactional behaviour in postpartum depression with and without pre-existing mental disorder

Sina Weingarten [a], Shirin Diop [a], Christina Specht [b], Luc Turmes [b], Georg Juckel [a,*], Paraskevi Mavrogiorgou [a]

[a] Department of Psychiatry, Ruhr University Bochum, LWL-University Hospital, Alexandrinenstr. 1-3, 44791 Bochum, Germany
[b] Department of Psychiatry, Psychotherapy, Psychosomatic Medicine and Preventive Medicine, LWL-Hospital Herten, Im Schloßpark 20, 45699 Herten, Germany

ARTICLE INFO

Keywords:
Postpartum depression
Mental disorders
Mother–child interaction

ABSTRACT

Background: Mothers with postpartum depression (PPD) show impaired affects and behaviour patterns in the mother-child interaction, which affects an infant's emotional and cognitive development and the maternal course of disease. However, impairment of the mother-child relationship does not occur in every case of PPD.
Aim: The aim of this exploratory-descriptive video-based study was to investigate the possible associations between mother-child interactions and aspects of maternal biography and clinical history, with a focus on pre-existing mental disorder.
Methods: Sixty-two mother-child dyads (31 mothers with PPD and pre-existing mental disorders and 31 mothers with PPD but no further mental disorder) hospitalized at the mother and baby unit (MBU) of the LWL-Hospital Herten were included in this study. The Marcé Clinical Checklist and the "Mannheimer Beurteilungsskala zur Erfassung der Mutter-Kind-Interaktion im Säuglingsalter" (MBS-MKI-S) were used to explore sociodemographic and clinical parameters, and video-based interaction behaviour was examined.
Results: Mother-infant interaction behaviour showed a significant group difference on the MBS-MKI-S-Vm subscale (variability in maternal behaviour) before psychiatric treatment (exact Mann-Whitney *U* test: $U = 555$, $p = 0.023$), with higher scores in mothers with a pre-existing mental disorder. Furthermore, significant differences were shown on the MBS-MKI-S-RSm (maternal reactivity/sensitivity) ($U = 259$, $p = 0.019$) and MBS-MKI-S-Rc (child's reactivity) subscales at discharge ($U = 251$, $p = 0.021$). Among mothers with a pre-existing diagnosis, the MBS-MKI-S-Tm (maternal tenderness) and MBS-MKI-S-Rc (child's reactivity) subscales were significantly correlated after treatment.
Conclusions: Mothers with PPD and a pre-existing mental disorder displayed significantly more behavioural variability than mothers with only PPD. Maternal behaviour seems to influence the child's responsive behaviour; thus, mothers and their children can benefit from inpatient treatment at an MBU. Further investigations with larger samples should be conducted.

1. Introduction

The peripartum period is commonly viewed as an exciting and expectant phase of life for most women, accompanied by joyful and intense experiences. However, expectant mothers are also confronted with doubts, fears and worries. Despite being subject to mood swings and physical and psychosocial changes, most women are successful in adequately managing this phase of life. However, for a few women, the physical changes associated with pregnancy and childbirth may lead to a myriad of serious mental illnesses requiring treatment. Postpartum depression (PPD) is the most common psychiatric disorder worldwide, affecting approximately 15% of women in the first year after childbirth [12,75]. Common symptoms include depressed mood, sadness, severe anxiety, panic attacks, insecurity, uneasiness, crying, thoughts of death, difficulty concentrating and sleep disturbances [67].

The aetiology of PPD is unclear so far. Extensive evidence suggests that PPD is a complex condition with a multifactorial pathogenesis involving psychosocial and neurobiological factors [12,54,56,81]. Among the psychological and social factors, the strongest predictors for PPD are stressful life events, marital stress, partner instability and low levels of social support during pregnancy and postpartum [53,75,81]. The strongest biological risk predictors include hypothalamic-pituitary-adrenal dysfunction and genetic vulnerabilities (review: [81]). Predictive factors can also include pre-existing hormone-dependent psychological and physical problems due to increased reproductive hormone sensitivity as well as an abrupt hormonal change [71]. Furthermore, several studies have emphasized that a previous history of depression as well as other mental illnesses, such as anxiety disorder or bipolar disorder, is a potent risk factor for PPD [25,29,42,50,69,70].

* Corresponding author.
E-mail address: georg.juckel@rub.de (G. Juckel).

https://doi.org/10.1016/j.comppsych.2021.152248

Mothers with postpartum depression seem to have a significantly impaired profile of affects and behaviour patterns, according to previous research. Consequently, the infant's emotional and cognitive development and the mother's course of disease are adversely affected [60].

Previous surveys of disorders of social cognitive skills in women with postpartum mental disorders (mainly in the form of PPD) were not entirely systematic (review: [24]). These studies point out that affected women have a reduced ability to adequately perceive and interpret their children's emotional signals [24]. The behaviour of depressed mothers is characterized by passivity, intrusiveness, and a lack of responsiveness. This is often associated with negative affects and reduced facial expression [32,61,62,72], which causes the typical behaviour patterns of the children of mothers affected by PPD. Infants avoid eye contact by turning their head frequently and showing reduced positive affect expression and level of activity [76,77]. The child's behaviour patterns are interpreted as "self-regulatory protective mechanisms" towards the non-responsive mother and her negative affectivity [60].

The importance of maternal cognitive abilities is discussed as a key factor in the disturbed interaction between the depressed mother and her infant [73]. The findings suggest that depressed mothers mirror the child's self-regulation tools, such as turning away and avoiding eye contact and general contact with negative cognitions [61]. Negative cognitions and attitudes towards maternal and child care appear to be more prevalent in depressed women with male infants and in those of lower social and economic status [35,41,55]. However, the origin of the negative cognitions (in the sense of depression traits or state features) is unclear. The overall findings are inconsistent, but repeated disturbances in the early interaction behaviour of depressed mothers and their children, combined with disadvantageous influences on the cognitive-emotional development of the child, have been described. Thus, it is still not clear what exactly characterizes the disturbance of the mother–child interaction in the sense of mutual influencing. Impairments of the mother–child relationship are not detectable in every woman with PPD.

Murray et al. [51] were able to show that an early experience of the mother's lack of sensitivity in the interaction has a more negative effect on the infant's development than maternal depressed symptomatology. It can be assumed that there are subgroups of women with PPD who are characterized by different clinical and phenomenological features. These features in turn may affect the relationship with the child to various degrees.

The aim of our exploratory-descriptive video-based study was to explore the possible associations between mother–child interactions and the influence of a pre-existing mental disorder using the German version of the Marcé Clinical Checklist [74] as part of the standardized recording procedure in the mother and baby unit (MBU).

2. Methods

2.1. Participants and procedure

Based on existing routinely collected data of mothers with PPD (F53.X in the International Classification of Diseases, Tenth Revision), the participants were identified from a total of 192 patients who were hospitalized and treated at the MBU of the LWL Hospital Herten during the last 4 years (from 2013 to 2017). Only women who stayed more than 5 days at the MBU were eligible for further examination. Mothers who did not give written informed consent were excluded from further data analysis. Missing data (using the Marcé Clinical Checklist included in the standard admission procedures; [3,13,74]) were also an exclusion criterion. There were no child-related exclusion criteria. After this screening phase, a study group of 92 patients was isolated.

In a further step, routine video recordings of the mother–child interaction in the course of inpatient treatment (at the beginning and end of hospitalization) were screened for further analysis. Mother-child dyads were recorded with two video cameras during a 10-min interaction in the laboratory playroom of the LWL Hospital Herten. The mothers were instructed to play with their babies as they normally would. When the child was crying or fussing, the mothers were instructed to terminate the session. The two cameras were placed behind the mother and infant to film the lateral view of the dyad. A split-screen generator was used to simultaneously record the mother's and the child's behaviour. The mother's and the infant's vocalizations were captured by microphones integrated in the video cameras and embedded in the video recording. Several video recordings had to be excluded due to technical problems with the filmed material; more than 35% were either not codable or the mother–child dyad recordings were missing.

The mother-child interaction was rated by trained coding analysts who had no additional information about the study. The interaction sequences were scored on the "Mannheimer Beurteilungsskala zur Erfassung der Mutter-Kind-Interaktion im Säuglingsalter" (Mannheim Assessment Scale for Gathering of Mother-Infant Interaction during Infancy, MBS-MKI-S; [20]) in relation to both the mother's and the child's behaviour.

The resulting final sample of 62 mother-child dyads was further explored for sociodemographic and clinical parameters, as well as video-based interaction behaviour on inpatient admission and discharge.

The study was approved by the Ethics Committee (No. 17-6159) of Ruhr University Bochum, Germany.

2.2. Instruments

2.2.1. Marcé clinical checklist

The Marcé Clinical Checklist is an international checklist that includes the following sections: subject demographics; baby demographics; referral process; purpose of admission; social and marital data; psychiatric history, including drug use in pregnancy and family history; obstetric data; duration and nature of current illness; and thoughts or actions of self-harming or harming the baby. At admission and discharge from the MBU, the clinician used the Global Assessment of Functioning scale (GAF; [66]) for current psychosocial functioning and the Clinical Global Impression scale (CGI; [34]) to rate the severity of the patient's illness at the time of assessment [3,13,74].

2.2.2. Mannheimer Beurteilungsskala zur Erfassung der Mutter-Kind-Interaktion im Säuglingsalter (MBS-MKI-S)

The MBS-MKI-S [20,40] was used for further video-based analysis of the mother–child interaction. The scale is composed of ten subscales to assess maternal behaviour (MBS-MKI-S-Em, emotion; MBS-MKI-S-Tm, tenderness; MBS-MKI-S-VVm, vocalization/verbalization; MBS-MKI-S-VRm, verbal restriction; MBS-MKI-S-CAm, congruity/authenticity; MBS-MKI-S-Vm, variability; MBS-MKI-S-RSm, reactivity/sensitivity; MBS-MKI-S-Sm, stimulation; MBS-MKI-S-SCm, speech content; and MBS-MKI-S-Gm, games) and five subscales to evaluate the child's behaviour (MBS-MKI-S-Ec, emotion/facial expressions; MBS-MKI-S-VVc, vocalization/verbalization; MBS-MKI-S-VDc, verbalization direction; MBS-MKI-S-Rc, reactivity; and MBS-MKI-S-PWc, potential willingness to interact). Each subscale item can be coded from 1 (not available) to 5 (strongly positive), and the respective sum scores or a total score can be calculated [40].

2.3. Statistical analysis

Further data analysis was performed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). The statistical evaluation was performed using non-parametric methods, with the general significance level set to $\alpha = 0.05$. After hypothesis-driven Bonferroni adjustment, the significance level was $\alpha = 0.025$. To check for a normal distribution of the data, the Kolmogorov-Smirnov test was applied. Non-parametric tests were chosen for analysis if the data were not normally distributed. The Mann-Whitney *U* test was applied for any analyses of difference hypotheses and non-parametric

analysis of variance. Furthermore, Spearman's rho (r_s) was used for correlation analysis.

3. Results

3.1. Sociodemographic features

The sociodemographic characteristics of the 62 mothers are presented in Table 1.

The mean age of the mothers was 29.97 years (SD = 5.32; range = 20–43), and the mean age of their infants was 21.77 weeks (SD = 11.23) or approximately 5.5 months (range = 4 weeks–12 months). There were almost equal proportions of female and male infants.

On average, the quality of partnership (husband, boyfriend/girlfriend) was rated 2.6 (SD =1.1; good–satisfactory). Women with pre-existing psychiatric diagnoses had slightly worse scores (2.7; SD = 1.0) in their relationship than women with initial PPD (2.4; SD =1. 1) (*t*-test: $p = 0.34$). At the time of discharge, significant improvements in the quality of the partnership were identified for both groups, but the women with initial PPD rated their partnership as better (1.9; SD = 0.7) than did women with pre-existing disease (2.0; SD = 0.8; $p = 0.38$).

The relationship with parents and friends was also identified as between good and satisfactory. The women with previous illnesses scored slightly more negative here. Even at discharge, no significantly improved qualities in these areas could be found for either group.

Most participants were well educated, with over 82% of the mothers having acquired a middle or high school degree. Furthermore, most mothers (83.9%) had completed a vocational training course or obtained a graduate or professional degree. Overall, our sample was a relatively socioeconomically advantaged group.

3.2. Clinical features

Strikingly, 51.6% ($n = 32$) of our sample had delivered by caesarean section and two women by forceps delivery. Almost 26% ($n = 16$) had suffered from an obstetric complication or medical illness (such as pre-eclampsia, eclampsia or gestational diabetes) in their current pregnancy. Seven (11.3%) of the participating mothers had an abortion or stillbirth in their previous pregnancies.

Eight (12.9%) of the mothers with PPD had preterm/low-birthweight infants. Moreover, 13 (20.96%) of the children were hospitalized due to conditions such as jaundice, neonatal sepsis or cardiac symptoms in their first month after birth.

In 15 women (24.2%; 9 with pre-existing psychiatric disorders and 6 with initial PPD) in our study, a positive family history of psychiatric disorder was found. Depression in the family history predominated in both subgroups, and six women stated that their husband/partner also suffered from a mental disease.

A total of 31 participants (50%) previously reported having been diagnosed with a mental health condition by a mental health provider. The pre-diagnostic profile included affective disorders ($n = 21$), with 19 women having unipolar depression and 2 women having bipolar disorder as a pre-diagnosis. In addition, five women suffered from a borderline personality disorder, three had anxiety disorders, one had an obsessive compulsive disorder, and another had a psychotic disorder.

A total of 18 participants (29%) reported having received mental health treatment peripartum or during breastfeeding, but only 12 (19.4%) reported being in regular ambulant psychiatric treatment. The medications used most frequently were antidepressants (e.g., citalopram, sertraline, and venlafaxine) and less frequently antipsychotics (e.g., quetiapine and promethazine) and basic anxiolytics (e.g., lorazepam).

On average, the current depressed symptomatology began in the first 2.5 weeks (SD = 4.2, range = 0–20 weeks) postpartum. Only five women showed symptoms during pregnancy. On admission, most mothers ($n = 45$) presented with retarded depression, 14 showed symptoms of anxious-agitated depression, and 2 had symptoms of fluctuating-alternating depression. It is noteworthy that 24 mothers additionally reported the occurrence of compulsive anxiety to do something to their own child in the sense of obsessive thoughts.

The current inpatient admission to the MBU on average was 20.6 weeks (SD = 11.7, range = 2–20) after delivery. The mean total GAF score at the time of current inpatient admission was 38.6 (SD = 11.6), indicating major impairment in several areas, such as work or school, family relations, judgement, thinking or mood [66]. Furthermore, the overall mean CGI score was 6.41 (SD = 0.7), corresponding to severe illness.

At the end of hospitalization in the MBU (the average length of stay was 66.8 weeks; SD = 22.9, range = 19–137), the GAF score was 58.6 (SD = 8.9), and the CGI score was 4.8 (SD = 0.7), indicating a clinical improvement in women's functioning and mental health. At the time of discharge, 58 of the 62 patients underwent psychopharmacotherapy, most commonly with antidepressants (e.g., selective serotonin reuptake inhibitors) and atypical antipsychotics.

Table 1
Descriptive socio-demographic characteristics.

Descriptive socio-demographic characteristics of the population ($n = 62$)	
Variable	*n* (%)
Gender (child)	
Male	31 (50.0)
Female	31 (50.0)
Number of childbirth in lifetime	
1. Childbirth	48 (77.4)
2. Childbirth	12 (19.4)
3. Childbirth	1 (1.6)
4. childbirth	1 (1.6)
Marital status	
Married/living together	49 (79.0)
Divorced/living apart from partner	2 (3.2)
Single/no relationship	11 (17.7)
Level of education	
Upper grade	30 (48.4)
Middle grade	21 (33.9)
Lower grade	9 (14.5)
Non degree	2 (3.2)
Professional education	
Graduate degree	14 (22.6)
Vocational training	5 (8.1)
Apprenticeship	33 (53.2)
No professional education	10 (16.1)

Note: n (%) = number of individuals in percentage.

3.3. Comparison of mothers with and without pre-existing mental disorder

Mothers with and without pre-existing mental illness were examined for differences according to the Marcé characteristics and the MBS-MKI-S outcome variables. The two clinical subgroups ($n = 31$ for each group) showed no significant group differences in the main sociodemographic variables, such as age ($p = 0.539$) and level of education ($p = 0.928$).

The main group differences in clinical variables between mothers with psychiatric pre-existing diagnosis and mothers with initial diagnosis of PPD are shown in Table 2.

3.4. Mother-child interactions

The changes in values between admission and discharge in terms of improved mother–child interaction were almost all significant. With respect to the whole study sample, there were no significant correlation coefficients between the Marcé sociodemographic and clinical

Table 2
Significant group differences in clinical variables between mothers with pre diagnosis and initial diagnosis.

	Pre-existing diagnosis		Initial diagnosis		
	M	*SD*	*M*	*SD*	*p*
Mother: Duration of stationary stay (days)	62.36	23.48	71.27	21.71	0.092
child: Duration of stationary stay (days)	61.30	23.67	70.20	21.95	0.087
Age mother	30.38	5.07	29.54	5.60	0.374
Age child (weeks)	21.16	11.77	22.38	10.81	0.642
Duration of breastfeeding (weeks)	6.73	7.22	5.50	5.97	0.422
Beginning of postpartum symptomatology (weeks)	2.70	5.16	2.36	2.91	0.325
GAF before treatment	35.33	11.03	42.86	11.21	**0.007***
GAF after treatment	55.74	8.87	61.67	7.87	**0.011***
CGI before treatment	6.63	0.764	6.17	0.539	**0.009***
CGI after treatment	5.03	0.752	4.67	0.611	0.066

Note: M = Mean, SD = standard deviation, CGI = Clinical Global IImpression, GAF = Global Assessment of Functioning, * level of significance ≤0.025, p = level of significance after bonferroni-adjustment.

parameters and the MBS-MKI-S outcome variables for the values at admission or time of discharge.

However, for the interaction behaviour of the mother and child detected by the MBS-MKI-S, a significant group difference was found between the two samples within the subscale MBS-MKI-S-Vm (variability in maternal behaviour) before treatment (exact Mann-Whitney U test: $U = 555$, $p = 0.023$; as displayed in Fig. 1). A significant group difference was also identified between the two samples within the behavioural interaction subscale MBS-MKI-S-RSm ($U = 259$, $p = 0.019$) after psychiatric treatment, as displayed in Fig. b.

At the time of discharge, a further significant group difference could be observed between infants of pre-diagnosed mothers and infants of mothers with an initial PPD diagnosis on the subscale MBS-MKI-S-Rc (infant's reactivity) ($U = 251$, $p = 0.021$; Fig. c).

3.5. Specific group correlations of MBS-MKI-S variables

Table 3 displays significant correlations between mothers (with and without pre-existing mental disorder) and infants for behavioural interaction skills before treatment.

Within the two clinical groups, no significant relationship between the MBS-MKI-S-PWc and any other MBS-MKI-S subscale was found before treatment. Additionally, no significant correlation between the MBS-MKI-S-VRm subscale and any other MBS-MKI-S variables was found. Overall, more frequent and stronger correlations were observed within the MBS-MKI-S properties among mothers with pre-diagnosis (range from $r_s(29) = 0.37$, $p = 0.004$ to $r_s(29) = 0.55$, $p = 0.003$) than among mothers with initial diagnosis of PPD (range from $r_s(29) = 0.38$, $p = 0.043$ to $r_s(29) = 0.71$, $p = 0.000$). A high positive relationship between the subscales MBS-MKI-S-Ec and MBS-MKI-S-RSm was found among mothers with a pre-diagnosis. However, between pre-diagnosed mothers and their infants, a high correlation was observed within the subscales MBS-MKI-S-VDc and MBS-MKI-S-Vm ($r_s(29) = 0.66$, $p = 0.000$) and between the subscales MBS-MKI-S-VDc and MBS-MKI-S-RSm ($r_s(29) = 0.60$, $p = 0.000$). A further correlation was found between the subscales MBS-MKI-S-Ec and MBS-MKI-S-Sm ($r_s(29) = 0.67$, $p = 0.000$).

With regard to the few substantial correlations in the women who were initially ill, there was a strong correlation between the subscales MBS-MKI-S-Em and MBS-MKI-S-Ec ($r_s(29) = 0.55$, $p = 0.002$) and MBS-MKI-S-VDc and MBS-MKI-S-Em ($r_s(29) = 0.51$, $p = 0.007$).

At the time of discharge, women with initial PPD showed more frequent correlations between the maternal and child interaction variables as an expression of improved interactions.

The MBS-MKI-S-Rc subscale correlated with all of the interaction scales regarding the child's behaviour (range from $r_s(28) = 0.38$, $p = 0.004$ to $r_s(28) = 0.70$, $p = 0.000$) except for the subscales MBS-MKI-S-VVm and MBS-MKI-S-SCm. Importantly, the interaction behaviour of the mothers with initial PPD needs to be improved in several ways, which also affects the increased reactive behaviour of the children. Notably, among the mothers with a pre-existing psychiatric disease, after therapy, the interaction variables improved, with the children of these women being more responsive to tenderness, verbalization and emotion. Consequently, a significant correlation was found between the subscales MBS-MKI-S-Tm and MBS-MKI-S-Rc among mothers with pre-existing diagnosis and their infants after treatment.

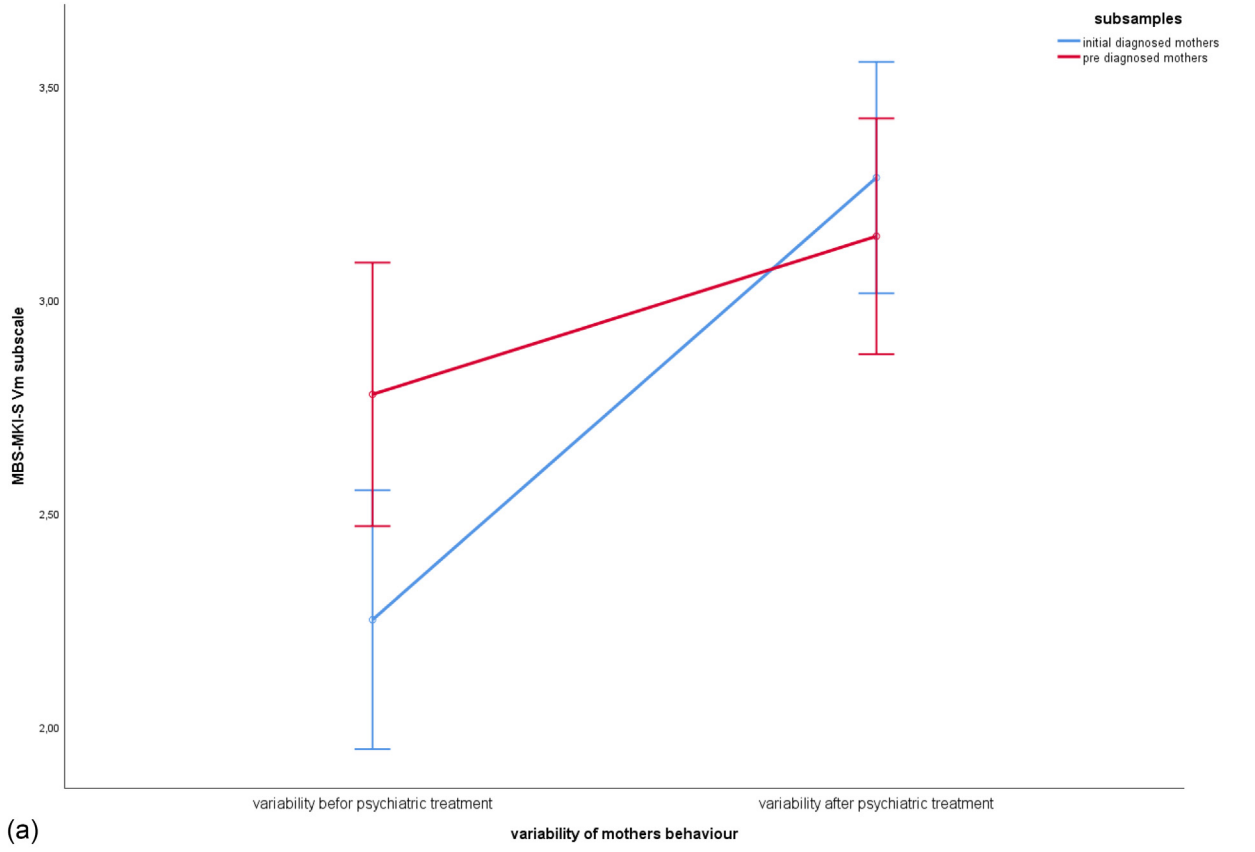
4. Discussion

The present retrospective study investigated the relationship between mother–child interaction and maternal sociodemographic and clinical characteristics of inpatient mothers with PPD from a German specifically equipped MBU. Furthermore, we looked at differences between mothers with postpartum depression with and without pre-existing mental disorders on video-based observed mother–infant interactions. The results on the sociodemographic and clinical characteristics of our study population are not surprising, even though the finding that half of the mothers with PPD had a psychiatric pre-existing illness initially struck us as very high. However, it is undeniable that pre-existing mental illnesses, irrespective of the type, are a significant risk factor for the occurrence of PPD [2,6,14,16,17,21,42,47,50,59,63,65,69,79]. These studies and meta-analyses have reported antenatal mental disorder prevalences of 8–50% and suggest that a previous history of psychiatric conditions is a strong risk factor for PPD. It is evident that women with a history of affective disorders already have a 20-fold higher risk of PPD [28,70]. Moreover, several studies and critical reviews have identified an association between prenatal psychosocial risk factors (women's abuse, couple's dysfunction, lack of social support, recent life stressors) and poor postpartum outcome [8,25,33,49,68,75,79].

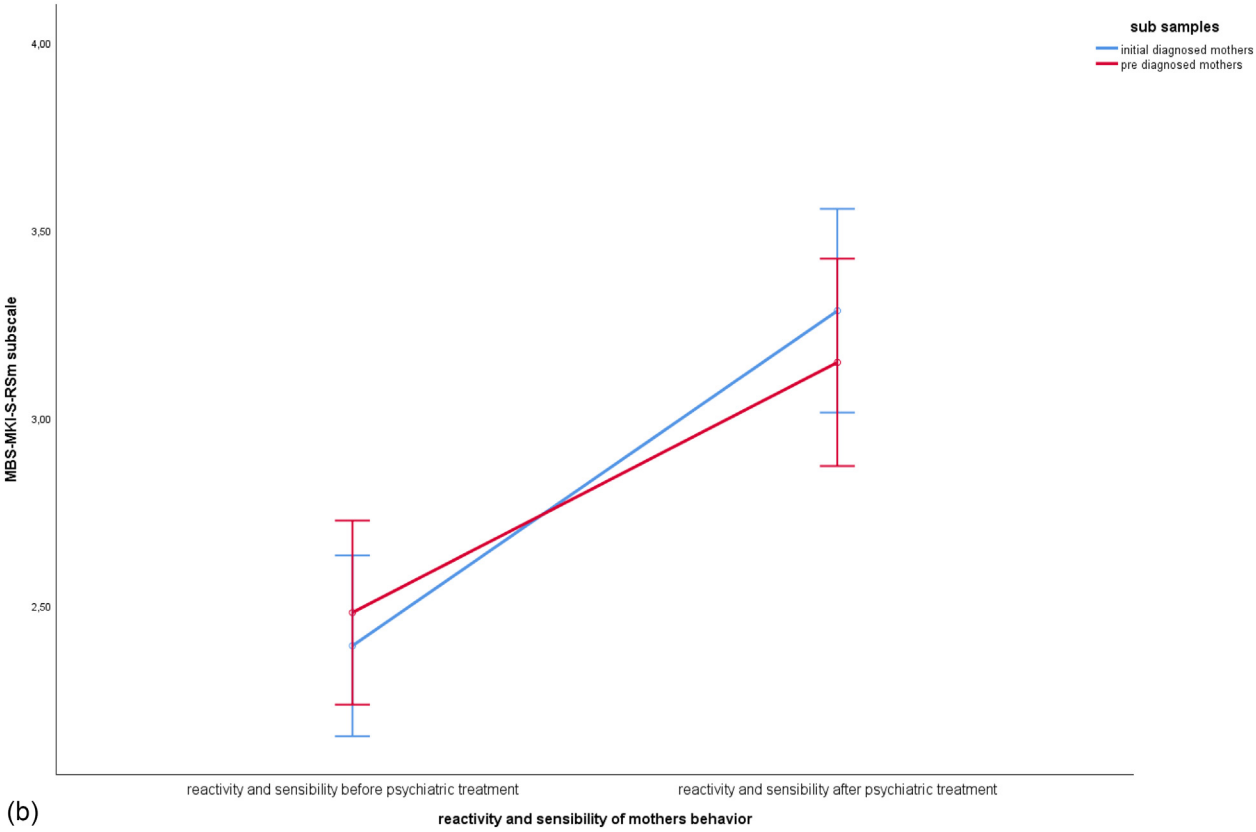
It is logical that women with pre-existing and usually comorbid mental illnesses have significant psychosocial functional impairments. This may have a negative effect not only on the mothering role but also on the mother–child relationship and infant development [1,7,9,10,26,31,80].

Our outcome was surprising because it shows that the women with pre-existing mental disorders, who were more affected (as measured by the CGI and GAF) than the mothers with initial PPD, performed substantially better in the interaction analysis at admission. Furthermore, our main findings showed that the mothers with PPD and pre-existing mental disorders (such as affective disorder, borderline personality disorder or anxiety disorders) performed with significantly more behavioural variability than mothers with initial onset PPD during the video-recorded mother–child interaction. Mothers with initial PPD were characterized by less variation, more repetitions and weak hesitant attempts in their behaviour to stimulate their child to interact than mothers with PPD and pre-existing psychiatric comorbidity; this is not surprising, especially as it is documented that interactions between mothers with PPD and their infants are characterized by reduced responsivity, passivity and mothers' fewer resources to resolve challenging interactions [43,61–63]. Moreover, extensive research has shown that maternal depression has been associated with a less responsive or more unavailable bonding style and with rigidity during mother–child interactions [18,22,23].

On the one hand, greater variability in behaviour appears to be a positive trait in the context of the mother–child interaction; on the other hand, in the corresponding literature, higher variability in behaviour in the context of the mother–child relationship and parenting is often termed inconsistent or indiscriminate, maladaptive parenting and mutual negativity [27,39,44,78].



(a)



(b)

Fig. 1. a. Significant group difference between the two samples within the subscale MBS-MKI-S-Vm (variability of behaviour) before and after psychiatric treatment. Illustrated are the respective raw scores on the x-axis and on the y-axis; error bar: CI 95% = confidence interval. b. Significant group difference between the two subsamples within the behavioural-interaction scale MBS-MKI-S-RSm (reactivity and sensibility in mothers behaviour) before and after treatment. Illustrated are the respective raw scores on the x-axis and on the y-axis; error bar: CI 95% = confidence interval. c. Significant group difference between infants with pre diagnosed mothers and infants with initial diagnosed mothers within the MBS-MKI-S-Rc (reactivity in infant's behaviour) before and after psychiatric treatment. Illustrated are the respective raw scores on the x-axis and on the y-axis; error bar: CI 95% = confidence interval.

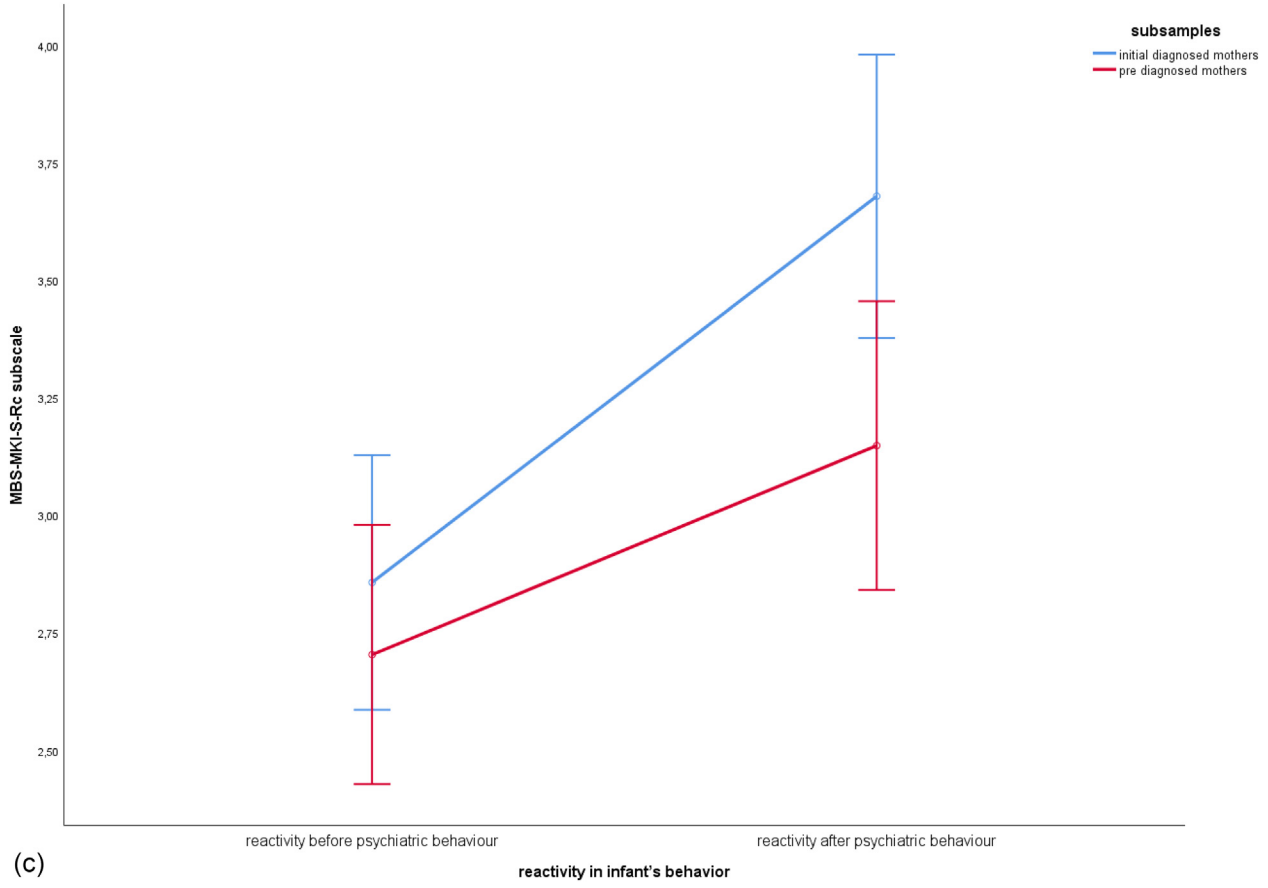


Fig. 1 (*continued*).

One possible explanation for our results could be that the women with comorbid mental disorders had learned more skills in the course of their illness, which they could consciously or unconsciously fall back on and could also display during the video recording. Thus, the behaviour could be a compensatory coping strategy of pre-diagnosed women to deal with negative affects and disturbances in the interaction with their children.

Furthermore, their greater variability in interaction behaviour could be interpreted as an attempt by affected women to avoid potential interaction difficulties. This could be an expression of limited authenticity in the presence of low self-esteem or lack of self-confidence. Essential indications for such behaviour can be deduced from studies on the self-confidence of women with PPD [48,55,64,82,83]. For instance, Reck et al. demonstrated a correlation between low maternal self-confidence and pre-existing anxiety or affective disorder in a community sample of 798 women with postpartum mental disorders [64]. Furthermore, the prospective longitudinal study by Zietlow et al. [83] in a sample of 54 women with PPD

Table 3
Correlations between behavioural-interaction scales of mother-infant dyads before treatment.

Mothers with initial diagnosis of postpartum depression						Mothers with pre diagnosis				
MBS-MKIS	-Ec	-VVc	-VDc	-Rc	-PWc	-Ec	-VVc	-VDc	-Rc	-PWc
-Tm	0.10	**0.37***	0.12	0.17	0.28	**0.50****	**0.50****	**0.54****	0.26	−0.24
-VVm	**0.38***	0.15	0.32	0.35	0.24	**0.50****	**0.49****	0.34	0.53**	0.24
-Em	**0.55****	0.34	**0.51****	**0.44***	0.01	0.37	0.25	**0.55****	0.42*	0.16
-Cam	0.04	0.01	0.11	0.15	0.14	**0.44***	0.28	0.33	**0.56****	0.30
-Vm	0.24	0.32	**0.41***	0.20	0.08	**0.57****	**0.57****	**0.66****	**0.53****	0.09
-RSm	0.06	0.35	0.36	0.20	−0.03	**0.71****	0.31	**0.60****	**0.42***	0.27
-Sm	0.28	0.31	0.268	0.26	0.25	**0.67****	**0.43***	**0.61****	0.33	0.06
-SCm	0.31	0.30	**0.38***	**0.37***	0.00	0.29	**0.42***	0.35	**0.52****	−0.16
-Gm	0.27	0.19	−0.05	−0.06	−0.27	**0.50****	**0.51****	**0.56****	**0.38***	−0.18

Note: *MBS-MKI-S = Mannheimer Beurteilungsskala der Mutter-Kind Interaktion für Säuglinge.*
m = mother variable: -Em = Emotion; -Tm = tenderness; -VVm = vocalization/verbalization;
-VRm = verbal restriction; -CAm = congruity/authenticity; -Vm = variability; -RSm = reactivity/sensitivity; -Sm = stimulation; -SCm = speech content; −gm = games; MTIS = Mother's Total-Interaction-score.
c = child variable: -Ec = motion/facial expressions; -VVc = vocalization/ verbalization; -VDc = viewing direction; −Rc = reactivity; PWc = potential willingness to interact.
p = level of significance, * = level of significance ≤0.05,** = level of significance ≤0.01.
Bold to highlight the effect.

or anxiety disorders showed a strong correlation between low self-confidence and mental illness and a long-term effect on maternal self-confidence up to preschool age.

Interaction difficulties may have been caused by the actual depressed and anxious mood that all the participating mothers displayed. In addition, it can be supposed that such interaction difficulties are expressed much more strongly in mothers with chronic mental illnesses, such as severe personality disorders. For instance, prior research has demonstrated that maternal borderline personality disorder (BPD) is associated with reduced sensitivity and increased intrusiveness towards the child ([52]; for review, see [58]). Furthermore, infants of mothers with BPD are more likely to exhibit disorganized attachment behaviour [36,37,45]. The study by Apter et al. [4] is worth mentioning in this context, which investigated the interaction behaviour of 19 women with BPD and 41 healthy controls in the context of the Still-Face paradigm. The authors reported that the mothers with BPD, compared to control mothers, were different in their baseline play and at reunion after the stress: at baseline, they engaged in less social attention, whereas at reunion, they showed decreased positive affect and increased nonintrusive touch compared to the control mothers. The authors interpret this change in behaviour as an attempt by mothers with BPD to handle conflicting interactions with their children without realizing that their intrusiveness is still present or continues to disrupt their child. This assumption can also be confirmed by the work of Marcoux et al. [46], which found that mothers with BPD were 3.6 times more likely than control mothers to make non-attuned comments pertaining to their infant's ongoing mental states and thus misinterpreted them. This could also be an explanation for our finding that women with PPD and additional mental illness performed slightly better in the interaction analysis than those with no comorbid mental illness.

Overall, the literature and our results on interaction behaviours are consistent with the findings that the maternal behaviour of women with postpartum illness towards their children may be affected in very different ways, such as in the form of a lack of emotionality and sensitivity or in the provision of inadequate verbal and physical benefits and attention [5,11,19].

In addition to many influencing factors described in the literature, the presence of an additional, possibly chronic, mental illness plays a special role in the differentiated determination of maternal interaction behaviour. Interestingly, Hoivik et al. [38] show that mothers with schizotypal personality symptoms appeared to be less structured and sensitive and more intrusive in their interactional behaviour, whereas mothers with BPD were more hostile in their interactions with their infants.

Our results can only be interpreted as a guideline for subgroup-specific interaction problems and deficits. Further investigations with larger subgroup case numbers are urgently needed, and this seems especially necessary to initiate early therapeutic steps.

While we have shown that maternal behaviour influences responsive child behaviour on many levels, children appear to be less susceptible to “double burden” women, probably as an expression of already rigid or early fixed interactive patterns in both the mother and the child. A similar view is shared by Perra et al. [57], who assume that, irrespective of current or antenatal depression, the ability of children to learn by imitation is reduced very early on by various biopsychosocial influencing factors, resulting in disturbed mother–child interactions.

As often shown in other studies, we found that mothers and their children can benefit from inpatient treatment at an MBU [1,15,30]. However, differentiated therapy modules could better address both the different interaction problems and the different needs of mothers and their children.

4.1. Limitations

There are several limitations to the study. In addition to the retrospective recording, the small case numbers in the individual subgroups represent a significant limiting factor with regard to general statements. Equally problematic is the heterogeneity of our study population, which allows only limited representative statements to be made regarding the group of comorbidly ill patients, especially in the inpatient MBU setting. It also has to be noted that the data from general psychiatric inpatients refer to more seriously ill patients.

Neither the severity of the current PPD nor the pre-existing mental disorder could be validated in this study, further limiting the representativeness of our results. Although we observed no systematic effect, a further limitation is that because of the medication state of the patients investigated, we were unable to verify this by comparison with a control group. Another limiting factor is that the videos were reviewed by only one rater for this investigation. Even though the Marcé Clinical Checklist has repeatedly been used in worldwide studies, it cannot be regarded as a universal validation and evaluation instrument, as is also the case with the MBS-MKI-S, thus limiting the significance of our results. It should be mentioned that the GAF, with its known methodological problems, must be used here as it is an integral part of the Marcé Clinical Checklist. Furthermore, approximately one-third of the video-recorded dyads had to be excluded for technical reasons, which can present a bias when analysing the remaining group. Finally, it must be mentioned that in the context of this exploratory pilot study, we performed numerous statistical group comparisons and correlations without any Bonferroni correction, so there is the risk that some of our findings could be the result of a type I error.

Comments

The presented partial results are data from the doctoral dissertation of S.W.

Declaration of Competing Interest

All authors report no biomedical financial interests or potential conflicts of interest.

Acknowledgement

We thank Proof-Reading-Service.com, Devonshire Business Centre, Works Road, Letchworth Garden City, SG6 1GJ, Hertfordshire, United Kingdom, as well as Elsevier Language Editing Services for editing and proofreading this manuscript.

References

[1] Abel KM, Webb RT, Salmon MP, Wan MW, Appleby L. Prevalence and predictors of parenting outcomes in a cohort of mothers with schizophrenia admitted for joint mother and baby psychiatric care in England. J Clin Psychiatry. 2005;66:781–9.
[2] Akman C, Uguz F, Kaya N. Postpartum-onset major depression is associated with personality disorders. Compr Psychiatry. 2007;48(4):343–7.
[3] Appleby L, Friedman T. The Marcé Clinical Checklist, the basis of multi-centre audit and research into severe postnatal illness, *Proceedings of the International Marcé Society Biennial* Conference, London; 1996.
[4] Apter G, Devouche E, Garez V, Valente M, Genet MC, Gratier M, et al. The still-face: a greater challenge for infants of mothers with borderline personality disorder. J Pers Disord. 2017;31(2):156–69. https://doi.org/10.1521/pedi_2016_30_243.
[5] Asselmann E, Venz J, Wittchen HU, Martini J. Maternal anxiety and depressive disorders prior to, during and after pregnancy and infant interaction behaviors during the face-to-face still face paradigma at 4 months postpartum: a prospective-longitudinal study. Early Hum Dev. 2018;122:45–53. https://doi.org/10.1016/j.earlhumdev.2018.05.007.
[6] Austin MP, Hadzi-Pavlovic D, Priest SR, Reilly N, Wilhelm K, Saint K, et al. Depressive and anxiety disorders in the postpartum period. How prevalent are they and can we improve their detection? Arch Womens Ment Health. 2010;13(5):395–401. https://doi.org/10.1007/s00737-010-0153-7.
[7] Battle CL, Weinstock LM, Howard M. Clinical correlates of perinatal bipolar disorder in an interdisciplinary obstetrical hospital setting. J Affect Disord. 2014;158:97–100. https://doi.org/10.1016/j.jad.2014.02.002.
[8] Bernard O, Gibson RC, McCaw-Binns A, Reece J, Coore-Desai C, Shakespeare-Pellington S, et al. Antenatal depressive symptoms in Jamaica associated with

limited perceived partner and other social support: a cross-sectional study. PLoS One. 2018;13(3):e0194338. https://doi.org/10.1371/journal.pone.0194338.
[9] Blackemore ER, Carroll J, Reid A, Biringer A, Glazier RH, Midmer D, et al. The use of the antenatal psychosocial health assessment (ALPHA) tool in the detection of psychosocial risk factors for postpartum depression: a randomized controlled trial. J Obstet Gynaecol Can. 2006;28(10):873–8. https://doi.org/10.1016/S1701-2163(16)32268-X.
[10] Blankley G, Galbally M, Snellen M, Power J, Lewis AJ. Borderline personality disorder in the perinatal period: early infant and maternal outcomes. Australas Psychiatry. 2015;23(6):688–92. https://doi.org/10.1177/1039856215590254.
[11] Braarud HC, Skotheim S, Hoie K, Markhus MW, Kjellevold M, Graff IE, et al. Affective facial expression in sub-clinically depressed and non-depressed mothers during contigent and non-contigent face-to face interactions with their infants. Infant Behav Dev. 2017;48:98–104. https://doi.org/10.1016/j.infbeh.2017.05.004.
[12] Brummelte S, Galea LA. Postpartum depression: etiology, treatment and consequences for maternal care. Horm Behav. 2016;77:153–66. https://doi.org/10.1016/j.yhbeh.2015.08.008.
[13] Cazas O, Glangeaud-Freudenthal NMC. The history of mother–baby units (MBUs) in France and Belgium and of the French version of the Marcé checklist. Arch Womens Ment Health. 2004;7(1):53–8.
[14] Christl B, Reilly N, Yin C, Austin MP. Clinical profile and outcomes of women admitted to a psychiatric mother–baby unit. Arch Womens Ment Health. 2015;18:805–16. https://doi.org/10.1007/s00737-014-0492-x.
[15] Connellan K, Bartholomaeus C, Due C, Riggs DW. A systematic review of research on psychiatric mother–baby units. Arch Womens Ment Health. 2017;20:373–88. https://doi.org/10.1007/s00737-017-0718-9.
[16] Davey HL, Tough SC, Adair CE, Benzies KM. Risk factors for sub-clinical and major postpartum depression among a community cohort of Canadian women. Matern Child Health. 2011;15(7):866–75. https://doi.org/10.1007/s10995-008-0314-8.
[17] Di Florio A, Jones L, Forty L, Gordon-Smith K, Blackemore ER, Heron J, et al. Mood disorders and parity – a clue to the aetiology of the postpartum trigger. J Affect Disord. 2014;152–154:334–9.
[18] Dubber S, Reck C, Müller M, Gawlik S. Postpartum bonding; the role of perinatal depression, anxiety and maternal–fetal bonding during pregnancy. Arch Womens Ment Health. 2015;18(2):187–95. https://doi.org/10.1007/s00737-014-0445-4.
[19] Egmose I, Cordes K, Smith-Nielsen J, Vaever MS, Koppe S. Mutual regulation between infant facial affect and maternal touch in depressed and nondepressed dyads. Infant Behav Dev. 2018;50:274–83. https://doi.org/10.1016/j.infbeh.2017.05.007.
[20] Esser G, Scheven A, Petrova A, Laucht M, Schmidt MH. Mannheimer Beurteilungsskalen zur Erfassung der Mutter-Kind Interaktionen im Säuglingsalter (MBS-MKI-S). Z Kinder Jugendpsychiatr. 1989;17(4):185–93.
[21] Falah-Hassani K, Shiri R, Dennis CL. The prevalence of antenatal and postnatal comorbid anxiety and depression: a meta-analysis. Psychol Med. 2017;47:2041–53. https://doi.org/10.1017/S0033291717000617.
[22] Farré-Sender B, Torres A, Gelabert E, Andrés S, Roca A, Lasheras G, et al. Mother–infant bonding in the postpartum period: assessment of the impact of pre-delivery factors in a clinical sample. Arch Womens Ment Health. 2018;21:287–97. https://doi.org/10.1007/s00737-017-0785-y.
[23] Field T. Postpartum depression effects on early interactions, parenting, and safety practices: a review. Infant Behav Dev. 2010;33(1):1–6. https://doi.org/10.1016/j.infbeh.2009.10.005.
[24] Field T. Prenatal depression risk factors, developmental effects and interventions: a review. J Pregnancy Child Health. 2017;4(1):301. https://doi.org/10.4172/2376-127X.
[25] Field T. Postnatal anxiety prevalence, predictors and effects on development: a narrative review. Infant Behav Dev. 2018;51:24–32. https://doi.org/10.1016/j.infbeh.2018.02.005.
[26] Field T, Diego M, Hernandez-Reif M, Ascencio A. Prenatal dysthymia versus major depression effects on early mother–infant interactions: a brief report. Infant Behav Dev. 2009;32:129–31. https://doi.org/10.1016/j.infbeh.2008.09.003.
[27] Gardner FE. Inconsistent parenting: is there evidence for a link with children's conduct problems. J Abnorm Child Psychol. 1989;17(2):223–33.
[28] Ghaedrahmati M, Kazemi A, Kheirabadi G, Ebrahimi A, Bahrami M. Postpartum depression risk factors: a narrative review. J Educ Health Promot. 2017;6:60. https://doi.org/10.4103/jehp.
[29] Ghaedrahmati M, Kazemi A, Kheirabadi G, Bahrami M, Ebrahimi A. Examining the relationship between mother's prenatal mental health and demographic factors with postpartum depression. J Educ Health Promot. 2018;7:146. https://doi.org/10.4103/jehp.
[30] Gillham R, Wittkowski A. Outcomes for women admitted to a mother and baby unit: a systematic review. Int J Womens Health. 2015;7:459–76. https://doi.org/10.2147/IJWH.S69472.
[31] Goodman JH, Santangelo G. Group treatment for postpartum depression: a systematic review. Arch Womens Ment Health. 2011;14(4):277–93. https://doi.org/10.1007/s00737-011-0225-3.
[32] Granat A, Gadassi R, Gilboa-Schechtman E, Feldman R. Maternal depression and anxiety, social synchrony, and infant regulation of negative and positive emotions. Emotion. 2017;17(1):11–27. https://doi.org/10.1037/emo0000204.
[33] Guardino CM, Schetter CD. Coping during pregnancy: a systematic review and recommendations. Health Psychol Rev. 2014;8(1):70–94.
[34] Guy W, editor. ECDEU assessment manual for psychopharmacology. Rockville, MD: U.S. Department of Health, Education, and Welfare; 1976.
[35] Hall PL, Holden S. Association of psychosocial and demographic factors with postpartum negative thoughts and appraisals. J Perinat Neonatal Nurs. 2008;22(4):275–81. https://doi.org/10.1097/01.JPN.0000341357.53069.ae.
[36] Hobson RP, Patrick M, Crandell L, Garcia-Perez R, Lee A. Personal relatedness and attachment in infants of mothers with borderline personality disorder. Dev Psychopathol. 2005;17(2):329–47.
[37] Hobson RP, Patrick M, Hobson JA, Crandell L, Bronfman E, Lyons-Ruth K. How mothers with borderline personality disorder relate to their year-old infants. Br J Psychiatry. 2009;195(4):325–30. https://doi.org/10.1192/bjp.bp.108.060624.
[38] Hoivik MS, Lydersen S, Ranoyen I, Berg-Nielsen TS. Maternal personality disorder symptoms in primary health care: associations with mother–toddler interactions at one-year follow-up. BMC Psychiatry. 2018;18:198. https://doi.org/10.1186/s12888-018-1789-5.
[39] Hollenstein T, Granic I, Stoolmiller M, Snyder J. Rigidity in parent–child interactions and the development of externalizing and internalizing behavior in early childhood. J Abnorm Child Psychol. 2004;32(6):595–607.
[40] Jacob A. Interaktionsbeobachtung von Eltern und Kind. Methoden-Indikation-Anwendung. , Vol. 2Stuttgart, Germany: Kohlhammer Verlag; 2016.
[41] Kathree T, Selohilwe OM, Bhana A, Petersen I. Perceptions of postnatal depression and health care needs in a South African sample: the "mental" in maternal health care. BMC Womens Health. 2014;14:140. https://doi.org/10.1186/s12905-014-0140-7.
[42] Kühner C. Mental disorders in pregnancy and postpartum: prevalence, course, and clinical diagnostics. Nervenarzt. 2016;87(9):926–36. https://doi.org/10.1007/s00115-016-0175-0.
[43] Lovejoy MC, Graczyk PA, O'Hara E, Neuman G. Maternal depression and parenting behavior: a meta-analytic review. Clin Psychol Rev. 2000;20(5):561–92.
[44] Lunkenheimer E, Lichtwarck-Aschoff A, Hollenstein T, Kemp CJ, Granic I. Breaking down the coercive cycle: how parent and child risk factors influence real-time variability in parental responses to child misbehavior. Parent Sci Pract. 2016;16(4):237–56. https://doi.org/10.1080/15295192.2016.1184925.
[45] Lyons-Ruth K, Riley C, Patrick MPH, Hobson RP. Disinhibited attachment behavior among infants of mothers with borderline personality disorder, depression, and no diagnosis. Personal Disord. 2019;10(2):163–72. https://doi.org/10.1037/per0000312.
[46] Marcoux AA, Bernier A, Séguin JR, Armerding JB, Lyons-Ruth K. How do mothers with borderline personality disorder mentalize when interacting with their infants? Personal Ment Health. 2017;11:14–22. https://doi.org/10.1002/pmh.1362.
[47] Marks MN, Wieck A, Checkley SA, Kumar R. Contribution of psychological and social factors to psychotic and non-psychotic relapse after childbirth in women with previous histories of affective disorder. J Affect Disord. 1992;29:253–64.
[48] Matthies LM, Wallwiener S, Müller M, Doster A, Plewniok K, Feller S, et al. Maternal self-confidence during the first four months postpartum and its association with anxiety and early infant regulatory problems. Infant Behav Dev. 2017;49:228–37. https://doi.org/10.1016/j.infbeh.2017.09.011.
[49] Meltzer-Brody S, Maegbaek ML, Medland SE, Miller WC, Sullivan P, Munk-Olsen T. Obstetrical, pregnancy and socio-economic predictors for new-onset severe postpartum psychiatric disorders in primiparous women. Psychol Med. 2017;47(8):1427–41. https://doi.org/10.1017/S0033291716003020.
[50] Mighton CE, Inglis AJ, Carrion PB, Hippman CL, Morris EM, Andrighetti HJ, et al. Perinatal psychosis in mothers with a history of major depressive disorder. Arch Womens Ment Health. 2016;19(2):253–8. https://doi.org/10.1007/s00737-015-0561-9.
[51] Murray L, Fiori-Cowley A, Hooper R, Cooper P. The impact of postnal depression and associated adversity on early mother–infant interactions and later infant outcome. Child Dev. 1996;67(5):2512–26.
[52] Newman LK, Stevenson CS, Bergman LR, Boyce P. Borderline personality disorder, mother–infant interaction and parenting perceptions: preliminary findings. Aust N Z J Psychiatry. 2007;41(7):598–605.
[53] Norhayati MN, Hazlina NH, Asrenee AR, Emilin WM. Magnitude and risk factors for postpartum symptoms: a literature review. J Affect Disord. 2015;175:34–52. https://doi.org/10.1016/j.jad.2014.12.041.
[54] O'Hara MW, McCabe JE. Postpartum depression: current status and future directions. Annu Rev Clin Psychol. 2013;9:379–407. https://doi.org/10.1146/annurev-clinpsy-050212-185612.
[55] Paris R, Bolton RE, Weinberg MK. Postpartum depression, suicidality, and mother–infant interactions. Arch Womens Ment Health. 2009;12:309–21. https://doi.org/10.1007/s00737-009-0105-2.
[56] Pawluski JL, Lonstein JS, Fleming AS. The neurobiology of postpartum anxiety and depression. Trends Neurosci. 2017;40(2):106–20. https://doi.org/10.1016/j.tins.2016.11.009.
[57] Perra O, Phillips R, Fyfield R, Waters C, Hay DF. Does mother's postnatal depression influence the development of imitation? J Child Psychol Psychiatry. 2015;56(11):1231–8. https://doi.org/10.1111/jcpp.12413.
[58] Petfield L, Startup H, Droscher H, Cartwright-Hatton S. Parenting in mothers with borderline personality disorder and impact on child outcomes. Evid Based Ment Health. 2015;18(3):67–75. https://doi.org/10.1136/eb-2015-102163.
[59] Ramsauer B. Komorbide Persönlichkeitsstörungen und parenting Stress bei postpartal depressiv erkrankten Müttern. Prax Kinderpsychol Kinderpsychiatr. 2016;65:282–6.
[60] Reck C. Postpartale Depression: Mögliche Auswirkungen auf die frühe Mutter-Kind-Interaktion und Ansätze zur psychotherapeutischen Behandlung. Prax Kinderpsychol Kinderpsychiatr. 2007;56(3):234–44.
[61] Reck C, Backenstraß M, Möhler E, Hunt A, Resch F, Mundt C. Mutter-Kind-Interaktion und postpartale Depression. Theorie und Empirie im Überblick. Psychotherapie. 2001;6(2):171–86.
[62] Reck C, Weiss R, Fuchs T, Möhler E, Downing G, Mundt C. Psychotherapie der postpartalen depression. Mutter-Kind-Interaktion im Blickpunkt Nervenarzt. 2004;75:1068–73.

[63] Reck C, Struben K, Backenstrass M, Stefenelli U, Reinig K, Fuchs T, et al. Prevalence, onset and comorbidity of postpartum anxiety and depressive disorders. *Acta Psychiatr*. Scand. 2008;118(6):459–68. https://doi.org/10.1111/j.1600-0447.2008.01264.x.
[64] Reck C, Noe D, Gerstenlauer J, Stehle E. Effects of postpartum anxiety disorders and depression on maternal self-confidence. Infant Behav Dev. 2012;35:264–72. https://doi.org/10.1016/j.infbeh.2011.12.005.
[65] Rich-Edwards JW, Kleinman K, Abrams A, Harlow BL, McLaughlin TJ, Joffe H, et al. Sociodemographic predictors of antenatal and postpartum depressive symptoms among women in a medical group practice. J Epidemiol Community Health. 2006;60:221–7.
[66] Saß H, Wittchen HU, Zaudig M, Houben I. Diagnostische Kriterien des Diagnostischen und Statistischen Manual Psychischer Störungen DSM-IV-TR. Göttingen, Germany: Hogrefe; 2003; 47–9.
[67] Serati M, Redaelli M, Buoli M, Altamura AC. Perinatal major depression biomarkers: a systematic review. J Affect Disord. 2016;193:391–404. https://doi.org/10.1016/j.jad.2016.01.027.
[68] Seymur-Smith M, Cruwys T, Haslam SA, Brodribb W. Loss of group memberships predicts depression in postpartum mothers. Soc Psychiatry Psychiatr Epidemiol. 2017;52(2):201–10. https://doi.org/10.1007/s00127-016-1315-3.
[69] Sharma V. Relationship of bipolar disorder with psychiatric comorbidity in the postpartum period: a scoping review. Arch Womens Ment Health. 2018;21(2):141–7. https://doi.org/10.1007/s00737-017-0782-1.
[70] Silverman ME, Reichenberg A, Savitz DA, Cnattingius S, Lichtenstein P, Hultman CM, et al. The risk factors for postpartum depression: a population-based study. Depress Anxiety. 2017;34(2):178–87. https://doi.org/10.1002/da.22597.
[71] Soares CN, Zitek B. Reproductive hormone sensitivity and risk for depression across the female life cycle: a continuum of vulnerability? *J*. Psychiatry Neurosci. 2008;33(4):331–43.
[72] Sokolowski MS, Hans SL, Bernstein VJ, Cox SM. Mothers' representations of their infants and parenting behavior: associations with personal and social-contextual variables in a high-risk sample. Infant Ment Health J. 2007;28(3):344–65. https://doi.org/10.1002/imhj.20140.
[73] Teti DM, Gelfand DM. The preschool assessment of attachment: construct validity in a sample of depressed and nondepressed families. Dev Psychopathol. 1997;9(3):517–36.
[74] Turmes L, Appelt S, Lier-Schehl H, Kramer M, Norra C. German version of the Marcé-Clinical-Checklist as a basic documentation for inpatient mother-and-baby units: evaluation of the MKE Herten data. Psychiatr Prax. 2015;42(2):90–5. https://doi.org/10.1055/s-0033-1359890.
[75] Vaezi A, Soojoodi F, Banihashemi AT, Nojomi M. The association between social support and postpartum depression in women: a cross sectional study. Women Birth. 2018. https://doi.org/10.1016/j.wombi.2018.07.014.
[76] Weinberg MK, Tronick EZ. Emotional characteristics of infants associated with maternal depression and anxiety. Pediatrics. 1998;102(5):1298–304.
[77] Weinberg MK, Tronick EZ. The impact of maternal psychiatric illness on infant development. J Clin Psychiatry. 1998;59(Suppl. 2):53–61.
[78] Weinberg M, Olson KL, Beeghly M, Tronick EZ. Making up is hard to do, especially for mothers with high levels of depressive symptoms and their infant sons. J Child Psychol Psychiatry. 2006;47:670–83.
[79] Wilson LM, Reid AJ, Midmer DK, Biringer A, Carroll JC, Stewart DE. Antenatal psychosocial risk factors associated with adverse postpartum family outcomes. Can Med Assoc J. 1996;154(6):785–99.
[80] Wolf IA, Gilles M, Peus V, Scharnholz B, Seibert J, Jennen-Steinmetz C, et al. Impact of prenatal stress on mother–infant dyadic behavior during the still-face paradigm. Borderline Personal Disord Emot Dysregul. 2018;5:2. https://doi.org/10.1186/s40479-018-0078-8.
[81] Yim IS, Tanner Stapleton LRT, Guardino CM, Hahn-Holbrook J, Dunkel Schetter C. Biological and psychosocial predictors of postpartum depression: systematic review and call for integration. Annu Rev Clin Psychol. 2015;11:99–137. https://doi.org/10.1146/annurev-clinpsy-101414-020426.
[82] Zheng X, Morrell J, Watts K. Changes in maternal self-efficacy, postnatal depression symptoms and social support among Chinese primiparous women during the initial postpartum period: a longitudinal study. Midwifery. 2018;62:151–60. https://doi.org/10.1016/j.midw.2018.04.005.
[83] Zietlow AL, Schlüter MK, Nonnenmacher N, Müller M, Reck C. Maternal self-confidence postpartum and at pre-school age: the role of depression, anxiety disorders, and maternal attachment insecurity. Matern Child Health J. 2014;18(8):1873–80. https://doi.org/10.1007/s10995-014-1431-1.