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Attachment security and disorganization in infants of mothers with severe psychiatric disorder: Exploring the role of comorbid personality disorder

Vandhana Choenni [a], Carlinde W. Broeks [b,c], Anne Tharner [d], Maartje P.C.M. Luijk [e], Frank C. Verhulst [a], Mijke P. Lambregtse-van den Berg [a,c], Rianne Kok [e,*]

[a] Department of Child and Adolescent Psychiatry/Psychology, Erasmus MC-Sophia Children's Hospital, University Medical Center Rotterdam, the Netherlands
[b] Arkin Institute for Mental Health, Amsterdam, the Netherlands
[c] Department of Psychiatry, Erasmus MC, University Medical Center Rotterdam, the Netherlands
[d] Clinical Child and Family Studies, Vrije Universiteit Amsterdam, Amsterdam, the Netherlands
[e] Department of Psychology, Education, and Child Studies, Erasmus University Rotterdam, Rotterdam, the Netherlands

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ABSTRACT

The aim of this preliminary study was to explore infant-mother attachment quality in a Dutch clinical sample of mothers with severe psychiatric disorder, with or without comorbid personality disorder. Thirty-two mothers were recruited through specialized secondary and tertiary outpatient clinics and mental health institutions. Maternal psychiatric and personality diagnoses were verified with structured clinical interviews during pregnancy. Maternal concurrent level of psychiatric symptoms was assessed by self-report and infant-mother attachment quality by observation in the Strange Situation Procedure at 14 months postpartum. In the full sample, almost half of the infants were classified as disorganized. All infants of mothers with a comorbid personality disorder were classified as either insecure or disorganized. Infants of mothers with a comorbid personality disorder had a significantly higher disorganization score than infants of mothers with a psychiatric disorder only. Continuous attachment security scores did not differ significantly between groups. In the full sample, continuous infant attachment security and disorganization score were not significantly correlated with the level of maternal concurrent psychiatric symptoms. Our exploratory findings suggest a specific link between maternal psychiatric and comorbid personality disorder and attachment disorganization. Moreover, chronicity of symptoms appears more relevant for attachment behaviors than the severity of concurrent psychiatric symptoms. Maternal personality disorder may have a strong formative impact on infant attachment security and disorganization, which warrants further research to inform clinical practice, in order to reduce the risk of intergenerational transmission of maternal psychopathology.

In the peripartum period, around 8–12 % of women suffer from a depressive or anxiety disorder (Goodman et al. 2016; Woody et al. 2017). Maternal psychiatric disorders are associated with adverse infant outcomes, including internalizing and externalizing problems,

* Correspondence to: Erasmus School of Social and Behavioral Sciences, Erasmus University Rotterdam, Burgemeester Oudlaan 50, 3062 PA Rotterdam, the Netherlands.
E-mail address: r.kok@essb.eur.nl (R. Kok).

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poorer cognitive capacities, and socioemotional problems (e.g., Liu et al. 2017; Madigan et al. 2018; Stein et al. 2014). Psychiatric disorders and personality disorders (PDs) often co-occur, with comorbidity rates as high as 50 % (Zimmerman et al. 2005). Prevalence studies on PDs (with or without comorbid psychiatric disorders) in the peripartum period are scarce and show a range of prevalence rates from 6.4–16.4 % (Börjesson et al. 2005; Crowley et al. 2020). Additionally, a recent meta-analytic study on borderline PD in the peripartum period revealed a prevalence rate of 14 % in clinical samples and slightly higher rates of borderline personality features among clinical samples as compared to non-clinical samples (Prasad et al. 2022).

PDs are enduring, inflexible, and pervasive, and are characterized by an intrapersonal component (i.e., dysregulation of arousal, impulse, and affect), an interpersonal component (i.e., dysfunctional relationships), and a social component (dysfunction within societal structures) (Adshead and Sarkar, 2012; American Psychiatric Association, 2013). Consequently, when PDs occur in parents, this may disrupt parenting behavior, parent-child interactions and the parent-child relationship. Some studies have demonstrated reduced maternal sensitivity/responsivity to infant signals, poor mother-infant attunement, and disrupted mother-infant interactions in mothers with PDs or disordered traits (e.g., Hazell Raine et al. 2019; Hobson et al. 2009; Laulik et al. 2013; Nath et al. 2019; Steele et al. 2019). However, research is scarce as to whether these problems also translate to the infant-mother attachment relationship (e.g., Wilson et al. 2017). Theoretically, the link between maternal PD and infant attachment security can be explained by maladaptive parenting behaviors (such as non-attuned mentalization) and disturbed mother-infant interactions (e.g., because of maternal frightened/frightening, dissociative, and disrupted behavior). These examples of suboptimal parenting practices have been observed in mothers with borderline PD, but other PDs as well (e.g., Eyden et al. 2016; Krink and Ramsauer, 2021).

During early infancy, the infant-mother attachment relationship develops as a result of repeated interactions and is impacted by maternal care and parenting behavior (Bowlby, 1969, 1982; Fearon and Belsky, 2016). Attachment is defined as the infant's need for proximity and comfort in the relation with a caregiver in times of distress (Bowlby, 1969, 1982). In the *Strange Situation Procedure*, a structured laboratory procedure, infants interactive behavior during reunions after two brief separations from the caregiver is scored on four scales, i.e., contact/proximity seeking, contact maintaining, avoidance of proximity and contact, and resistance to contact and comforting. Scores on these scales are used to assign either a secure, insecure avoidant, or insecure resistant classification (Ainsworth et al. 1978). Additionally, disorganized/disoriented attachment is distinguished, describing infants who display behavior that indicates conflict (e.g., expression of contradictory behavioral patterns towards the caregiver), confusion, and/or apprehension in relation to the caregiver during the *Strange Situation* (Main and Solomon, 1990). Globally, 51.6 % of infants are classified as securely attached, 14.7 % as avoidant, 10.2 % as resistant, and 23.5 % as disorganized (Madigan et al. 2023). In studies focusing on parental psychopathology, slightly lower rates of attachment security (44 % versus 52 % respectively) and slightly higher rates of disorganized attachment (31 % versus 23 % respectively) are found in clinical samples as compared to other samples, but no differences with regards to rates of avoidant and resistant attachment (Madigan et al. 2023). Insecure infant attachment, but especially disorganized attachment, is associated with externalizing problems and internalizing problems (e.g., Fearon et al. 2010; Groh et al. 2012). Since, the infant-parent attachment relationship plays a major role in the infant's early life and various biopsychosocial outcomes across child development (for a summary of meta-analytic findings see Groh et al. 2017), gaining more insight into predictors of the quality of this relationship is of great importance for developmental researchers and clinicians working with mothers and their infants (Ranson and Urichuk, 2008; Thompson, 2016).

In the meta-analysis by Madigan et al. (2023) studies on maternal psychiatric and personality disorders were taken together and compared to studies in which maternal psychopathology was absent. However, there is considerable methodological variation between studies with clinical samples, for example with regards to recruitment procedure, severity or chronicity of maternal psychiatric symptoms, and maternal treatment status (e.g., Hipwell et al. 2000; Ramsauer et al. 2014). Furthermore, empirical studies on the association between maternal PD and infant-mother attachment are scarce and therefore are difficult to compare with regards to methodology and the distribution of attachment classifications. In a study comparing mothers with postpartum depressive symptoms, including a subgroup with comorbid PD symptomatology, to mothers without psychopathology, similar rates of secure attachment (65.5 % and 62.7 % respectively), insecure attachment (20.6 % and 25.5 % respectively), and disorganization (13.8 % and 11.8 % respectively) were reported in both groups (Smith-Nielsen et al. 2016). Similarly, in a convenience sample of mothers with clinically relevant levels of self-reported borderline pathology, the majority of infants were securely attached and 33 % were insecurely attached (Gratz et al. 2014). In contrast, in a small group of mothers with a borderline PD diagnosis and no comorbid disorders, recruited via antenatal screening and advertisements, around 20 % of infants were classified as secure, 50 % as insecure, and 80 % as disorganized (Hobson et al. 2005). Overall, it should be noted that studies in clinical samples can vary considerably with regard to population, design, and methods. Moreover, previous study findings in clinical samples have limited capacity to be generalized to other samples or clinical practice. These studies often do not represent high-risk or clinically representative (treatment) samples, which are characterized by persistent and severe symptomatology and accompanying psychosocial risk factors.

In the current study, we aim to explore the distribution of secure, insecure, and disorganized attachment classifications at 14 months postpartum between infants of mothers with a psychiatric disorder versus infants of mothers with a psychiatric and comorbid personality disorder. To meet this aim, we recruited a unique, hard-to-reach sample of pregnant women receiving treatment for a chronic and severe psychiatric disorder, presenting with a high comorbidity rate and as such representative of a high-risk clinical population. Our study should be regarded as preliminary and hypothesis-generating given the small sample size.

The distribution of attachment classifications has been studied in several general population studies (e.g., Huang et al., 2012; Luijk et al. 2010; Madigan et al. 2023). Also, it has been suggested that the etiology of peripartum psychiatric disorders is complex and that mothers with psychiatric symptoms or disorders are a heterogeneous group, often presenting with comorbid disorders and/or co-existing psychosocial difficulties (e.g., Ban et al. 2012; Howard et al. 2014; Meltzer-Brody et al. 2018; Waqas et al. 2023). As a result, it is likely there are differences between samples with regard to potential risk factors for infant development. Therefore, it is of

great value to shed more light onto specific correlates and risk factors associated with the infant-mother attachment relationship, especially within clinical samples. For these reasons, a healthy control group was not recruited and instead the potential role of co-morbid personality disorder, within the group of mothers with chronic and severe psychiatric disorders, was explored. We confirmed maternal psychiatric status in an independent clinical interview and assessed the quality of infant-mother attachment at 14 months postpartum. In the total sample, we expect more infants to be classified as insecure or disorganized compared to general population samples. Furthermore, we hypothesize that infants of mothers with a psychiatric disorder and comorbid PD show more attachment insecurity and more and/or more intense disorganized behaviors than infants of mothers with a psychiatric disorder only.

The association between maternal psychiatric disorder and infant-mother attachment can be explained by the presence of psychiatric symptoms at the time (i.e., concurrent) of attachment measurement. The impact of current psychiatric symptoms, within our chronically affected sample, was investigated by testing the association between concurrent psychiatric symptoms and continuous measures of the quality of the infant-mother attachment relationship at 14 months postpartum. Based on attachment theory and previous studies, we expect a small association within our clinical sample between concurrent, self-reported psychiatric symptoms and infant attachment or disorganization.

1. Materials and methods

1.1. Study design and sample

This study is part of the Infant Caregiving Assessment Scales validation study, which is described in more detail elsewhere (Choenni et al. 2022). Mothers were recruited during pregnancy through specialized Psychiatry-Obstetrics-Pediatry (POP) secondary and tertiary outpatient clinics and mental health care institutions focusing on peripartum psychiatry. The main inclusion criteria were the presence of a severe psychiatric disorder, that is, the presence of any DSM-IV axis-I and/or axis-II disorder, with a duration of service and/or treatment contact of two or more years, and impaired daily functioning as indicated by the Global Assessment of Functioning score (GAF; Jones et al. 1995). Psychiatric diagnoses were checked by a certified interviewer using the Structural Clinical Interview for DSM-IV axis I and II disorders (SCID I and II) (First et al., 1997, 2002). The GAF score was based on clinical diagnosis by the treating (resident) psychiatrist at intake (during pregnancy) and duration of service use was based on self-reported patient history at intake.

Exclusion criteria were (impending) outplacement of the infant, maternal insufficient command of the Dutch language, and infant prematurity (<37 weeks). Background and clinical information was obtained through questionnaires in the third trimester and infant characteristics were collected at 6–7 weeks postpartum. Additional maternal and infant data were collected at 6 and 14 months postpartum.

Written informed consent was obtained from all mothers ($n = 65$) during pregnancy for their own and their infant's participation, and from fathers with legal guardianship where applicable. The study was approved by the Medical Ethics Committee of the Erasmus University Medical Center, Rotterdam (NL42662.078.12). Due to attrition ($n = 11$) and practical reasons (e.g., travel time to the lab was too long; $n = 11$) the SSP was conducted in 43 dyads. For 11 dyads no attachment classification could be assigned due to technical or procedural difficulties (e.g., failed video recording, premature termination of the procedure, or infant was given a pacifier). The final sample consisted of 32 mother-infant dyads with a completed SSP protocol. This sample size is similar to the sample size of clinical groups in previous studies (e.g., Hipwell et al., 2000; Smith-Nielsen et al., 2016) that found associations between maternal psychiatric symptoms or comorbidity status (i.e., psychiatric disorder with or without comorbid PD) and infant attachment security.

A non-response analysis was conducted, comparing mothers-infants dyads with a completed and usable SSP protocol to all other mother-infant dyads included in the INCAS study. In the subset of SSPs used for the current analysis, mothers were slightly older than mothers who were not included in this subset. There were no differences between dyads with regard to maternal educational level, primiparity, and level of self-reported psychiatric symptoms at 14-month follow-up, or with regard to infant age, sex, birth weight, and gestational age. Also, we explored whether mothers in the SSP subset differed from those who were not included, with regards to their DSM-IV Axis I or II disorders (presence/absence of a mood, anxiety, or personality disorder). These analyses only revealed a significantly lower percentage of mothers with an anxiety disorder in the SSP subset compared to mothers who were not included.

1.2. Measures

1.2.1. Infant-mother attachment security

To assess security of the infant-mother attachment relationship, the Strange Situation Procedure (SSP) was conducted at the infant age of 14 months. The SSP consists of seven 3-minute episodes and is designed to evoke mild stress in the infant to trigger attachment behaviour elicited by the unfamiliar lab environment, a female stranger entering the room and engaging with the infant, and the mother leaving the room twice (Ainsworth et al. 1978). Infant attachment behavior was coded from video recordings by certified coders trained at the University of Minnesota (author information omitted for purpose of masked review). Coders were blind to maternal and infant demographic and clinical characteristics during the entire coding process. Infants were classified as secure (B), avoidant (A), or resistant (C) according to the coding manual from Ainsworth et al. (1978). Also, a continuous attachment security score was calculated to maximize statistical power (according to the algorithm of Richters et al. 1988). This score has been strongly associated with secure versus insecure attachment classification, predicting about 90 % of the cases (Van IJzendoorn and Kroonenberg, 1990). The continuous attachment security score has been used in various studies (e.g., Galbally et al., 2022; Leerkes et al. 2017). The continuous attachment security score could be calculated for 31 infants, because scores were missing for one infant during certain key episodes. Additionally, infant disorganized attachment behavior, in relation to the caregiver during the SSP, was rated on a 9-point

scale and scores above 5 were classified as disorganized (D; Main and Solomon, 1990). If this score exceeded 5, the original three-way (ABC) classification was superseded by a D classification.

At the start of the coding process one trained coder intended to code all SSPs. The second coder was intended to independently code a subset of the SSPs to establish interrater reliability. During the coding process the sample proved complex, both due to technical and procedural issues, as well as unclear child behavior. When reliability was assessed (n = 17) the kappa was deemed high for the three-way attachment security classification (ABC; κ = .823) and fair for the four-way classification (κ = .362). Intercoder reliability (intraclass correlation coefficients [ICC]) for the continuous attachment security score was.85 (n = 16), indicating good reliability (Koo and Li, 2016). The suboptimal kappa for the four-way classification was likely caused by the small sample size, which is a known limitation of Cohen's kappa (Feinstein and Cicchetti, 1990). Inter-coder agreement for attachment security was 94.1 % and 52.9 % for the three-way and four-way classification respectively, indicating that the classification including disorganization should be interpreted cautiously. To enhance quality of the data, it was decided that both coders would code all remaining SSPs, allowing for discussion or second opinion (in order to finalize a code), and to use consensus ratings in the analyses. Since many SSPs were discussed, reliability could not be re-assessed based on the total sample.

1.2.2. Maternal psychiatric diagnosis

Presence and history of psychiatric diagnoses were verified at study inclusion (i.e., during pregnancy) with the Structured Clinical Interview for DSM-IV Axis I and DSM-IV Axis-II Disorders (SCID-I; First et al. 2002; SCID-II; First et al. 1997), by a trained interviewer (author information omitted for purpose of masked review). The SCID-I and SCID-II are considered the gold standard of semi-structured clinical interviews to yield diagnoses of psychiatric and personality disorders based on DSM-IV-TR diagnostic criteria, with adequate to excellent validity and interrater reliability (e.g., Lobbestael et al. 2011; Weertman et al. 2003).

1.2.3. Maternal symptom severity

At the 14-months lab visit, mothers filled out the Dutch Brief Symptom Inventory (BSI), which assesses the presence and severity of global psychopathology in the past seven days (Derogatis and Melisaratos, 1983; De Beurs and Zitman, 2006). The BSI comprises nine symptom dimensions (including Interpersonal Sensitivity, Depression, and Anxiety), scored on a 5-point scale. In this study, the internal consistency of the BSI was high (α = .986, n = 28). The General Severity Index (GSI) is calculated using the sum of all items, divided by the total number of acknowledged items. The GSI combines information about the number and intensity of symptoms.

1.3. Statistical analysis

Data were analyzed using the Statistical Package for Social Science (IBM SPSS Statistics, Version 25). Attachment classifications in infants of mothers with a psychiatric disorder only (hereafter "the non-comorbid group") and in infants of mothers with a comorbid PD (hereafter "the comorbid group") were explored by examining the distribution of the four attachment classifications in both groups (not tested due to small cell size). To examine the association between self-reported maternal psychiatric symptoms, infant attachment security, and infant attachment disorganization Spearman's rho correlations were calculated. Given the small sample size, possible

Table 1
Sample characteristics and descriptive statistics for mothers with psychiatric disorder (n = 16), comorbid personality disorder (n = 16), all infants, and the total group (N = 32).

	Psychiatric disorder with no comorbid PD	Psychiatric disorder and comorbid PD	Total sample
Mother	%	%	%
Age (years)†[a]	33.27 (4.1)	32.8 (5.4)	33.1 (4.7)
Birth country, % Netherlands[a]	18.8	18.8	81.3
Marital status, % partner[b]	93.8	81.3	93.3
Educational level, % high[b]	26.7	20	23.3
Employment status, % yes[c]	35.7	40	37.9
Primiparity, % yes[b]	40	80	60*
Smoking during pregnancy, % yes[e]	33.3	35.7	34.5
Psychotropic medication use during pregnancy, % yes[d]	69.2	60	64.3
General psychopathology score†[c]	0.7 (0.4)	1.1 (0.7)	.93 (.62)
Child			
Age at attachment assessment (months)†[a]	14.5 (0.9)	14.1 (0.2)	14.3 (0.6)
Gestational age (weeks)†[b]	38.2 (3.1)	39.4 (1.3)	38.8 (2.4)*
Sex, % female[a]	43.8	37.5	40.6
Birth weight (grams)†[b]	3208 (618.5)	3431.67 (385.8)	3319.8 (519.1)

† Values are mean (SD).
[a] Total sample.
[b] $N = 30$.
[c] $N = 29$.
[d] $N = 28$.
[e] $N = 29$.
* $p < 0.05$

covariates were not added to these analyses to maximize statistical power.

2. Results

Demographic and clinical characteristics of mothers and infants are displayed in Tables 1 and 2. Most mothers in our sample were married, less than half were employed, less than 25 % had higher professional or university education, and most were born in the Netherlands. Over 60 % of mothers used psychotropic medication during pregnancy. Most mothers had a mood or anxiety disorder (75 % and 59.4 % respectively). Two or more psychiatric disorders were present in 62.6 % of mothers. Forty-seven percent of mothers met the criteria for a PD (as displayed in Table 2), most of whom had a borderline PD (n = 7) or an avoidant PD (n = 6). Other disorders that occurred, were paranoid (n = 2), schizotypical (n = 1), dependent (n = 2), and obsessive-compulsive (n = 2) PD. Both the non-comorbid group as well as the comorbid group consisted of 16 mothers.

2.1. Exploration of attachment security in infants of mothers with psychiatric disorder in the comorbid and non-comorbid group

To facilitate the comparison of results across studies, the results of the four-way classification are reported. The distribution of attachment classifications for the infants of mothers in the non-comorbid group, comorbid group, and for the two groups combined, are displayed in Table 3.

In the total group, almost half of the infants were classified as disorganized (46.9 %; n = 15), followed in descending order by the resistant (21.9 %; n = 7), secure (18.8 %; n = 6), and avoidant (12.5 %; n = 4) classifications. Secondly, we explored the distribution of attachment classifications separately for the non-comorbid and comorbid group. Given the small cell counts ($n < 5$), the difference between distributions could not be tested statistically and are outlined descriptively. All infants in the comorbid group were classified as either insecure or disorganized. In the non-comorbid group, 25 % (n = 4) of the infants were classified as disorganized, in contrast to 68.8 % (n = 11) of infants in the comorbid group. None of the infants in the non-comorbid group were classified as avoidant, whereas 25 % (n = 4) of infants in the comorbid group were classified as avoidant. Almost 38 % (n = 6) of infants in the non-comorbid group were classified as resistant, as opposed to 6.3 % (n = 1) of infants in the comorbid group.

Using the continuous measures of attachment security and disorganization, it was possible to statistically test differences between subgroups. Continuous attachment security scores did not differ significantly between infants in the non-comorbid group ($M = -0.69$, $SD = 3.2$) and comorbid group (($M = -1.9$, $SD = 2.2$), $t(29) = 1.24$, $p = .22$). Infants in the comorbid group had a higher disorganization score ($M = 5.0$, $SD = 1.9$) than infants in the non-comorbid group (($M = 3.13$, $SD = 2.1$), $t(30) = -2.62$, $p = .01$).

2.2. Association between maternal concurrent psychopathology symptoms, infant security, and disorganization

At the 14-months postpartum measurement, the GSI ranged from.09 to 2.85 and was positively skewed, indicating fewer scores on the higher end. Three mothers in the total group reported a GSI higher than 1.33 which can be considered above average for Dutch female psychiatric outpatients (De Beurs, 2011). The level of maternal psychopathology symptoms at 14 months was not associated with infant attachment security ($\rho = .03$, $p = .88$). Similarly, no significant association was found between the level of maternal psychopathology symptoms at 14 months and infant disorganization ($\rho = .24$, $p = .21$).

Table 2
Frequency and percentage of maternal psychiatric and personality disorders during pregnancy (N = 32).

Psychiatric disorders	% (n)
Mood disorder	75 (24)
Anxiety disorder	59.4 (19)
Psychotic disorder	6.3 (2)
Other disorders	15.6 (5)
Comorbid psychiatric disorders (≥2)	62.6 (20)
Personality disorders	
No personality disorder	53.1 (17)
Cluster A personality disorder	12.5 (4)
Cluster B personality disorder	21.9 (7)
Cluster C personality disorder	25.0 (8)
Comorbid personality disorder (≥2)	12.6 (4)

Note. Other Axis-I disorder = somatoform and/or eating disorders. Cluster A = paranoid, schizoid, and schizotypal personality disorder. Cluster B = borderline, narcissistic, histrionic, and antisocial personality disorder. Cluster C = avoidant, dependent, and obsessive-compulsive personality disorder.

Table 3
Distribution of infant attachment classification, attachment security score, and disorganized behavior score according to maternal group status.

	Psychiatric disorder with no comorbid PD ($n = 16$)	Psychiatric disorder and comorbid PD ($n = 16$)	Total sample ($N = 32$)
Classification	% (n)	% (n)	% (n)
Avoidant (A)	-	25 (4)	12.5 (4)
Secure (B)	37.5 (6)	-	18.8 (6)
Resistant (C)	37.5 (6)	6.3 (1)	21.9 (7)
Disorganized (D)	25 (4)	68.8 (11)	46.9 (15)
Continuous measures	*M* (*SD*)	*M* (*SD*)	M (*SD*)
Attachment security score†[a]	-0.69 (3.2)	-1.9 (2.2)	-1.31 (2.75)
Disorganized behavior score†	3.13 (2.1)	5 (1.9)	4.06 (2.21)

Note. Difference between secure and insecure not tested due to cell counts < 5.
PD = personality disorder.
[a] $N = 31$.

3. Discussion and conclusions

We explored the distribution of infant-mother attachment classifications at 14 months postpartum in a unique, hard-to-reach sample of mothers who suffered from a severe psychiatric disorder with or without comorbid PD. Among this clinical sample, regardless of mother's comorbidity, almost half of the infants were classified as disorganized and less than 20 % as secure. No differences in attachment security scores were found between infants of mothers with or without a comorbid personality disorder. We did find that infants of mothers with a psychiatric and comorbid personality disorder showed significantly more and/or more intense disorganized behaviors than infants of mothers without a comorbid PD. These findings are reflected in the distributions of attachment classifications; around 69 % of infants of mothers diagnosed with a comorbid PD were classified as disorganized, while 25 % of infants of mothers without a comorbid PD received this classification. This difference could not be tested statistically due to the limited sample size. Lastly, none of the infants of mothers with a comorbid PD were securely attached.

Most infants in our sample were classified as disorganized or insecure, which differs from general population samples (Madigan et al. 2023), but also most clinical samples which could be due to differing recruitment methods between studies (e.g., during clinical treatment of during antenatal screening) and a limited focus on the impact of comorbidity in previous studies (Hipwell et al. 2000; Ramsauer et al. 2014; Smith-Nielsen et al. 2016). This variety of factors cannot easily be taken into account when making qualitative comparisons or in quantitative analyses which often require large sample sizes. However, these study differences possibly reflect underlying differences in severity, chronicity, and comorbidity of problems in the study samples, which in turn could explain the variations in the distribution of infant-mother attachment classifications. Our sample consisted of mothers with a clinical diagnosis, confirmed by diagnostic interview, who showed a high comorbidity rate and received specialized treatment for at least two years. Thus, our sample is potentially more affected and impaired in comparison with other clinical samples. For example, Smith-Nielsen et al. (2016) characterized their sample as well-resourced and low-risk despite the clinical diagnoses of depression and PD. This is in contrast with the current study, in which not only the psychiatric characteristics (i.e., severity, chronicity, and comorbidity), but also the psychosocial characteristics (e.g., unemployment or low educational level) characterize the high-risk nature of the sample. From a theoretical standpoint, the distribution of attachment classifications in our sample can be explained by the notion that the attachment relationship is established through repeated infant-caregiver interactions. In this light, it can be argued that the enduring, inflexible, and pervasive nature of PD has a stronger formative impact on the infant-mother attachment relationship as compared to maternal psychiatric symptoms, which can fluctuate substantially over time (e.g., Ku et al. 2024).

With regards to our second research question, we found that maternal concurrent self-reported psychiatric symptoms were not related to continuous measures of infant attachment security and disorganized attachment behaviors. Some studies suggest that the chronicity (i.e., length of exposure) might be of importance, rather than current symptoms (e.g., Flowers et al. 2018). Indeed, our findings suggest that chronic and severe maternal psychiatric disorders, classified by structured clinical interview, underlie infant attachment behavior. Interestingly, other studies have also pointed out that maternal psychiatric disorder established by clinical interview, whether or not combined with self-reported symptoms, is related to infant attachment (e.g., Barnes and Theule, 2019; Śliwerski et al., 2020). Possibly, the extent of chronic maternal psychiatric symptomatology explains differences found in attachment distributions between clinical populations, which warrants further research.

Also, we cannot rule out that mothers underreported their symptoms, possibly due to feelings of fear or being judged (e.g., Goodman, 2009). Lastly, it should be noted that we studied a severely affected sample of mothers, who received outpatient treatment during pregnancy and the postpartum period. This may have (positively) impacted their parenting and the developing mother-infant relationship. In sum, these factors related to our sample might explain the lack of association between maternal symptom severity and infant continuous attachment security in our study.

Because of the preliminary nature of the study, the results should be interpreted with caution and can best be seen as hypothesis generating. Based on our descriptive findings, it could be of interest to study whether there are associations between specific maternal PDs and infant attachment classifications. It can also be hypothesized that maternal comorbid PD is a risk factor, specifically for infant disorganization. This should be considered in the light of chronic psychiatric disorder (e.g., in the form of symptom trajectories), to

clarify how either type of disorder and their combined effects impact the infant-mother attachment relationship. Furthermore, future studies could shed more light on the association between maternal PD and infant disorganization specifically, by thorough exploration of specific disorganized behaviors in infants (Duschinsky and Solomon, 2017). Also, it could be of added value to also assess maternal personality pathology dimensionally (Livesley, 2007), as there may be associations between personality symptoms clusters and infant attachment, apart from categorical PD diagnosis, which could provide further insight into the nature and strength of this association. Symptom clusters could be related to specific types of infant attachment insecurity or disorganization, revealing distinct at-risk profiles. Moreover, previous studies have shown an association between parental reflective functioning, infant attachment security, and parental psychiatric symptoms (e.g., Georg et al. 2023; Zeegers et al. 2017). As such, parental reflective functioning in mothers with (comorbid) personality disorder warrants more attention in future research. Lastly, clinical studies with psychiatric populations and/or populations including (young) infants, more often than not, struggle to reach adequate sample size (e.g., De Graaf et al. 2013; DeMauro et al. 2019). While strategies to increase sample size have been suggested, future research could profit from a collective effort to recruit samples with severe and/or chronic psychiatric disorder or combine existing data across research groups. This would increase statistical power which is needed to unravel the role of maternal psychiatric and (comorbid) personality disorder, combined with aspects of parenting (e.g., parental reflective functioning), for the developing infant-mother attachment relationship.

The SSP coding process for this specific sample proved complex and an adapted coding approach (i.e., allowing for discussion or second opinion in order to assign a consensus code) by two experienced, certified coders was adopted to enhance the quality of the SSP codes. Because of this, caution is required when interpreting the results. At the same time, the current study is one of few in a sample of mothers with a severe psychiatric disorder and their infants. Therefore, these findings are important to gain a greater understanding of the etiology of infant attachment disorganization, all the more because this is a factor associated with (adverse) child outcomes and specific parenting behaviors which can be incorporated in parenting interventions.

Previous studies have paid limited attention to infant-mother attachment in clinical or treatment samples and the role of various comorbid PDs. While our sample is representative of a severely affected clinical population, challenges in recruitment especially during the peripartum period, resulted in a limited sample size. This impeded analyses of the association between specific maternal disorders and infant attachment classification. This is of importance since non-response analysis revealed that mothers with an anxiety disorder are underrepresented in our current subset of mothers. Also, we could not test differences between attachment classification distributions of mothers in the comorbid and non-comorbid group. Furthermore, we found a substantial, yet non-significant, association between maternal concurrent psychiatric symptoms and infant disorganization at 14 months, which might be an artefact of our small sample size. Therefore, the current study findings should be tested, replicated (e.g., for different PDs), and extended (e.g., by investigating underlying parenting mechanisms or diagnosis-specific associations). More research on the potential risk of maternal PD for the development of infant attachment disorganization is crucial for healthcare professionals to enable them to make informed decisions about identification and early intervention, and to reduce intergenerational transmission of maternal psychopathology.

Ethics approval

The Infant Caregiving Assessment Scales (INCAS) validation study was approved by the Medical Ethics Committee of the Erasmus University Medical Center, Rotterdam (NL42662.078.12, date of approval 18 March 2013).

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CRediT authorship contribution statement

Vandhana Choenni: Writing – review & editing, Writing – original draft, Investigation, Formal analysis, Data curation. **Carlinde W. Broeks:** Writing – review & editing. **Anne Tharner:** Writing – review & editing, Methodology, Investigation, Data curation. **Maartje P.C.M. Luijk:** Writing – review & editing, Methodology, Investigation, Data curation. **Frank C. Verhulst:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization. **Mijke P. Lambregtse van den Berg:** Writing – review & editing, Supervision, Methodology, Funding acquisition, Conceptualization. **Rianne Kok:** Writing – review & editing, Supervision, Methodology, Funding acquisition, Conceptualization.

Data availability

The data that has been used is confidential.

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Author contributions

Rianne Kok, Mijke Lambregtse-Van den Berg and Frank Verhulst contributed to the study conception and design. Material preparation, data collection and analyses were performed by Vandhana Choenni, with the cooperation of several graduate students. Coding of video observations was carried out by Maartje Luijk and Anne Tharner. The first draft of the manuscript was written by Vandhana Choenni and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Consent

Written informed consent was obtained from all mothers for their own and their infant's participation, and from fathers with legal guardianship where applicable.

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