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Katrine Røhder
Angus MacBeth
Kirstine Agnete Davidsen
Andrew Gumley
Jessica Brennan
Carol George
&
Susanne Harder

Author affiliation:
Katrine Røhder, Department of Psychology, University of Copenhagen, Copenhagen, Denmark; Angus MacBeth, School of Health in Social Science, University of Edinburgh, Edinburgh, Scotland, UK; Kirstine Agnete Davidsen, Department of Psychology, University of Southern Denmark and Department of Child and Adolescent Mental Health Odense, Research Unit & Mental Health Services in the Region of Southern Denmark, Odense, Denmark; Andrew Gumley, Institute of Health and Wellbeing, University of Glasgow, Glasgow, Scotland, UK; Jessica Brennan, The Department of Brain and Psychological Science, University of Delaware, Newark, Delaware; Carol George, Department of Psychology, Mills College, Oakland, California; Susanne Harder, Department of Psychology, University of Copenhagen, Copenhagen, Denmark.

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Corresponding author:
Katrine Røhder, Department of Psychology, University of Copenhagen, Oester Farigmagsgade 2a, 1353 Copenhagen, Denmark. Email: katrine.rohder@psy.ku.dk; ORCID-ID 0000-0002-4915-1585

Compliance with Ethical Standards
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The authors declare that they have no conflict of interests.

Ethical approval: The WARM study has been approved by The committees of Health Research Ethics in the Capital Region of Denmark (Protocol no: H-2-014-024) and by the West of Scotland Research Ethics Service and the NHS GG&C Board Approval (REC Reference 14/WS/1051) in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study before assessments took place.

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Abstract

Psychopathology poses a risk for optimal parenting. The current study explored antenatal caregiving representations as markers for later risk of non-optimal maternal behavior among mothers with severe mental illness.

Sixty-five mothers diagnosed with psychosis, bipolar disorder, depression (psychopathology group), and non-clinical controls participated in a longitudinal study from pregnancy to 16 weeks after birth. Mental health diagnoses and caregiving representations were assessed during pregnancy. Maternal behavior was assessed during the five-minute recovery phase of the Still Face paradigm at 16 weeks. Mothers with psychopathology reported significantly higher levels of ‘heightened’ caregiving representations (i.e., separation anxiety from the child) than controls. The only significant diagnostic group difference in perinatal maternal behavior was that mothers diagnosed with depression exhibited more overriding-intrusive behavior than non-clinical control mothers. Regression modelling results showed that, antenatal caregiving representations of ‘role reversal’ predicted significantly lower levels of sensitivity and higher levels of overriding-intrusive behavior independent of the effect of psychopathology. The findings can be interpreted in the context of representational transformation to motherhood during pregnancy. The results provide preliminary evidence for the potential of a new questionnaire measure of caregiving representations as a screening instrument for antenatal representational risk.

Keywords: antenatal caregiving representation; perinatal maternal behavior; psychopathology; psychosis, depression
Severe maternal psychopathology affects parenting behavior and places children at risk for poor developmental outcomes (Oyserman, Mowbray, Meares, & Firminger, 2000). There is substantial evidence that maternal depression diagnosis is associated with increased negative-intrusive and hostile behavior, and decreased engaged and positive-sensitive behavior (Lovejoy, Graczyk, O'Hare, & Neuman, 2000). Negative-intrusive behavior may be more state-dependent than other maternal behavior dimensions; however, evidence suggests that mothers with depression diagnoses are more intrusive compared to controls even in the absence of significant psychiatric symptomatology. A recent systematic review concluded that mothers diagnosed with schizophrenia showed disturbed parental behavior during the first 12 months compared to affective and non-clinical controls. More specifically, mothers with psychosis showed reduced social contact, greater tension, and more behavioral intrusiveness as compared to controls (Davidsen, Harder, MacBeth, Lundy, & Gumley, 2015). Research on maternal behavior among mothers with bipolar disorder is sparse; the few existing studies reported that bipolar depressed mothers are more likely to vocalize and engage in positive interactions with their children compared to unipolar depressed mothers (Goodman & Liu, 2014). However, children of mothers with bipolar disorder are more likely to be insecurely attached to their mother than children of mothers with unipolar depression (Radke-Yarrow, Cummings, Kuczynski, & Chapman, 1985). Bipolar disorder, therefore, appears to be a risk factor for maternal behavior and child development.

Severe mental illness is by nature episodic (Oyserman et al., 2000). Therefore, children whose mothers have a lifetime history of severe mental illness are likely to experience different kinds of parenting during active and remission phases. Epidemiological research has demonstrated that more than half of mothers with severe
psychopathology (e.g., schizophrenia, bipolar disorder and other psychotic disorders) become mothers and found no clinical differences between women who become mothers compared to those who do not (Howard, Kumar, & Thornicroft, 2001). Most parenting studies of mothers with severe mental illness are cross-sectional and based on samples recruited from inpatient facilities (i.e., mother-baby units) (Davidsen et al., 2015). Therefore, most research on the impact of severe mental illness on maternal behavior is based on observations during periods of active symptoms. Less is known about how a lifetime history of severe mental illness affects parental behavior during remission phases. Oyserman et al. (2000) found that persistent emotional and relational difficulties among mothers with severe mental illness are likely to be important in understanding impairments in motherhood. Antenatal caregiving representational development could be one parental domain affected by psychopathology. Better understanding of the link between caregiving representations and psychopathology could enable early detection of mothers at risk of non-optimal caregiving behavior.

Caregiving Representations

Substantial research has demonstrated that transformations during pregnancy prepares women for motherhood (Slade, Cohen, Sander, & Miller, 2011). This process involves maternal representations of becoming a parent that develop from emotional engagement with the fetus (i.e., maternal-fetal relationship) and expectations for their future relationship with their children. Both concepts have been suggested to form parts of the caregiving system (Walsh, 2010). Following attachment theory, George and Solomon (2008) theorized that all parents transform their internal representation from seeking protection (the attachment system goal) to providing comfort and care for their children (the caregiving system goal) in order to become the “stronger and wiser” member of the attachment-caregiving relationship required to adequately protect and care for children. Further, these
authors demonstrated that mothers of children with disorganized attachment have caregiving representations characterized by helplessness or role reversal, conceived as high-risk representations of maternal abdication of care and failed protection and associated with children’s developmental risk.

Antenatal assessment of maternal representations predicts observed and mother-reported maternal behavior as well as infant attachment at 12 months (Crawford & Benoit, 2009; Dayton, Levendosky, Davidson, & Bogat, 2010; Siddiqui & Hägglöf, 2000; van den Bergh & Simons, 2009). Meta-analytic findings suggest that depression is a significant predictor of representations of the maternal-fetal relationship (Yarcheski, Mahon, Yarcheski, Hanks, & Cannella, 2009). One study reported that clinically depressed mothers were less involved with their fetus compared to non-depressed mothers (McFarland et al., 2011).

Overall, the field does not have much information regarding the impact of psychosis and bipolar disorder on caregiving representations and perinatal research involving clinical groups is needed. Furthermore, antenatal caregiving representations assessment to date has relied on the use of time-consuming maternal interviews; the practical usefulness of these instruments is limited in larger samples and clinical practice.

Aim and Hypothesis

The present study aimed to explore associations between psychopathology, antenatal caregiving representations, and maternal perinatal behavior in interactions with the infant at 16 weeks in a sample of mothers with severe mental disorders and non-clinical controls. We hypothesized that mothers with psychopathology would report greater levels of non-optimal antenatal caregiving representations, and they would show less positive-sensitive and more negative-overriding maternal behavior in interactions with their infant compared to non-clinical mothers. We explored diagnostic group differences for caregiving
representations and perinatal behavior without making specific hypotheses because research on mothers with psychosis and bipolar disorder is sparse. Finally, we hypothesized that antenatal caregiving representations would predict maternal behavior.

Method

The Current Study

Data were drawn from an ongoing prospective, longitudinal Danish-Scottish cohort (WARM, Wellbeing And Resilience study examining Mechanisms of transmission of health and risk in parents with complex mental health problems and their offspring). The WARM study was established to explore early risk and resilience factors among infants of mothers with psychosis-related mental disorders, and compare these infants to a control group of infants of mothers without severe mental illness (Harder et al., 2015). Ethical approval was granted by Health Research Ethics, Capital Region of Denmark (Protocol no: H-2-014-024) and the West of Scotland Research Ethics Service (REC Reference 14/WS/1051). Data reported here were collected in Denmark and Scotland between October 2014 and November 2016.

The study participants were Danish or Scottish pregnant women and their infants. Inclusion criteria were one of the four following criteria: a) DSM-5 diagnosis of Delusional Disorder, Schizophriniform Disorder, Schizophrenia or Schizoaffective Disorder, Psychosis NOS, Brief Psychotic Disorder, b) DSM-5 diagnosis of Bipolar I and II Disorder, c) DSM-5 diagnosis of Major Depressive Disorder (current moderate-severe episode or lifetime recurrent moderate -severe), or d) a non-psychiatric control group defined as mothers without any history of treatment or admission for a psychiatric disorder or drug or alcohol addiction. Maternal exclusion criteria were: a) mother unable to speak English or Danish, b)
miscarriage or still birth, c) diagnosis of Autistic Spectrum Disorder, or d) unable to provide informed and written consent for their own and their unborn child’s participation in the study. Infant exclusion criteria were a) infants born with a congenital developmental disorder, which can be diagnosed from birth, such as for example Down’s Syndrome, or b) miscarriage after antenatal assessments were completed. Participants were recruited through a non-selective procedure through obstetric wards in Capital Region of Denmark, Region of Southern Denmark, and Region Zealand, and in Scotland through perinatal mental health services and midwifery in NHS Greater Glasgow and Clyde (see Harder et al., 2015 for further information). Seventy participants consented to participate in the study. Five participants dropped out before antenatal data collection was finished and were not included in the present study (participant flow is presented in Figure 1).

Following the WARM study protocol (Harder et al., 2015), maternal psychopathology was assessed after obtaining written informed consent from all participants to confirm inclusion diagnosis. Assessment of caregiving representations was part of a small battery of questionnaires assessed at a subsequent scheduled meeting. The majority of assessments of maternal psychopathology were conducted at the beginning of the third trimester ($M = 30.1$ GA weeks; $SD = 6.4$; range: 14.9-38.3). Antenatal caregiving representations assessment took place approximately one week later ($M = 31.1$ GA weeks; $SD = 7.3$; range = 13.9-38.9). Most mothers completed the PCEQ during the third trimester (76.6%); a minority of participants completed it during the first (1.6%) and second (21.9%) trimesters. Research suggests that antenatal caregiving representations undergo important changes during pregnancy (Cannella, 2005; Stern, 1995) and trimester of completion was incorporated as a potential confounder for analyses. All antenatal assessments were
conducted during home-visits or at the obstetric ward according to mothers’ preferences. Mother-infant interaction was assessed at 16 weeks of infant age during home-visits.

Measures

- Maternal psychopathology. Psychiatric diagnoses to confirm inclusion diagnosis were assessed using the psychosis and mood modules of the Structured Clinical Interview for DSM-5 (First, Williams, Karg, & Spitzer, 2016). All diagnostic assessments were supervised by a researcher trained on the SCID (KR) and all diagnoses were discussed and confirmed through consensus discussion among the senior researchers (AM, AG, KD, & SH).

- Caregiving representations. Antenatal caregiving representations were assessed using the Prenatal Caregiving Experience Questionnaire (PCEQ, unpublished instrument, Brennan & George, 2013), a 40-item self-report measure assessing pregnant women’s expectations about their future relationship with their child. Responses are given on a 5-point Likert scale (1 not characteristic to 5 very characteristic). The PCEQ was translated into Danish by two independent researchers and back translated by a bilingual English-Danish speaking Associate Professor in Psychology. Divergences between the translation and the original version were resolved by discussion with and guidance from the PCEQ co-authors (JB, CG). A cross-cultural validated four-factor model of the postnatal version of the questionnaire (CEQ age 1.5-5 years) was used in the current study (Røhder et al., 2018). There are four subscales: Enjoyment, mothers expect positive feelings about the child (α = .709; e.g. “My baby will be worth all the love and attention I can give him or her”); heightened, mothers expect difficulties in separating from their child (α = .758; e.g. “I think that I will be lonely when my baby and I are separated”); helplessness, mothers expect their child to be out of control and themselves as unable to take care of child (α = .801; e.g.
“Sometimes I may just lose it and scream at him or her or punish too harshly”); and role reversal; mothers expect the child to understand and cheer up the mother (α = .672; e.g. “My baby and I will be really close. I will be able to just sit there and tell him or her if I had a bad day and s/he will understand”). To our knowledge, the PCEQ is the only existing time-efficient, multi-dimensional measure of antenatal caregiving representations. Cross-sectional studies using the PCEQ support the multi-dimensional structure of the measure as well as construct validity in relation to maternal-fetal attachment, social support, and adverse childhood experiences (Brennan, 2017; Røhder et al., 2019).

Maternal behavior. Maternal behavior was assessed during the recovery phase of a 10-minute interaction based on the Still-face paradigm. The infant was placed in an infant chair with the mother placed in front of her infant. Two cameras facing mother (face and shoulders) and infant (full body and face) were used. Coding was based on split-screen recordings that showed both mother and infant. The mother was asked to first play with her infant for three minutes (engagement phase) and then hold a still face (freezing, not displaying emotions, or touching the infant) for two minutes (still face phase). The five-minutes recovery phase that followed was coded using the Coding Interactive Behavior manual (CIB, unpublished manual, Feldman 1998). The decision to score maternal behavior during the recovery phase was based on prior research on the caregiving system suggesting that the mother’s caregiving system is activated in situations where the infant’s attachment system is activated and, thus, best observed in distressing situations (Lyons-Ruth, Bronfman, & Parsons, 1999; Solomon & George, 1996). CIB is a global measure that incorporates parent, child, and dyadic affective states and interactive patterns validated for use in dyads with infants 2-36 months of age. The coding consists of 33 items rated on a 5-point Likert scale allowing half points (1 little to 5 much). The CIB provides maternal composite scores for maternal sensitivity and intrusiveness, infant involvement and withdrawal, dyadic
reciprocity, and dyadic negative states are calculated as means of item scores. The current study used the maternal sensitivity and intrusiveness composites. Maternal sensitivity consists of the following items: acknowledging, imitating, elaborating, parent gaze, positive affect, vocal appropriateness, appropriate range of affect, resourcefulness, affectionate touch, and parent supportive presence. The item parent gaze was excluded from the original sensitivity composite due to lack of variability (all mothers gazed to the infant). The adjusted sensitivity composite showed high internal consistency ($\alpha = .81$). The original intrusiveness composite consists of the following items at four months: forcing, overriding, parent negative affect/anger, hostility, and parent anxiety. Our sample had no or very limited variability in the items parental negative affect/anger, hostility, and parent anxiety. Forcing is considered “common in the interactions of parents and very young infants (2-6 months)” (Feldman, CIB manual, version 4, 1998, p. 7). In our sample, forcing and overriding behavior were not significantly correlated; Pearson’s $r = .03, p > .5$. The original intrusiveness composite, thus, showed poor internal consistency ($\alpha = .19$). Overriding behavior is the central item in this composite and was, therefore, used as a proxy of intrusive maternal behavior. All interactions were coded blind to maternal psychopathology diagnoses by the first author and a second judge who had passed the CIB reliability test from Ruth Feldman. Inter-rater reliability calculated using 20% of randomly selected interactions of mothers with and without psychopathology rated blindly showed good reliability; ICC (2,1) = .81.

Statistical Analysis

Assumptions for the use of parametric tests were explored and parametric and non-parametric tests used as appropriate. All analyses used two-tailed tests. A series of ANOVAs with planned contrasts were conducted to explore the impact of psychopathology on caregiving representations and maternal behavior. Spearman’s rho correlation was used to
evaluate non-parametric associations and intercorrelations among antenatal caregiving representations and maternal caregiving behavior. The assumptions for testing a mediation model were not met, therefore, we conducted multiple hierarchical regression analysis using the backward method to explore the predictive validity of psychopathology and antenatal caregiving representations on maternal behavior. We stratified the regression analyses by trimester to explore potential confounding effects of infant gestational age.

As data were deemed missing at random, missing items in the symptom interviews and the PCEQ were analyzed and handled with mean imputation on subscale level. Analyses of dropout and missing data indicated no differences between participants with missing data or, participants who dropped out during the study and those that remained in the study.

Results

Sample Characteristics

Demographic information and clinical characteristics of the mothers and their infants are presented in Table 1. Socio-demographic factors (maternal age, education, relationship status, parity, employment status, nationality, infant gender, and infant age at still face procedure) were not related to maternal behavior and, therefore, not included as covariates in models predicting maternal behavior.

Psychopathology and Caregiving

The first analyses examined the effect of psychopathology on antenatal caregiving representations and maternal behavior. Descriptive statistics are reported in Table 2. The only significant differences between diagnostic groups emerged for heightened
caregiving representations, $F(3,60) = 6.04$, $p = .001$. There were no significant overall
effects of psychopathology groups on maternal sensitivity, $F(3,42) = 0.07$, $p = .98$ or
maternal overriding behavior, $F(3,42) = 2.34$, $p = .09$. Planned contrasts analyses showed
that mothers diagnosed with depression were significantly more overriding compared to non-
clinical control mothers, $p = .04$. The relatively small group sizes gave an estimated effect of
0.71 difference in averages (95% confidence interval of 0.04 -1.38). The behavior of mothers
diagnosed with psychosis or bipolar disorder did not differ from the behavior of non-clinical
controls.

**Predictors of Perinatal Maternal Behavior**

The second analysis examined associations between antenatal caregiving
representations and maternal behavior (see Table 3). As hypothesized, there were significant
positive associations between caregiving helplessness and role reversal and overriding
maternal behavior. Contrary to our expectations however, associations between heightened
caregiving and maternal behavior as well as associations between antenatal caregiving
representations and maternal sensitivity were not significant.

We used hierarchical regression analyses (backwards entry method) to explore
the effect of psychopathology and antenatal caregiving representations on maternal sensitivity
and overriding behavior respectively (see Tables 4 and 5). The results showed that antenatal
representational role reversal was the only significant predictor of maternal sensitivity, with
greater infant-mother role reversed representations associated with decreased sensitivity
(medium effect size $d = .35$). Enjoyment and role reversal emerged as equally good predictors
of overriding behavior at 16 weeks (medium effect sizes $d = .29$ and .33).
We stratified analysis by trimester to explore the potential confounding effect of gestational age. Only one mother filled out the PCEQ during the first trimester. The prediction of role reversal effects on maternal sensitivity and maternal overriding behavior was only significant for mothers in the third trimester, $\beta = -.36$, $p = .03 \ [ -.36; -.02]$ and $\beta = .37$, $p = .02 \ [ .06; .78]$, respectively. Predictions of enjoyment effects on maternal overriding behavior was not significant at the .05 level, although reached trend-level during the third trimester, $\beta = -.27$, $p = .08 \ [ -1.68; .11]$. 

**Discussion**

The current study explored associations between psychopathology, antenatal caregiving representations, and maternal behavior among mothers diagnosed with psychosis, bipolar disorder, and depression compared to non-clinical controls. This is the first study to explore the association between psychopathology and non-optimal caregiving representations during pregnancy using a multi-dimensional questionnaire measure of these representations. We report that mothers with psychopathology during pregnancy expected more separation difficulties from their children (heightened caregiving) as compared to non-clinical controls. Previous research has also found increase in distorted caregiving representations in clinical groups (Vreeswijk, Maas, & van Bakel, 2012). Dayton et al. (2010) found that mothers whose representations of their children were termed affectively over-activated during pregnancy (e.g., distorted representations in the Working Model of the Child Interview similar to the heightened dimension on the PCEQ) were more hostile in interactions with their one-year-old children. Benoit, Parker, and Zeanah (1997) found an association between distorted caregiving representations and resistant infant attachment at 12 months. Finally, Brennan (2012) and Røhder et al. (2018) demonstrated an association between heightened...
caregiving representations and parental distress among mothers of children aged 1.5 and 5 years. This result, suggests that over-activated representations might be important for maternal well-being and feelings of self-efficacy, which we did not assess in the current study. These findings point to the potential negative effects of antenatal heightened caregiving representations on parental distress, later mother-infant interactions, and child attachment. We did not observe any significant negative effect of heightened representations on early caregiving behavior in our study. One explanation may be that maternal separation problems are less characteristic during the early phases of infant life because mothers and infants need more proximity than later ages where separation from the mother becomes an important developmental task of the infant. This interpretation is not supported in one study, however, where Korja et al. (2010) reported associations between distorted (over-aroused) representations of the child and non-optimal mother-infant interaction among six months old infants.

Study findings are consistent with existing studies of depression and maternal behavior. We found that mothers diagnosed with depression showed more overriding behavior compared to control mothers without psychopathology (Lovejoy et al., 2000). Mothers diagnosed with psychosis and bipolar disorder resembled non-clinical mothers in interactions with the infant at 16 weeks. Other studies of mothers with psychosis in remission have reported similar findings. For instance, Howard, Thornicroft, Salmon, and Appleby (2004) found that mothers with psychotic disorders admitted to a mother-baby unit did not need social services supervision when discharged. Pawlby et al. (2010) found that mothers with psychotic disorders did not differ from healthy controls in their ability to respond appropriately to their infant’s cues. Snellen, Mack, and Trauer (1999) found that the quality of mother-infant interaction improved when maternal psychotic symptoms declined.
Finally, higher levels of antenatal role reversal caregiving representations assessed during the third trimester predicted reduced maternal sensitivity and increased overriding interactions with their infants at 16 weeks. These results suggest that, in addition to the previously identified risk of maternal severe mental illness for suboptimal maternal perinatal behavior (Davidsen et al., 2015; Lovejoy et al., 2000), antenatal caregiving development may be an equally important psychological domain that should be addressed in research and clinical practice on maternal perinatal health. Attachment and psychodynamic perspectives on the perinatal period (Ammaniti, Tambelli, & Odorisio, 2013; George & Solomon, 2008; Slade et al., 2011) emphasized that all women need to make a transformational representational shift to motherhood. However, although the significance of antenatal caregiving representations for maternal behavior is described in the developmental literature, its impact may not have been fully considered in relation to developmental psychopathology.

The current study is the first to demonstrate the predictive value of antenatal caregiving representations for maternal behavior using a questionnaire measure. Similar results have been found using interview-based measures of caregiving representations (Crawford & Benoit, 2009; Dayton et al., 2010). Crawford and Benoit (2009) reported that the presence of disrupted representations of the unborn child (e.g. role/boundary confusion, fearfulness/dissociation/disorientation, intrusiveness/negativity, affective communication errors, and withdrawal) during pregnancy predicted atypical maternal behavior (AMBIANCE) with their 12-month-old infant. Vulliez-Coady, Obsuth, Torreiro-Casal, Ellertsdottir, and Lyons-Ruth (2013) posited that role reversal/confusion encompasses the mothers need’s for emotional support from her child, a view that is consistent with the George and Solomon (2008) caregiving model. Similarly, qualitative studies have reported
that for some mothers living with psychopathology motherhood holds a special significance. These mothers often described motherhood as a new beginning, providing meaning to their lives, an opportunity to receive love, or a wish for their children meeting the mothers’ unmet emotional needs (Birtwell, Hammond, & Puckering, 2015; Dolman, Jones, & Howard, 2013). These findings suggest that antenatal development of caregiving representations is an important factor in the mother’s emotional preparation for motherhood. Consequently, representational role reversal could be an important focus for antenatal clinical interventions, in addition to monitoring and treatment of psychopathology.

Strengths and Limitations

There were several strengths to this study. One was the transdiagnostic inclusion of a broader range of complex maternal psychopathology than in previous research, allowing for comparison among different clinical groups. This is contrast to the existing literature, which has mostly focused on maternal depression. Furthermore, all participants were non-selectively, consecutively identified. Second, participants represented mothers living with severe mental illness in the community as compared with previous research that has relied mostly on mothers admitted to inpatient psychiatric facilities. The current study expands this research by exploring maternal behavior among more well-functioning mothers with severe mental illness living in the community.

The study also had a number of study limitations, particularly small group sizes, which may have led to lack of power for detection of some group differences. We identified more than 400 potential participants during the recruitment period, but only 224 of these were referred to the WARM team. Of these, 70 consented to participate in the study. It is possible therefore, that the final sample had some selection bias from both referring staff and mothers themselves. Mothers in our sample were mostly in a stable phase of illness and not
experiencing acute, severe episodes of psychopathology. Therefore, the sample might reflect perinatal caregiving among better functioning mothers with severe mental illness-histories. This may compromise the generalizability of our results to the more acute or chronic incidences of severe mental illness. Finally, the PCEQ is a new instrument, which fits with previous studies reporting on postnatal assessments (Røhder et al., 2018). The usefulness of the PCEQ for antenatal screening requires exploration in large community-based samples in order to identify norms and cut-offs for non-optimal caregiving representations.

Conclusion
The current study explored the impact of psychopathology on antenatal caregiving representations and perinatal maternal behavior among mothers diagnosed with lifetime psychosis, bipolar disorder, depression, and non-clinical controls. We found that antenatal role reversal caregiving representations predicted reduced maternal sensitivity and increased overriding maternal behavior when infants were 16 weeks of age. We suggest that in addition to the risk of lifetime psychopathology, this study supports models suggesting that mothers would benefit from perinatal representational transformation to establish a self-representation as the stronger and wiser, protective parental figure in their mother-child relationships. Finally, our results provide preliminary evidence for the screening potential of assessing antenatal representational risk in all mothers using a brief questionnaire.

References
RUNNING HEAD: ANTENATAL AND PERINATAL CAREGIVING


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FIGURE 1 Flow chart of recruitment and dropout at 16 weeks
Table 1

<table>
<thead>
<tr>
<th>Maternal and infant characteristics</th>
<th>Psychosis</th>
<th>Bipolar disorder</th>
<th>Depression</th>
<th>Non-clinical control</th>
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<tr>
<td>Maternal characteristics</td>
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<tr>
<td>Maternal age (years)</td>
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<tr>
<td></td>
<td>$n = 13$</td>
<td>$n = 12$</td>
<td>$n = 26$</td>
<td>$n = 14$</td>
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<td>$M (SD)$</td>
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<td>$M (SD)$</td>
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<td>$M (SD)$</td>
</tr>
<tr>
<td>Maternal age (years)</td>
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<td>32.0 (5.7)</td>
<td>29.3 (4.2)</td>
<td>30.7 (3.5)</td>
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<td>$n (%)$</td>
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<tr>
<td>Primiparous</td>
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<td>6 (50.0)</td>
<td>18 (69.2)</td>
<td>11 (78.6)</td>
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<td>Living with a partner</td>
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<td>12 (100)</td>
<td>20 (76.9)</td>
<td>12 (85.7)</td>
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<td>Education. ISCED level 5 or higher</td>
<td>2 (15.4)**</td>
<td>6 (50)*</td>
<td>16 (61.5)*</td>
<td>13 (92.9)</td>
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<td>Employment</td>
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<td>13 (50.0)</td>
<td>11 (78.6)</td>
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<td>Danish participants</td>
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<td>10 (83.3)</td>
<td>13 (50.0)**</td>
<td>14 (100)</td>
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<td>8 (66.7)</td>
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<td></td>
<td>18.1 (3.0)</td>
<td>18.6 (2.8)</td>
<td>17.9 (2.6)</td>
<td>18.7 (3.6)</td>
</tr>
<tr>
<td>$n (%)</td>
<td></td>
<td>$n (%)$</td>
<td>$n (%)$</td>
<td>$n (%)$</td>
</tr>
<tr>
<td>Infant gender (girls)</td>
<td>4 (44.4)</td>
<td>8 (66.7)</td>
<td>11 (57.9)</td>
<td>10 (83.3)</td>
</tr>
</tbody>
</table>

Note. ISCED = International Standard Classification of Education, 1997. DSM-V = Diagnosis and Statistical Manual of Mental Disorders (5th ed.).

$^a$ ANOVA; $^b$ $\chi^2$.

Sample size at 16 weeks: Psychosis $n = 8$ (17.4%); Bipolar disorder $n = 10$ (21.7%); Depression $n = 17$ (37.0%), and non-clinical controls $n = 11$ (23.9%).

* $p < .05$; ** $p < .01$; *** $p < .001$; all $p$-values are two-tailed and indicate differences from non-clinical controls.
Table 2

Group differences in maternal representations and behavior

<table>
<thead>
<tr>
<th>Variables</th>
<th>Psychosis</th>
<th>Bipolar disorder</th>
<th>Depression</th>
<th>Non-clinical control</th>
<th>Cohens' f</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
</tr>
<tr>
<td>Representations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enjoyment</td>
<td>4.66 (.27)</td>
<td>4.58 (.36)</td>
<td>4.54 (.34)</td>
<td>4.50 (.25)</td>
<td>.05</td>
</tr>
<tr>
<td>Heightened</td>
<td>3.35 (1.04)**</td>
<td>2.83 (.85)*</td>
<td>3.14 (.81)**</td>
<td>2.14 (.49)</td>
<td>.43</td>
</tr>
<tr>
<td>Helplessness</td>
<td>2.11 (.42)+</td>
<td>2.14 (.60)+</td>
<td>2.08 (.68)+</td>
<td>1.71 (.44)</td>
<td>.16</td>
</tr>
<tr>
<td>Role Reversal</td>
<td>3.56 (1.07)+</td>
<td>3.08 (.88)</td>
<td>3.39 (.62)</td>
<td>2.98 (.69)</td>
<td>.22</td>
</tr>
<tr>
<td>Maternal Behavior</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>3.40 (.49)</td>
<td>3.35 (.47)</td>
<td>3.32 (.47)</td>
<td>3.38 (.45)</td>
<td>.03</td>
</tr>
<tr>
<td>Overriding</td>
<td>1.81 (.65)</td>
<td>1.89 (.96)</td>
<td>2.53 (.83) *</td>
<td>1.82 (.96)</td>
<td>.33</td>
</tr>
</tbody>
</table>

Note. M = Mean; SD = Standard deviation.

*p ≤ .10, *p < .05; **p < .01; ***p < .001; all p-values indicate differences from non-clinical controls.
**Table 3**

*Correlations between antenatal caregiving representations and perinatal maternal behavior: Spearman’s rho*

<table>
<thead>
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<th></th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
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<tbody>
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<td>Enjoyment</td>
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<td>.16</td>
<td>-.35**</td>
<td>.26*</td>
<td>.11</td>
<td>-.21</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>.27*</td>
<td>.29*</td>
<td>-.20</td>
<td>.15</td>
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<td></td>
<td>.07</td>
<td>-.23</td>
<td>.31*</td>
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<td></td>
<td></td>
<td></td>
<td>-.27*</td>
<td></td>
<td>.33*</td>
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<tr>
<td>Sensitivity</td>
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<td></td>
<td></td>
<td>-.55***</td>
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<tr>
<td>Overriding</td>
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<td></td>
</tr>
</tbody>
</table>

*Note.*  `p ≤ .10 * p < .05 ** p < .01 *** p < .001.`
Table 4

Linear Model of Predictors of Maternal Sensitive Behavior at 16 Weeks Infant Age, with 95% bias corrected and accelerated confidence intervals reported in brackets. Confidence Intervals and Standard Errors based on 1000 Bootstrap samples

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th></th>
<th></th>
<th>Model 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B$</td>
<td>$SE\ B$</td>
<td>$\beta$</td>
<td>$B$</td>
<td>$SE\ B$</td>
<td>$\beta$</td>
</tr>
<tr>
<td>SMI</td>
<td>.06</td>
<td>.18</td>
<td>.06</td>
<td>.02</td>
<td>.15</td>
<td>.02</td>
</tr>
<tr>
<td></td>
<td>[-.30; .43]</td>
<td></td>
<td></td>
<td>[-.29; .33]</td>
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<td></td>
</tr>
<tr>
<td>Enjoyment</td>
<td>.24</td>
<td>.27</td>
<td>.15</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>[-.31; .78]</td>
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<tr>
<td>Heightened</td>
<td>-.06</td>
<td>.09</td>
<td>-.11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[-.24; .13]</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Role Reversal</td>
<td>-.19</td>
<td>.09</td>
<td>-.33*</td>
<td>-.21</td>
<td>.08</td>
<td>-.36*</td>
</tr>
<tr>
<td></td>
<td>[-.37; -.01]</td>
<td></td>
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<td>[-.38; -.04]</td>
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<tr>
<td>Helplessness</td>
<td>-.02</td>
<td>.15</td>
<td>-.02</td>
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<tr>
<td></td>
<td>[.32; .28]</td>
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<tr>
<td>$R^2$</td>
<td>.16</td>
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<td>.13*</td>
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<td></td>
</tr>
</tbody>
</table>

Note. SMI = severe mental illness. Backward entry used.

*p < .05.
Table 5

Linear Model of Predictors of Maternal Overriding Behavior at 16 Weeks Infant Age, with 95% bias corrected and accelerated confidence intervals reported in brackets. Confidence Intervals and Standard Errors based on 1000 Bootstrap samples

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th></th>
<th></th>
<th>Model 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B$</td>
<td>$SE$ $B$</td>
<td>$\beta$</td>
<td>$B$</td>
<td>$SE$ $B$</td>
<td>$\beta$</td>
</tr>
<tr>
<td>SMI</td>
<td>.40</td>
<td>.33</td>
<td>.20</td>
<td>.38</td>
<td>.29</td>
<td>.18</td>
</tr>
<tr>
<td></td>
<td>[-.26;1.07]</td>
<td>[-.20;96]</td>
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</tr>
<tr>
<td>Enjoyment</td>
<td>-.60</td>
<td>.49</td>
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<td>[-1.71;-04]</td>
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<tr>
<td>Heightened</td>
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<td>-.18</td>
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<td></td>
</tr>
<tr>
<td>Role Reversal</td>
<td>.38</td>
<td>.16</td>
<td>.34*</td>
<td>.37</td>
<td>.16</td>
<td>.33*</td>
</tr>
<tr>
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<td>[.06;.68]</td>
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<td></td>
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<tr>
<td>Helplessness</td>
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<td>.27</td>
<td>.17</td>
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</tr>
<tr>
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<td>[-.27;81]</td>
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<tr>
<td>$R^2$</td>
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<td>.25*</td>
<td></td>
<td>.23*</td>
</tr>
</tbody>
</table>

Note. SMI = severe mental illness. Backward entry used.

*p < .05.