Personality Factors as Determinants of Depression in Postpartum Women: A Prospective 1-Year Follow-up Study

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Objective: Personality has been associated with clinical depression in general. However, few studies have investigated personality in relation to postpartum depression, and these studies reported inconclusive findings. Therefore, the present study focused on neuroticism and introversion in the prediction of postpartum depression. **Method:** In a population-based prospective study, women were screened during mid-pregnancy on standard risk factors for depression. In a group of randomly selected women ($n = 277$), neuroticism and introversion were measured at 32 weeks gestation. Clinical depression (Research Diagnostic Criteria) and depressive symptoms (Edinburgh Postnatal Depression Scale) were measured at 32 weeks gestation and at 3, 6, and 12 months postpartum. **Results:** High neuroticism was associated with an increased risk of clinical depression and depressive symptoms during the postpartum period. The combination of high neuroticism *and* high introversion was the only independent predictor of clinical depression across the first year postpartum (odds ratios: 3.08, 4.64, and 6.83 at 3, 6, and 12 months postpartum, respectively, $p <$ .05–.01), even when controlling for clinical depression during pregnancy. History of depression was the only other independent predictor during the early but not during the late postpartum. Inclusion of personality not only significantly improved the detection of women at increased depression risk but also the identification of women with an extremely low depression risk. **Conclusions:** Personality may be an important and stable determinant of postpartum depression. The combination of high neuroticism and high introversion considerably improved the risk estimates for clinical depression across the first year postpartum. **Key words:** personality; prediction; depression; postpartum.

RDC = research diagnostic criteria; **EPDS** = Edinburgh Postnatal Depression Scale; **N** = neuroticism; **I** = introversion; **CPI** = California Psychological Inventory; **DPQ** = Dutch Personality Questionnaire; **CI** = confidence interval.

INTRODUCTION

Nonpsychotic depression is common after childbirth, affecting 10 to 20% of women in the first year postpartum (1–5). A variety of psychosocial factors have been associated with depression in the postpartum period, including history of pathology, psychopathology during pregnancy, poor marital satisfaction, low social support, and stressful life events (6–9). Personality traits like neuroticism and introversion have been associated with depression in nonchildbearing populations (10–14). Neuroticism and introversion-extraversion represent major sources of individual variation in (a) emotionality and (b) sociability and activity level, respectively. A high neuroticism score indicates feelings of tension, emotional liability, and insecurity, and a low score indicates emotional stability. A high introversion score indicates inhibition and shyness in social interactions, and a low score indicates sociability and feelings of competence in social interactions.

However, few studies have examined personality as a determinant of depression after childbirth. Moreover, these studies have produced mixed findings (15–18) attributable to differences in mode (i.e., clinical interview versus self-reported symptoms) and time (i.e., from 6 weeks to 12 months postpartum) of depression assessment (3,16).

Therefore, the present study was designed to address these issues. More specifically, depression was assessed on syndrome (clinical depression) as well as on symptom (self-report) level at three different measurement points in the first year postpartum. In terms of personality, we studied neuroticism and introversion as possible determinants of clinical depression and of depressive symptoms after childbirth.

METHOD

Subjects

The subjects of the present study participated in a longitudinal study of postpartum depression. During mid-pregnancy, women who visited the obstetrician or midwife for antenatal care were invited to complete a screening questionnaire concerning risk factors for depression.

Of 1618 women referred by midwife or obstetrician, 1031 were eligible: Dutch speaking with a term of 20 to 30 weeks pregnancy, living in the vicinity of Tilburg and Eindhoven, having returned a fully completed questionnaire, and having consented to participate in a follow-up study during pregnancy and the postpartum. Screening questionnaires were numbered in correspondence to the order in which they were received, and odd numbers were selected. A group of 339 selected women assessed during pregnancy continued their participation postpartum. Forty-five women (13%) dropped out of the study. Seventeen women had incomplete data and were excluded from the study. Thus, 277 women participated in the present study.

The mean age of these women was 30.8 years (SD = 4.1, range = 19–43); 94% were living with a partner, 1.4% were divorced, and 4.3% were single; 43.8% were primipara and 56.2% multipara. The educational level of this sample was representative for the Dutch population: 1% primary, 76% secondary (general or occupational), and, 23% tertiary (occupational or university) education. The women who dropped out were not different from those who remained in the study in terms of socio-demographic characteristics, personality, or level of depressive symptomatology during mid-pregnancy.

Procedure

At 34 weeks pregnancy, and at 3, 6, and 12 months postpartum, women were visited at home for psychological assessment, including clinical interview and questionnaire components. Personality traits were assessed once, during the interview at 34 weeks pregnancy. Clinical depression and depressive symptoms were measured at all the four assessment points. The study protocol was approved by the Medical Ethical Committees of the St. Joseph Hospital, Veldhoven, and the Two Cities Hospital, Tilburg.

Clinical Diagnosis of Depression

Clinical depression was the primary endpoint in the present study. In accordance with previous research on postpartum depression in The Nether-

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lands (19–22), research diagnostic criteria (RDC) (23) were used for classifying minor/major depressive disorder on the basis of a structured interview implying all relevant criteria. Women were diagnosed with major depression if they fulfilled one core criterion (depressed mood) and at least five of eight additional criteria (loss of appetite/weight, sleep difficulties, fatigue or loss of energy, psychomotor agitation/retardation, loss of interest or pleasure, low self-esteem/inappropriate guilt, difficulty concentrating/indecisiveness, thoughts of suicide) with a duration of at least 2 weeks and significant impairment in functioning. Those women who fulfilled 3 or 4 additional criteria were diagnosed as minor depressed.

Self-Reported Symptoms of Depression

Depressive symptoms were assessed as a secondary endpoint. The Edinburgh Postnatal Depression Scale (EPDS) was used to assess intensity of depressive symptoms (24). The EPDS is a 10-item self-report scale, developed specifically for the assessment of postnatal depressive symptoms. Each item is scored 0 to 3, according to increased severity of symptoms. The EPDS has good psychometric properties (24,25) and has also been validated in The Netherlands (26).

Personality

Two personality traits, neuroticism (N) and introversion (I), were assessed by the Dutch version of the California Psychological Inventory (CPI) (27). This personality scale, which was termed the "Dutch Personality Questionnaire," is a reliable and valid personality measure (28,29). In the present sample, the Cronbach α for the N-scale was 0.85 and for the I-scale 0.87. The emotional stability scale of the Dutch Personality Questionnaire (DPQ) negatively correlates with the neuroticism scale of the Five Factor Personality Inventory (30,31), and the Eysenck Personality Questionnaire (32), $r = -.74$, $r = -.78$, respectively; likewise the DPQ introversion scale correlates negatively with the extraversion- introversion scale of the Five Factor Personality Inventory ($r = -.71$) and the Eysenck Personality Questionnaire ($r = -.70$).

In the present study, the two scales of the DPQ were combined in a 36-item self-report questionnaire with a 3-point response scale (*agree* = 0, ? = 1, *disagree* = 2). Neuroticism and introversion-extraversion represent major sources of individual variation in (a) emotionality and (b) sociability and activity level, respectively. Claridge and Davis (33) examined these traits not as separate variables with unitary linear effects but as possible moderator variables in a so-called "zone analysis" of neuroticism and introversion (34) where these traits modulate each others' role in influencing behavior. This more dynamic analysis can reveal relationships between neuroticism and depression by looking at the possibility that introversion might interact in that relationship.

To address this issue, we used a categorical classification of personality. Subjects scoring in the upper thirds were considered to be high on the corresponding personality trait. Hence, a score of ≥13 on the Neuroticism-scale was used to define high-neuroticism (high N; $n = 82$; 30%), and a score of ≥12 on the Introversion-scale was used to define high-introversion (high I; $n = 92$; 33%). With regard to the combination of neuroticism and introversion, four personality types could be differentiated: (a) high on both (high N-high I; $n = 44$; 16%); (b) high-neuroticism and low-introversion (high N-low I; $n = 38$; 14%); (c) low-neuroticism and high-introversion (low N-high I; $n = 48$; 17%); and (d) low on both (low N-low I; $n = 147$; 53%).

Standard Risk Factors for Depression

During the second trimester of pregnancy, women were screened by means of a questionnaire on the following risk factors for depression: (a) a personal history of depression; (b) a family history of depression; and (c) severe depressive symptomatology during the second trimester of pregnancy (8). The first two factors were each assessed by a single item with a two-point response scale (*yes* versus *no*) as follows: (a) *Did you ever suffer from depression during your life?* (b) *Did anyone in your family (father, mother, brothers or sisters) suffer from depression?* Women with severe depressive symptomatology were identified by using the EPDS > 11 criterion (8,35).

Statistical Analyses

Descriptive statistics were used to analyze the socio-demographic characteristics and the prevalence rates of clinical depression. Logistic regression analyses were used to test whether personality traits were determinants of depression. Differences in prevalence rates of clinical depression among different personality types were explored by χ^2 analysis. Multiple logistic regression analyses were used to test whether personality types were determinants of depression.

To examine whether personality types were independent determinants of clinical depression, we used multiple logistic regression analysis. This analysis was repeated, excluding women who were diagnosed during pregnancy as clinically depressed, to assess the risk of depression during the postpartum prospectively in women who were initially free from depression during pregnancy. The repeated measures multivariate analysis of variance were used to analyze changes in levels of depressive symptoms as a function of personality traits. In post hoc analyses, *t* tests were used to explore the differences in mean scores of depression at symptom level as a function of personality traits.

RESULTS

Prevalence of Clinical Depression

The percentage of women depressed at one or more measurement points during the first postpartum year was 18% ($n = 50$). Point-prevalence rates were 12.6% ($n = 35$), at 34 weeks pregnancy and 10.8% ($n = 30$), 8.7% ($n = 24$), and 7.2% ($n = 20$) at 3, 6, and 12 months postpartum, respectively.

Personality Traits as Predictors of Clinical Depression

Neuroticism and introversion were significantly associated with an increased risk of clinical depression at each measurement point (Table 1). Both personality factors predicted clinical depression (at one or more assessment points) during the first year postpartum (odds ratio = 4.53; 95% CI = 2.39–8.60; $p < .001$, odds ratio = 1.95; 95% CI = 1.05–3.64; $p = .034$, respectively).

Personality Types as Predictors of Clinical Depression

Prevalence rates of clinical depression of the four combinations of personality traits are presented in Figure 1. Within the group of low N women, there were no significant differences in prevalence rates between women who scored high on introversion (high I) or low on introversion (low I). Hence, pooling of women in one low N group for further analyses was justified. Prevalence rates of depression were significantly higher in the high N-high I women compared with the low N women at 3, 6, and 12 months postpartum. Also, significantly higher prevalence rates were found in the high N-low I women compared with the low N women at 3 and 12 months postpartum but not at 6 months (Figure 1).

Moreover, of the two high N personality types, high N-high I was the only predictor of clinical depression across the whole first year postpartum (Table 1). Both personality types high N-high I and high N-low I predicted clinical depression (at one or more assessment points) during the first year postpartum (odds ratio = 5.74; 95% CI = 2.70–12.17; $p < .001$ and odds ratio = 3.37; 95% CI = 1.46–7.78; $p < .01$, respectively).

TABLE 1. Clinical Depression During the First Year Postpartum ($N = 277$) on a Function of Personality Traits and Types

	Clinical Depression (Major and Minor, Research Diagnostic Criteria)					
	3 Months Postpartum		6 Months Postpartum		12 Months Postpartum	
	OR	95% CI	OR	95% CI	OR	95% CI
Personality traits†						
Neuroticism	4.29***	1.96 to 9.43	3.81**	1.61 to 8.98	8.50***	2.98 to 24.30
Introversion	2.57*	1.19 to 5.53	2.60*	1.12 to 6.06	3.32*	1.31 to 8.43
Personality types‡						
High neuroticism–low introversion	2.86*	1.01 to 8.16	2.18	0.65 to 7.34	5.76**	1.57 to 20.98
High neuroticism–high introversion	5.71***	2.36 to 13.83	5.44***	2.10 to 14.07	11.17***	3.60 to 34.70

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

† Logistic regression.

‡ Multiple logistic regression. Figure 1 showed that there were no significant differences within the N-low group on prevealence rates of depression. Therefore women were pooled in one low N group. Further analyses focused on three personality types: 1) Low N, 2) High N-low I, 3) High N-high I. The Low-N group was the reference group in multiple logistic regression.

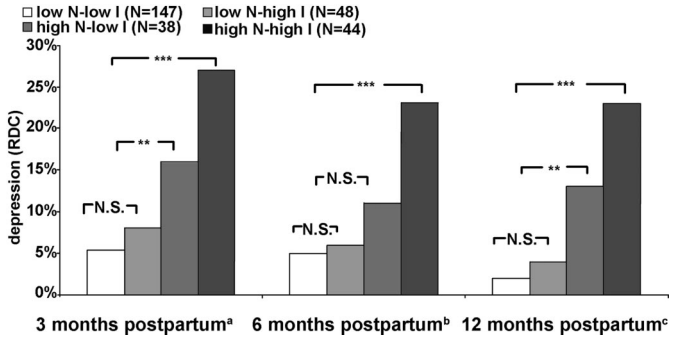

Figure 1. Prevalence rates of clinical depression as a function of four personality types. Note: **$p < .01$, ***$p < .001$. N = neuroticism, I = introversion. **A**, low N–low I versus low N-high I: $\chi^2 = 0.52$, $df = 1$, $p = .469$; low N-low or high I versus high N-low I: $\chi^2 = 4.14$, $df = 1$, $p = .042$; low N-low or high I versus high N-high I: $\chi^2 = 17.72$, $df = 1$, $p < .001$. **B**, low N-low I versus low N-high I: $\chi^2 = 0.16$, $df = 1$, $p = .685$; low N-low or high I versus high N-low I: $\chi^2 = 1.64$, $df = 1$, $p = .200$; low N-low or high I versus high N-high I: $\chi^2 = 14.50$, $df = 1$, $p < .001$. **C**, low N-low I versus low N-high I: $\chi^2 = 0.65$, $df = 1$, $p = .418$; low N-low or high I versus high N-low I: $\chi^2 = 8.69$, $df = 1$, $p = .003$; low N-low or high I versus high N-high I: $\chi^2 = 24.81$, $df = 1$, $p < .001$.

Independent Predictors of Clinical Depression

Multiple logistic regression analyses showed that after controlling for other risk factors of depression, high N-high I was the only independent predictor of clinical depression across the first year postpartum (Table 2). A personal history of depression was the only other factor significantly associated to clinical depression but only at 3 months postpartum. Next, these analyses were repeated, excluding women diagnosed as clinically depressed during late pregnancy. This was done to examine the risk factors associated with the onset of clinical depression during the postpartum in women who were not clinically depressed during pregnancy ($n = 242$). Those women with a personal history of depression were at increased risk for the onset of depression but only during the early postpartum (odds ratio = 3.67; 95% CI = 1.31–10.28; $p = .013$). Once again, women with a high score on neuroticism and introversion were at increased risk for the onset of depression both during the early and late postpartum period (odds ratio = 4.78; 95% CI = 1.48–15.44; $p = .008$, odds ratio = 5.65; 95% CI = 1.45–22.01; $p = .013$, odds ratio = 9.24; 95% CI = 2.17–39.48; $p = .003$ at 3, 6, and 12 months, respectively).

History of Depression and Personality as Predictors of Clinical Depression

To examine the combined effect of both independent predictors of postpartum depression, women were stratified by personal history of depression (*yes/no*) and high-risk person-

TABLE 2. Independent Predictors of Clinical Depression During the First Year Postpartum ($N = 277$)

	Depression (Major and Minor, Research Diagnostic Criteria)					
	3 Months Postpartum		6 Months Postpartum		12 Months Postpartum	
	OR	95% CI	OR	95% CI	OR	95% CI
High neuroticism-high introversion	3.08*	1.10–8.63	4.64**	1.65–13.16	6.83**	1.97–23.74
Personal history of depression	4.84**	1.88–12.55	1.65	0.64–4.25	2.17	0.73–6.44
High neuroticism-low introversion	1.58	0.51–4.93	1.82	0.51–6.48	3.75	0.96–14.74
Family history of depression	1.60	0.67–3.85	1.19	0.45–3.13	0.76	0.25–2.35
Depressive symptoms during mid-pregnancy†	2.10	0.82–5.37	1.22	0.39–3.21	2.63	0.90–7.69

* $p < .05$, ** $p < .01$.

† EPDS = Edinburgh Postnatal Depression Scale > 11.

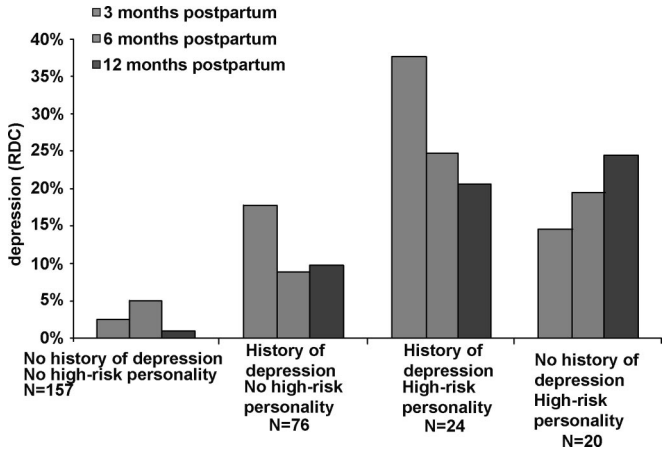

Figure 2. Prevalence rates of Depression (RDC, **A**) in Women With or Without a Personal History of Depression (**B**) in Combination With or Without a High-risk Personality (**C**). Note: **A**, RDC = research diagnostic criteria; **B**, No personal history of depression (self-reported); **C**, High-risk personality = high-neuroticism in combination with high-introversion.

ality (high N-high I/other). Prevalence rates of depression were higher in the group of women with both a history of depression and high-risk personality compared with the group of women with a history of depression but no high-risk personality (37.5% versus 18.4%; $p = .053$, 25% versus 9.2%; $p = .045$; 20.8% versus 10.5%; $p = .191$, respectively, at 3, 6, and 12 months postpartum (Figure 2, subgroups 2 and 3). Only at 6 months were differences in prevalence rates between the two groups significant. Hence, addition of high-risk personality to a history of depression increases the risk for clinical depression at 6 months postpartum. Moreover, by not taking personality into account, an important group of women at increased risk (i.e., no history of depression but high-risk personality) would be missed in depression screening. This is especially noteworthy for depression during the late postpartum (Figure 2, subgroup 4). Of the 20 women who were clinically depressed at 12 months postpartum, 25% were women with a high-risk personality but no history of depression.

At 3, 6, and 12 months postpartum, women with no history of depression and no high risk personality were significantly less likely to be at risk for clinical depression than women with no history of depression but with a high-risk personality (2.5% versus 15%, $p = .007$; 4.5% versus 20.0%, $p = .007$; 1.3% versus 25%, $p < .001$, respectively; Figure 2, subgroups 1 and 4).

Accordingly, the addition of personality type in risk stratification did not only add to the detection of women at increased risk but also enhanced the identification of a large group of women with an extreme low depression risk.

Personality Traits as Predictors of Depressive Symptoms

On symptom level, repeated measures multivariate analysis of variance showed a main effect of time ($F = 4.12$ [2, 271], $p = .02$), i.e., in the total group there was a significant decrease in depressive symptoms. There was a main effect of neuroticism and introversion; ($F = 66.27$ (1, 272), $p < .001$; $F = 6.612$ (1, 272), $p = .01$, respectively) but no significant personality × time interaction effects, indicating that neuroticism and introversion were stable predictors of the depressive symptom level across the first year postpartum. There was no significant neuroticism × introversion interaction effect. At each measurement, high neuroticism and high introversion were significantly related to higher levels of depressive symptoms (Table 3). Hence, personality was not only a significant predictor of clinical depression but also of self-reported symptoms.

DISCUSSION

Personality was a stable determinant of both clinical depression and depressive symptoms in the first year postpartum. Introversion contributed to the association between neuroticism and depression; i.e., women scoring high on both neuroticism *and* introversion (high N-high I) were at 4- to 6-fold increased risk for clinical depression. High N-high I was the only independent and stable predictor of clinical depression across the whole first year postpartum. Moreover, high N-high I was clearly a better predictor of clinical depression than history of depression (the other independent predictor) especially on the long-term. Addition of high N-high I to a previous history of depression enhanced the identification of women at increased risk as well as the identification of women with an extreme low depression risk.

These findings are consistent with the emerging role of personality as a vulnerability factor for depression in other

TABLE 3. Depressive Symptoms During the First Year Postpartum ($N = 277$) as a Function of Personality Traits

Personality Traits	N	Depressive Symptoms (Edinburgh Postnatal Depression Scale)								
		3 Months			6 Months			12 Months		
		Mean	SD	*t* value	Mean	SD	*t* value	Mean	SD	*t* value
Neuroticism										
High	195	7.89	4.81	−6.99*	6.91	4.39	−6.91*	7.26	4.88	−8.20*
Low	82	4.06	3.85		3.42	3.57		3.17	3.57	
Introversion										
High	195	6.71	5.20	−4.05*	5.75	4.55	−3.91*	5.69	4.65	−3.74*
Low	82	4.55	3.92		3.81	3.78		3.73	3.81	

* $p < .001$.

populations (10,11,36–38). Individuals high on neuroticism *and* introversion are at risk for depressive symptoms (39,40), including depressive symptoms in cardiac patients (41). In childbearing women, however, others have reported mixed findings (15–18). One explanation for these inconclusive findings might be the difference between studies in methods of measuring depression at syndrome level by clinical interviews or at symptom level by self-reports (3). Another explanation might be that the association between neuroticism and depression depends on the time of assessment during the postpartum varying from 6 weeks to 12 months across studies (16). We found evidence that personality predicted depression in the postpartum, regardless of mode or time of assessment. Personality also predicted the onset of depression in women who initially were not depressed during pregnancy. Hence, failure to account for personality may lead to inaccurate risk estimates of depression in the postpartum period.

The strengths of this study are its prospective design over a 1-year period and the repeated assessment of depression at syndrome and symptom level. Of course this study has a number of limitations. First, in accordance with previous research on postpartum depression in The Netherlands (19–22), clinical depression was diagnosed according to the Research Diagnostic Criteria (RDC). Therefore, it is difficult to generalize our present findings on clinical depression to the more current DSM-IV or ICD criteria. Second, one might argue that this personality-depression relationship is spurious because depression during pregnancy might have influenced personality assessment. Some investigators have suggested that personality measures might be state-dependent (42,43), but others have found that neither past nor current depression had significant impact on personality assessment (44–47). Not much is known about the use of the DPQ in depressed populations. Therefore, we controlled for depression at the time of personality assessment. Even when women clinically depressed during pregnancy were excluded, the combination of high N-high I still predicted clinical depression at 3, 6, and 12 months postpartum. These findings support the use of the DPQ in the present study, although more information is needed about the validation of the DPQ in pregnant depressed women. Third, this study focuses on the relationship between personality and postpartum depression. Although we controlled for stable predictors of depression in general, we have not taken into account potential powerful risk factors such as concurrent life events, social support, and quality of the marital relationship (3) or other personal and environmental factors that may influence the personality-depression relationship in postpartum women.

The findings of this study have important clinical implications. Personality assessment in the psychosocial screening of women at risk for postpartum depression is not common in obstetrical practice. Inclusion of personality may significantly improve this screening. Our findings also suggest that to improve the recognition of postpartum depression, it is important to screen women for depression during the first months but also during the late postpartum period. Moreover, treatment of postpartum depression should not only be focused on postpartum related issues but also on patient related issues such as personality. To improve the care for women in obstetrics, depression screening and care management interventions (48) are necessary.

High neuroticism in combination with high introversion was a stable predictor of clinical depression across the whole first year postpartum. It is now time that personality be included in the early identification of those women who are at increased risk for depression in the postpartum period.

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