
TREATMENT OF POSTPARTUM DEPRESSION IN MOTHERS: SECONDARY BENEFITS TO THE INFANTS

SHERRYL H. GOODMAN, MICHELLE R. BROTH, CHRISTINE M. HALL,
AND ZACHARY N. STOWE

Emory University

ABSTRACT: This study examined the quality of mother–infant interaction and levels of perceived stress and parenting efficacy in association with mothers' levels of depression among mothers with significant depressive symptoms during the postpartum period, who were followed prospectively during treatment, and their infants less than 6 months old. Mothers with postpartum depression ($n = 19$) were treated with medication, and the mothers were observed with their infants prior to treatment and 3 and 6 months later. A comparison group of nondepressed mothers ($n = 25$) was included to control for the normal developmental changes associated with the postpartum period. The depressed women experienced a significant reduction in depressive symptoms and did not differ significantly from well mothers 6 months after beginning treatment. Despite initial levels of parenting quality and depression, mothers' reduced levels of depression, after 12 weeks of treatment, were associated with improvements in the quality of their interactions with their infants and with improvements in their infants' quality of play. For both perceived stress and parenting efficacy beliefs, both depressed and well mothers showed a significant improvement from the initial to the 12-week visit, and there were no significant differences between depressed and well mothers' perceived stress or efficacy beliefs at the 12-week visit. Depression at the 12-week visit did not predict perceived stress or efficacy beliefs beyond the variance accounted for by initial levels of those variables and depression. The impact of reducing levels of maternal depression symptoms supports theoretical models of the role of parenting in the association between maternal depression and child functioning. Further, these findings support the benefits to infants of reducing depression in mothers.

RESUMEN: Este estudio examinó la calidad de la interacción madre-infante y los niveles de percepción de la tensión emocional y la eficacia de la crianza en asociación con los niveles de depresión de las madres,

Sherryl H. Goodman, Michelle R. Broth, and Christine M. Hall, Department of Psychology; Zachary N. Stowe, Department of Psychiatry and Behavioral Sciences, Emory University, Atlanta, GA. Michelle Broth is now at the Department of Psychiatry and Behavioral Sciences, Emory University School of Medicine, Atlanta, GA. Christine Hall is now at the Maternal Substance Abuse Project, Department of Psychiatry and Behavioral Sciences, Emory University School of Medicine, Atlanta, GA. This research was supported by an Emory University Research Committee Grant (Treatment of Depression in Mothers: Secondary Benefits to the Children) awarded to S.H. Goodman. We gratefully acknowledge the assistance of the participants, Lynne Raynor (an honors student whose thesis was based on some of the preliminary findings from this study), Erin Tully (who helped immensely with the ratings), and many other undergraduate research assistants. Portions of the findings described here were presented at the meeting of the Society for Research in Child Development, Tampa, FL, April 24–27, 2003. Direct correspondence to: Sherryl H. Goodman, Department of Psychology, 532 Kilgo Circle, Emory University, Atlanta, GA 30322; e-mail: psyysg@emory.edu

INFANT MENTAL HEALTH JOURNAL, Vol. 29(5), 492–513 (2008)

© 2008 Michigan Association for Infant Mental Health

Published online in Wiley InterScience (www.interscience.wiley.com).

DOI: 10.1002/imhj.20188

entre madres con síntomas considerables de depresión durante el período posterior al parto, a las cuales se les dio seguimiento de manera esperada durante el tratamiento, y sus infantes de menos de seis meses de nacidos. Las madres con depresión posterior al parto ($n = 19$) fueron tratadas con medicamentos, y se les observó con sus infantes con anterioridad al tratamiento y a los tres y seis meses más tarde. Se incluyó un grupo de comparación de madres no depresivas ($n = 25$) para que sirviera de control en cuanto a los cambios normales de desarrollo asociados con el período posterior al parto. Las mujeres depresivas experimentaron una reducción significativa en los síntomas depresivos y no difirieron significativamente de las otras madres seis meses después del inicio del tratamiento. A pesar de los niveles iniciales en cuanto a la calidad de la crianza y la depresión, los reducidos niveles de depresión de las madres, después de 12 semanas de tratamiento, se asociaron con mejoramientos en la calidad de sus interacciones con sus infantes y mejoramientos en la calidad del juego de sus infantes. Con respecto a lo que se creía de la percibida tensión emocional y la eficacia de la crianza, ambos tipos de madres mostraron un significativo mejoramiento desde la primera hasta la visita a las 12 semanas, y no se dieron significativas diferencias en la percepción de la tensión emocional y lo que se creía sobre la eficacia entre las madres depresivas y las del grupo de control al momento de la visita de la semana 12. La depresión al momento de la visita de la semana 12 no predijo la percepción de la tensión emocional ni lo que se creía de la eficacia más allá de la variación que se atribuyó a los niveles iniciales de dichas variables y de la depresión. El impacto de reducir los niveles de los síntomas de depresión maternos apoya los modelos teóricos del papel de la crianza en la asociación entre la depresión maternal y cómo se desenvuelve el niño. Es más, estos resultados apoyan los beneficios de reducir la depresión en las madres para los infantes.

RÉSUMÉ: Cette étude a examiné la qualité de l'interaction mère-nourrisson et les niveaux de stress perçu et d'efficacité de parentage associés aux niveaux de dépression au sein des mères avec des symptômes dépressifs importants durant la période postpartum, qui étaient suivies prospectivement durant le traitement, et leurs nourrissons de moins de six mois. Les mères avec la dépression postpartum ($n = 19$) ont été traitées avec des médicaments, et les mères ont été observées avec leurs nourrissons avant le traitement et trois et six mois plus tard. Un groupe de comparaison de mères non déprimées ($n = 25$) a été inclus pour contrôler les changements normaux en matière de développement liés à la période postpartum. Les mères non déprimées ont expérimenté une réduction importante des symptômes dépressifs et n'ont pas différé de manière importante des mères non déprimées six mois après avoir commencé le traitement. En dépit des niveaux initiaux de qualité de parentage et de dépression, les niveaux réduits de dépression des mères, après 12 semaines de traitement, ont été liés aux améliorations de la qualité de leurs interactions avec leurs nourrissons et avec les améliorations de la qualité de jeu de leurs nourrissons. Pour ce qui concerne à la fois le stress perçu et les croyances d'efficacité de parentage, à la fois les mères déprimées et les mères non déprimées ont fait preuve d'une amélioration importante du moment initial à la visite de 12 semaines, et il n'y avait pas de différences importantes entre les mères déprimées et les mères non déprimées pour ce qui concerne le stress perçu ou les croyances d'efficacité à la visite de 12 semaines. La dépression à la visite de 12 semaines n'a pas constitué de facteur de prédiction pour le stress perçu ou les croyances d'efficacité au delà de la variance établie par les niveaux initiaux de ces variables et de la dépression. L'impact de la réduction des niveaux des symptômes de dépression maternelle soutient les modèles théoriques du rôle du parentage dans le lien entre la dépression maternelle et le fonctionnement de l'enfant. De plus ce résultats soutiennent les bénéfices de la réduction de la dépression chez les mères pour les nourrissons.

ZUSAMMENFASSUNG: Diese Studie untersuchte die Qualität von Mutter-Kleinkind Interaktionen, den Grad des wahrgenommenen Stresses sowie die elterliche Wirksamkeit in Verbindung mit dem Schweregrad der mütterlichen Depression, bei Müttern mit signifikant depressiven Symptomen nach der Geburt ihres Kindes, die prospektiv begleitet wurden und deren Säuglinge weniger als 4 Monate alt waren. Die Mütter mit

Wochenbettdepressionen ($n = 19$) wurden medikamentös behandelt sowie zusammen mit ihrem Säugling vor-, sowie 3 und 6 Monate nach der Behandlung beobachtet. Eine Vergleichsgruppe von nicht depressiven Müttern ($n = 25$) wurde zur Kontrolle der altersentsprechenden kindlichen Entwicklungsveränderungen nach der Geburt in die Studie aufgenommen. Die depressiven Mütter hatten eine signifikante Reduzierung ihrer depressiven Symptome und unterschieden sich 6 Monate nach der Behandlung nicht signifikant von den gesunden Müttern. Trotz der Unterschiede des elterlichen Umgangs mit ihren Kind und dem unterschiedlichen Grad der mütterlichen Depression zu Beginn der Behandlung, verbesserte sich nach 12 Wochen Behandlung die Depressionen, was auch die elterliche Interaktion mit dem Säugling und die kindliche Spielqualität besserte. Nach 12 Wochen Behandlung verringerte sich der wahrgenommene Stress, sowie die elterliche Effizienz signifikant und zwar sowohl in der Gruppe der depressiven- als auch der gesunden Mütter. Es zeigte sich kein signifikanter Unterschied der depressiven und gesunden Mütter bezüglich ihrer Einstellungen gegenüber wahrgenommenem Stress und elterlichen Effizienz. Nach 12 Wochen zeigte die Depression keinen Einfluss auf die elterliche Einstellungen bezüglich Stress und Effizienz, selbst bei Berücksichtigung der anfänglichen Unterschiede. Die Bedeutung der Verbesserung der mütterlichen Depression beeinflusst positiv theoretische Modelle, die die elterliche Rolle in Bezug auf Depression und kindliche Entwicklung beschreiben. Darüber hinaus unterstützen die Ergebnisse den positiven Effekt, den Säuglinge, auf die Reduktion der mütterlichen Depression haben.

抄録: この研究では、産褥期に深刻な抑うつ症状があった母親の抑うつレベルとの関連で、母親-乳幼児の相互交流の質と認知されたストレス、そして養育の有効性が調べられた。その母親は治療中に前向きに追跡され、彼女たちの乳児は6か月未満だった。産褥うつ病の母親 ($n = 19$) は、薬物療法を受けた。そして母親たちは、治療前、3か月後と6か月後に、乳児と共に観察された。抑うつではない母親の比較群 ($n = 25$) が、産褥期に伴う正常な発達上の変化を対照するために、研究に含められた。うつ病の女性に抑うつ症状の有意な減少を経験し、治療開始後6か月には、健康な母親と有意な差がなかった。初期の養育の質と抑うつレベルにもかわらず、12週間の治療後の抑うつレベルの減少は、母親の乳幼児との相互交流の質の改善、および乳児のプレイの質の改善と関連していた。認知されたストレスと養育の有効性の信念 efficacy beliefs の両方については、抑うつ母親と健康な母親の両者が、初期から12週目の訪問にかけて有意な改善を示した。そして、12週目の訪問では、認知されたストレスあるいは有効性の信念について、抑うつ母親と健康な母親の間に有意な差がなかった。12週目の訪問での抑うつは、認知されたストレスあるいは有効性の信念の変数と抑うつ初期レベルによって説明される分散を越えては、認知されたストレスあるいは有効性の信念を予測しなかった。母親の抑うつ症状レベルの減少の影響は、母親の抑うつと子どもの機能との間の関係における養育の役割の理論的モデルを支持する。さらに、これらの所見は、母親の抑うつを減少させることが乳児に与える利益を支持する。

* * *

The childbearing years represent a time of enhanced vulnerability for the development of depression in women (Weissman, 1987). The postpartum period has historically been viewed as a period of increased risk, with 10 to 15% of women experiencing a major depression after the birth of a child (O'Hara & Swain, 1996). Postpartum depression is of particular concern given the potential adverse implications for the infants as a result of mothers' impaired ability to care for and interact with their infants. Although some women with postpartum depression spontaneously recover within a few months, many postpartum women are still depressed 1 year after childbirth (O'Hara, 1997). One unanswered question, which is the focus of this study, is the extent to which reductions in mothers' levels of depression are associated with improvements in the quality of interactions with their infants. Do infants benefit secondarily as their mothers become less depressed?

A broad literature has demonstrated that maternal depression is associated with increased rates of behavior problems, social-emotional maladjustment, and deficits in cognitive-intellectual functioning in offspring, from infancy through adolescence (Goodman, 2007). In particular, a substantial body of evidence gathered over the past two decades provides a strong indication of the negative outcomes to infants of depressed mothers. Infants with depressed mothers have been observed to be more tense, less happy, and more distressed, to score lower on the Bayley Scales of Infant Development, and to have higher rates of insecure attachment than do infants of nondepressed mothers (Cohn & Campbell, 1992; Field, 1992; Lyons-Ruth, Connell, Grunebaum, & Botein, 1990; Radke-Yarrow, Cummings, Kuczynski, & Chapman, 1985; Whiffen & Gotlib, 1989). The effect sizes for the association between maternal depression and child functioning are stronger for younger children, further underscoring the need to study infants exposed to maternal depression (Connell & Goodman, 2002). Infants may be more vulnerable to the adverse experiences associated with having a depressed mother relative to older children who have developed competencies that prepare them for successful coping (Sroufe & Rutter, 1984).

Given the maladaptive child outcomes associated with maternal depression, it is essential to examine the mechanisms by which maternal depression transmits such risk. One of the potential mechanisms for the transmission of risk from depressed mothers to their young children is impaired parenting (Goodman & Gotlib, 1999). Parenting of infants by depressed mothers has been observed to be less optimal than that of well mothers, as noted in a meta analysis (Lovejoy, Graczyk, O'Hare, & Neuman, 2000). Researchers have found depressed mothers to be less contingently responsive, less warm, more neglectful, more unresponsive, and more uninvolved relative to nondepressed mothers. A burgeoning literature has demonstrated the adverse impact of depression on mother–infant interaction and on infant well-being.

Despite the clear association between maternal depression and impaired parenting, less is known about whether such adverse parenting persists in the face of mothers' recovery from depression. Remittance from postpartum depression, whether spontaneously or treatment-related, provides an opportunity to at least indirectly test the importance of parenting as one of the mechanisms in the transmission of risk from depressed mothers to their children (Goodman & Gotlib, 1999). Although some literature has suggested that remittance of depression does not completely alleviate the risk to children, treatment of mothers' depression may improve parenting and, hence, infant well-being. Most studies of infants with depressed parents have been cross-sectional and did not control for treatment, which does not allow this hypothesis to be tested.

In the relatively smaller number of studies of infants or toddlers with depressed mothers that included a longitudinal component, most found that children's problems persist despite the mothers' remission or recovery from depression. For example, A.D. Cox, Puckering, Pound, and Mills (1987) conducted a 6-month follow-up of 2-year-old children whose mothers had been depressed and found that the children of the recovered mothers showed fewer disturbances than did the children of nonremitted mothers, but greater disturbances than did the children of control mothers who had never been depressed. Similarly, Ghodsian, Zayicek, and Wolkind (1984) followed 14-month-olds with depressed mothers into the preschool period and found that earlier maternal depression was predictive of behavior problems even when the mother's depression had remitted by the preschool period. In addition, Alpern and Lyons-Ruth (1993) examined parent- and teacher-rated child behavior problems of low-income 4- to 6-year-old children who had been studied previously when the children were 18 months old. Both the group of children whose mothers were depressed at both times and the group whose mothers were previously, but

not currently, depressed had more behavior problems than did the children with never-depressed mothers. Similarly, Coghill, Caplan, Alexandra, Robson, and Kumar (1986) found that maternal depression during the first postpartum year predicted lower cognitive ability at 4 years of age regardless of the mother's depression status when the child was 4 years old. Finally, Stein et al. (1991) found that 19-month-olds whose mothers had recovered from depression that had occurred during the first postnatal year showed lower quality interaction with their mothers and with a stranger than did children whose mothers had never been depressed.

Thus, several studies have found that infants exposed to their mothers' depression, studied over time, continue to show more emotional and behavioral problems and lower cognitive abilities even when their mothers recover, relative to infants who had never been exposed to maternal depression. The question remains, then, as to why such problems persist in children and whether the impaired parenting associated with maternal depression continues beyond depression remission and thus serves as a mechanism of continued risk. The present study was designed to address that question.

To the extent that parenting quality does improve with depression remission, children may benefit accordingly. Campbell, Cohn, and Meyers (1995), for example, found that mothers who were depressed 2 months' postpartum but whose depression remitted by 6 months were significantly more positive and more competent in feeding their infants relative to mothers whose depression was chronic through 6 months' postpartum. Further, the infants in the depression-remission group were significantly more positive in face-to-face interactions with their mothers than were those whose mothers remained depressed, although they did not differ significantly in terms of negative interaction or in the quality of engagement with their mothers in toy play. In addition, Field (1992) reported that of mothers who had been depressed early in the postpartum period, 75% of the women continued to have symptoms at 6 months' postpartum; but of the others who were no longer depressed when the infants were 6 months old, the infants did not display a "depressed" style of interaction or have lower Bayley mental and motor scale scores at 1 year of age (Field, 2002).

Although the latter findings suggest that depression remission is related to improved quality of parenting or improved infant behavior, that conclusion may be specific to depression that occurs in and is limited to the immediate postpartum period (i.e., it is not chronic). In contrast, for the most part, the longitudinal studies suggest a need to be concerned about children whose mothers had been depressed, even among those who have recovered. An outstanding question is whether recovery may be unrelated to improvement in the quality of parenting, which may explain children's ongoing problems.

What is typically missing from this body of literature is information on treatments the mothers may or may not have received during the course of the study. Relative to those more naturalistic studies, investigations that have included an active maternal treatment component and mother-infant assessments provide an opportunity to more directly test the hypothesis that parenting is one of the mechanisms in the transmission of risk from depressed mothers to their children (Goodman & Gotlib, 1999), although there are few such studies. O'Hara, Stuart, Gorman, and Wenzel (2000) completed a controlled trial of interpersonal psychotherapy in postpartum women with major depression, which they found to be effective in reducing levels of depression. They also found significant improvement on self-report measures of mothers' relationships with their children associated with interpersonal psychotherapy, even though the women did not achieve the levels typical of women with no history of depression. Similarly, Cooper and Murray (1997), with a community sample screened for depression, found that treated

mothers (randomly assigned to either nondirective counseling, cognitive-behavioral therapy, or dynamic psychotherapy), despite significant improvement in mood, were not observed to differ from untreated mothers or early remission mothers either on sensitive–insensitive or intrusive–withdrawn dimensions in face-to-face interactions with their infants. However, these studies may have been restricted in their ability to find an impact of treatment on parenting in that the initial level of disturbances in parenting in this community sample was relatively minor. In a third study, Fleming, Klein, and Corter (1992) investigated a community sample of depressed women who were treated with group therapy. Despite limited changes in ratings of depression, the treated mothers made more noninstrumental approaches to their infants, and the infants decreased in amounts of crying and increased in noncry vocalizations. Although all three of these studies relied on psychotherapy as the mode of treatment, antidepressant medications also are effective in the treatment of depression (Hollon, Thase, & Markowitz, 2002). Yet, no studies have reported associations between medication-based treatments for postpartum depression and changes in the quality of mother–infant interaction, which is important to examine since some women opt for pharmacological treatment either alone or as an adjunct to psychotherapy for their postpartum depression. This article contributes to the literature by extending such work to the study of women receiving medication as the primary treatment for their postpartum depression.

Overall, data from both longitudinal studies of the impact of maternal depression on children's development and studies of treatment-related parenting correlates in mothers with depression suggest that maternal depression has acute and potentially long-term sequelae for the child, yet the factors mediating these effects on children in women treated for postpartum depression remain relatively obscure (Goodman & Gotlib, 1999). Certainly, the alterations noted in the offspring as well as the qualities of parenting associated with maternal depression may reflect a contribution of heritability. Further, although most researchers focus on the potential mechanism of quality of mothers' parenting in the transmission of risk from depressed mothers to their children, other possible mechanisms are maternal stress and self-efficacy beliefs (Goodman & Gotlib, 1999), both of which have been found to be related to postpartum depression (O'Hara & Swain, 1996; Teti & Gelfand, 1991). Thus, other ways in which treatment-related or spontaneous remission from depression may reduce risk to infants is by decreasing mothers' perceived stress and increasing their self-efficacy beliefs. Depressed mothers' perceptions of stress in their lives and their feelings of self-efficacy in the parenting role may be important additional considerations in efforts to understand associations between reductions in levels of postpartum depression and changes in mother–infant interaction. Given cognitive biases and perceptual distortions associated with depression, treatment might be associated with changes in perceptions of stress and of self-efficacy. Moreover, mothers who perceive less stress in their lives and who feel more effective in their role as parents might be better interaction partners for their infants.

The purpose of this study was to focus on a population of women with significant levels of depressive symptoms during the postpartum period followed prospectively during treatment. These data allowed examination of two variables that might be related to persistence or recovery of the early problems in infant development associated with depression in mothers: (a) the mothers' reduction in depression symptoms and (b) an improvement in the quality of the interaction between mothers and their infants. We also examined whether reduction in mothers' depression symptoms was associated with lowered levels of perceived stress and increased levels of perceived parenting efficacy. Along with improvement in the quality of mothers' interaction with their infants, either of these factors also might mediate associations between decrease in

maternal depression and children returning to a path of healthy development. Although testing a mediating role was beyond the scope of this article, the findings would be a first step in indicating the extent to which these maternal variables might be important components of such a model.

METHOD

Participants

Participants were 19 depressed and 25 well mothers and their infants (60% male) who ranged in age from 1 to 6 months of age ($M = 3.5$ months, $SD = 1.67$) at the study entry. The Emory Women's Mental Health Program (WMHP), a tertiary center for the treatment of mental illness during pregnancy and the postpartum period, referred all of the depressed women. The non-depressed, postpartum women were community volunteers recruited through a list of families willing to consider participating in psychological research. All women in the depressed group met diagnostic criteria for a major depressive disorder; none of the women in the control group met criteria for any depressive or other Axis I disorder. The Structured Clinical Interview for *DSM-IV* (SCID; First, Spitzer, Gibbon, & Williams, 1995), used to determine diagnostic status, was completed by advanced graduate students who were unaware of the women's diagnostic or treatment status. The depressed group received all treatment through a psychiatrist at the WMHP (the fourth author, Z.N.S.).

Study entry criteria included: (a) >17 years of age, (b) term delivery of a healthy infant in the past 6 months, (c) had continuously lived with their babies in the same household, and (d) provided informed consent. Women with any serious medical condition, drug or alcohol abuse, or nondepressive primary psychiatric disorder were excluded. Mothers on average were 30.6 years of age ($SD = 5.78$), had completed college (79%), were married (90%), and had a median household income in the level of \$41,000 to 50,000. Most of the women (85%) were White; the others were African American. For most of the women (67.4%), this infant was their first child. The depressed and well women did not differ significantly on any of these sociodemographic characteristics nor on the age or sex of their infants.

Procedure

All women provided informed consent and completed the SCID interview. Women completed the Beck Depression Inventory (BDI; Beck, 1987; Beck, Ward, Mendelsohn, Mock, & Erbaugh, 1961), the Perceived Stress Scale (PSS; S. Cohen, Kamarck, & Mermelstein, 1983), and a measure of their parenting efficacy beliefs; they also were observed and videotaped in the mother-child interactions at study entry and 12 weeks later. Although the primary analyses were conducted based on those two visits, a subset of mothers were willing to participate in a follow-up visit 24 weeks after study entry (6 months after beginning treatment for the depressed mothers), and the same procedure was repeated. Sixteen (84%) depressed mothers and 23 (92%) nondepressed mothers participated in the follow-up; there were no significant differences between those who participated in the follow-up and those who did not on levels of depression, perceived stress, perceived efficacy, quality of mother-infant relationship at the first two visits, age of mother, age of infant, income level, marital status, or race/ethnicity. Raters were blind to the treatment status of the mother (i.e., whether they were observing a depressed or well mother) and the time of the observation (i.e., an initial, 12-, or 24-week visit).

The depressed women participated in a 12-week open trial of antidepressant treatment combined with biweekly sessions providing support and education (Stowe, Casarella, Landry, & Nemeroff, 1995). Prior personal treatment history, breast-feeding status, and tolerability determined the selection of the antidepressant. All maternal daily doses were adjusted clinically based on side effects and response. Selective serotonin reuptake inhibitors were prescribed to all but 1 of the women (95%): Sixty-five percent received sertraline (Zoloft), 18% received fluoxetine (Prozac), and 12% received paroxetine (Paxil). The remaining woman received venlafaxine (Effexor).

Measures

Maternal Depression. Interviewers using the SCID (First et al., 1995) confirmed that all women in the depressed group met diagnostic criteria for Major Depressive Disorder (MDD), and none of the women in the well group met criteria for MDD or any other Axis I disorder. All mothers completed the BDI (Beck, 1987; Beck, Ward, Mendelsohn, Mock, & Erbaugh, 1961), a self-report measure of level of severity of current depression symptoms. The measure contains 21 items that respondents rate on a scale of 0 (*I do not feel sad*) to 3 (*I am so sad or unhappy that I can't stand it*) to describe how they have been feeling in the past week. Total scores range from 0 to 63, with higher scores indicating more severe depressed mood. The BDI has been widely used with both patients and nonpatients, and has been shown to have good internal consistency, discriminant validity, and construct validity and high correlations with other questionnaire and clinical ratings of depression (Beck, Steer, & Garbin, 1988) that focus on the preceding 7 days. Recent studies have shown the BDI to be valid for postpartum women and comparable to the Edinburgh Postnatal Depression Scale (J.L. Cox, Holden, & Sagovsky, 1987; Huffman, Lamour, Bryan, & Pederson, 1990; Lussier, David, Saucier, & Borgeat, 1996; Steer, Scholl, & Beck, 1990), although it may be insensitive to minor depression (Whiffen, 1988).

Maternal Stress Maternal stress was measured with the PSS (S. Cohen, Kamarck, & Mermelstein, 1983). This 14-item self-report scale measures the extent to which respondents appraise the situations in their lives as being stressful, particularly in terms of perceiving them as unpredictable, uncontrollable, and overloading. The questions ask about stress experienced in the past month, and each is scored on a scale from 0 (*never*) to 4 (*very often*). After reverse-scoring a subset of items, the total score is the sum across items and thus ranges from 0 to 56, with higher scores indicating more stress. The PSS has good internal consistency and strong construct validity as indicated by relations with other stress measures, health, health behaviors, and life-satisfaction scales (S. Cohen et al., 1983; S. Cohen & Williamson, 1988). For our sample, the alpha coefficients were .91, .90, and .91 for the three visits, respectively.

Maternal Parenting Efficacy Beliefs. Self-efficacy in the parenting role was assessed with the Parenting Sense of Competence Scale (PSCS; Gibaud-Wallston, 1977). Only the 7-item self-efficacy subscale was used. Items are rated on a scale of 1 (*strongly agree*) to 6 (*strongly disagree*). Total scores potentially range from 6 to 42, with *higher* scores indicating *lower* perceived efficacy. This subscale has good internal consistency (Chronbach's $\alpha = .72$) and validity (correlated .48 with the Coopersmith Self-Esteem Inventory; Gibaud-Wallson, 1977). For our sample, the alpha coefficients were .90, .84, and .91 for the three visits, respectively.

Mother–Infant Interaction Quality: The Parent–Child Early Relational Assessment (ERA) Scales (Clark, 1985) were used to measure mother–infant interaction quality. The ERA was designed for use with children from birth to 4+ years of age and has been used in several published studies (Clark, 1999; Clark, Paulson, & Conlin, 1993). Mothers were observed and videotaped as they interacted with their infants in four 5-min sessions: Session 1: feeding, Session 2: structured task, Session 3: free play, and Session 4: separation/reunion. The ERA consists of a set of rating scales to measure maternal relational quality, infant relational quality, and the quality of the dyadic relationship. Scores on each scale range from 1 (*an area of concern*) to 5 (*an area of strength*). Thus, higher scores reveal more positive parenting or infant functioning, and, conversely, lower scores reflect either the relative absence of positive parenting or the presence of more negative parenting. Because there was little variability in ratings of maternal relational quality in association with mothers' depression status or changes in levels of depression in three of the four contexts, the analyses were restricted to the free-play observation. The free-play context measures the mother's capacity to be playful with and enjoy her child and to facilitate her child's capacity for exploratory play, two constructs of concern for women with depression. We created the *Positive Parenting Scale* from a subset of the maternal items to reflect the presence of positive affect and sensitive, responsive involvement with the infant, qualities of parenting that have been identified as essential components of parenting infants (Blehar, Lieberman, & Ainsworth, 1977). The Positive Parenting Scale consisted of seven items: Enjoyment/Pleasure, Quality of Verbalizations, Social Initiative, Mirroring, Low Anxious Mood (relaxed vs. tense), Sensitivity and Responsivity, and Consistency/Predictability. The scale score is the mean of the scores across the seven items. Mothers who score high on the Positive Parenting Scale express much enjoyment and pleasure in their child, communicate in a developmentally appropriate manner, are easygoing and relaxed, and respond sensitively and consistently to their infants cues. Conversely, mothers who score low, at the extreme, show blank stares, verbalize minimally or fail to communicate in a facilitative manner, look agitated or speak in an anxious tone of voice, show insensitivity, misread or misinterpret cues, or are minimally and unpredictably responsive. Two independent raters completed the scales for 20% of the videotaped interactions. Interrater reliability was acceptable, with Ks of .74, .75, and .72 for the three visits, respectively, for the Positive Parenting Scale. Internal consistency also was high, with .87, .90, and .87 at each visit, respectively. The final score was the mean of the two observers' scores. For the infants, all four 5-min segments were retained. Infants were rated on all 28 of the variables from the original ERA scale and summarized into three scales based on factor analytic work (Clark, 1985, 1999): *Infant Positive Affect, Communicative and Social Skills* (8 items; α s = .76, .77, and .74; Ks = .70, .73, and .71 for the three visits, respectively), *Infant Quality of Play, Interest, and Attentional Skills* (10 items; α s = .67, .70, and .70; Ks = .71, .72, and .71, respectively), and *Infant Dysregulation and Irritability* (6 items; α s = .74, .78, and .72; Ks = .82, .86, and .79 for the three visits, respectively).

Data Analytic Plan

First, we calculated for the initial visit, 12 weeks later, and 24 weeks later descriptive statistics (means and SDs) for and correlations among our primary variables: maternal depressive symptoms, perceived stress, efficacy beliefs, and the quality of mothers' and infants' behavior during observed interaction. Second, we tested for differences between depressed and well mothers on each of these variables at the initial visit. We also evaluated changes in depressive

symptoms, quality of mother interaction, quality of infant interaction, perceived stress, and parenting efficacy beliefs over the course of treatment/time, specifically examining the effects of time, depression status, or the interaction of Time \times Depression status on each of those variables. Finally, to test our hypotheses regarding associations between depression recovery and the quality of mother interaction, quality of infant interaction, perceived stress, and efficacy beliefs, we conducted regression analyses evaluating the statistical contribution of mothers' depressive symptoms at 12 weeks towards explaining the variance in each of these variables, beyond the variance accounted for by mothers' depressive symptoms and each of these variables at the initial visit.

RESULTS

Descriptive Statistics and Patterns of Correlation

Table 1 shows the means and *SDs* on women's depression, perceived stress, parenting efficacy, and positive parenting. Table 2 shows the pattern of correlations among the maternal self-report measures of depression, perceived stress, parenting efficacy, and positive parenting separately for depressed and well mothers.

Comparisons Between Depressed and Well Mothers at Initial Visit

At the time that depressed mothers began treatment (i.e., pretreatment), depressed and control groups were well matched on sociodemographic characteristics. As expected, the women in the depressed group were significantly more depressed, $t(44) = 7.46, p = .001$, and reported significantly more stress, $t(45) = 6.86, p = .001$, and lower levels of perceived efficacy, $t(45) = 3.00, p = .01$, relative to controls (see Table 1). Depressed and well mothers also differed on their quality of parenting, with depressed mothers rated as lower on the Positive Parenting Scale than were well mothers, $t(45) = -3.85, p = .001$ (see Table 1). The infants of depressed mothers did not differ significantly from the infants of well mothers on any of the three scales of infant quality of interaction.

TABLE 1. Means (*SDs*) at Initial, 12, and 24 weeks on Depression, Perceived Stress, Parenting Efficacy, and Positive Parenting for Depressed and Well Mothers

	Initial		12 Weeks		24 Weeks		Significance		
	Depressed (<i>n</i> = 19)	Well (<i>n</i> = 28)	Depressed (<i>n</i> = 18)	Well (<i>n</i> = 27)	Depressed (<i>n</i> = 15)	Well (<i>n</i> = 27)	<i>p</i> Time Dep.	<i>p</i> Time Dep.	<i>p</i> Time \times Dep.
BDI	24.79 (9.70)	7.59 (5.93)	12.33 (10.08)	6.04 (5.03)	9.12 (10.61)	5.33 (4.70)	.001	.001	.001
PSS	36.95 (6.99)	22.07 (7.48)	20.22 (7.29)	18.33 (9.13)	17.27 (10.19)	17.70 (7.60)	.001	.04	.001
Efficacy	19.00 (8.22)	13.18 (5.07)	13.29 (4.92)	11.78 (4.46)	12.44 (5.15)	10.81 (4.33)	.001	n.s.	.004
Maternal	3.51 (0.55)	4.20 (0.64)	3.61 (0.71)	3.87 (0.83)	3.84 (0.75)	4.05 (0.68)	n.s.	.05	.04
Positive Parenting									

BDI = Beck Depression Inventory, PSS = Perceived Stress Scale.

TABLE 2. Associations Among Depression, Perceived Stress, and Parenting Efficacy (Depressed: Below Diagonal; Well: Above Diagonal)

	Depression Initial	Depression 12 weeks	Depression 24 weeks	Stress Initial	Stress 12 weeks	Stress 24 weeks	Efficacy Initial	Efficacy 12 weeks	Efficacy 24 weeks
Depression Initial	–	.60**	.59**	.72**	.45*	.43*	.07	–.01	.08
Depression 12 weeks	.44	–	.79**	.65*	.68**	.55**	.24	.25	.15
Depression 24 weeks	–.61**	.67**	–	.59**	.47*	.56**	.25	.28	.20
Perceived Stress Initial	.52*	–.06	.24	–	.59**	.50**	.25	.14	.16
Perceived Stress 12 weeks	.60**	.48*	.55*	–.06	–	.70**	.04	.04	.20
Perceived Stress 24 weeks	.74**	.51	.81**	.04	.76*	–	–.12	.00	.10
Parenting Efficacy Initial	.01	.20	.01	.24	–.11	–.26	–	.76**	.79**
Parenting Efficacy 12 weeks	.19	.33	.30	.02	.22	.30	.54*	–	.83**
Parenting Efficacy 24 weeks	.23	.35	.18	–.18	.04	.18	.57*	.84**	–

Changes in Women's Depression Over the Course of Treatment/Time

Even though this research was not designed as a study of treatment effectiveness, it was important to know to what extent the depressed women became less depressed over the time of the study. A 3 (time: initial, 12-week, 24-week) \times 2 (depression status) repeated measures ANOVA with BDI scores revealed significant effects of time, depression status, and the interaction of Time \times Depression status (see Table 1). As shown in Table 1, we found that mothers' levels of depression (BDI) significantly decreased from study entry, when their scores were in the moderate to severe range (9–47), to 3 months after the initiation of treatment, when their scores were in the mild to moderate range (2–32). In addition, women maintained their relatively low level of depression symptoms through the follow-up, 6 months after the initiation of treatment, $F(2, 14) = 20.04$, $p < .001$. BDI scores improved for all but 1 woman, with decreases ranging from 2 to 40 points. Despite the significant improvement at the group level, 5 women (26%) still met diagnostic criteria for MDD after 3 months of treatment, and 10 women (52%) continued to score in the clinical range on the BDI (≥ 9). At the follow-up visit (24 weeks), 2 women continued to meet diagnostic criteria, 1 woman who had recovered by the 12-week visit had a recurrence at the 24-week follow-up, and 4 women (24%) continued to score in the clinical range on the BDI. Moreover, as a group, the depressed women were still significantly more depressed than the well women even at 12 weeks (after 3 months of treatment), $t(39) = 2.61$, $p = .01$, although they were no longer significantly more depressed than the well women at the 24-week follow-up.

TABLE 3. *Summary of Regression Analysis for Predicting Maternal Positive Parenting at 12 Weeks*

Variable	<i>B</i>	<i>SE B</i>	β	Total R^2	R^2 Change
Step 1				0.20**	
Positive Parenting at Time 1	0.58	0.20	0.48**		
Depression at Time 1	0.04	0.01	0.07		
Step 2				0.32	0.12**
Depression at Time 2	−0.03	0.02	−0.42*		

Changes in Women's Parenting Over the Course of Treatment/Time

A 3 (time: initial, 12-week, 24-week) \times 2 (depression status) repeated measures ANOVA with Maternal Positive Parenting revealed no significant effect of time and a significant effect of depression status and the interaction of Time \times Depression status (see Table 1). Post hoc analyses revealed that although depressed mothers had been rated as significantly less positive at the initial visit, they were not significantly different from the well mothers at 12 or 24 weeks.

Associations Between Depression Recovery and Changes in Quality of Maternal Interaction

Stepwise regression analyses tested the extent to which depression recovery was associated with the quality of maternal interaction at the 12-week visit. Both positive parenting and the BDI score from the initial visit were entered in the first step as control variables. The BDI score at the 12-week visit was entered in the second step to test the extent to which it was accounting for additional variance. As shown in Table 3, while positive parenting at the initial visit was predictive of positive parenting at the 12-week visit, the BDI score at the initial visit was not. In the second step, the BDI score at 12 weeks added significantly to the prediction of parenting at 12 weeks, beyond the variance accounted for by the initial levels of parenting and depression. That is, changes in depressive symptoms predicted quality of maternal interaction at the 12-week visit.

Changes in Infants' Quality of Interaction With Their Mothers Over the Course of Treatment/Time

A 3 (time: initial, 12 weeks, 24 weeks) \times 2 (depression status) repeated measures ANOVA with the three infant ERA scales revealed significant effects of time, but not of depression or Time \times Depression (see Table 1). Post hoc analyses revealed that regardless of mothers' depression status, infants' quality of play, dysregulation and irritability, and positive affect improved over time, particularly between the initial and second (12-week) assessments ($p < .05$).

Associations Between Depression Recovery and Changes in Infants' Quality of Interaction

A series of three stepwise regressions was run to test the extent to which change in the infants' quality of interaction with their mothers could be accounted for by change in maternal depression,

TABLE 4. *Summary of Regression Analysis for Predicting Infant Quality of Interaction at 12 Weeks From Changes in Mothers' Depression*

Variable	<i>B</i>	<i>SE B</i>	β	Total R^2	R^2 Change
Infant Positive Affect					
Step 1				0.25**	
Positive Affect at Time 1	0.56	0.17	0.49**		
Depression at Time 1	0.003	0.004	0.10		
Step 2				0.27	0.02
Depression at Time 2	−0.006	0.007	−0.15		
Infant Quality of Play					
Step 1				.18*	
Quality of Play at Time 1	.43	.16	.42		
Depression at Time 1	.004	.003	.02		
Step 2				.26*	.08*
Depression at Time 2	−.01	.005	−.36*		
Dysregulation & Irritability					
Step 1				.003	
Dysregulation at Time 1	−.06	.17	−.06		
Depression at Time 1	−.008	.005	−.03		
Step 2				.000	.003
Depression at Time 2	−.00	.009	.002		

with each of the three infant qualities of interaction as the dependent variable in separate equations. Initial levels of infant quality of interaction and mothers' level of depression were entered first as control variables, with maternal depression at the 12-week visit entered in the second step. As shown in Table 4, only for one of the three infant qualities of interaction, Infant Quality of Play, did mothers' level of depression at the 12-week visit account for significant variance beyond that accounted for by infants' initial level of quality of interaction and mothers' initial level of depression. That is, change in depressive symptoms over the course of treatment predicted infants' quality of play at the 12-week visit.

Associations Between Change in Parenting Quality and Changes in Infants' Quality of Interaction

A series of three stepwise regressions was run to test the extent to which change in the infants' quality of interaction with their mothers could be accounted for by change in mothers' quality of interaction, with each of the three infant qualities of interaction as the dependent variable in separate equations. Initial levels of infant quality of interaction and mothers' level of positive parenting were entered first as control variables, and mothers' level of positive parenting at the 12-week visit was entered in the second step. For one of the three infant qualities of interaction, Infant Positive Affect, mothers' level of positive parenting at the 12-week visit account for significant variance beyond that accounted for by infants' initial level of positive affect and mothers' initial level of parenting quality, total $R^2 = .41$, $p < .05$; R^2 change = .09,

$p < .05$. Change in mothers' quality of interaction did not significantly predict changes in infants' Quality of Play or Dysregulation and Irritability.

Associations Between Depression Recovery and Perceived Stress and Parenting Efficacy

For both depressed and well mothers at the initial visit, 12 weeks, and 24 weeks, higher levels of depression symptoms were associated with higher levels of perceived stress, but not with lower levels of perceived parenting efficacy (see Table 2).

A 3 (time: initial, 12 week, and 24 week) \times 2 (depression status) repeated measures ANOVA of the Perceived Stress Scale scores across the three visits revealed significant effects of depression status, time, and an interaction of Depression Status \times Time (see Table 1). Follow-up analyses revealed that depressed mothers' levels of perceived stress significantly decreased from the initial visit to the visit 12 weeks later, $t(17) = 6.74$, $p = .001$, and then did not change significantly at the 24-week follow-up. In addition, at 12 weeks, the depressed mothers no longer were significantly more stressed than were the well mothers. Further, the well mothers' stress scores also significantly declined from the initial visit to the 12-week visit, $t(26) = 2.84$, $p = .01$, and then did not change significantly at the 24-week follow-up.

A 3 (time: initial, 12 week, 24 week) \times 2 (depression status) repeated measures ANOVA of the Perceived Efficacy Scale scores across the three visits revealed significant effects of time and an interaction of Depression Status \times Time, but not a main effect of depression status (see Table 1). Follow-up analyses revealed that depressed mothers' parenting efficacy beliefs significantly improved (i.e., lower mean scores) from the initial visit to the 12-week visit, $t(16) = 3.00$, $p = .01$, and then did not change significantly at the 24-week follow-up visit. As with stress, at 12 weeks, the depressed mothers no longer perceived themselves as less effective than the well mothers. Similarly to our findings with stress, the well mothers' perceived parenting efficacy also significantly improved from the initial visit to the 12-week visit, $t(26) = 2.23$, $p = .05$, and then did not change at the 24-week follow-up.

A stepwise regression analysis was run to determine the extent to which depression at the 12-week visit predicted mothers' perceived stress score at that visit, after accounting for initial levels of perceived stress and depression. Results showed that levels of depression at the 12-week visit accounted for a nonstatistically significant 7% increase in variance in levels of perceived stress at 12 weeks ($p = .07$). Further, contrary to the expectation that mothers who perceive less stress in their lives might be better interaction partners for their infants, levels of perceived stress at the 12-week visit also did not account for additional variance in the prediction of Positive Parenting at 12 weeks beyond the variance accounted for by levels of stress and of Positive Parenting at the initial visit. Perceived stress at the 12-week visit also did not add significantly to the prediction of any of the three measures of infants' quality of interaction with the mothers after accounting for initial levels of stress and infant quality of interaction.

Finally, a stepwise regression analysis was run to determine the extent to which depression at the 12-week visit accounted for levels of efficacy beliefs at that time, after accounting for initial levels of depression and efficacy beliefs. Depression at 12 weeks was found to not account for a significant increase in variance in efficacy beliefs. Levels of perceived efficacy at 12 weeks also did not account for significant increases in the variance in mothers' Positive Parenting or in infant qualities of interaction with the mother after accounting for initial levels of efficacy beliefs and mothers' or infants' qualities of interaction.

DISCUSSION

A major consideration in determining why the negative outcomes in children with depressed mothers persist is the course of the mother's depression episode: Does she recover, how soon, how completely, and for how long? Mothers whose depression is chronic continue to expose their children to the adverse experiences that characterize parenting by depressed mothers. That is, they continue to (a) expose their children to models of maladaptive behavior and affect as a function of their symptoms of depression (e.g., negative affectivity) and (b) interact with their children with less warmth and sensitive responsiveness than are associated with optimal child development. To address the question of why the negative effects of depressed mothers on their children either persist or recover, we studied a group of infants and their mothers with MDD postpartum who were undergoing treatment for that depression. We asked whether mothers' decline in depression symptoms would be associated with improvement in their quality of interaction with their infants. In addition, we explored the role of two correlates of maternal depression and asked whether mothers' decrease in their perceived stress and increase in their perceived parenting efficacy were associated with their decline in depression symptoms. Finally, we examined whether there might be any evidence that improvement in mothers' depression and perception of stress and efficacy correlate with changes in the quality of the infant's relationship with the mother. In these ways, this article makes an important contribution as a test of the extent to which a reduction in symptoms of depression in postpartum depressed mothers is associated with improvements in the quality of the mother's interaction with her infant and thus indirectly benefits the infant.

The depressed women, all of whom were in treatment for postpartum depression, experienced a significant reduction in depressive symptoms, and at the follow-up 6 months after beginning treatment, their BDI scores were not significantly different from the well mothers. Furthermore, although the depressed mothers as a group did not show a significant improvement in parenting over time, reductions in depression, after 12 weeks of treatment, were associated with improvements in the quality of their interaction with their infants. The initial gap between depressed and well mothers on positive parenting narrowed significantly, due in part to less positive ratings of well mothers over time as well as slight improvements among depressed mothers.

In addition to being associated with mothers' improved interaction quality, a reduction in depression symptoms also was associated with improvement in the infants' quality of interaction, although only for their quality of play. Specifically, as mothers became less depressed, their infants improved in the quality of play with the mothers. In a further test of the role of mothers' parenting in the association between her depression and infant functioning, we examined whether changes in the mothers' quality of interaction with their infants accounted for changes in infants' quality of interaction. We found that improvements in mothers' quality of interaction after 12 weeks of treatment accounted for changes in infants' positive affect. These two findings are consistent with the idea that infants benefit from mothers' recovery from postpartum depression and, specifically, in terms of mothers improving in their quality of parenting.

These findings build on the work of both Cooper and Murray (1997) and O'Hara et al. (2000), who had previously tested associations between treatment for postpartum depression and changes in the mothers' quality of parenting and in infant functioning. In contrast to Cooper and Murray, we examined these associations in a clinical sample of women, all of whom had clinically significant levels of postpartum depression. Cooper and Murray's failure to demonstrate an

association between treatment and either sensitive–insensitive or intrusive–withdrawn parenting may have been due to a relatively low level of disturbance in their community sample even prior to treatment. O’Hara (2000) relied on maternal self-reports of the quality of mothers’ interaction with their infants, rather than observing face-to-face interactions, and found that women tended to report a high quality of interaction even prior to treatment. Findings from the current study are preliminary given the small sample size and homogeneity of the study groups, yet they represent novel evidence of infants deriving secondary benefits from their mothers’ improved mood, as mediated through their more positive parenting. It will be important for future studies to include larger samples and additional outcome measures of children’s functioning to further test this mediational hypothesis. With a recovery-related improvement in quality of parenting, previously depressed mothers may become better able to provide the buffering effect of secure parent–child relationships, which may be essential for children to develop the mechanisms to decrease hypothalamic–pituitary–adrenocortical axis stress reactivity. Dysregulation of this axis has been implicated in the development of psychopathology in children with depressed mothers (Ashman & Dawson, 2002).

Note that for the depressed women, there was no significant overall change in positive parenting over time, although by the 12-week visit their levels of positive parenting no longer significantly differed from the levels of well mothers. These findings support the continued use of a nondepressed comparison group to reveal age-specific norms for quality of parenting. It will be important for future studies, with larger samples, to replicate our finding that postpartum depressed mothers show nonnormative (i.e., lower) levels of involvement only when significantly depressed. Future research also should explore the role of infants’ development, even within the first year of life. We found that infants became more positive, less dysregulated, and engaged in better quality of play over a 12-week period. More broadly, at 6 months of age, infants are increasingly interested in objects and have less need for maternal engagement (Rochat, 2001), a shift that depressed mothers may respond to differently than may nondepressed mothers.

The next question addressed by this article was whether a decrease in mothers’ perceived stress was associated with their decline in depression symptoms. At the initial visit, the depressed mothers’ levels of perceived stress were significantly higher than those of the well mothers. Interestingly, by the second visit, when depressed women had been in treatment for 12 weeks, both depressed and control mothers demonstrated a significant decrease in perceived stress, and depressed mothers were no longer significantly different from well mothers; however, depression at the 12-week visit did not predict perceived stress beyond the variance accounted for by initial levels of stress and depression. The fact that all of these new mothers showed a decrease in perceived stress may simply indicate that the first few months of motherhood tend to be more stressful for most women, regardless of their level of depression, relative to the later months (Cowan, Cowan, Heming, & Miller, 1991). The trend to decreased stress over the course of these assessments within the first year is likely associated with the time at which infants begin to sleep through the night and become more self-regulated in other ways.

The failure to find associations between later levels of perceived stress and the quality of mothers’ parenting or of infants’ quality of interaction suggests that the mother–infant interaction does not benefit directly from mothers’ lower levels of stress. Thus, although postpartum depressed women may benefit from interventions aimed at helping them to reduce their perceived stress levels, it is likely that parenting is the more proximal variable and would be a more effective target of intervention. Also consider that there may be a crucial distinction between levels of mothers’ perceived stress, as measured here, and the levels of stress experienced by the

mother and family. In theoretical models of risk for transmission of depression from mothers to children, it is the stress context to which depressed mothers expose their children that has been implicated as a potentially important mechanism in the transmission of maternal depression (Goodman & Gotlib, 1999). Thus, future studies need to determine the role of different aspects of stress in the association between maternal depression and the development of psychopathology in children.

A third question was whether a decline in depression symptoms would be associated with a decrease in mothers' perceived parenting efficacy. Similar to the findings for perceived stress, both well and depressed mothers showed a significant improvement in their parenting efficacy beliefs from the initial visit to the 12-week visit. At the 12-week visit, there was no significant difference between depressed and well mothers' perceived parenting efficacy. These findings suggest that regardless of depression, women increase in their parenting efficacy beliefs as they gain experience with their newborns. Again, however, although depressed women did show an increase in perceived parenting efficacy, the level of depression at 12 weeks did not add significantly to the variance in efficacy beliefs at 12 weeks beyond initial levels of efficacy beliefs and depression. Additionally, efficacy at 12 weeks did not explain additional variance in parenting quality or infants' quality of interaction with their mothers beyond initial levels of those variables or of efficacy beliefs. These findings suggest that interventions aimed at improving mothers' parenting efficacy beliefs alone are unlikely to benefit directly the quality of mother–infant interaction; however, it will be important to consider Teti and Gelfand's (1991) finding of a significant role of parenting efficacy beliefs in the association between maternal depression and mothers' quality of interaction with their infants derived from a more specific measure of efficacy beliefs. It is possible that our measure was too broad to capture essential aspects of mothers' beliefs about their abilities to parent a newborn.

If replicated, the findings on perceived stress and efficacy beliefs bring into question the theoretical model of mothers' stress or efficacy beliefs mediating the association between improvement in depression and children resuming a path towards healthy development. We failed to find support for associations between changes in depression and either reduction in perceived stress or improvement in parenting efficacy beliefs. Thus, we failed to find support for the first step that would be necessary to establish a mediating relationship. These findings suggest the need to conceptualize and test other possible mechanisms to explain how changes in mothers' depression might be related to changes in mother–infant relationship quality and, ultimately, infant development.

Although the focus in this study was on the group of mothers with postpartum depression, the findings from the same set of associations in the sociodemographically matched control group in which the mothers had no current or past depression are worth noting. These mothers had been included to provide a comparison to infants' normal developmental changes over the same period of time during which the infants with depressed mothers were studied. Interestingly, these mothers reported lower perceived stress and higher levels of parenting efficacy over that same time. These findings underscore the importance of including a control group of well mothers to track normal developmental changes associated with the postpartum period for both mothers and their infants.

Although several weaknesses limit the conclusions that one can draw from this study, it makes an important contribution as a test of the extent to which reduction in symptoms of depression in postpartum depressed mothers is associated with improvements in the quality of the mothers' interaction with their infants and indirectly benefits the infants. By observing

interactions of the mothers with their children both before and 3 and 6 months after treatment began, using well-developed observational procedures and standardized rating scales of depression and two important correlates, we found beginning support for the secondary benefits to infants of effective treatment of postpartum depression. As the mothers became less depressed, they improved in the quality of their parenting. By 3 months after beginning treatment, they were no longer significantly different from well mothers in the quality of their parenting despite still being significantly higher on depressive symptoms. Moreover, as the mothers became less depressed, the infants began to display better quality of play in their face-to-face interactions with their mothers.

Since we did not include a no-treatment or a waitlist treatment group of depressed mothers, another limitation of this study is that we are unable to determine the extent to which the changes in the depressed mothers were attributable to the treatment. Without treatment, the rate of recovery from postpartum depression in community samples has been found to range from fewer than 2% remaining depressed after 6 months' postpartum (Campbell & Cohn, 1997) to as many as 75% remaining depressed when their children were 3 years old (Field, 2002). The most likely explanation of this extensive range of rates of recovery is the presence of other risk factors such as poverty or young maternal age. Our sample, characterized by high levels of clinical depression but relatively low levels of other risk factors, likely would have had a recovery rate without treatment somewhere between those extremes. A related limitation is that the findings can be generalized only to women with postpartum depression who are willing to be treated with antidepressants. As many as 50% of women with postpartum depression refuse such treatment (Appleby, Warner, Whitton, & Faragher, 1997; Cooper, Murray, Hooper, & West, 1996; O'Hara & Swain, 1996). Thus, researchers need to replicate these findings with empirically supported psychotherapy approaches to depression, such as cognitive-behavior therapy and interpersonal therapy.

Finally, this study also is limited in that it measured only one aspect among many infant outcomes that researchers have reliably found to be associated with maternal depression (Goodman & Gotlib, 1999). The long-term goals of this line of research are to design preventive interventions to minimize the risks to children with depressed parents. If researchers replicate these findings, the next step will be to conduct the studies, called for since 1997 by Cooper and Murray, to test the impact of treatment for postpartum depression on the infant outcomes that have been reliably associated with maternal depression. Thus, future studies would benefit from including measures of infants' cognitive-intellectual functioning, EEG asymmetries, stress reactivity, and security of attachment in tests of the role of improved parenting quality in the association between treatment-related decreases in depression and stability or change in child functioning in these domains.

Findings from such studies also will serve as tests of the theoretical model for the importance of impaired parenting as a primary mechanism in the association between maternal depression and the development of psychopathology in children (Goodman & Gotlib, 1999). Of the four proposed mechanisms—heritability; innate dysfunctional neuroregulatory mechanisms; exposure to mothers' negative affect, behavior, and cognitions; and exposure to stressful environments—the latter two are most amenable to intervention. Moreover, parenting and stress, while important independent mechanisms in their own right, also are likely to interact with the two other proposed mechanisms—genetic and neuroregulatory dysfunctions—which may be less amenable to intervention. Preventive intervention studies are needed to test the extent to which parenting or stress, if experimentally manipulated as targets of preventive intervention,

are associated with prevention of vulnerabilities or psychopathology in children. Interventions designed to improve quality of parenting and to reduce stress levels, such as those related to the marital distress that frequently accompanies depression (Fincham, Beach, Harold, & Osborne, 1997), will further reveal the extent to which children benefit beyond the improvement that might be attained from mothers' reduction in depression alone. If these suggested studies reveal that children's problems persist, relative to never-exposed children, despite improvements not only in mothers' depression but also in their quality of parenting, then other mechanisms need to be explored to explain such persistence. For example, some infants with postpartum depressed mothers also will have been exposed to their mothers' depression prenatally, and may have been born with vulnerabilities that influence child functioning regardless of mothers' levels of symptoms or quality of parenting (Goodman & Gotlib, 1999).

Clinical Implications

These findings provide beginning support for the importance of treating postpartum depression not only for the direct benefit to women in terms of the reduction of their symptom levels but also for the possibility that the treatment curtails the effects on the children and improves their chances for returning to a path of healthy development. As next steps in this line of research, clinicians are encouraged to develop and test interventions designed to more directly change mothers' poor-quality interaction that is associated with their depression (Field, 2002; Gladstone & Beardslee, 2002).

Clinicians who treat postpartum depression may want to be particularly attentive to those who continue to be mildly depressed. While our findings are based on group-level associations, we also noted much variability in the patterns of improvement in depression within the group of women with postpartum depression, including a few who were slow to recover. The latter group is likely to continue to parent more poorly than would never-depressed mothers. In addition, it may be important to consider the role of personality disorders and chronic stressors.

REFERENCES

- Alpern, L., & Lyons-Ruth, K. (1993). Preschool children at social risk: Chronicity and timing of maternal depressive symptoms and child behavior problems at school and at home. *Development and Psychopathology*, 5, 371–387.
- Appleby, L., Warner, R., Whitton, A., & Faragher, B. (1997). A controlled study of fluoxetine and cognitive-behavioral counseling in the treatment of post-natal depression. *British Medical Journal*, 314, 932–936.
- Ashman, S.B., & Dawson, G. (2002). Maternal depression, infant psychobiological development, and risk for depression. In S.H. Goodman & I.H. Gotlib (Eds.), *Children of depressed parents: Mechanisms of risk and implications for treatment* (pp. 37–58). Washington, DC: American Psychological Association.
- Beck, A.T. (1987). *Beck Depression Inventory Manual*. San Antonio, TX: Psychological Corporation.
- Beck, A.T., Steer, R.A., & Garbin, M. (1988). Psychometric properties of the Beck Depression Inventory: A review. *Clinical Psychology Review*, 8, 77–100.
- Beck, A.T., Ward, C.H., Mendelsohn, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, 4, 561–571.

- Blehar, M.C., Lieberman, A.F., & Ainsworth, M.D. (1977). Early face-to-face interaction and its relation to later infant-mother attachment. *Child Development*, 48, 182-194.
- Campbell, S.B., & Cohn, J.F. (1997). The timing and chronicity of postpartum depression: Implications for infant development. In L. Murray & P. Cooper (Eds.), *Postpartum depression and child development* (pp. 165-197). New York: Guilford Press.
- Campbell, S.B., Cohn, J.F., & Meyers, T. (1995). Depression in first-time mothers: Mother-infant interaction and depression chronicity. *Developmental Psychology*, 31, 349-357.
- Clark, R. (1985). *The Parent-Child Early Relational Assessment: Instrument and Manual*. Unpublished manuscript. Madison: University of Wisconsin Medical School, Department of Psychiatry.
- Clark, R. (1999). The Parent-Child Early Relational Assessment: A factorial validity study. *Educational and Psychological Measurement*, 59, 821-846.
- Clark, R., Paulson, A., & Conlin, J.S. (1993). Assessment of developmental status and parent-infant relationships. In C. Zeanah (Ed.), *Handbook of infant mental health* (pp. 191-209). New York: Guilford Press.
- Coghill, S.R., Caplan, H.L., Alexandra, H., Robson, K., & Kumar, R. (1986). Impact of maternal postnatal depression on cognitive development of young children. *British Medical Journal*, 292, 1165-1167.
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24, 385-396.
- Cohen, S., & Williamson, G.M. (1988). Perceived stress in a probability sample of the United States. In S. Spacapan & S. Oskamp (Eds.), *The social psychology of health* (pp. 31-67). Newbury Park, CA: Sage.
- Cohn, J.F., & Campbell, S.B. (1992). Influence of maternal depression on infant affect regulation. In D. Cicchetti & S. Toth (Eds.), *Rochester Symposium on Developmental Psychopathology: Vol. 4. A developmental approach to affective disorders* (pp. 103-130). Rochester, NY: University of Rochester Press.
- Connell, A.M., & Goodman, S.H. (2002). The association between psychopathology in fathers versus mothers and children's internalizing and externalizing behavior problems: A meta-analysis. *Psychological Bulletin*, 128, 746-773.
- Cooper, P., & Murray, L. (1997). The impact of psychological treatments of post-partum depression on maternal mood and infant development. In L. Murray & P. Cooper (Eds.), *Postpartum depression and child development* (pp. 201-220). New York: Guilford Press.
- Cooper, P.J., Murray, L., Hooper, R., & West, A. (1996). The development and validation of a predictive index for postpartum depression. *Psychological Medicine*, 26, 627-634.
- Cowan, C.P., Cowan, P.A., Heming, G., & Miller, N.B. (1991). Becoming a family: Marriage, parenting, and child development. In P.A. Cowan & E.M. Hetherington (Eds.), *Family transitions* (pp. 79-109). Hillsdale, NJ: Erlbaum.
- Cox, A.D., Puckering, C., Pound, A., & Mills, M. (1987). The impact of maternal depression in young children. *Journal of Child Psychology and Psychiatry*, 28, 917-928.
- Cox, J.L., Holden, J.M., & Sagovsky, R. (1987). Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale. *British Journal of Psychiatry*, 150, 782-786.
- Field, T. (1992). Infants of depressed mothers. *Development and Psychopathology*, 4, 49-66.
- Field, T. (2002). Prenatal effects of maternal depression. In S.H. Goodman & I.H. Gotlib (Eds.), *Children of depressed parents: Mechanisms of risk and implications for treatment* (pp. 59-88). Washington, DC: American Psychological Association.

- Fincham, F.D., Beach, S.R.H., Harold, G.T., & Osborne, L.N. (1997). Marital satisfaction and depression: Different causal relationships for men and women? *Psychological Science*, 8, 351–357.
- First, M.B., Spitzer, R.L., Gibbon, M., & Williams, J.B.W. (1995). *Structured Clinical Interview for DSM-IV Axis I Disorders*. Washington, DC: American Psychiatric Press.
- Fleming, A., Klein, E., & Corter, C. (1992). The effects of a social support group on depression, maternal attitudes and behavior in new mothers. *Journal of Child Psychology and Psychiatry*, 33, 685–698.
- Ghodsian, M., Zayicek, E., & Wolkind, S. (1984). A longitudinal study of maternal depression and child behavior problems. *Journal of Child Psychology and Psychiatry*, 25, 91–109.
- Gibaud-Wallston, J. (1977). Self-esteem and situational stress factors related to sense of competence in new parents. Unpublished doctoral dissertation. University of Rhode Island. Providence.
- Gladstone, T.R.G., & Beardslee, W.R. (2002). Treatment, intervention, and prevention with children of depressed parents: A developmental perspective. In S.H. Goodman & I.H. Gotlib (Eds.), *Children of depressed parents: Mechanisms of risk and implications for treatment* (pp. 277–305). Washington, DC: American Psychological Association.
- Goodman, S.H. (2007). Depression in mothers. In S. Nolen-Hoeksema, T.D. Cannon, & T. Widiger (Eds.), *Annual review of clinical psychology* (Vol. 3, pp. 107–135). Palo Alto, CA: Annual Reviews.
- Goodman, S.H., & Gotlib, I.H. (1999). Risk for psychopathology in the children of depressed mothers: A developmental model for understanding mechanisms of transmission. *Psychological Review*, 106, 458–490.
- Hollon, S.D., Thase, M.E., & Markowitz, J.C. (2002). Treatment and prevention of depression. *Psychological Science in the Public Interest*, 3, 39–77.
- Huffman, L.C., Lamour, M., Bryan, Y.E., & Pederson, F.A. (1990). Depressive symptomatology during pregnancy and the postpartum period: Is the Beck Depression Inventory applicable? *Journal of Reproductive and Infant Psychology*, 8, 87–97.
- Lovejoy, M.C., Graczyk, P.A., O'Hare, E., & Neuman, G. (2000). Maternal depression and parenting behavior: A meta-analytic review. *Clinical Psychology Review*, 20, 561–592.
- Lussier, V., David, H., Saucier, J.-F., & Borgeat, F. (1996). Self-rating assessment of postnatal depression: A comparison of the Beck Depression Inventory and the Edinburgh Postnatal Depression Scale. *Pre- and Peri-Natal Psychology Journal*, 11, 81–91.
- Lyons-Ruth, K., Connell, D.B., Grunebaum, H.U., & Botein, S. (1990). Infants at social risk: Maternal depression and family support as mediators of infant development and security of attachment. *Child Development*, 61, 85–98.
- O'Hara, M.W. (1997). The nature of postpartum depressive disorders. In L. Murray & P.J. Cooper (Eds.), *Postpartum depression and child development* (pp. 3–31). New York: Guilford Press.
- O'Hara, M.W., Stuart, S., Gorman, L., & Wenzel, A. (2000). Efficacy of interpersonal psychotherapy for postpartum depression. *Archives of General Psychiatry*, 57, 1039–1045.
- O'Hara, M.W., & Swain, A.M. (1996). Rates and risk of postpartum depression: A meta-analysis. *International Review of Psychiatry*, 8, 37–54.
- Radke-Yarrow, M., Cummings, E.M., Kuczynski, L., & Chapman, M. (1985). Patterns of attachment in two- and three-year olds in normal families and families with parental depression. *Child Development*, 56, 884–893.
- Sroufe, L.A., & Rutter, M. (1984). The domain of developmental psychopathology. *Child Development*, 55, 17–29.
- Steer, R.A., Scholl, T.O., & Beck, A.T. (1990). Revised Beck Depression Inventory scores of inner-city adolescents: Pre- and postpartum. *Psychological Reports*, 66, 315–320.

- Stein, A., Gath, D.H., Buchere, J., Bond, A., Day, A., & Cooper, P.J. (1991). The relationship between post-natal depression and mother-child interaction. *British Journal of Psychiatry*, 158, 46–52.
- Stowe, Z.N., Casarella, J., Landry, J., & Nemeroff, C.B. (1995). Sertraline in the treatment of women with postpartum major depression. *Depression*, 3, 49–55.
- Teti, D.M., & Gelfand, D.M. (1991). Behavioral competence among mothers of infants in the first year: The mediational role of maternal self-efficacy. *Child Development*, 62, 918–929.
- Weissman, M.M. (1987). Advances in psychiatric epidemiology: Rates and risks for major depression. *American Journal of Public Health*, 77, 445–451.
- Whiffen, V.E. (1988). Screening for postpartum depression: A methodological note. *Journal of Clinical Psychology*, 44, 367–371.
- Whiffen, V.E., & Gotlib, I.H. (1989). Infants of postpartum depressed mothers: Temperament and cognitive status. *Journal of Abnormal Psychology*, 98, 274–279.