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The relationship between maternal attitudes and symptoms of depression and anxiety among pregnant and postpartum first-time mothers

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Abstract

Two studies examined the relationship between maternal attitudes and symptoms of depression and anxiety during pregnancy and the early postpartum period. In the first study, a measure of maternal attitudes, the Attitudes Toward Motherhood Scale (AToM), was developed and validated in a sample of first-time mothers. The AToM was found to have good internal reliability and convergent validity with cognitive biases and an existing measure of maternal attitudes. Exploratory and confirmatory factor analyses determined that the measure comprises three correlated factors: beliefs about others' judgments, beliefs about maternal responsibility, and maternal role idealization. In the second study, we used the AToM to assess the relationship between maternal attitudes and other psychological variables. The factor structure of the measure was confirmed. Maternal attitudes predicted symptoms of depression and anxiety, and these attitudes had incremental predictive validity over general cognitive biases and interpersonal risk factors. Overall, the results of these studies suggest that maternal attitudes are related to psychological distress among first-time mothers during the transition to parenthood and may provide a useful means of identifying women who may benefit from intervention during the perinatal period.

Keywords

Parental attitudes; Pregnancy; Postpartum; Risk factors; Depression; Anxiety

The role of maternal attitudes in the prediction of symptoms of depression and anxiety among pregnant and postpartum first-time mothers

Emotional distress during the perinatal period is one of the most common complications of childbearing. Approximately 10–15 % of women experience a depressive episode during pregnancy or the first year postpartum (Bennett et al. 2004; Joseffson et al. 2001). High levels of anxiety are also common during pregnancy (Lee et al. 2007) and the first year postpartum (Stuart et al. 1998; Wenzel et al. 2005).

Depression and anxiety during the perinatal period are associated with adverse fetal and child outcomes. Depression during pregnancy is associated with increased risk for preterm birth, low birth weight, and preeclampsia (Grote et al. 2010; Kim et al. 2013). Postpartum depression is a risk factor for a range of undesirable child outcomes, including behavioral problems and impaired cognitive development (Grace et al. 2003). Prenatal anxiety is also associated with poor birth outcomes (Littleton et al. 2007), and maternal anxiety is a risk factor for behavioral and emotional maladjustment in children, even controlling for the effects of depressive symptoms (O’Conner et al. 2002). Given the prevalence and potential consequences of perinatal depression and anxiety, research that helps clinicians and researchers identify women at risk for these disorders and develop effective interventions is vitally necessary.

Epidemiological research has identified a wide range of risk factors for perinatal depression and anxiety. A personal or familial history of major depressive episodes is among the most potent predictors of perinatal depressive symptoms (Beck 2001; O’Hara and Swain 1996; Robertson et al. 2004). Women of low socioeconomic status, ethnic/racial minorities, and single women are also at higher risk for perinatal depression and anxiety (Beck 2001; Littleton et al. 2007; O’Hara and Swain 1996; Robertson et al. 2004). While these risk factors can help clinicians and researchers identify women at risk for distress during the transition to parenthood, many of these risk factors are challenging to modify. An important goal for research in this area is the identification of modifiable risk factors that can serve as targets for prevention and intervention.

Beck’s cognitive model provides a conceptual framework that may guide us in the identification of risk factors for depression and anxiety that could be targeted for intervention. According to this model, cognitive biases confer a vulnerability to symptoms of depression and anxiety in the context of potentially stressful life events (Beck 1967, 1976, 1985). In cognitive models, the relationship between life events and emotional experiences is mediated by cognitive processes. Maladaptive emotional responses, such as depression and anxiety, result from systematic biases in these cognitive processes. In depressed individuals, these biases are commonly characterized by a negative view of the self, world, and future (Beck 1967, 1976). Among individuals with anxiety disorders, cognitions are

frequently characterized by heightened perceptions of threat and danger (Beck 1985). Previous research has demonstrated that negative cognitive biases are associated with both depression and anxiety during pregnancy and the postpartum (Cutrona 1983; Grazioli and Terry 2000; Hull and Mendolia 1991; Littleton et al. 2007; O'Hara et al. 1982). Importantly, these biases can be targeted through psychological interventions, particularly cognitive-behavioral therapies (Appleby et al. 1997; Cooper et al. 2003).

While much research on cognitive vulnerability to depression and anxiety has focused on general negative biases, there is also evidence that specific types of cognitions may interact with particular stressors to produce maladaptive emotional responses. According to this "event congruency hypothesis," an individual's characteristic cognitive style may leave them differentially vulnerable to distress in the context of negative events that are congruent with the important components of their maladaptive schemas (Francis-Raniere et al. 2006; Segal et al. 1992). Most research in this area has investigated the role of self-criticism and dependency, two particular styles of negative cognition, in interaction with life events that are achievement- or interpersonally oriented. Overall, the results of longitudinal research in this area suggest that individuals who have a self-critical cognitive style are particularly vulnerable to depressive episodes following achievement-oriented stressors, while individuals with a dependent cognitive style are particularly vulnerable to depressive episodes following interpersonally oriented stressors (Hammen et al. 1985, 1989; Francis-Raniere et al. 2006). Interestingly, research among perinatal populations suggests that self-criticism is a risk factor for depressive symptoms, while dependency is not associated with increased risk for depression (Besser and Priel 2003; Besser et al. 2007).

There is also evidence that the specific content of maladaptive cognitions may confer risk for psychopathology in the context of relevant stressors. For example, Schmidt et al. (1997) studied whether anxiety sensitivity, a hypothesized cognitive risk factor for panic disorder, predicted the occurrence of panic attacks among young adults enrolled in a 5-week basic training program at the Air Force Academy. They found that anxiety sensitivity predicted the probability that recruits would experience a panic attack during this period, even controlling for a history of previous panic attacks. Hilsman and Garber (1995) found that cognitions related to academic competence predicted negative affect and depressive symptoms among elementary-school children whose grades were lower than expected, and beliefs specifically related to academic competence had incremental predictive validity beyond the students' general attributional style. These studies suggest that it may be possible to identify specific maladaptive beliefs that are conceptually related to potential stressors that place an individual at risk for negative emotional responses.

According to the cognitive model, beliefs about motherhood could function as a specific cognitive risk factor for perinatal depression and anxiety. While cognitive biases would function as a general risk factor for depression and anxiety in this population, beliefs about motherhood could also mediate the relationship between the specific stressors women experience during pregnancy and early parenthood and their emotional responses to these events. For example, a tendency to perceive negative events as uncontrollable is associated with increased risk for depression (Abramson et al. 1978; Peterson et al. 1993). However, new parents often experience unpredictable and uncontrollable negative events, such as

prolonged periods of crying or fussiness. Thus it may be adaptive for new parents to have beliefs specific to the context of parenthood regarding the uncontrollability of negative parenting-related events. If this is the case, maternal attitudes would represent an additional and more specific risk factor for symptoms of depression and anxiety among perinatal populations.

There is evidence supporting an association between maladaptive maternal attitudes and depression during pregnancy and the first year postpartum. Women's expectations of motherhood and attitudes toward role conflict predict subsequent depressive symptoms during pregnancy (Warner et al. 1997). Women's attitudes toward performance-oriented elements of motherhood are predictive of later depressive symptoms (Grazioli and Terry 2000). Women's attitudes toward motherhood have also been found to mediate the relationship between parental stress and depressive symptoms (Church et al. 2005). Dysfunctional maternal attitudes predict concurrent levels of depressive symptoms during pregnancy and the early postpartum period, and changes in maternal attitudes from pregnancy through 6 weeks postpartum predict depressive symptoms at 6 weeks postpartum, even controlling for prior depressive symptoms (Sokol 2008).

A key tenet of cognitive models of depression and anxiety is that the relationship between life events and affect is mediated by cognition. Because of this, it is important that assessments of cognitive bias are careful to distinguish between appraisals of life events and the events themselves. Previous research investigating cognitive risk factors for perinatal depression has been limited by a lack of differentiation among different types of beliefs or cognitions related to motherhood. In our research, we are primarily interested in maternal *attitudes*. Attitudes have been defined as "a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor" (Eagly and Chaiken 2007, p. 582). In contrast, other beliefs related to motherhood lack this evaluative component. *Expectations* are beliefs that reflect predictions about the future, such as "my baby will cry." *Experiences* are beliefs that represent what an individual has experienced, such as "my baby cried every evening." Both expectations and experiences lack the evaluative component of maternal attitudes, such as "if my baby cries, it is because I am a bad mother."

Previous research in this area has not adequately differentiated among women's expectations, experiences, and attitudes related to motherhood. Several measures designed for use by women during pregnancy emphasize women's expectations of parenthood (e.g., Belsky 1985; Harwood 2004; Kalmuss et al. 1992). However, given that pregnancy and parenthood are inherently periods of increased stress, negative expectations may not only be accurate, but may serve a protective function. Research investigating discrepancies between new parents' expectations and actual experiences find that parents who have overly optimistic expectations for parenthood are at increased risk for depression and marital dissatisfaction during the postpartum period (Belsky 1985; Harwood 2004; Kalmuss et al. 1992). Other measures of maternal cognitions assess women's experiences of pregnancy and parenting without including an evaluative component (DiPietro et al. 2004; Kumar et al. 1984; Warner et al. 1997).

In addition to conceptual limitations of existing measures of maternal attitudes, previous research has identified psychometric problems with a commonly used measure of this construct. Specifically, in a previous study of the role of maternal attitudes in predicting perinatal depressive symptoms, we found that the Maternal Attitudes Questionnaire (Warner et al. 1997) had poor internal reliability, particularly among subjects who were pregnant with their first child (Sokol 2008). Examination of the content of the measure revealed items, such as “Having a baby has made me as happy as I expected,” that may be confusing or inappropriate for primiparous pregnant women. A key question regarding the role of maternal attitudes in relation to symptoms of anxiety and depression is how prenatal attitudes might influence later symptoms. In order to address this question, researchers and clinicians need a measure of these attitudes appropriate for use by both pregnant and postpartum women—particularly first-time mothers. Given the limitations of existing measures, the development of a valid and reliable measure of maternal attitudes is necessary for further research assessing their role as a potential risk factor for perinatal depression and anxiety.

The overarching goal of the present research was to develop a measure of maternal attitudes appropriate for use with first-time mothers, both pregnant and postpartum, and to use this measure to assess the relationship between maternal attitudes and emotional distress. We hypothesized that maternal attitudes would predict symptoms of depression and anxiety and have incremental predictive validity over and beyond general cognitive biases and interpersonal risk factors.

Study 1

The goal of Study 1 was to validate a self-report measure of maternal attitudes in a sample of first-time mothers. We conducted exploratory and confirmatory factor analyses to assess the psychometric properties of the measure. We expected that maternal attitudes would comprise several factors reflecting specific types of beliefs related to motherhood. We tested the convergent validity of the Attitudes Toward Motherhood Scale (AToM) with a measure of general cognitive biases (the Dysfunctional Attitudes Scale, DAS; Weissman and Beck 1978) and an existing but flawed measure of maternal attitudes (the Maternal Attitudes Questionnaire, MAQ; Warner et al. 1997). We expected that maternal attitudes as measured by the AToM and MAQ would correlate strongly with one another and that participants' scores on the AToM would also be strongly related to general cognitive biases. Furthermore, we expected the AToM to have superior reliability to the MAQ, particularly among pregnant participants.

Method

Participants and procedures—Participants for this study were recruited online via social media through sites such as Facebook, Twitter, and online forums for women who are pregnant or parenting (e.g., Mothering.com). The survey site began with an online consent form followed by eligibility questions. Participants then completed our measure of maternal attitudes, followed by measures of general cognitive biases and an existing measure of maternal attitudes. Demographic information was collected after all other measures had been completed. Participants were compensated via a raffle for \$150.

Two hundred thirty-four women initiated participation in the study. Women were eligible to participate if they were between the ages of 18 and 45, resided in the USA, and were either pregnant with their first child (between 13 and 40 weeks gestational age) or had given birth to their first child within the previous 6 months. Three subjects were excluded because they were under age 18, 14 subjects were excluded because they were not pregnant or within 6 months of giving birth to their first child, and 7 subjects were excluded because they did not reside in the USA. Of the 210 women who were eligible to participate, 65 % ($n=136$) women completed the AToM and 50 % ($n=104$) completed all study measures. We compared women who dropped out at each stage of the study to women who completed the measures; there were no differences between dropouts and completers on any measure.

Demographic characteristics of the sample are presented in Table 1. Slightly more than half (59 %) of subjects were currently pregnant with their first child ($n=80$) and 41 % ($n=56$) had given birth to their child within the past 6 months. For pregnant subjects, the mean gestational age was 26.1 weeks ($SD=8.3$ weeks; range, 13–40 weeks). The mean age of postpartum subjects' children was 12.5 weeks ($SD= 8.2$ weeks; range, 1–24 weeks). The sample was predominantly married (65 %) and Caucasian (78 %) and represented a wide range of socioeconomic backgrounds.

Measures

Development of the attitudes toward motherhood scale—We began by generating a pool of 62 items assessing maternal attitudes. Some items were derived by modifying measures of general cognitive biases to reflect content specific to motherhood (e.g., “Making mistakes caring for my baby is fine because I can learn from them” was modified from the DAS item “Making mistakes is fine because I can learn from them,” Weissman and Beck 1978). We also modified items from a measure of women's expectations of motherhood to reflect beliefs, rather than expectations (e.g., “I should not have difficulty becoming comfortable caring for my baby” was modified from the Parenting Expectations Measure item “I will not have difficulty becoming comfortable caring for my baby,” Harwood 2004). Additional items were derived from a manual of cognitive-behavioral therapy for postpartum depression, which listed common maladaptive beliefs expressed by these women (e.g., “Now that I am a mother, my past lifestyle and activities should not be important,” Oloff 1991) and from interviews with women who were pregnant or mothers of children under the age of 2 years (e.g., “I feel guilty about wanting to do the things I did before I became pregnant”). The set of items proposed for inclusion in the measure was reviewed by a small group of faculty and graduate students in clinical psychology who are familiar with the cognitive models of depression and anxiety disorders. Their comments regarding item clarity and wording and additional suggested items were used to modify the item pool. Finally, the measure was piloted online with a small group of women recruited separately from those in the present study. These women were asked to provide qualitative feedback after completing the measure; these responses were used to refine the measure and to generate additional items. Participants rated the frequency with which they agreed with each statement on a 6-point Likert scale, with higher scores indicating more frequent agreement.

Dysfunctional attitudes scale—General cognitive biases were assessed with the short form of the Dysfunctional Attitude Scale (DAS), a 40-question self-report measure designed to assess the various assumptions and beliefs posited by Beck (1967, 1976) to underlie psychological maladjustment (Weissman and Beck 1978). Subjects rated the degree to which they agree with statements of beliefs or attitudes (e.g., “If I do not do well all the time, people will not respect me”) on a 7-point Likert scale. Higher scores reflect more maladaptive cognitions. Cronbach’s alpha in the sample was 0.91 and was comparable for the pregnant ($\alpha=0.90$) and postpartum ($\alpha=0.90$) samples.

Maternal attitudes questionnaire—Participants also completed an existing measure of maternal attitudes, the Maternal Attitudes Questionnaire (MAQ; Warner et al. 1997). This is a 14-question self-report measure that assesses cognitions in three domains: expectations of motherhood, expectations of the self as a mother, and role conflict (e.g., “I think my baby is very demanding”). Higher scores are indicative of more maladaptive cognitions. As in our previous research, internal reliability for the measure was low ($\alpha=0.63$), especially among pregnant participants ($\alpha=0.57$, postpartum sample $\alpha=0.64$).

Results and discussion

Of the original 62 items considered for inclusion in the AToM, we initially retained 50 % of items representing items with the greatest variance. We then conducted an exploratory factor analysis on the remaining 31 items. Factor analysis was conducted using principal axis factoring with SPSS v. 20.0. We used several means of assessing the optimal number of factors: Cattell’s (1966) scree test, Bartlett’s chi-square test (Geweke and Singleton 1980), parallel analysis (Horn 1965), and the minimum average partial criterion (Velicer 1976). These tests all suggested the optimal factor solution would contain two to four factors, with a modal solution of three factors. We assessed the two-, three-, and four-factor structures for conceptual clarity of extracted factors and the best approximation of simple structure. A three-factor structure with promax rotation satisfied these criteria; this three-factor solution explained 64 % of the variance. An oblique factor rotation was used because the factors were assumed to correlate with one another. Factor analysis was also conducted using an orthogonal (varimax) rotation; the three-factor structure was replicated with this rotation.

The initial factor solution produced a three-factor structure with six to eight items loading on each factor (factor loadings, >0.40), for a total of 21 items. Each of these factors was then examined for redundancy and item clarity. To reduce subject burden, when multiple items were conceptually similar, we eliminated the item with the lowest factor loading. See Table 2 for the 12 retained items with factor loadings and item-total correlations. The first factor contains four items that reflect beliefs related to others’ judgments (e.g., “If my baby is crying, people will think I cannot care for him/her properly”), the second factor contains four items reflecting beliefs related to maternal responsibility (e.g., “Good mothers always put their baby’s needs first”), and the third factor contains four items reflecting beliefs related to maternal role idealization (e.g., “It is wrong to have mixed feelings about my baby”). Cronbach’s alpha in the full sample was 0.81 and was comparable for the pregnant ($\alpha=0.82$) and postpartum ($\alpha=0.79$) samples.

To test the integrity of the final three-factor solution, we used confirmatory factor analysis to assess the overall fit of the three-factor model and to compare the three-factor model to a one-factor model. Confirmatory factor analysis was conducted using AMOS v. 17.0. The three-factor model demonstrated good fit to the data, $\chi^2(51)=83.3$, $p<0.01$, SRMR=0.08, CFI=0.95, RMSEA=0.07, $p>0.05$. Comparison of the three- to a one-factor solution indicated that the three-factor solution was a significantly better fit to the data, $\chi^2(3)=233.81$, $p<0.001$.

Descriptive statistics for the study measures and intercorrelations among the measures are presented in Table 3. We assessed the convergent validity of the AToM using the DAS and MAQ. Due to the low reliability of the MAQ, we corrected the correlations among the measures for attenuation according to Block's (1963) method. The AToM was significantly correlated with both general cognitive biases ($r=0.50$ after correction for attenuation) and maternal attitudes as assessed by the MAQ ($r=0.43$ after correction for attenuation), with magnitudes in the medium range. The MAQ was also significantly correlated with general cognitive biases ($r=0.36$ after correction for attenuation). The approach of Meng et al. (1992) for comparing the magnitude of correlation coefficients was used to assess the difference between these correlations; there were no significant differences in the magnitude of the strength of the relationships among the three variables.

We assessed the convergent validity of the three subscales of the AToM using the same approach. Internal reliability coefficients for the subscales ranged from 0.74 to 0.82. Factor 1 of the AToM, comprising beliefs related to others' judgments, was moderately associated with factor 3 of the AToM (comprising beliefs related to maternal role idealization) and with the MAQ, and was strongly associated with general cognitive biases. Factor 2 of the AToM, comprising beliefs related to maternal responsibility, was not associated with factor 1 of the AToM, general cognitive biases, or the MAQ, but was strongly associated with factor 3 of the AToM. Factor 3 of the AToM, comprising beliefs related to maternal role idealization, was moderately associated with factor 1 of the AToM, general cognitive biases, and the MAQ, and was strongly associated with factor 2 of the AToM.

Results of these analyses support our hypothesis that maternal attitudes, as assessed using the AToM, are associated with general cognitive biases. We also demonstrated that our measure has good convergent validity with an existing, but problematic, measure of maternal attitudes. We did not find that maternal attitudes, as assessed by the AToM and MAQ, were related more strongly to one another than to general cognitive biases. The AToM had good internal reliability, which was superior to that of the MAQ, particularly in the pregnant sample.

The pattern of correlations observed among the subscales of the AToM and the MAQ and DAS suggest that beliefs related to maternal responsibility may represent a distinct facet of maternal attitudes that, while related to maternal role idealization, are distinct from general patterns of negative cognitive biases and other elements of maternal attitudes. Beliefs related to others' judgments appear most strongly related to general cognitive biases. The patterns of correlations observed among the sub-scales of the measure suggest that, while the

maternal attitudes assessed by the AToM are related to general cognitive biases, they represent a separate construct.

Study 2

The goal of study 2 was to use the AToM to assess the relationship between maternal attitudes and psychological variables among first-time mothers during the transition to parenthood. We hypothesized that maternal attitudes would predict symptoms of depression and anxiety among pregnant and postpartum first-time mothers and that these attitudes would have incremental predictive validity over general cognitive biases and interpersonal risk factors for depression and anxiety.

Methods

Participants and procedures—Recruitment, administration of the study, and compensation were conducted in the same manner as Study 1. After providing informed consent and confirming eligibility, participants completed the AToM, followed by measures of symptoms of depression and anxiety, then completed measures of additional cognitive and interpersonal risk factors. Demographic information was collected after all other study measures had been completed.

Three hundred eighty-three women initiated participation in the study. Eligibility criteria were the same as for study 1. Four subjects were excluded because they were under age 18 or over age 45, 29 subjects were excluded because they were not pregnant or within 6 months of giving birth to their first child, and 11 subjects were excluded because they did not reside in the USA. Of the 339 women who were eligible to participate, 85 % ($n=288$) completed the AToM and 62 % ($n=211$) completed all study measures.

Demographic characteristics of the sample are presented in Table 1. About 43 % of subjects were currently pregnant with their first child ($n=145$), and 57 % ($n=195$) had given birth to their child within the previous 6-month period. For pregnant subjects, the mean gestational age was 24.1 weeks ($SD=7.2$ weeks; range, 12–39 weeks). The mean age of postpartum subjects' children was 13.9 weeks ($SD=7.0$ weeks; range, 1–24 weeks). The sample was predominantly married (80 %) and Caucasian (94 %). The sample was highly educated and relatively affluent: 45 % of subjects had a graduate/professional degree, 30 % of subjects reported annual household incomes greater than \$100,000, and 52 % of subjects reported that they were employed full-time.

Measures

Cognitive risk factors—Maternal attitudes were assessed using the AToM, described in study 1. Cronbach's alpha for the full scale was 0.86 and ranged from 0.73 to 0.81 for the subscales. General cognitive biases were assessed using the Dysfunctional Attitudes Scale (DAS); to reduce subject burden, we utilized the 17-item version (de Graaf et al. 2009). Cronbach's alpha for the DAS was 0.92.

Interpersonal risk factors—Subjects who were married or in a committed relationship completed the Dyadic Adjustment Scale (DYAD; Spanier 1976), a 32-item measure of

relationship satisfaction. Cronbach's alpha for the DYAD was 0.93. All subjects completed the Multidimensional Scale of Perceived Social Support (MDPSS; Zimet et al. 1988), which assesses satisfaction with perceived social support from partners, family, and friends. Cronbach's alpha for the MDPSS was 0.94. As subjects' scores on the MDPSS were non-normally distributed, the variable was square-root transformed prior to analyses.

Psychological symptoms—Depressive symptoms were assessed using the Edinburgh Post-Natal Depression Scale (EPDS; Cox et al. 1987). This 10-item measure was developed for use by pregnant and postpartum women; the scale takes into account normative experiences of perinatal women that correspond with diagnostic criteria for depression (e.g., weight change and fatigue) that can bias other measures of depressive symptoms. Scores greater than or equal to 12 are indicative of a possible depressive episode (Cox et al. 1996). Cronbach's alpha for the EPDS was 0.87. Symptoms of anxiety were assessed using the State-Trait Anxiety Inventory (STAI; Spielberger 1983), a 40-item measure that assesses current symptoms of anxiety and subjects' global tendency toward trait anxiety. Cronbach's alpha for both the state and trait subscales of the STAI was 0.94. As the two subscales of the STAI were highly correlated ($r=0.80$), a composite STAI score was calculated and used as the outcome variable for all analyses; Cronbach's alpha for the composite STAI was 0.96.

Results and discussion

We compared subjects who completed each measure to subjects who dropped out at each stage of the study. Subjects who dropped out prior to completing the DAS had significantly higher AToM scores than subjects who completed the DAS, subjects who dropped out prior to completing the DYAD had significantly higher AToM and STAI scores than those who completed the DYAD, and subjects who dropped out prior to completing the MDPSS had significantly higher AToM and DYAD scores than those who completed the MDPSS. Overall, the results of these analyses suggest that subjects at higher risk for psychological difficulties were more likely to drop out of the study prior to completion of all measures.

Descriptive statistics for the primary study measures and intercorrelations among the measures are presented in Table 4. Given that many participants completed only some of the study measures, correlations were calculated using both listwise and pairwise deletion. As the magnitude and significance of correlations were comparable using both approaches, we present results using pairwise deletion. As expected, cognitive risk factors, interpersonal risk factors, and psychological symptoms were moderately to highly correlated. The AToM was most highly correlated with the DAS ($r=0.50$), followed by symptoms of depression ($r=0.41$) and anxiety ($r=0.41$). The approach of Meng et al. (1992) for comparing the magnitude of correlation coefficients was used to assess the difference between these correlations; there was a trend for the AToM to be more strongly associated with the DAS than with the EPDS ($p=0.06$) and the STAI ($p=0.06$). The correlations between the AToM and measures of interpersonal risk, including the DYAD ($r=-0.15$) and the MDPSS ($r=0.20$) were significantly smaller than the correlations between the AToM and the DAS and psychological symptoms (all $p<0.001$).

In contrast to the results of study 1, each of the three subscales of the AToM was moderately to strongly correlated with the other subscales. All three factors of the AToM correlated moderately to highly with general cognitive biases and symptoms of depression and anxiety. Factors 1 and 2 of the AToM were weakly correlated with inadequate social support, and factor 1 of the AToM was weakly associated with low marital satisfaction. As expected, psychological symptoms were strongly correlated with one another. Marital satisfaction and social support were also moderately correlated with one another.

Factor structure of the AToM

To assess the stability of the factor structure of the AToM identified in study 1, confirmatory factor analysis was used to assess the fit of the original three-factor model and to compare this model to a one-factor model. Confirmatory factor analysis was conducted using AMOS v. 17.0. The three-factor model was a marginally acceptable fit to the data, $\chi^2(51)=202.8$, $p<0.001$, SRMR=0.10, CFI=0.89, RMSEA=0.10, $p<0.001$. Comparison of the three-factor solution to a one-factor solution indicated that, as in study 1, the three-factor solution was a significantly better fit to the data, $\chi^2(3)=346.8$, $p<0.001$.

We also assessed whether the factor structure of the AToM was comparable for pregnant and postpartum subjects. We first specified a model in which the factor loadings and factor covariances were allowed to vary freely between the two groups. Next, we specified a model in which factor loadings were constrained to be equal between the two groups. There was not a significant difference in the fit of the constrained model $\chi^2(12)=16.48$, $p>0.05$, and the change in the CFI was <0.01 (CFI=0.003), which indicates that the constrained model has comparable model fit (Cheung and Rensvold 2002). Finally, we specified a model in which both the factor loadings and the factor correlations were constrained to be equal between the two groups. There was not a significant difference in the fit of the constrained model, $\chi^2(3)=6.82$, $p>0.05$, and the change in the CFI was <0.01 (CFI=0.003), which indicates that the constrained model has comparable model fit (Cheung and Rensvold 2002). Results of these analyses suggest that the factor structure of the AToM and the correlations among the factors are comparable for pregnant and postpartum subjects.

Convergent and predictive validity of the AToM

We used multiple regression to assess the convergent and predictive validity of the AToM (see Table 5). First, we assessed the convergent validity of maternal attitudes (AToM) with general cognitive biases (DAS). After controlling for demographic variables, maternal attitudes significantly predicted general cognitive biases ($\beta=0.50$). The predictive validity of maternal attitudes was assessed in separate analyses using depressive symptoms (EPDS) and symptoms of anxiety (STAI) as outcomes. After controlling for demographic variables, maternal attitudes were a significant predictor of both depressive symptoms ($\beta=0.43$) and anxiety symptoms ($\beta=0.43$).

A series of hierarchical multiple regressions were then conducted to assess the incremental predictive validity of maternal attitudes as compared to general cognitive biases (DAS) and interpersonal risk factors (marital satisfaction, DYAD, and inadequate social support, MDPSS). We first assessed the incremental predictive validity of maternal attitudes after

controlling for demographic variables and cognitive biases (see Table 6). In these models, the AToM was a significant predictor of both depressive symptoms ($\beta=0.24$) and symptoms of anxiety ($\beta=0.18$).

Next, we assessed the incremental predictive validity of maternal attitudes after controlling for demographic variables, cognitive biases, and interpersonal risk factors (see Table 7). Separate regressions were conducted for symptoms of depression and anxiety. Again in these models, we found that dysfunctional maternal attitudes were a significant predictor of both depressive symptoms ($\beta=0.15$) and anxiety symptoms ($\beta=0.18$).

Finally, in order to assess the relative contributions of interpersonal and cognitive risk factors, we also conducted hierarchical multiple regressions in which we assessed the incremental predictive validity of interpersonal risk factors after controlling for demographic variables and cognitive biases (see Table 8). Separate regressions were conducted for symptoms of depression and anxiety. Both inadequate social support and marital satisfaction were significant predictors of symptoms of depression ($\beta_{MDPSS}=0.23$, $\beta_{DYAD}=-0.17$) and anxiety ($\beta_{MDPSS}=0.27$, $\beta_{DYAD}=-0.19$).

General discussion

The results of these studies suggest that maternal attitudes are associated with symptoms of depression and anxiety during the transition to parenthood, even when known risk factors are accounted for. In study 1, we developed a measure of maternal attitudes that is appropriate for use among first-time mothers. We demonstrated that the measure has good convergent validity with general cognitive biases and an existing but flawed measure of maternal attitudes. We also demonstrated that the measure has adequate reliability among both pregnant and postpartum women. In study 2, we used this measure to assess the relationship between maternal attitudes and psychological symptoms among pregnant and postpartum first-time mothers. Maternal attitudes were strongly predictive of both depression and anxiety and demonstrated incremental predictive validity over and beyond general cognitive biases and interpersonal risk factors for these symptoms.

Our findings are consistent with the results of other studies assessing risk factors for perinatal distress. Reviews of research in this area have consistently found that both cognitive and interpersonal factors have moderate to large associations with depressive symptoms (Beck 2001; O'Hara and Swain 1996; Robertson et al. 2004). We found that both cognitive and interpersonal risk factors have unique predictive validity for symptoms of depression and anxiety, even when other risk factors are controlled for. The results of these studies build upon this previous literature by demonstrating that a risk factor specific to the perinatal period, maternal attitudes, has incremental predictive validity above and beyond these established risk factors.

These findings are consistent with Beck's cognitive theory of psychopathology (Beck 1967, 1976, 1985), which would predict that women with maladaptive beliefs about motherhood would be at increased risk for depression and anxiety in the context of parenting-related stressors. While general maladaptive beliefs may also be activated by stressful events during

this time, specific beliefs about motherhood may be most strongly activated by the particular stressors of pregnancy and parenting. For example, consider the following subject from the current study: This woman is currently 16 weeks pregnant with her first child. Her EPDS score of 5 is in the nondepressed range, and her DAS score of 33 is in the 16th percentile for our sample. However, her AToM score of 56 places her in the 95th percentile for our sample. This subject reported that she “almost always” believes “If I love my baby, I should want to be with him/her all the time.” This subject’s generally low level of overall cognitive biases may be protective against depression in the context of other life stressors. However, it is likely that during the postpartum period she will have the experience of wanting to spend some time away from her baby. Because of her specific attitudes toward motherhood, she may interpret this desire to mean that she does not love her child enough, and may then interpret this belief to mean that she is a bad mother. These beliefs could then lead to symptoms of depression, including feelings of sadness, guilt and worthlessness.

In both studies, we found that maternal attitudes are comprised of beliefs in several domains. In study 1, beliefs related to maternal responsibility were less strongly associated with other maternal attitudes and general cognitive biases than beliefs related to other judgments or maternal role idealization. In contrast, in study 2, we found that all three components of maternal attitudes were significantly correlated with one another and with general cognitive biases. Demographic differences between the samples in the two studies may have contributed to these different findings. Participants in study 2 were more likely to be married, Caucasian, and to have completed a college degree. It is possible that, among more diverse samples, beliefs related to maternal roles could be less indicative of individual cognitive biases and more related to cultural norms or expectations regarding parental responsibility. Further research assessing maternal attitudes in diverse samples is necessary to clarify the role of cultural norms and beliefs in shaping these attitudes and to investigate whether there are differences in the relationship between these attitudes and psychological adjustment among diverse groups of mothers.

These studies represent only the first step towards better understanding the relationship between maternal attitudes and psychological adjustment during the perinatal period. A major limitation of the current studies is their cross-sectional design. As risk factors and psychological symptoms were assessed simultaneously, it is impossible to establish whether maternal attitudes contributed causally to the development of these symptoms or whether they simply reflect the presence of depression and anxiety. Future longitudinal research is necessary to establish whether these maladaptive beliefs precede the development of symptoms. Another major limitation of these studies is their relatively small sample sizes and high dropout rates. High dropout rates are a known problem in internet-based research (Birnbaum 2004), and we found evidence that women at greater risk for depression and anxiety were more likely to drop out of study 2 before completion. Our completion rates of 50 % (study 1) and 62 % (study 2) are slightly below averages for internet-based survey designs, which may be accounted for by the relatively high burden of participation in our studies (Musch and Reips 2000). Replication of our findings in larger samples and with procedures to increase subject retention, such as providing individualized feedback or increasing monetary compensation, would increase our confidence in our findings (Bosnjak and Batinic 2002; Knapp and Heidingsfelder 2001).

Another limitation of the current studies was the homogeneity of our subjects. Participants in these studies were more likely to be white, highly educated, affluent, and married. The lack of sociodemographic diversity is a demonstrated problem in healthcare research (Woodall et al. 2010). This is particularly relevant to the current research, as several studies have suggested that different factors may be predictive of depression and anxiety among ethnic minorities, women of low socioeconomic status, and women without a partner (e.g. Halbreich 2005; Logsdon and Usui 2001; Seguin et al. 1995; Surkan et al. 2006). We did not find that demographic characteristics were associated with psychological symptoms in our sample, but our ability to detect potential differences may have been limited by the relatively small numbers of single women, racial/ethnic minorities, and women of low socioeconomic status who participated in our studies. Further efforts to increase the diversity of participants in this research are necessary in order to determine whether maternal attitudes are related to demographic characteristics and whether the role of maternal attitudes may differ among women of different backgrounds.

The association between maternal attitudes and perinatal distress may provide clinicians with a means of detecting women at risk for perinatal depression and anxiety. There is some evidence that there is a subgroup of women who are particularly vulnerable to perinatal depressive episodes (Bloch et al. 2000; Cooper and Murray 1995). By identifying women whose beliefs about motherhood may put them at risk for psychological distress during pregnancy and the postpartum period, clinicians may be able to intervene early to prevent symptoms from occurring or reduce their severity or duration. A wide range of preventive interventions have been found to effectively reduce the prevalence of depressive episodes during the postpartum period (Sokol et al. 2013); women with maladaptive beliefs about motherhood may be likely to benefit from these interventions.

Our findings may also prove useful for clinicians and researchers interested in developing interventions for perinatal depression and anxiety, particularly cognitive-behavioral interventions. There is some evidence that cognitive-behavioral therapy may not be as effective for perinatal depression as interpersonal psychotherapy (Sokol et al. 2011). However, interpersonal psychotherapy has been specifically adapted for use among perinatal populations in ways that address the interpersonal challenges that women face during the transition to parenthood (O'Hara et al. 2000). A qualitative study of women's preferences for treatment for postpartum depression found that women are interested in treatments that address concerns unique to the perinatal period, particularly "motherhood myths" that affect the way they view themselves as mothers (O'Mahen et al. 2012). Our findings provide evidence for themes that characterize depressed women's beliefs about motherhood that could be integrated into cognitive-behavioral therapies to increase their relevance among perinatal populations. While cognitive-behavioral therapy is inherently sensitive to individuals' particular cognitive biases, developing specific interventions for perinatal populations that incorporate common cognitive distortions could lead to improved efficacy of cognitive-behavioral interventions for this population.

Overall, the results of these studies suggest that maternal attitudes are strongly associated with psychological symptoms during the perinatal period. While maternal attitudes are strongly associated with general cognitive biases, they have incremental predictive validity

for symptoms of depression and anxiety over these more general beliefs. Moreover, maternal attitudes continue to predict symptoms of depression and anxiety even after controlling for interpersonal factors. These findings are consistent with Beck's cognitive model of psychopathology. Results of these studies suggest that maternal attitudes may function as a specific risk factor for perinatal depression and anxiety that could be used by clinicians and researchers to identify women at-risk for these disorders and as targets for intervention and prevention. Although further research is necessary to establish the causal role of these attitudes in the development of psychological symptoms and to assess whether these beliefs play a similar role among more diverse populations, these findings provide evidence that maternal attitudes play an important role in perinatal depression and anxiety.

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Table 1

Demographic characteristics of samples in studies 1 and 2

	Study 1	Study 2
Age, <i>M</i> (SD)	28.3 (4.7)	29.2 (4.8)
Gestational age (weeks), <i>M</i> (SD)	26.1 (8.3)	24.1 (7.2)
Infant age (weeks), <i>M</i> (SD)	12.5 (8.2)	13.9 (7.0)
Relationship status		
Married	65 %	80 %
In a relationship, living together	13 %	13 %
In a relationship, not living together	2%	1%
Other	2%	6%
Race/ethnicity		
Asian/Pacific Islander	3%	1%
Black/African–American	1%	4%
Caucasian	78 %	94 %
Latina	2%	5%
Annual household income		
<\$25,000	16 %	11 %
\$25,000–\$49,999	18 %	21 %
\$50,000–\$74,999	18 %	21 %
\$75,000–\$99,999	12 %	17 %
>\$100,000	18 %	30 %
Employment status		
Full-time	30 %	52 %
Part-time	15 %	16 %
Unemployed	29 %	23 %
Highest level of education		
Did not complete high school	1%	0%
High school diploma/GED	3%	7%
Some college	19 %	13 %
Associate's degree/trade school	4%	6%
Bachelor's degree	32 %	29 %
Graduate or professional degree	24 %	44 %

Table 2

Exploratory factor analysis of attitudes toward motherhood scale (AToM) with promax rotation in study 1

Item	<u>Promax loading</u>			Item-total <i>r</i>
	Factor 1	Factor 2	Factor 3	
Beliefs related to others' judgments				
If I make a mistake, people will think I am a bad mother.	0.81	−0.10	0.12	0.42
People will probably think less of me if I make parenting mistakes.	0.81	−0.01	0.03	0.42
If my baby is crying, people will think I cannot care for him/her properly.	0.81	0.05	−0.14	0.32
Seeking help with my baby from other people makes me feel incompetent.	0.54	0.09	0.03	0.37
Beliefs related to maternal responsibility				
If I love my baby, I should want to be with him/her all the time.	0.11	0.90	−0.11	0.51
I should feel more devoted to my baby.	−0.13	0.60	0.06	0.33
I am the only person who can keep my baby safe.	0.12	0.45	0.14	0.47
Good mothers always put their baby's needs first.	−0.07	0.41	0.31	0.46
Beliefs related to maternal role idealization				
It is wrong to feel disappointed by motherhood.	0.02	−0.09	0.91	0.61
It is wrong to have mixed feelings about my baby.	0.06	0.10	0.74	0.65
Negative feelings towards my baby are wrong.	−0.16	0.15	0.62	0.45
If I fail at motherhood, then I am a failure as a person.	0.20	−0.02	0.53	0.51

Table 3
Summary statistics and intercorrelations among maternal attitudes and general cognitive biases in study 1

	<i>n</i>	Range	<i>M</i> (SD)	AtoM total	AtoM factor 1	AtoM factor 2	AtoM factor 3	MAQ	DAS
AtoM total	136	16–58	37.22 (8.32)	(0.81)	0.62***	0.74***	0.83***	0.31**	0.43**
Others' judgments (AtoM factor 1)	136	4–21	11.34 (3.84)	0.76***	(0.82)	0.10	0.24**	0.30**	0.53***
Maternal responsibility (AtoM factor 2)	136	5–24	14.24 (3.61)	0.96***	0.13	(0.74)	0.55***	0.16	0.13
Role idealization (AtoM factor 3)	136	4–23	11.65 (3.97)	1.03***	0.30**	0.71***	(0.80)	0.21*	0.27**
Maternal attitudes (MAQ)	111	0–15	4.34 (2.77)	0.43**	0.42**	0.23	0.30*	(0.63)	0.27**
Cognitive biases (DAS)	104	64–178	119.23 (24.21)	0.50**	0.62***	0.16	0.32***	0.36**	(0.90)

Uncorrected correlations are displayed above the diagonal. Correlations below the diagonal have been corrected for attenuation. Internal reliability coefficients are displayed in parentheses on the diagonal

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$

Table 4

Descriptive statistics and correlations among primary study measures in study 2

	<i>n</i>	Range	<i>M</i> (<i>SD</i>)	AtoM total	AtoM factor 1	AtoM factor 2	AtoM factor 3	DAS	EPDS	STAI	DYAD	MDPSS
Maternal attitudes (AtoM total)	288	12–67	38.8 (10.6)	(0.86)	0.73***	0.82***	0.87***	0.50***	0.41***	0.41***	–0.15***	0.20**
Others' judgments (AtoM factor 1)	293	4–22	11.5 (3.9)	0.88***	(0.80)	0.37***	0.45***	0.57***	0.41***	0.48***	–0.18*	0.19**
Maternal responsibility (AtoM factor 2)	290	4–24	13.8 (4.3)	1.03***	0.48***	(0.73)	0.62***	0.31***	0.33***	0.30***	–0.11	0.19**
Role idealization (AtoM factor 3)	292	4–24	13.5 (4.8)	1.04***	0.56***	0.81***	(0.81)	0.37***	0.25***	0.26***	–0.09	0.12
Cognitive biases (DAS)	237	17–94	49.2(16.6)	0.57***	0.67***	0.38***	0.43***	(0.91)	0.49***	0.58***	–0.33***	0.16*
Depressive symptoms (EPDS)	278	0–25	8.3 (4.8)	0.47***	0.49***	0.41***	0.30***	0.55***	(0.87)	0.79***	–0.36***	0.30***
Anxiety symptoms (STAI)	240	40–155	73.3(21.3)	0.45***	0.55***	0.36***	0.29***	0.62***	0.86***	(0.96)	–0.43***	0.44***
Marital satisfaction (DYAD)	211	73–145	118.8(14.5)	–0.17***	–0.21*	–0.13	–0.10	–0.36***	–0.40***	–0.46***	(0.93)	–0.21**
Inadequate social support (MDPSS ^a)	229	12–84	70.5 (13.9)	0.22***	0.22***	0.23**	0.17*	0.17*	0.33***	0.42***	–0.22**	(0.95)

Uncorrected correlations are displayed above the diagonal. Correlations below the diagonal have been corrected for attenuation. Internal reliability coefficients are displayed in parentheses on the diagonal

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

^a Descriptive statistics are presented for the non-transformed MDPSS. As subjects' scores on the MDPSS were not normally distributed, correlations were calculated using the transformed variable

Table 5

Multiple regressions assessing the convergent and predictive validity of maternal attitudes (AtoM) in study 2

Outcome	General cognitive biases (DAS) β	Depressive symptoms (EPDS) β	Anxiety symptoms (STAI) β
Age	0.12	0.04	0.04
Pregnant vs. postpartum	0.11	-0.13	-0.06
Married vs. nonmarried	-0.01	-0.01	0.10
White vs. nonwhite	0.07	0.05	0.08
Maternal attitudes (AToM Total)	0.50***	0.43***	0.43***
R^2	0.27***	0.20***	0.21***

*
 $p < 0.05$;**
 $p < 0.01$;***
 $p < 0.001$

Table 6

Hierarchical multiple regressions assessing the incremental predictive validity of maternal attitudes (AToM) compared to general cognitive biases (DAS) in study 2

Outcome	Depressive symptoms (EPDS)	Anxiety symptoms (STAI)
Step 1		
Age	−0.05	−0.07
Pregnant vs. postpartum	−0.07	−0.02
Married vs. nonmarried	0.02	0.13
White vs. nonwhite	0.09	0.11
Step 2		
Cognitive biases (DAS)	0.50***	0.58***
Step 3		
Maternal attitudes (AToM)	0.24**	0.18**
Step 1 R^2	0.02	0.04
Step 2 R^2	0.24***	0.32***
Step 3 R^2	0.04**	0.02*

*
 $p < 0.05$;

**
 $p < 0.01$;

 $p < 0.001$

Table 7

Hierarchical multiple regressions assessing the incremental predictive validity of maternal attitudes (AToM) compared to general cognitive biases (DAS) and interpersonal risk factors (DYAD and MDPSS) in study 2

Outcome	Depressive symptoms (EPDS)	Anxiety symptoms (STAI)
Step 1		
Age	0.06	0.01
Pregnant vs. postpartum	−0.11	−0.02
Married vs. nonmarried	0.03	0.14
White vs. nonwhite	−0.03	0.01
Step 2		
Lack of social support (MDPSS)	0.26**	0.33***
Marital satisfaction (DYAD)	−0.29***	−0.28***
Step 3		
Cognitive biases (DAS)	0.42***	0.47***
Step 4		
Maternal attitudes (AToM)	0.15*	0.18*
Step 1 R^2	0.02	0.02
Step 2 R^2	0.16***	0.22***
Step 3 R^2	0.15***	0.20***
Step 4 R^2	0.02*	0.02*

*
 $p < 0.05$;

**
 $p < 0.01$;

 $p < 0.001$

Table 8

Hierarchical multiple regressions assessing the incremental predictive validity of interpersonal risk factors (DYAD and MDPSS) compared to cognitive risk factors (AToM and DAS) in study 2

Outcome	Depressive symptoms (EPDS)	Anxiety symptoms (STAI)
Step 1		
Age	0.06	0.01
Pregnant vs. postpartum	−0.11	−0.02
Married vs. nonmarried	0.03	0.14
White vs. nonwhite	−0.03	0.01
Step 2		
Maternal attitudes (AToM)	0.36***	0.41***
Step 3		
Cognitive biases (DAS)	0.40***	0.47***
Step 4		
Lack of social support (MDPSS)	0.23***	0.27***
Marital satisfaction (DYAD)	−0.17*	−0.19**
Step 1 R^2	0.02	0.02
Step 2 R^2	0.13***	0.16***
Step 3 R^2	0.12***	0.16***
Step 4 R^2	0.08***	0.12***

*
 $p < 0.05$;

**
 $p < 0.01$;

 $p < 0.001$