



## Mother- Versus Infant-Centered Correlates of Maternal Mind-Mindedness in the First Year of Life

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We investigated whether maternal mind-mindedness in infant–mother interaction related to aspects of obstetric history and infant temperament. Study 1, conducted with a socially diverse sample of 206 eight-month-old infants and their mothers, focused on links between maternal mind-mindedness and (i) planned conception, (ii) perception of pregnancy, and (iii) recollections of first contact with the child. The two indices of mind-mindedness (appropriate and nonattuned mind-related comments) related to different aspects of obstetric history, but no strong associations were seen with socioeconomic status, maternal depression, or perceived social support. In Study 2, we found good temporal stability in both indices of mind-mindedness in a sample of 41 infant–mother dyads between 3 and 7 months. Neither index of mind-mindedness related to infant temperament. We conclude that mind-mindedness is best characterized as a facet of the specific caregiver–child relationship, while also being influenced by stable cognitive–behavioral traits in the mother.

Caregivers' proclivity to adopt the intentional stance in interactions with their children has long been recognized to have an important role in development (e.g., Bruner, 1975; Fonagy, Steele, Steele, Moran, & Higgitt, 1991; Newson, 1979). One aspect of this proclivity has been termed *mind-mindedness* (Meins, 1997). In early research on this topic, measures of mind-mindedness were derived from mothers' interview-based descriptions of their children (Meins, Fernyhough, Russell, & Clark-Carter, 1998), and tendency to attribute meaning to their infants' nonword utterances (Meins, 1998; Meins & Fernyhough, 1999). The most recent operationalization assesses mind-mindedness from mothers' interactions with their infants in the first year of life (Meins & Fernyhough, 2010; Meins, Fernyhough, Fradley, & Tuckey, 2001) based on whether they comment appropriately or in a nonattuned manner on their infants' putative internal states.

Unlike constructs that are purely representational measures of the caregiver-child relationship (such as those derived from the Working Model of the Child Interview; Benoit, Parker, & Zeanah, 1997), the observation-based operationalization of mind-mindedness draws on both representational and behavioral facets of the caregiver's relationship with the child. To comment appropriately on the infant's internal state, caregivers must first represent the infant's likely thoughts or feelings and then use this representation to inform their interactions with the child. Mind-mindedness also differs from caregivers' general use of internal state language in the home (e.g., Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991) or during laboratory-based tasks (e.g., Taumoepeau & Ruffman, 2008) in differentiating between internal state language that appropriately reflects the child's current internal state (appropriate mind-related comments) and that which betrays a lack of attunement to what the child might be experiencing (nonattuned mind-related comments).

Although appropriate mind-related comments correlate positively with concurrent maternal sensitivity (Laranjo, Bernier, & Meins, 2008; Meins et al., 2001), appropriate mind-related comments and maternal sensitivity appear to assess distinct facets of infant-mother interaction. For example, imagine an infant begins to cry and reach up his or her arms when the mother walks away to get something from the other side of the room, resulting in the mother returning to comfort the child. This response would appear to be sensitive and socially contingent, but in the absence of the mother voicing her reasons for returning to comfort the child, it is impossible to establish whether the response is mind-minded. If, while comforting the infant, the mother remarks that the child is crying because he or she did not want her to leave or wished she would come back, these would be classified as appropriate mind-related comments. However, if the mother comments that the child is crying because he or she is angry with her or bored,

these comments would be classified as nonattuned because they appear to misinterpret the infant's likely internal state. Focusing on mind-related discourse thus provides crucial information on the mother's psychological orientation toward her child.

Previous research has shown that appropriate mind-related comments predict (i) secure infant–mother attachment (Meins et al., 2001) and (ii) superior mentalizing abilities at age 2 (Laranjo, Bernier, Meins, & Carlson, 2010) and in the preschool years (Meins et al., 2002, 2003). In contrast, the potential correlates and consequences of nonattuned mind-related comments have been largely ignored. Nonattuned mind-related comments occur around five times less frequently during infant–mother interaction than do appropriate mind-related comments (Meins et al., 2003), and mothers' scores for appropriate and nonattuned mind-related comments have been found to be unrelated (Arnott & Meins, 2007; Meins et al., 2002). These findings suggest that the two separate indices of mind-mindedness may be determined by different factors. One important question in establishing the developmental significance of the mind-mindedness indices relates to the extent to which they represent stable maternal traits. In this article, we report on two studies designed to address this issue.

Mothers' tendency to comment appropriately on their infants' putative internal states is not related to factors, such as mothers' socioeconomic status (SES; Meins et al., 1998), educational level, or previous experience of motherhood (Meins et al., 2002). Rather than being determined by such general social factors, mind-mindedness may stem from the mother's own specific experiences and appraisals of her relationship with her child. That is, certain mothers may be highly mind-minded because such an approach is congruent with their experiences of the child's fetal development, birth, and early life. Of particular importance here is the fact that the construct of mind-mindedness taps into caregivers' representations of their infants' mental lives. Thus, a crucial difference between mind-mindedness and maternal sensitivity is that a mother can begin to think about and represent her child before the child is born, while she can not respond sensitively to the child's cues until after birth. Arnott and Meins (2008) reported that the number of comments mothers produced in describing their future child during pregnancy was positively associated with their scores for appropriate mind-related comments when interacting with their infants at age 6 months. This continuity in mind-mindedness across the transition to parenthood could not be explained in terms of mothers' emotional involvement with the fetus, since mothers' self-reported closeness and tenderness toward the fetus were unrelated to antenatal conjectures about the unborn child and to postnatal mind-mindedness (Arnott & Meins, 2008).

The fact that mothers' antenatal representations of their future children relate to their tendency to comment appropriately on their infants' thoughts and feelings postpartum suggests that factors that predate the birth may relate to later mind-mindedness. The main aim of Study 1 was to investigate links between maternal mind-mindedness in the first year of life and various factors relating to the mother's specific experiences during pregnancy and birth. The first variable we considered was planned conception. A mother who has planned to conceive is likely to have made a positive evaluation of the impact that pregnancy and a baby will have upon her life. Planned pregnancies are also likely to be identified earlier than those that are not planned. Planned conception may thus enable a mother to start to view her unborn child as an individual person earlier than would be the case if the pregnancy were unplanned. Additionally, an unplanned pregnancy is more likely to be an unwanted pregnancy, and might be associated with delay in engaging with the unborn infant.

Surprisingly, there is very little research on whether planned conception impacts upon mothers' representations of and interactions with their infants. An exception is a study by Roe and Drivas (1993), who reported that infants born of planned conceptions vocalized more positively when interacting with their mothers than with a female stranger, whereas unplanned infants' vocalizations showed no such differentiation. Roe and Drivas argued that these differences indicate that plannedness affects mothers' unconscious feelings for their infants and thus their ability to engage positively with them. They supported this argument with the finding that infants whose mothers were more affectionate showed a greater differential vocal response between mother and stranger (Roe, Drivas, Karagellis, & Roe, 1985). For similar reasons, we predicted that mothers would be more likely to comment appropriately and less likely to comment in a nonattuned manner on their infants' internal states if the pregnancy had been planned.

The second antenatal variable that we considered was the mother's perception of her pregnancy. We suggest these perceptions may tap into the mother's earliest representations of her child. For example, a woman who perceives her pregnancy to have been difficult may have greater concerns about her child's well-being which may dampen her tendency to form representations of her future child's characteristics. It was also crucial to determine the accuracy of such perceptions of pregnancy. For this reason, we included a third variable, namely actual complications during the pregnancy.

The final obstetric history variables focused on the birth experience itself. If mothers evaluate the birth in a positive light they may feel they have been attuned to their infants from the outset. In contrast, negative or self-focused recollections may index the mother's unwillingness to represent the child's

perspective, and would be expected to relate to higher levels of nonattuned mind-related comments. Once again, we assessed a number of important control variables that might confound any relation between evaluations of the birth and mothers' mind-mindedness: labor complications and neonatal medical conditions.

To conclude that a mother's appraisals of her pregnancy and birth experiences were correlates specifically of mind-mindedness, it was important to consider whether these appraisals related to mothers' more general sensitivity when interacting with their infants. Consequently, Study 1 also included an assessment of maternal sensitivity. If mothers' pregnancy and birth appraisals relate to mind-mindedness because of common variance associated with mothers' representations of their infants, one would predict that these appraisals will not be related to a behavioral measure like sensitivity. In contrast, if positive appraisals of pregnancy and birth index general warmth and tenderness toward the child, these variables should relate to general sensitivity as well as to mind-mindedness. We also investigated whether the mind-mindedness indices and maternal sensitivity were related to the overall number of potential risk factors experienced, in order to address the specificity of any observed relations between obstetric history and the quality of infant–mother interaction.

An alternative possibility regarding potential origins of mind-mindedness is that it is determined by caregivers' psychological well-being. In particular, one could hypothesize that depressive symptoms will have a detrimental effect on caregivers' ability to comment appropriately on their infants' cognitive and emotional states. Key features of depression, such as social withdrawal, impaired concentration, fatigue, and irritability, are likely to prevent caregivers from "tuning in" to their infants' internal states and engaging in mind-minded discourse when interacting with them. In support of this suggestion, Murray, Kempton, Woolgar, and Hooper (1993) reported that, although depression had no effect on the complexity or syntax of mothers' language, depressed mothers were less likely to talk about what their infants were experiencing and to assign agency to the infant's behavior. Clearly, levels of postnatal depression may well also relate to the variables assessing obstetric history. The present study accordingly investigated whether any observed links between pregnancy history or birth experience and mind-mindedness were independent of mothers' concurrent levels of depression.

We also included a measure of perceived social support in Study 1 to investigate whether a mother's perceptions of available psychological support related to her tendency to demonstrate mind-mindedness when interacting with her infant. Demers, Bernier, Tarabulsy, and Provost (2010) investigated the relation between parental stress and mothers' mind-mindedness using an adaptation of Meins et al.'s (1998) "describe your child"

interview, in which they rated the valence of mothers' mentalistic descriptions of their 18-month-olds. Demers et al. reported that levels of parental stress were negatively correlated with mothers' tendency to describe their infants using positively valenced mentalistic descriptions. It may thus be that perceived lack of social support will relate to lower levels of appropriate mind-related comments and higher levels of nonattuned comments.

## STUDY 1

Relations between mother-centered versus relationship-centered factors and the two indices of mind-mindedness (appropriate and nonattuned mind-related comments) were investigated in a large, socially diverse sample of infants and mothers. Mothers' SES, depressive symptoms, and the amount of psychological support they perceived to be available to them were used to index mother-centered factors. Relationship-centered factors were assessed in terms of mothers' pregnancy history (plannedness, perception of pregnancy, obstetric complications) and birth experience (recollections of first impressions on being given the baby, labor complications, neonatal medical problems). We hypothesized that higher levels of mind-mindedness would be associated with (i) lower levels of depression and higher levels of perceived social support, and (ii) planned pregnancy, perceiving the pregnancy as having been easy, and positive recollections of first contact with the baby. In addition, we considered whether any observed relations between obstetric history and mind-mindedness were (iii) specific to indices of mind-mindedness, or generalized to a measure of mothers' overall sensitivity, and (iv) independent of concurrent maternal depression, perceived social support, and any complications experienced during pregnancy or labor. Finally, we investigated whether the mind-mindedness indices and maternal sensitivity related to the total number of potential risk factors experienced.

### Method

#### *Participants*

Participants were 206 mothers and their infants (108 girls, 98 boys), recruited through local health care professionals and mother and baby groups in North-East England. The vast majority of the mothers (203) were White. Maternal age was  $M = 28.08$  years,  $SD = 5.48$ , range = 16–41 years. The Hollingshead scale (Hollingshead, 1975) was used to assess participants' SES, and scores ranged from 11 to 66. Around half of the sample ( $n = 90$ ) fell into the lowest two Hollingshead categories (unskilled or

menial and semi-skilled or manual). With respect to parity, 86 (41.7%) infants were first-born.

All infants were full-term apart from nine who were born between 32- and 36-weeks gestation. Infants were 8 months old ( $M = 8.52$ ,  $SD = 0.48$ , range = 7.0–10.2). Three infants out of the sample were diagnosed with significant health problems; one child has Turner's syndrome, one child has ectodermal dysplasia, and one has profound hearing loss. Initial analyses showed that exclusion of these cases made no difference to the overall results for the sample, and these cases were therefore included in the analyses. Informed written consent was obtained and the study was approved by the relevant health service and university ethics committees.

#### *Variables relating to obstetric history*

Each mother was given a questionnaire in which she was asked: (i) whether her pregnancy had been planned, (ii) if she personally felt that the pregnancy had been easy or difficult, (iii) whether any complications had arisen during the pregnancy (providing details if complications had occurred), (iv) whether there had been complications during labor (again providing details), and (v) whether the infant had suffered from any medical problems or needed medical attention at birth. The variables assessing complications in pregnancy or labor and neonatal medical problems were all converted to dichotomous (present–absent) scores.

The questionnaire also asked mothers to report their recollections of how they felt when the baby was first given to them: "How did you feel when your baby was given to you"? Recollections were classified into one of five categories: (i) a highly emotional reaction of an exclusively positive nature, (ii) an emotional reaction of an exclusively positive nature, (iii) a mixed emotional response, (iv) a neutral response, (v) a negative emotional response, or (vi) a focus purely on the mother's physical reaction. Recollections of first contact with the infant were scored by a researcher blind to all other data and to the hypotheses of the study. A randomly selected 25% of mothers' birth evaluations was coded by a second, blind researcher; interrater reliability was  $\kappa = .87$ .

#### *Maternal mind-mindedness*

Mothers and their infants participated in a 20-min free-play session, with the only instruction to mothers being to play with their infants as they would do if they had a few spare minutes together at home. A range of age-appropriate toys was available, and mothers were free to move around, although every session began with the mother and child playing together on

a play mat in the center of the room. The mother and infant were alone, and the observation was filmed using two wall-mounted cameras located in opposite corners of the room.

Mothers' speech during the session was transcribed verbatim, and transcripts were used to identify utterances that contained a reference to the infant's internal state (so-called "mind-related comments"). Mind-related comments were defined using Meins and Fernyhough's (2010) criteria: (i) comments on mental states, such as knowledge, thoughts, desires, and interests (e.g., "You know what a dog is, don't you?"; "You think that's pretty, don't you?"); (ii) comments on mental processes (e.g., "Do you recognize yours?"; "Are you thinking?"); (iii) references to the infant's level of emotional engagement (e.g., comments about the infant being bored, self-conscious, excited); (iv) comments on the infant's attempts to manipulate people's beliefs (e.g., "You're joking"; "You're just teasing me"); and (v) the mother "putting words into the infant's mouth" so that her speech took the form of a dialogue.

Each mind-related comment was then coded dichotomously as appropriate or nonattuned using Meins and Fernyhough's (2010) criteria. A comment was classified as an appropriate mind-related comment if: (i) the independent coder agreed with the mother's reading of her infant's mind (e.g., if a mother's comment that her infant liked or was interested in a particular toy was judged to be consistent with the infant's behavior); (ii) the comment linked the infant's current activity with similar events in the past or future, for example, "We came in a car, remember"? (while looking at a picture of a car); and (iii) the comment served to clarify how to proceed if there was a lull in the interaction, for example, "Do you want to play with this"? (after the infant had been gazing around the room, not focused on any object or activity, for several seconds). Mind-related comments were coded as nonattuned if: (i) the coder believed that the mother was misinterpreting her infant's mind (e.g., stating that the infant liked or wanted a particular toy when he or she showed no obvious interest in or preference for it); (ii) the comment referred to a past or future event that had no obvious relation to the infant's current activity; (iii) the mother asked what the infant wanted to do, or commented that the infant wanted or preferred a different object or activity, when the infant was already actively engaged in an activity or was showing a clear preference for a particular object; or (iv) the referent of the mother's comment was not clear (e.g., saying "You like that" when the object or activity to which the comment referred was not obvious).

Each mind-related comment was classified as appropriate or nonattuned by a researcher blind to all other measures. A second researcher, blind to all other measures and to the hypotheses of the study, coded a randomly



selected 25% of the mother–infant interactions. Raters achieved perfect agreement on which comments were mind-related. Interrater agreement for dichotomously classifying mind-related comments as appropriate or nonattuned was  $\kappa = .70$ . In order to control for differences in maternal verbosity, scores for appropriate and nonattuned mind-related comments were calculated as a proportion of the mother’s total number of comments made during the session (Meins & Fernyhough, 2010). Proportional scores for appropriate and for nonattuned mind-related comments were the dependent variables used in all analyses.

The mind-mindedness coding scheme has been reported to have good reliability in a number of independent samples (e.g., Laranjo et al., 2008; Lundy, 2003; Meins et al., 2001).

### *Maternal sensitivity*

Maternal sensitivity was assessed from the free-play sessions from which the mind-mindedness data were obtained. Sensitivity was rated using Ainsworth, Bell, and Stayton’s (1974) scale which has five anchor points between *highly sensitive* (9) and *highly insensitive* (1). A trained researcher who was blind to all other measures and to the study’s hypotheses scored all of the sessions, with a second trained, blind researcher coding a randomly selected 25% of the sessions. (Note that these researchers were not involved in coding mind-mindedness.) Interrater reliability (intraclass correlation) was .83.

### *Maternal depression*

Maternal depression was assessed using the Beck Depression Inventory (BDI; Beck, Ward, Mendelsohn, Mock, & Erbaugh, 1961). The BDI contains 21 items, each rated on a 0–3 scale, and participants are requested to complete the questionnaire to indicate their mood in the past 2 weeks. Possible scores range from 0 to 63, with higher scores indicating greater levels of depression. Mothers received an overall score for the BDI. Scores between 0 and 13 denote minimal depression, between 14 and 19 mild depression, between 20 and 28 moderate depression, and scores of 29 and above indicate severe depression.

### *Perceived social support*

Perceived social support was assessed using Henderson, Duncan-Jones, McAuley, and Ritchie’s (1978) index of social support. The 15 items focus on social isolation, loneliness, and whether individuals feel they have someone who can provide psychological support if needed. Items are rated using

a five point Likert scale, yielding possible scores between 15 and 75, with higher scores indexing higher perceived social support.

## Results

### *Descriptive statistics and preliminary analyses*

Table 1 shows the descriptive statistics for Study 1. Information on planned conception was available on 203 mothers (141 pregnancies were planned), 205 mothers provided information on perception of pregnancy (150 perceived the pregnancy to have been easy), and data on pregnancy complications were available for 204 mothers (60 mothers experienced complications). With respect to birth experiences, 201 mothers provided information on labor complications (56 experienced complications), data on neonatal medical problems were available for 204 infants (30 experienced problems), and 200 mothers reported on how they felt when they were first given the baby. Missing data in all cases arose because mothers declined to answer the specific question, apart from the labor complications variable, for which two mothers were unable to answer due to planned Caesarian section deliveries. Hollingshead scores were available for all participants, BDI data were available for 201 mothers, and social support data were available for 194 mothers. With respect to BDI categories, classifications were as follows: 166 minimal depression, 24 mild depression, four moderate depression, and seven severe depression. Missing BDI and social support data were due to mothers failing to respond to all questions. Mind-mindedness and sensitivity data were not available for one participant due to a technical recording problem. In total, 26 mothers had at least one missing data point. In the analyses, missing data were dealt with using pairwise deletion.

TABLE 1  
Descriptive Statistics for Study 1

| <i>Variable</i>           | <i>Mean</i> | <i>SD</i> | <i>Range</i> |
|---------------------------|-------------|-----------|--------------|
| AMRC total                | 11.94       | 8.66      | 0–42         |
| AMRC (%)                  | 5.34        | 3.64      | 0–18.67      |
| NAMRC total               | 3.53        | 4.56      | 0–28         |
| NAMRC (%)                 | 1.58        | 1.88      | 0–8.94       |
| Maternal sensitivity      | 5.64        | 1.48      | 2–9          |
| Hollingshead Index (SES)  | 34.00       | 14.03     | 11–66        |
| Perceived social support  | 60.15       | 8.73      | 30–75        |
| Beck Depression Inventory | 8.41        | 7.69      | 0–42         |

*Note.* AMRC = appropriate mind-related comments; NAMRC = nonattuned mind-related comments; SES, socioeconomic status.

With respect to recollections of first contact with the infant, mothers on average recollected 2.23 responses ( $SD = 1.19$ , range = 1–7), with 17 mothers recollecting a highly emotional reaction of an exclusively positive nature (e.g., “I started to cry with joy. It was the best feeling of love I have experienced,” “totally overjoyed and in love with my baby”), 99 recollecting an emotional reaction of an exclusively positive nature (e.g., “happy,” “elated”), 59 recollecting a mixed emotional response (e.g., “happy and scared”), 11 recollecting a neutral response (e.g., “relieved”), five recollecting a negative emotional response (e.g., “very low,” “upset,” “worried”), and nine focusing purely on their own physical reaction (e.g., “tired,” “exhausted,” “uncomfortable”). Due to the low numbers in some of the categories, mothers’ recollections of first contact with the infant were dichotomized into positive (highly emotional and emotional reactions of an exclusively positive nature) and other (mixed, neutral, negative emotional, and mothers’ physical reactions) categories, with 116 mothers in the positive category and 84 mothers in the other category.

Scores for nonattuned mind-related comments and BDI were positively skewed. However, the  $F$ -test is robust against violations of the assumption of normality as long as there are at least 20 degrees of freedom for error (Tabachnick & Fidell, 2007). Nonparametric analyses (Spearman’s  $\rho$  and Mann–Whitney  $U$ ) yielded precisely the same findings as parametric analyses, so results for parametric statistics (Pearson’s  $r$  and  $t$  tests) are presented below for ease of interpretation of effect sizes.

As in previous research (Arnott & Meins, 2007; Meins et al., 2001, 2002), mothers’ scores for appropriate mind-related comments were unrelated to scores for nonattuned mind-related comments,  $r(203) = .07$ ,  $ns$ , and scores for appropriate comments were positively correlated with maternal sensitivity,  $r(203) = .39$ ,  $p < .001$ . Nonattuned mind-related comments were unrelated to maternal sensitivity,  $r(203) = .04$ ,  $ns$ . These correlations between mind-mindedness and sensitivity in this sample are also reported in Meins et al. (2010).

With respect to interrelations among the three obstetric history variables, planned conception was not related to pregnancy evaluation,  $\chi^2(1) = 2.42$ ,  $ns$ ,  $w = 0.11$ . Neither was planned conception related to the emotional valence of recollections of first contact with the infant,  $\chi^2(1) = 1.61$ ,  $ns$ ,  $w = 0.09$ . Finally, pregnancy evaluation was unrelated to recollections of first contact with the infant,  $\chi^2(1) = 0.18$ ,  $ns$ ,  $w = 0.03$ .

Planned pregnancy was associated with higher perceived social support (planned  $M = 61.46$ ,  $SD = 8.14$ ; unplanned  $M = 56.84$ ,  $SD = 9.44$ ),  $t(190) = 3.40$ ,  $p < .001$ ,  $d = 0.53$ , higher SES (planned  $M = 36.70$ ,  $SD = 14.02$ ; unplanned  $M = 27.97$ ,  $SD = 12.40$ ),  $t(201) = 4.23$ ,

$p < .001$ ,  $d = 0.66$ , and lower BDI scores (planned  $M = 6.80$ ,  $SD = 5.30$ ; unplanned  $M = 12.53$ ,  $SD = 10.57$ ),  $t(195) = 5.06$ ,  $p < .001$ ,  $d = 0.72$ .

Evaluating the pregnancy as easy was associated with higher perceived social support (easy  $M = 61.56$ ,  $SD = 7.31$ ; difficult  $M = 56.08$ ,  $SD = 11.03$ ),  $t(192) = 3.97$ ,  $p < .001$ ,  $d = 0.60$ , higher SES (easy  $M = 35.47$ ,  $SD = 14.35$ ; difficult  $M = 30.13$ ,  $SD = 12.48$ ),  $t(203) = 2.44$ ,  $p < .025$ ,  $d = 0.40$ , and lower BDI scores (easy  $M = 6.81$ ,  $SD = 5.48$ ; difficult  $M = 13.11$ ,  $SD = 10.57$ ),  $t(197) = 5.48$ ,  $p < .001$ ,  $d = 0.79$ .

Recollections of first contact with the infant were not associated with perceived social support (positive  $M = 60.42$ ,  $SD = 9.11$ ; other  $M = 59.49$ ,  $SD = 8.40$ ),  $t(187) = 0.71$ , *ns*,  $d = 0.11$ , SES (positive  $M = 32.84$ ,  $SD = 14.58$ ; other  $M = 35.51$ ,  $SD = 13.07$ ),  $t(198) = 1.34$ , *ns*,  $d = 0.19$ , or BDI scores (positive  $M = 8.80$ ,  $SD = 8.23$ ; other  $M = 8.02$ ,  $SD = 7.05$ ),  $t(194) = 0.70$ , *ns*,  $d = 0.10$ .

We investigated whether the mother–infant interaction variables related to infant gender and women’s previous experience of motherhood. For appropriate mind-related comments, there was no difference between mothers of girls ( $M = 5.35$ ,  $SD = 3.69$ ) and mothers of boys ( $M = 5.32$ ,  $SD = 3.60$ ),  $t(203) = 0.07$ , *ns*,  $d = 0.01$ . For nonattuned mind-related comments, mothers of girls ( $M = 1.36$ ,  $SD = 1.52$ ) and those of boys ( $M = 1.83$ ,  $SD = 2.20$ ) did not differ,  $t(203) = 1.81$ , *ns*,  $d = 0.25$ . Neither did child gender relate to maternal sensitivity: mothers of girls ( $M = 5.48$ ,  $SD = 1.53$ ), mothers of boys ( $M = 5.82$ ,  $SD = 1.42$ ),  $t(203) = 1.65$ , *ns*,  $d = 0.23$ .

With respect to parity, for appropriate mind-related comments, primiparous mothers ( $M = 5.01$ ,  $SD = 3.69$ ) did not differ from multiparous mothers ( $M = 5.79$ ,  $SD = 3.55$ ),  $t(203) = 1.50$ , *ns*,  $d = 0.22$ . For nonattuned mind-related comments, there was no difference between primiparous ( $M = 1.75$ ,  $SD = 2.04$ ) and multiparous ( $M = 1.34$ ,  $SD = 1.61$ ) mothers,  $t(203) = 1.54$ , *ns*,  $d = 0.22$ . For maternal sensitivity, primiparous mothers ( $M = 5.48$ ,  $SD = 1.52$ ) did not differ from multiparous mothers ( $M = 5.87$ ,  $SD = 1.41$ ),  $t(203) = 1.87$ , *ns*,  $d = 0.27$ .

Given the null findings for relations with infant gender and parity, these variables are not considered further in the analyses reported below.

#### *Relations between infant–mother interaction variables and SES, perceived social support, and depression*

As shown in Table 2, scores for appropriate mind-related comments were positively correlated with SES, and scores for nonattuned mind-related comments were positively correlated with BDI. However, although statistically significant, both effects were small (Cohen, 1988). These

TABLE 2  
Correlations (Pearson's  $r$ ) between Infant–Mother Interaction Variables and SES, Perceived Social Support, and Depression

|                              | <i>AMRC</i> | <i>NAMRC</i> | <i>Sensitivity</i> |
|------------------------------|-------------|--------------|--------------------|
| Hollingshead Index (SES)     | .16*        | -.05         | .30**              |
| Perceived social support     | .12         | -.07         | .28**              |
| Beck Depression Inventory    | -.11        | .14*         | -.29**             |
| Total number of risk factors | -.12        | .04          | -.26**             |

*Notes.* AMRC = appropriate mind-related comments; NAMRC = nonattuned mind-related comments; SES, socioeconomic status.

\* $p < .05$ . \*\* $p < .001$ .

findings suggest that a mother's mind-mindedness when interacting with her infant is not strongly related to her social background, how much social support she perceived to be available to her, or to her concurrent level of depression.

Table 2 also shows the correlations between maternal sensitivity and SES, perceived social support, and concurrent BDI scores. As shown in Table 2, maternal sensitivity was positively correlated with both SES and social support, and was negatively correlated with concurrent depression. All relations were medium size effects (Cohen, 1988). Thus, greater maternal sensitivity was associated with (i) higher SES, (ii) higher perceived social support, and (iii) lower concurrent depression.

### *Relations between mind-mindedness and obstetric history*

First, we explored relations between the two mind-mindedness indices and the control variables (pregnancy complications, labor complications, neonatal medical problems) using a series of independent samples  $t$  tests. Neither of the mind-mindedness indices related to any of the control variables,  $t_s < 1.81$ ,  $d_s < 0.32$ .

Relations between the obstetric history variables and each of the mind-mindedness indices were investigated using analysis of covariance (ANCOVA), with dichotomous obstetric history variables (planned pregnancy, pregnancy evaluation, and recollection of feelings after birth) entered as fixed factors and SES, BDI, perceived social support, pregnancy complications, labor complications, and neonatal medical problems entered as covariates. The results of the ANCOVAs are summarized in Table 3.

As shown in Table 3, there was a main effect of pregnancy evaluation and an interaction between pregnancy evaluation and planned pregnancy on mothers' appropriate mind-related comments scores (see Figure 1). Post hoc tests showed no differences in appropriate mind-related comments in moth-

TABLE 3  
Results of Analyses of Covariance for Relations between Obstetric History and Infant–Mother Interaction Variables

|   | AMRC    |          | NAMRC    |          | Sensitivity |          |
|---|---------|----------|----------|----------|-------------|----------|
|   | F       | $\eta^2$ | F        | $\eta^2$ | F           | $\eta^2$ |
| Main effects                                  |         |          |          |          |             |          |
| Planned                                       | 2.73    | .017     | 0.01     | .000     | 0.05        | .000     |
| Evaluation                                    | 6.36*   | .037     | 0.33     | .002     | 1.65        | .008     |
| Feelings                                      | 0.50    | .003     | 13.64*** | .067     | 0.88        | .004     |
| Interactions                                  |         |          |          |          |             |          |
| Planned $\times$ Evaluation                   | 10.42** | .041     | 0.38     | .002     | 1.39        | .007     |
| Planned $\times$ Feelings                     | 0.01    | .000     | 2.92     | .017     | 0.00        | .000     |
| Evaluation $\times$ Feelings                  | 1.44    | .008     | 0.69     | .003     | 5.08        | .024     |
| Planned $\times$ Evaluation $\times$ Feelings | 0.11    | .001     | 0.14     | .001     | 1.02        | .005     |

Notes. AMRC = appropriate mind-related comments; NAMRC = nonattuned mind-related comments; Planned = planned or nonplanned pregnancy; Evaluation = easy or difficult pregnancy evaluation; Feelings = positive or other recollections of feelings at birth.

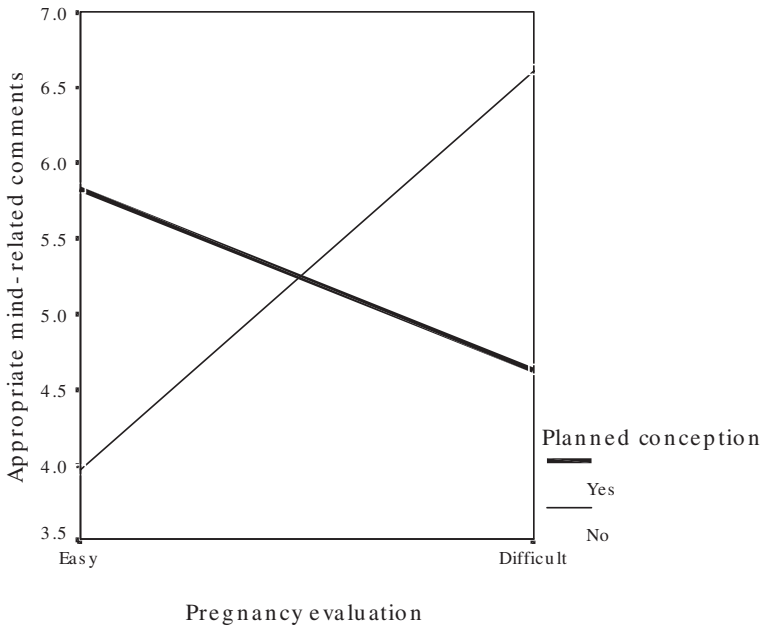
\* $p < .05$ . \*\* $p < .005$ . \*\*\* $p < .001$ .

ers who perceived the pregnancy to have been easy ( $M = 5.30$ ,  $SD = 3.61$ ) and those who perceived it to have been difficult ( $M = 5.44$ ,  $SD = 3.76$ ),  $t(203) = 0.25$ ,  $d = 0.04$ . However, in mothers who perceived the pregnancy to have been easy, those who had planned to conceive scored more highly for appropriate mind-related comments ( $n = 108$ ,  $M = 5.83$ ,  $SD = 3.32$ ) than did those who had unplanned conceptions ( $n = 41$ ,  $M = 3.97$ ,  $SD = 4.02$ ),  $t(147) = 2.87$ ,  $p < .005$ ,  $d = 0.51$ . In contrast, in mothers who perceived the pregnancy to have been difficult, there was no difference in scores for appropriate mind-related comments between mothers who had planned to conceive ( $n = 33$ ,  $M = 4.63$ ,  $SD = 3.40$ ) and those who had not ( $n = 21$ ,  $M = 6.62$ ,  $SD = 4.11$ ),  $t(52) = 1.93$ ,  $ns$ ,  $d = 0.42$ .

As shown in Table 3, for nonattuned mind-related comments scores, there was a main effect of mothers' recollections of first contact with the infant, with no other main effects or interactions. A post hoc  $t$  test showed that mothers with positive recollections scored lower for nonattuned mind-related comments ( $M = 1.22$ ,  $SD = 1.53$ ) than did those in the other category ( $M = 2.07$ ,  $SD = 2.18$ ),  $t(198) = 3.25$ ,  $p < .001$ ,  $d = 0.49$ .

#### *Relations between maternal sensitivity and obstetric history*

With respect to relations between maternal sensitivity and the control variables, independent samples  $t$  tests showed that sensitivity was unrelated



**Figure 1** Interaction between perception of pregnancy and planned pregnancy for mothers' mean appropriate mind-related comments scores.

to pregnancy complications and neonatal medical problems,  $t_s < 1.02$ ,  $d_s < 0.22$ , but mothers who had experienced labor complications were more sensitive ( $M = 6.14$ ,  $SD = 1.39$ ) than their counterparts who had no complications ( $M = 5.44$ ,  $SD = 1.47$ ),  $t(198) = 3.06$ ,  $p < .005$ ,  $d = 0.49$ .

Relations between the obstetric history variables and maternal sensitivity were investigated using ANCOVA as described above. The results are summarized in Table 3. As shown in Table 3, there were no main effects or interactions for the obstetric history variables.

#### *Relations between infant–mother interaction variables and total number of risk factors*

To investigate whether the infant–mother interaction variables were related to overall number of risk factors, we tallied the total amount of risk experienced by each mother. Mothers received one point for each of the following potential risk factors: (i) unplanned pregnancy, (ii) perceiving the pregnancy to have been difficult, (iii) nonpositive recollection of first contact with the child, (iv) depression score in the mild, moderate, or severe band, and (v) falling into the lowest two SES bands. As shown in Table 2, total

risk was unrelated to both appropriate and nonattuned mind-related comments, but was negatively correlated with sensitivity.

## Discussion

The results of Study 1 showed that the two indices of mind-mindedness (appropriate mind-related comments and nonattuned mind-related comments) related to different aspects of mothers' obstetric history. For mothers' tendency to comment appropriately on their infants' likely internal states, there was a main effect of pregnancy evaluation and an interaction between planned conception and pregnancy evaluation. Post hoc tests showed that, in mothers who perceived the pregnancy to have been easy, those who had planned to conceive were more likely to comment appropriately on their infants' internal states than were their counterparts whose pregnancies were unplanned. However, planned pregnancy was unrelated to appropriate mind-related comments in mothers who perceived the pregnancy to have been difficult. Appropriate mind-related comments were unrelated to mothers' recollection of their first contact with their infants. In contrast, mothers' tendency to make nonattuned comments on their infants' thoughts and feelings was unrelated to planned pregnancy and pregnancy evaluation but was associated with mothers' recollections of first contact with the child. Mothers who recollected emotional reactions of an exclusively positive nature were less likely to comment in a nonattuned manner on their infants' internal states than were mothers who recalled mixed, neutral, or negative emotions or focused purely on their own physical reaction to birth.

No strong support was obtained for the suggestion that mind-mindedness was related to mothers' SES, perceived social support, or concurrent depression. Although appropriate mind-related comments correlated positively with SES, and nonattuned mind-related comments were negatively correlated with concurrent depression, both effects were small (Cohen, 1988). Moreover, the relations between obstetric history and the mind-mindedness indices were independent of SES, perceived social support, concurrent maternal depression, and actual complications experienced during pregnancy, labor, and birth. The fact that neither index of mind-mindedness was related to the total number of risk factors experienced suggests that the observed relations between the obstetric history and mind-mindedness variables are specific and can not be explained in terms of cumulative risk.

A different picture emerged when maternal sensitivity was used to index individual differences in infant-mother interaction. Maternal sensitivity was unrelated to planned conception, pregnancy evaluation, and mothers' recollections of first contact with the infant. However, more sensitive mothers



tended (i) to come from higher SES backgrounds, (ii) to report higher levels of perceived social support, (iii) to report lower levels of concurrent depression, and (iv) to have experienced fewer risk factors.

Taken together, the findings of Study 1 suggest that the indices of mind-mindedness are independent of stable mother-centered factors, such as SES, and of factors assessing mothers' concurrent psychological well-being (depression and perceived social support) or overall potential risk. Rather, factors specific to mothers' recollections of their relationship with their children during pregnancy and immediately after birth relate to mothers' mind-mindedness, with the two indices relating to different aspects of obstetric history.

## STUDY 2

The results of Study 1 are consistent with the hypothesis that the indices of mind-mindedness reflect cognitive-behavioral traits in the mother given that they appear immune to the impact of the mother's general social circumstances or psychological well-being. The aim of Study 2 was to investigate this hypothesis further.

Meins et al. (2003) reported that mothers' mind-mindedness when interacting with their 6-month-olds was positively correlated with their tendency at age 4 to describe their children with reference to their mentalistic characteristics. However, the description-based mind-mindedness assessment does not distinguish between appropriate versus nonattuned mentalistic attributions, thus precluding an exploration of whether the separate indices of appropriate and nonattuned mind-related comments remain stable over time. No study has yet investigated the temporal stability of both indices of mind-mindedness.

It may be that appropriate and nonattuned mind-related comments show different levels of stability over time. For example, there may be greater temporal stability in mothers' appropriate mind-related comments than in their nonattuned mind-related comments because infants' behaviors become more purposeful and motorically controlled as they get older. Mothers may thus be more likely to comment in a nonattuned manner on their infants' internal states at younger ages because young infants' behaviors are more difficult to interpret. To investigate this possibility, Study 2 explored whether appropriate and nonattuned mind-related comments become more or less common as the child gets older.

With regard to infant-centered characteristics, previous research lends little support to the contention that certain mothers are more mind-minded because their infants are more cognitively able, socially engaging,

interactive, and so on. For example, maternal mind-mindedness is unrelated to various indices of concurrent infant behavior (Meins et al., 2001), and to children's scores on standardized ability scales in infancy (Meins et al., 2001) and at age 4 (Meins et al., 2002). However, it may be premature to conclude on the basis of this evidence that mind-mindedness is independent of infant characteristics. Although specific types of infant behavior during play sessions in the laboratory or scores on standardized tests appear not to be associated with mind-mindedness, infants' general temperamental characteristics might relate more strongly to mothers' tendency to comment appropriately on their infants' internal states and to misread their infants' thoughts and feelings.

Mothers' tendency to comment appropriately on their infants' internal states may be positively associated with infants' temperamental tendencies to be active, to be attentive for prolonged periods of time, or to show emotional responses. For example, if an infant consistently shows fear or attentive interest toward specific stimuli, this may enable a mother to make a judgement about her child's fears and interests and thus lead her to comment appropriately on these internal states. Assessing infant behavior in terms of specific temperamental traits may thus highlight an influence of infant-centered factors on maternal mind-mindedness.

The aim of Study 2 was to investigate further whether mind-mindedness can be characterized as a cognitive-behavioral trait in the mother. If this is the case, one would predict that mind-mindedness will (i) remain stable over time and (ii) be unrelated to infant-centered characteristics.

## Method

### *Participants*

Participants were 41 full-term infants (24 girls, 17 boys) and their mothers. Families were predominantly lower-middle class, and came from North-East England. All of the children and mothers were White. Children were tested at age 3 months (mean age = 14 weeks; range = 12–17 weeks) and age 7 months (mean age = 30 weeks; range = 28–34 weeks). Mothers' average age at the first-testing session was 30 years (range = 18–38 years). Of the 41 infants, 23 were first-born.

### *Assessment of maternal mind-mindedness at 3 and 7 months*

At age 3 months, infants were seated in a baby seat with mothers facing them, and mothers were instructed to interact with their infants as they normally would. Mothers were provided with a small selection of age-appro-

priate toys that they could use during the interaction if they wished. Mothers interacted with their infants for 5 min. Testing sessions were scheduled for times when the infant was likely to be alert, and every effort was made to ensure that the infant was comfortable before the session began. The mother and infant were alone during the observation, and cameras on opposite walls of the room filmed the mother's and infant's faces. Split-screen video recording provided simultaneous input from both cameras.

At age 7 months, the indices of mind-mindedness were obtained from a longer (20 min) play session. Given 7-month-olds' motor skills, the play session was conducted with the infants and mothers sitting together on a play mat on the floor rather than having the infants restrained in a baby seat as in the 3-month session, mirroring the mind-mindedness session in Study 1. As in the play session at 3 months, mothers were simply asked to play with their infants as they normally would, and a range of age-appropriate toys was provided.

At both 3 and 7 months, mind-mindedness was coded using the procedures outlined by Meins and colleagues (Meins & Fernyhough, 2010; Meins et al., 2001) and described in detail in Study 1, with a randomly selected 25% of the play sessions from each phase being coded by a second, blind coder. (Note that different coders were used for the 3- and 7-month phases.) At both ages, raters achieved perfect agreement for identifying mind-related comments. Interrater agreement for dichotomous appropriate–nonattuned classification was  $\kappa = .89$  at age 3 months, and  $\kappa = .82$  at age 7 months.

At each testing phase, scores for appropriate mind-related comments and nonattuned mind-related comments were calculated as a proportion of the mother's total number of comments made during the session to control for differences in verbosity between mothers. Proportional scores were used in the analyses.

### *Infant temperament*

Infant temperament was assessed using Rothbart's (1981) Infant Behavior Questionnaire (IBQ) at the 7-month testing phase. This well-respected measure of infant temperament yields scores on six different temperamental dimensions: (i) activity level (locomotor activity, squirming, moving arms and legs), (ii) smiling and laughter, (iii) fear, (iv) distress to limitations (e.g., fussing, crying or distress in response to waiting for food or being placed in a confined place or position), (v) soothability (positive response to various soothing techniques, such as rocking or singing), and (vi) duration of orienting (tendency to vocalize, look at, or interact with a single object for an extended period of time). Mothers rated each item on the questionnaire using a seven-point Likert scale, with high scores indicating more frequent

demonstration of the specific dimension of behavior. Infants received a mean score for each temperamental dimension. One mother did not complete the IBQ. The internal reliabilities of the temperament dimensions were as follows: activity level  $\alpha = .72$ , smiling and laughter  $\alpha = .59$ , fear  $\alpha = .69$ , distress to limitations  $\alpha = .77$ , soothability  $\alpha = .65$ , and duration of orienting  $\alpha = .79$ .

### *Maternal education*

Mothers' level of education was included as a control variable. Mothers were asked to identify their highest educational level (North American equivalents to the British educational system are shown in parentheses): 0: no examinations; 1: CSEs (equivalent to high school up to age 16 for less academic students); 2: GCSEs or O-Levels (high school up to age 16 for more academic students); 3: A-Levels (high school up to age 18); 4: further qualification, not to degree level (e.g., nursing); 5: undergraduate degree; 6: postgraduate qualification. Scores for the 41 participating mothers were as follows: 1 scored 0, 2 scored 1, 13 scored 2, 1 scored 3, 12 scored 4, 9 scored 5, and 3 scored 6.

## Results

### *Descriptive statistics and preliminary analyses*

Table 4 shows the descriptive statistics. Data for all variables were normally distributed except those for the nonattuned mind-related comments scores at 3 months, which were positively skewed. Nonparametric analyses yielded the same pattern of findings as parametric analyses, so parametric statistics are reported below.

As in Study 1 and in previous research (Arnott & Meins, 2007; Meins et al., 2002), scores for appropriate mind-related comments and nonattuned mind-related comments were unrelated at 3 months,  $r(39) = .09$ , *ns*, and at 7 months,  $r(39) = .12$ , *ns*.

Maternal educational level was unrelated to appropriate mind-related comments at 3 months,  $r(39) = .10$ , *ns*, and at 7 months,  $r(39) = .26$ , *ns*. Maternal education was also unrelated to nonattuned mind-related comments at 3 months,  $r(39) = .03$ , *ns*, and at 7 months,  $r(39) = -.09$ , *ns*.

### *Temporal stability in mind-mindedness from 3 to 7 months*

Mothers' proportional scores for appropriate mind-related comments at 3 and 7 months were positively correlated,  $r(39) = .53$ ,  $p < .001$ .

TABLE 4  
Descriptive Statistics for Study 2 Variables

| <i>Variable</i>            | <i>Mean</i> | <i>SD</i> | <i>Range</i> |
|----------------------------|-------------|-----------|--------------|
| Maternal mind-mindedness   |             |           |              |
| AMRC 3 months (%)          | 5.47        | 5.95      | 0–23.81      |
| NAMRC 3 months (%)         | 1.41        | 2.26      | 0–9.76       |
| AMRC 7 months (%)          | 9.81        | 4.46      | 2.38–21.63   |
| NAMRC 7 months (%)         | 2.82        | 3.38      | 0–13.58      |
| Infant temperament         |             |           |              |
| Activity level             | 3.19        | 0.69      | 1.79–4.46    |
| Smiling and laughter       | 5.21        | 0.64      | 3.80–6.40    |
| Fear                       | 4.26        | 0.77      | 2.59–6.12    |
| Distress to limitations    | 3.80        | 1.07      | 2.18–5.73    |
| Soothability               | 5.10        | 0.66      | 3.80–6.38    |
| Duration of orienting      | 2.65        | 0.91      | 1.36–6.07    |
| Control variables          |             |           |              |
| Maternal educational level | 3.56        | 1.58      | 0–6          |

*Note.* AMRC = appropriate mind-related comments; NAMRC = nonattuned mind-related comments.

Proportional scores for nonattuned mind-related comments at the two testing phases were also positively correlated,  $r(39) = .37, p < .01$ . These correlations remained significant when maternal education was partialled out: for appropriate mind-related comments,  $r(38) = .53, p < .001$ ; for nonattuned mind-related comments,  $r(38) = .36, p < .01$ . These correlations show that there was temporal stability between 3 and 7 months in mothers' tendency to comment both appropriately and in a nonattuned manner on their infants' internal states. The effect size for temporal stability in appropriate mind-related comments was large, with a medium effect size for stability in nonattuned mind-related comments (Cohen, 1988).

Paired samples *t* tests were carried out in order to establish whether mothers were more likely to comment appropriately on their infants' internal states or to misinterpret what their infants might be thinking or feeling at the younger age. The mean scores for the two mind-mindedness indices at 3 and 7 months are shown in Table 4. Scores for appropriate mind-related comments were higher at 7 months than at 3 months,  $t(40) = 4.27, p < .001, d = 0.83$ . Scores for nonattuned mind-related comments were also higher at 7 months than at 3 months,  $t(40) = 2.60, p < .025, d = 0.46$ . Thus, at the older age, mothers were more likely to comment appropriately on their infants' internal states, but were also more likely to misinterpret their infants' thoughts and feelings.

TABLE 5  
 Partial Correlations (Pearson's  $r$ ) between Maternal Mind-Mindedness and Infant  
 Temperament Dimensions, Controlling for Maternal Educational Level

|                         | <i>AMRC</i>     | <i>NAMRC</i>    |
|-------------------------|-----------------|-----------------|
|                         | <i>7 months</i> | <i>7 months</i> |
| Activity level          | .04             | .15             |
| Smiling and laughter    | -.19            | -.34            |
| Fear                    | -.04            | -.16            |
| Distress to limitations | .10             | -.16            |
| Soothability            | -.12            | -.10            |
| Duration of orienting   | -.17            | -.17            |

*Note.* AMRC = appropriate mind-related comments; NAMRC = nonattuned mind-related comments.

### *Relations between infant temperament and mind-mindedness*

Table 5 shows concurrent relations between the maternal mind-mindedness indices and the temperament dimensions, controlling for maternal educational level. Alpha was adjusted to .008 (.05/6) to control for multiple comparisons for relations with each index of mind-mindedness. As shown in Table 5, none of the temperament dimensions correlated with mothers' scores for either appropriate or nonattuned mind-related comments. Effect sizes for all correlations were small, apart from the medium effect size for the negative correlation between infant smiling and laughing and mothers' nonattuned mind-related comments. However, it should be noted that smiling and laughter was the temperament dimension that scored lowest on internal reliability.

### Discussion

The first aim of Study 2 was to investigate whether there was temporal stability between 3 and 7 months in mothers' tendency to comment appropriately and in a nonattuned manner on their infants' internal states. The findings show that both indices of mind-mindedness were stable over the 4-month period, and that this temporal stability remained once mothers' educational level had been controlled. Scores for nonattuned mind-related comments were higher at 7 months than at 3 months, as were scores for appropriate mind-related comments. The findings of Study 2 thus gave no credence to the suggestion that mothers might be more likely to misinterpret their infants' internal states at younger ages as a result of young infants' behaviors being more difficult to interpret, since one would have expected more nonattuned mind-related comments at the younger age if this were the case.

The second aim of Study 2 was to establish whether mothers' appropriate and nonattuned mind-related comments related to infants' temperamental characteristics. None of the six temperament dimensions related either to mothers' appropriate mind-related comments or to their tendency to comment in a nonattuned manner on their infants' internal states. The results of Study 2 thus provide no support for the hypothesis that infants' own temperamental characteristics relate to their mothers' concurrent tendency to voice an appropriate interpretation of their infants' internal states or to misinterpret what the infant might be thinking or feeling.

Finally, the results of Study 2 showed that the two mind-mindedness indices at both ages were unrelated to maternal educational level, adding to the findings of Study 1 regarding the null relations between mind-mindedness and mother-centered factors.

## GENERAL DISCUSSION

In the two studies reported here, we set out to investigate a number of potential explanations for individual differences in mind-mindedness. We explored whether mind-mindedness is best characterized as (i) a facet of the specific caregiver-child relationship, (ii) reflecting fluctuating caregiver-centered characteristics, such as mood or well-being, (iii) reflecting a stable cognitive-behavioral trait in the caregiver, or (iv) a response to infant-centered temperamental traits.

The results of Study 1 provided support for (i), with both indices of mind-mindedness being found to relate to aspects of mothers' obstetric history. In contrast, small effects were observed for relations between mind-mindedness and mothers' concurrent scores for depression and perceived social support, suggesting that mood-related characteristics have little impact on a mother's tendency to engage in mind-minded discourse with her infant. Neither did the total number of potential risk factors experienced relate to the two mind-mindedness indices.

The results of Study 2 are in line with the notion that mind-mindedness reflects a cognitive-behavioral trait in the mother since both indices of mind-mindedness were found to be stable over a 4-month period. Despite the fact that, at the older age, mothers as a whole scored more highly both for appropriate mind-related comments and for comments that indicated nonattuned readings of the infant's internal states, there was impressive stability in mind-mindedness for mothers as individuals. This suggests that, regardless of age-related changes in the infants and in how mothers talk to their infants, mothers who tended to comment appropriately on their infants' internal states at 3 months continued to do so at 7 months, and

mothers who tended to misinterpret their infants' thoughts and feelings at age 3 months also did so 4 months later.

Study 2 also addressed the issue of relations between mind-mindedness and infants' temperamental traits. None of the six temperament dimensions was associated with either index of mind-mindedness, suggesting that mothers' tendency to comment appropriately on their infants' internal states and to misinterpret their infants' thoughts and feelings is independent of infant temperamental traits. These results are in line with previous findings suggesting that infant characteristics are unrelated to maternal mind-mindedness (Meins et al., 2001, 2002). However, the relatively small sample size for Study 2 is a limitation, and the null findings on the relations between infant temperament and mind-mindedness should be replicated in a larger sample before definitive conclusions can be drawn. That said, the effect sizes for all but one of the correlations between temperament and mind-mindedness were negligible or small. It is also worth noting that infant characteristics were assessed in Study 2 on the basis of maternal report rather than from direct observation of infant behavior. One would expect that maternal report of infant temperament might be more strongly related to mind-mindedness than would observation-based measures, given that maternal report and the indices of mind-mindedness both depend on the mother's interpretation of the infant's characteristics and behavior. The observed null findings are therefore striking. Future research could further explore relations between infant temperament and maternal mind-mindedness by assessing temperament using observational measures, investigating whether mind-mindedness mediates or moderates any relation between maternal report and observational assessments of temperament.

The results of Studies 1 and 2 highlight a number of issues worthy of further discussion. First, it is important to consider why different aspects of obstetric history related to each of the mind-mindedness variables. Mothers' appropriate mind-related scores were associated with an interaction between planned pregnancy and pregnancy evaluation, with planned conception being positively associated with appropriate mind-related comments only for mothers who perceived the pregnancy to have been easy. In contrast, nonattuned mind-related comments were associated with mothers' recollections of first contact with their infants, with mothers who recollected emotional reactions of a purely positive nature being less likely to misinterpret their infants' internal states than mothers who recalled mixed, neutral, or negative feelings or who focused solely on their own physical reaction to the birth.

It may be that mothers' tendency to comment appropriately on their infants' internal states is initially fostered by a conscious decision to conceive, but the relation between planned conception and appropriate



mind-related comments is then moderated by the woman's evaluation of whether the pregnancy is easy or difficult. If the pregnancy is perceived to have been difficult, this negates any positive initial impact of planned conception on women's appropriate mind-related comments. Conversely, in mothers who perceived the pregnancy to have been difficult, although differences in appropriate mind-related comments between the planned and unplanned conception groups were nonsignificant, the effect was in the opposite direction (see Figure 1), with unplanned conception being associated with higher scores for appropriate mind-related comments. One possible explanation for the difference in direction of effect is that, compared with making a decision to attempt to conceive, deciding to continue with an unplanned pregnancy may require more detailed consideration of what kind of individual the fetus may become. If the woman then perceives the pregnancy to be difficult, she may become more concerned about the well-being of the fetus as a result of this more detailed reflection on the future identity of the infant, leading to higher levels of appropriate mind-related comments postpartum. A combination of wanting to become pregnant and feeling that the pregnancy is progressing smoothly may similarly make mothers more likely to attempt to "tune in" to their infants' thoughts and feelings, and thus result in higher levels of appropriate mind-related comments after the child is born.

With regard to the correlates of nonattuned mind-related comments, mothers who recollect nonpositive reactions to first contact with the child might be less willing or able to represent their infants' internal states, thus leading to higher scores for nonattuned comments. For example, many of the recollections of a nonpositive nature involved only the mother's perspective (relief, shock, exhaustion, etc.) rather than her response to the infant. This tendency only to represent one's own perspective is likely to lead to misinterpretations of the infant's thoughts and feelings. Our findings thus suggest that assessing factors relating to the antenatal period may help to explain individual differences in the quality of infant-mother interaction in the first year of life, and add to the findings of Arnott and Meins (2008) in highlighting how antenatal perceptions relate to postpartum mind-mindedness.

One limitation of Study 1 was that our assessments of obstetric history and first contact with the infant were based on mothers' retrospective report, so it could be argued that intervening life events may have colored how mothers perceived their pregnancy and their recollections of first meeting the infant. It would thus be interesting for future research to establish what types of intervening experience may be capable of influencing mothers' recollections of pregnancy and birth. For example, if a mother's antenatal expectations about her infant or herself in the caregiving role are not met,

this may prompt her to re-evaluate how successfully she dealt with pregnancy or how positively she felt about her baby immediately after birth. Longitudinal data from pregnancy and across the transition to parenthood would be instructive in addressing these questions.

A second finding requiring further discussion is the fact that, although the observed temporal stability in both indices of mind-mindedness suggests that this construct may reflect a cognitive-behavioral trait in the mother, it is not possible on the basis of Study 2's findings to exclude the possibility that this maternal behavior is specific to the relationship with that infant. Establishing that indices of mind-mindedness generalize across relationships would provide stronger evidence that mind-mindedness is best characterized as a cognitive-behavioral trait.

Two studies have addressed this issue, investigating how caregivers' mind-mindedness relates to their recollections of their own childhood experiences with caregivers during the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1996). Arnott and Meins (2007) reported that mothers' tendency to reflect on attachment memories and caregivers' motivations for behaving as they did (so-called reflective functioning; Fonagy, Target, Steele, & Steele, 1998) was negatively associated with their nonattuned mind-related comments during on-line interactions with their infants. Demers et al. (2010) found that the coherence of mothers' discourse during the AAI was positively associated with their tendency to use positively valenced mentalistic characteristics when describing their infants. These findings suggest that mothers' own state of mind with regard to attachment may play a role in mediating or moderating the observed link between the maternal obstetric history variables and mind-mindedness.

To investigate whether mind-mindedness generalizes across different close relationships, it would also be interesting to explore how indices of mind-mindedness vary across siblings. If mothers who tended to comment appropriately or in a nonattuned manner when interacting with their first-born children also tended to comment in a similar fashion with their second-born children, this would support a view of mind-mindedness as a cognitive-behavioral trait in the caregiver, independent of individual child characteristics.

In addition to finding different correlates of the two indices of mind-mindedness, Studies 1 and 2 replicated previous results suggesting that appropriate and nonattuned mind-related comments are unrelated to one another (Arnott & Meins, 2007; Meins et al., 2002). The findings of Study 1 also add to the literature highlighting differences between maternal mind-mindedness and mothers' general sensitivity (e.g., Meins et al., 2001, 2002). Maternal sensitivity was found to be positively associated with SES and perceived social support and negatively associated with mothers' concurrent

depression and total amount of experienced risk, but was unrelated to any of the obstetric history variables. This suggests that maternal sensitivity is best characterized as a reflection of maternal well-being, whereas mind-mindedness indexes qualities of the ongoing mother–infant relationship or cognitive–behavioral traits in the mother that are not strongly determined by women’s social circumstances or psychological state.

Although the sample of women who participated in Study 1 was drawn from the general community, with the vast majority reporting minimal levels of depression, the results of a recent study are in line with this conclusion. Pawlby et al. (2010) assessed mind-mindedness in mothers hospitalized with a range of severe mental illnesses, including major depression and schizophrenia. Mothers’ mental illness was unrelated to their scores for nonattuned mind-related comments; for appropriate mind-related comments, there was a trend for depressed mothers to be less likely to comment appropriately on their infants’ internal states, but this trend was seen only on admission and not at discharge. The fact that even severe mental illness in the mother is not strongly related to her levels of mind-mindedness highlights how mind-mindedness is a relational construct.

Finally, as well as having different potential origins, it may be that the two indices of mind-mindedness have somewhat separate developmental trajectories. Given that, on average, mothers use nonattuned mind-related comments more rarely than they comment appropriately on their infants’ internal states, the former may ultimately turn out to be the stronger predictor of subsequent development. Alternatively, each of the two mind-mindedness indices may be important depending on the outcome variable in question. For example, in a follow-up study of the sample who participated in Study 1, Meins et al. (2010) reported that, although nonattuned mind-related comments were more strongly related to 15-month infant–mother attachment security than were appropriate mind-related comments, each mind-mindedness index accounted for unique variance in attachment security. In continuing to address how both indices of mind-mindedness relate to subsequent development, future research will be able to refine the construct of caregiver mind-mindedness and establish more precisely its role in predicting developmental outcomes.

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