



Mind-Mindedness as a Multidimensional Construct: Appropriate and Nonattuned Mind-Related Comments Independently Predict Infant–Mother Attachment in a Socially Diverse Sample

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In a socially diverse sample of 206 infant–mother pairs, we investigated predictors of infants’ attachment security at 15 months, with a particular emphasis on mothers’ tendency to comment appropriately or in a non-attuned manner on their 8-month-olds’ internal states (so-called mind-mindedness). Multinomial logistic regression analyses showed that higher scores for appropriate mind-related comments and lower scores for non-attuned mind-related comments distinguished secure-group mothers from their counterparts in the insecure-avoidant, insecure-resistant, and insecure-disorganized groups. Higher scores for appropriate mind-related comments and lower scores for non-attuned mind-related comments also independently predicted dichotomous organized/disorganized attachment. General maternal sensitivity predicted neither attachment security nor organization, although sensitivity was found to relate to dichotomous secure/insecure attachment specifically in the context of low socioeconomic status. The findings highlight how appropriate and non-attuned mind-related comments make independent contributions to attachment and suggest that mind-mindedness is best characterized as a multidimensional construct.

In the decades since Ainsworth, Bell, and Stayton (1971, 1974) operationalized individual differences in maternal sensitivity, several research groups have attempted to characterize how a caregiver’s sensitive responsiveness might shape the infant–caregiver attachment relationship. While some have focused on behavioral characteristics (e.g., synchrony) that might denote sensitivity (Isabella & Belsky, 1991; Isabella, Belsky, & von Eye, 1989), others have argued that it is the mother’s ability to reflect on the internal world of her child that promotes secure infant–mother attachment (Fonagy, Steele, Moran, Steele, & Higgitt, 1991). However, there is no strong evidence that reflection on internal states, as assessed for example using the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1996), predicts more sensitive caregiving or that caregiver sensitivity mediates the relation between parental state of mind and the security of the infant–parent attachment relationship, resulting in a *transmission gap* in accounting for the observed intergenerational transfer of attachment security (van IJzendoorn, 1995).

Mind-mindedness (Meins, 1997) is a construct at the interface between behavioral and representational operationalizations of the caregiver–child relationship. In order to be mind-minded, caregivers must first form a representation of the infant’s internal state and then use this representation to inform their behavioral engagement with the child. Assessing mind-mindedness involves identifying discourse in which the caregiver comments on the infant’s putative internal state (Meins, Fernyhough, Fradley, & Tuckey, 2001). However, not all such “mind-related comments” are indicative of mind-mindedness; each of these comments is further coded dichotomously as appropriate or non-attuned (Meins & Fernyhough, 2010; Meins et al.,

2001). Appropriate mind-related comments index the caregiver's use of internal-state language that appears to be an accurate reflection of what the infant might be thinking or feeling (e.g., stating that the infant wants a particular toy if he reaches or gestures toward it, or commenting that the infant is excited if she squeals joyfully). Conversely, non-attuned mind-related comments indicate a tendency to misinterpret the infant's internal state (e.g., commenting that the infant is bored with a toy when still actively engaged with it, or attributing an emotion to the infant in the absence of any behavior indicative of the particular emotional state).

Mind-mindedness can thus be conceptualized as indexing caregivers' interaction with their infants along two distinct dimensions: one that encapsulates traditional notions of engagement, responsivity, and sensitivity (appropriate mind-related comments) and one that indexes the caregiver's lack of attunement to the infant's point of view and imposition of the caregiver's own agenda (non-attuned mind-related comments). In order to avoid the loss of important information on caregivers' psychological attunement to their infants' internal states, this line of reasoning suggests that it is necessary to use mind-related language in addition to caregiver behavior to assess sensitive responsivity in its full richness and complexity.

Take the example of a mother withdrawing a toy after the infant calmly turned away when offered it. While the withdrawal can be seen to be a sensitive response, the mother's accompanying mind-related discourse may either be an appropriate interpretation of the infant's putative thoughts or feelings or else may betray a lack of attunement to the infant's likely internal state. For example, it would appear appropriate to interpret calmly turning away as an indication that the infant did not want or like the toy. However, if the mother interpreted the turning away as indicating that the infant was surprised or frightened by the toy, or as evidence that she herself was disliked by her infant, these comments (in the absence of any other evidence to support such interpretations) would be classed as non-attuned. Thus, the same seemingly sensitive response from the caregiver could be associated with various appropriate or non-attuned attributions about the infant's internal states. Unless caregivers voice these attributions, it is impossible to assess their psychological attunement.

The study reported here involved a detailed investigation of the mind-mindedness construct in order to explore whether individual differences in mind-mindedness can predict variance in attachment security over and above any contribution made by maternal sensitivity. There are grounds to suggest that including non-attuned mind-related comments in particular may account for additional variance. For example, whereas appropriate mind-related comments are positively correlated with maternal sensitivity (Arnott & Meins, 2007; Meins et al., 2001), non-attuned mind-related com-

ments appear to be unrelated to general sensitivity (Arnott & Meins, 2007; Meins et al., 2002). Indices of appropriate mind-related comments and non-attuned mind-related comments have been found to be unrelated (Arnott & Meins, 2007; Meins et al., 2002), and these two types of mind-related comment occur at very different frequencies in maternal discourse, with appropriate mind-related comments being around four or five times more frequent (Meins, Fernyhough, Arnott, Leekam, & Turner, 2011; Meins et al., 2003). Taken together, these findings suggest that non-attuned comments tap into aspects of caregiving that are not captured by traditional definitions of sensitive responsiveness.

Assessing both appropriate and non-attuned mind-related comments in addition to traditional sensitivity may thus prove successful in predicting attachment security across the full spectrum of attachment classifications: secure, insecure-avoidant, insecure-resistant (the original categories identified by Ainsworth, Blehar, Waters, & Wall, 1978), and insecure-disorganized (Main & Solomon, 1986, 1990). Predicting attachment security at this fine-grained level on the basis of sensitivity alone has proved elusive in previous research, both when sensitivity is assessed from brief laboratory-based (Ansfeld, Casper, Nozyce, & Cunningham, 1990; Isabella, 1993; Stifter, Couleham, & Fish, 1993) and more extensive home-based (Pederson, Gleason, Moran, & Bento, 1998; Raval et al., 2001) observations. Indeed, even in Ainsworth et al.'s (1978) original sample, which is recognized as providing the strongest support currently available for sensitivity predicting attachment security (De Wolff & van IJzendoorn, 1997), mean sensitivity scores could not distinguish between mothers of insecure-avoidant and insecure-resistant infants. Moreover, although the mean sensitivity score for mothers of infants in the optimally secure B3 subgroup was 7.36, the mean for mothers for the B1/B2 subgroup of secure infants was only 4.50, far below the score of seven that indicates mothers are objectively sensitive (Ainsworth et al., 1974). The picture of the relation between caregiver sensitivity and attachment security may thus be further complicated by the fact that assumptions have been drawn on the basis of only the most optimally secure sample rather than secure-group dyads as a whole.

Including the two indices of mind-mindedness in addition to sensitivity may improve the accuracy with which one can predict specific patterns of attachment because these measures will assess caregivers' psychological attunement (and lack of attunement) as well as their behavioral response to the infant. How might the indices of mind-mindedness help differentiate between the four attachment categories? Avoidant-group mothers' psychological unavailability and rejection (Ainsworth et al., 1971) may relate to their inability or unwillingness to entertain their infants' putative thoughts and feelings, and a tendency to follow their own agenda rather than respond

to cues from the child. One would thus predict that avoidant-group mothers will make few appropriate mind-related comments but have a heightened tendency to use comments that are non-attuned to the infant's internal state. Resistant-group mothers' inconsistent pattern of caregiving (Ainsworth et al., 1971; Isabella, 1993) arguably implies that they are likely to achieve high scores on both appropriate and non-attuned mind-related comments. Appropriate mind-related comments are likely to occur in the times during which resistant-group mothers are responsively attuned to their infants, but the psychological unavailability they show at other times will result in them making non-attuned comments. Thus, while avoidant and resistant groups have been found not to differ from one another in terms of mothers' mean sensitivity scores (Ainsworth et al., 1978), we predicted that these two organized forms of insecure attachment would be distinguished on the basis of different combinations of scores for appropriate and non-attuned comments. Secure-group mothers were expected to score highly for appropriate mind-related comments and to make few non-attuned comments.

We now turn to potential links between mind-mindedness and disorganization. Disorganized attachment is regarded in the literature as being (a) orthogonal to Ainsworth et al.'s (1978) original attachment categories and (b) predicted by distinct parenting behaviors. Infants given a primary disorganized classification are also assigned a "forced-choice" secondary classification from the secure/avoidant/resistant categories to indicate the underlying organized attachment strategy. While parental behavior predictive of the three organized patterns of attachment is usually characterized in terms of parents' sensitivity (e.g., De Wolff & van IJzendoorn, 1997; Goldsmith & Alansky, 1987), disorganized attachment is believed to be linked with atypical parenting behaviors (Hesse & Main, 2000, 2006; Lyons-Ruth, Bronfman, & Parsons, 1999; Madigan et al., 2006).

Parallels can be drawn between non-attuned mind-related comments and certain atypical parenting behaviors. For example, the caregiver's unwillingness or inability to be attuned to the infant's internal states has the potential to result in behaviors described in Lyons-Ruth et al.'s (1999) AMBIANCE scheme, such as affective errors (not offering comfort when the infant is distressed), negative-intrusion (e.g., mocking or teasing the infant), and withdrawal. Bernier and Meins (2008) proposed that a caregiver who frequently misreads the infant's thoughts and feelings is likely to confuse and potentially frighten the child. Consequently, the person who is meant to comfort the child is the source of anxiety or fear, resulting in the "fright without solution" that is postulated to be the hallmark of disorganized behavior.

One might thus predict that disorganized attachment will be associated with high levels of non-attuned mind-related comments. However, the links between mind-mindedness and disorganization are likely to be complex

given the fact that disorganized infants are also given a secure/avoidant/resistant classification to index their underlying behavioral strategy. Moreover, in low socioeconomic status (SES) contexts, insensitive (rather than atypical) caregiving has been found to predict disorganization (Bailey, Moran, Pederson, & Bento, 2007; van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999), suggesting that SES may moderate the relation between parenting behavior and disorganized attachment.

THE PRESENT STUDY

Previous research (Laranjo, Bernier, and Meins 2008; Lundy, 2003; Meins et al., 2001) has reported predictive links between caregivers' use of appropriate mind-related comments and later secure/insecure attachment, with appropriate mind-related comments being associated with secure attachment. However, no study has yet addressed whether (a) non-attuned comments predict further unique variance in attachment security or (b) mind-mindedness predicts security across the full range of attachment classifications. The present study treated mind-mindedness as a multidimensional construct and investigated whether appropriate and non-attuned mind-related comments independently predicted infant–mother attachment security.

We hypothesized that (a) secure-group mothers would obtain higher scores for appropriate mind-related comments and lower scores for non-attuned mind-related comments than their counterparts in the insecure-avoidant and insecure-resistant groups and (b) resistant-group mothers would score more highly on appropriate mind-related comments than mothers in the avoidant group (no differences in non-attuned comments were predicted between these groups). Relations between the indices of mind-mindedness and disorganized attachment were explored, although no specific directional hypotheses were made. The social diversity of our sample enabled us to consider the role of SES in predicting attachment security. Finally, we investigated whether any relations between attachment and mind-mindedness were independent of mothers' general sensitivity.

METHOD

Participants

Participants were 206 infant–mother dyads (108 girls, 98 boys), recruited through mother-and-baby groups and local health care professionals. The majority of the mothers ($N = 203$) were White, and 86 (41.7%) infants were first-born. Mean maternal age was 28.1 years, $SD = 5.48$, range 16–41. The

Hollingshead Index (Hollingshead, 1975) was used to assess participants' SES, and scores ranged from 11 to 66 ($M = 34.10$, $SD = 13.96$). Around half of the sample ($n = 90$) were classed as low SES. Ethical approval was obtained from local health authority committees, and mothers gave full informed consent at each testing phase.

At phase 1, infants were 8 months ($M\ age = 8.5$ months, $SD = 0.48$, range = 7.0–10.2months), and at phase 2, infants were 15 months ($M\ age = 15.5$ months, $SD = 0.60$, range = 13.7–17.3months). At phase 2, three infants had been diagnosed with significant health problems. 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.

Materials and methods

Maternal mind-mindedness

Maternal mind-mindedness was assessed at phase 1 from a video-taped 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 the room, although every session began with the mother and child on a play mat in the center of the room.

Mind-mindedness was coded using the procedures outlined by Meins and colleagues (Meins & Fernyhough, 2010; Meins et al., 2001). Mothers' speech during the sessions was transcribed verbatim, and all comments that included an internal-state term referring to the infant's mind or emotion (mind-related comments) were identified from the transcripts. Mind-related comments included references to wishes and desires, mental states (e.g., thoughts, knowledge, interests), mental processes (e.g., recognition, remembering, decision making), emotions, and attempts to manipulate people's beliefs (e.g., joking, teasing). Comments where the mother "put words into her infant's mouth" so that her speech took the form of a dialogue were also classified as mind-related.

A researcher who was blind to all other measures watched the entire video-taped interaction and classified each mind-related comment on the transcript as appropriate or non-attuned using Meins and colleagues' (Meins & Fernyhough, 2010; Meins et al., 2001) criteria. A comment was classified as an appropriate mind-related comment if one or more of the following conditions were met: (a) the independent coder agreed with the mother's reading of her infant's internal state, (b) the internal state comment linked the infant's current activity with similar events in the past or future (e.g.,

“Do you recognize this one from home?”), (c) the internal state comment served to clarify how to proceed if there was a lull in the interaction (e.g., “Do you want to play with the rings now?”; “You’ll like this one”), or (d) the mother voiced (using the first person) what the infant might say if he/she could speak (e.g., “I’m just playing with this, thanks”). A coding of non-attuned mind-related comments was made if (a) the coder believed that the mother was misinterpreting her infant’s internal state, (b) the internal state comment referred to a past or future event that had no obvious relation to the infant’s current activity (e.g., “I bet you’d like to go swimming later”), (c) 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 (d) the referent of the mother’s internal state comment was not clear (e.g., “You like that” when the mother was not attending to the child’s focus of attention).

The coding system was strictly dichotomous; a comment had to be classified either as appropriate or as non-attuned. 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 dichotomous appropriate/non-attuned classification was $\kappa = 0.70$; disagreements were resolved by discussion.

Maternal sensitivity

Maternal sensitivity was assessed from the same free-play sessions from which the mind-mindedness data were obtained using Ainsworth et al.’s (1974) scale. This measure rates general maternal sensitivity and responsiveness on a 1- to 9-point scale, with five anchor points between “highly sensitive” (9) and “highly insensitive” (1). All of the sessions were scored for sensitivity by a trained researcher who was blind to all other measures and to the study’s hypotheses. A second trained, blind researcher coded a randomly selected 25% of the sessions. (Note that these researchers were not involved in coding mind-mindedness.) Interrater reliability (intraclass correlation) was .83.

Attachment security

Infant–mother attachment security was assessed at phase 2 using the strange situation procedure (Ainsworth & Wittig, 1969; Ainsworth et al., 1978). All of the strange situations were classified by a trained and reliable

TABLE 1
Descriptive Statistics for Continuous Variables as a Function of Attachment Security

	<i>Avoidant</i>	<i>Secure</i>	<i>Resistant</i>	<i>Pooled organized</i>	<i>Disorganized</i>	<i>Whole sample</i>
Appropriate mind-related comments (total)	9.89 (8.41)	13.08 (8.86)	12.00 (6.37)	12.39 (8.70)	8.37 (7.65)	11.94 (8.66)
Appropriate mind-related comments (%)	4.26 (3.32)	5.85 (3.76)	5.00 (2.57)	5.49 (3.65)	4.02 (3.42)	5.34 (3.64)
Non-attuned mind-related comments (total)	5.64 (6.02)	2.20 (2.64)	10.82 (5.02)	3.39 (4.34)	5.11 (6.38)	3.53 (4.56)
Non-attuned mind-related comments (%)	2.36 (2.11)	1.01 (1.26)	4.66 (2.14)	1.50 (1.79)	2.54 (2.51)	1.58 (1.88)
Total number of utterances	218.22 (67.54)	221.55 (68.83)	237.09 (47.92)	221.83 (67.35)	203.74 (84.90)	220.14 (69.13)
Maternal sensitivity	5.75 (1.61)	5.63 (1.46)	6.09 (1.76)	5.68 (1.50)	5.53 (1.12)	5.64 (1.48)
Hollingshead Index (SES)	32.75 (15.71)	33.83 (13.16)	33.09 (14.34)	33.57 (13.68)	38.00 (17.43)	34.00 (14.03)

Notes. SES = socioeconomic status. Standard deviations are in parentheses.

researcher who was blind to all other measures. A second blind, reliable researcher coded a randomly selected 25% of strange situations. Interrater reliability using the four-way classification system was $\kappa = 0.82$.

RESULTS

Preliminary analyses and analysis strategy

Table 1 shows the descriptive statistics for all continuous variables as a function of attachment classification. Mind-mindedness and sensitivity data were unavailable for one mother because of technical problems. In order to control for differences in maternal verbosity, scores for appropriate mind-related comments and non-attuned mind-related comments were calculated as a percentage of the mother's total number of utterances during the 20-min session. Percentages were used in all analyses. (Note, however, that the pattern of findings presented below was unchanged when overall frequency scores for appropriate and non-attuned mind-related comments were used.)

Two strange situations were terminated because of undue distress. Of the remaining 204 children, 138 were classified as secure, 36 as insecure-avoidant, 11 as insecure-resistant, and 19 as insecure-disorganized (forced classification: 12 secure, seven insecure-avoidant).

Replicating previous research (Arnott & Meins, 2007; Meins et al., 2001, 2002), maternal sensitivity was robustly positively correlated with appropriate mind-related comments, $r(203) = .39$, $p < .001$, but was unrelated to non-attuned mind-related comments, $r(203) = .04$, *ns*, and appropriate mind-related comments were unrelated to non-attuned mind-related comments, $r(203) = .07$, *ns*.

In order to facilitate comparison between our findings and those of previous studies on sensitivity and attachment, we present analyses that treat attachment as dichotomous (organized versus disorganized and secure versus insecure), three-way (secure, avoidant, resistant), and four-way (secure, avoidant, resistant, disorganized) variables.

Predictors of organized (ABC) attachment

Predictors of organized attachment classification were investigated using multinomial logistic regression. The 19 disorganized infants were excluded from this analysis rather than using their forced-choice ABC classifications. Secure attachment was initially used as the reference group. The overall model was constructed hierarchically in two steps. Maternal sensitivity and SES were entered at the first step. The resulting model was not significant,

TABLE 2
Summary of Multinomial Logistic Regression Analysis for Variables Predicting Three-Way Attachment Classification (With Secure Reference Category)

<i>Variable</i>	<i>B</i>	<i>SE B</i>	<i>Wald</i>	<i>OR</i>	<i>95% CI</i>
Insecure-avoidant					
SES	0.00	0.02	0.00	1.00	[0.97, 1.03]
Maternal sensitivity	0.28	0.16	2.96	1.33	[0.96, 1.83]
AMR comments	-0.26	0.09	9.13*	0.77	[0.66, 0.91]
NAMR comments	0.57	0.13	19.23**	1.77	[1.37, 2.29]
Insecure-resistant					
SES	0.01	0.03	0.06	1.01	[0.83, 2.57]
Maternal sensitivity	0.38	0.29	1.75	1.46	[0.96, 1.06]
AMR comments	-0.29	0.17	3.03 ^a	0.75	[0.54, 1.04]
NAMR comments	1.01	0.20	26.10**	2.75	[1.86, 4.05]

Notes. OR = odds ratio; CI = confidence interval; AMR = appropriate mind-related; NAMR = non-attuned mind-related; SES = socioeconomic status.

^a $p = .082$. * $p < .005$. ** $p < .001$.

$\chi^2(4) = 1.71$, *ns*, Nagelkerke pseudo- $R^2 = .01$, and neither of the predictors approached significance. When mind-mindedness predictors were added at the second step, the resulting model was significant, $\chi^2(8) = 57.76$, $p < .001$, Nagelkerke pseudo- $R^2 = .36$. The final model is summarized in Table 2 and shows that, for both contrasts, secure-group mothers used fewer non-attuned mind-related comments than their counterparts in both the avoidant and resistant groups. Secure-group mothers used more appropriate mind-related comments than did avoidant-group mothers, with a non-significant trend for mothers in the secure group to use more appropriate mind-related comments than their resistant-group counterparts. Expressed in terms of *SD* increments in each mind-related comments scale, for a single *SD* (3.64) increment in a mother's score for appropriate mind-related comments, her infant was 2.6 times less likely to be classified as avoidant, and 2.9 times less likely to be classified as resistant. In contrast, for a single *SD* (1.88) increment in a mother's score for non-attuned mind-related comments, her infant was 2.9 times more likely to be classified as avoidant, and 6.7 times more likely to be classified as resistant.

A further model was constructed in order to explore the possibility that appropriate and non-attuned mind-related comments had an interactive influence on subsequent attachment classification. The introduction of the interaction term did not improve the overall model, $\chi^2(2) = 0.11$, *ns*.

The contrasts presented in Table 2, with the secure group as the reference group, do not allow one to establish whether the predictor variables differentiate the avoidant and resistant categories. Therefore, the model was rerun

with the resistant category as the reference group. The overall model was identical to that reported above, but the additional contrasts showed that resistant-group mothers used a higher percentage of non-attuned mind-related comments compared with the avoidant-group mothers, $p = .012$; odds ratio = 1.55, 95% CI [1.10, 2.19]. There was no difference in appropriate mind-related comments between the avoidant and resistant groups.

Predictors of disorganized (D) attachment

Next, predictors of attachment disorganization were investigated using binary logistic regression with organized (avoidant + secure + resistant; reference category) versus disorganized (D) attachment classification as the dependent variable. At the first step, with SES and maternal sensitivity entered, the model was not significant, $\chi^2(2) = 2.32$, *ns*, Nagelkerke pseudo- $R^2 = .03$. When the mind-mindedness indices were added at the second step, the model was significant, $\chi^2(4) = 12.01$, $p = .017$, Nagelkerke pseudo- $R^2 = .12$. This model is summarized in Table 3. Expressed in terms of *SD* increments in each mind-related scale, for a single *SD* (3.64) increment in a mother's score for appropriate mind-related comments, her infant was 2.0 times less likely to be classified as disorganized. Conversely, for a single *SD* (1.88) increment in a mother's score for non-attuned mind-related comments, her infant was 1.75 times more likely to be classified as disorganized. The addition of an interaction term (appropriate mind-related comments \times non-attuned mind-related comments) did not improve the overall model, $\chi^2(1) = 3.74$, *ns*.

Predictors of four-way (ABCD) attachment

Despite the apparent difference between the organized and disorganized attachment groups on the two mind-mindedness indices, inspection of

TABLE 3
Summary of Binary Logistic Regression Analysis for Variables Predicting Attachment Disorganization

<i>Variable</i>	<i>B</i>	<i>SE B</i>	<i>Wald</i>
SES	0.03	0.02	3.04
Maternal sensitivity	-0.04	0.20	0.04
AMR comments	0.20	0.10	3.86*
NAMR comments	-0.30	0.12	6.76**

Notes. AMR = appropriate mind-related; NAMR = non-attuned mind-related; SES = socioeconomic status.

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

Table 1 suggested that this finding might be to some extent carried by differences specifically between the secure and disorganized groups. Indeed, Table 1 suggests a similar profile on appropriate and non-attuned mind-related comments for the disorganized and avoidant groups. Therefore, a further multinomial logistic regression analysis was conducted on the entire sample, using four-way classification attachment as the outcome variable. The disorganized group was used as the reference category. At the first step, with SES and maternal sensitivity scores entered, the resulting model was not significant, $\chi^2(6) = 4.98$, *ns*, Nagelkerke pseudo- $R^2 = .02$, and neither of the predictors approached significance. With the addition of the mind-mindedness variables at the second step, the overall model was significant, $\chi^2(12) = 72.22$, $p < .001$, Nagelkerke pseudo- $R^2 = .35$.

The overall model is summarized in Table 4 and shows that disorganized-group mothers used a lower proportion of appropriate mind-related comments and a higher proportion of non-attuned mind-related comments compared with their secure-group counterparts. There was a marginal effect ($p = .06$) indicating that disorganized-group mothers used fewer non-attuned comments than their resistant-group counterparts. Mothers in

TABLE 4
Summary of Multinomial Logistic Regression Analysis for Variables Predicting Four-Way Attachment Classification (With Disorganized Reference Category)

<i>Variable</i>	<i>B</i>	<i>SE B</i>	<i>Wald</i>	<i>OR</i>	<i>95% CI</i>
Insecure-avoidant					
SES	-0.03	0.02	2.36	0.97	[0.93, 1.01]
Maternal sensitivity	0.20	0.23	0.70	1.22	[0.77, 1.92]
AMR comments	0.04	0.13	0.09	1.04	[0.81, 1.33]
NAMR comments	-0.07	0.15	0.24	0.93	[0.70, 1.24]
Insecure-resistant					
SES	-0.03	0.03	1.05	0.97	[0.92, 1.03]
Maternal sensitivity	0.38	0.32	1.45	1.47	[0.79, 2.23]
AMR comments	-0.06	0.17	0.11	0.95	[0.68, 1.32]
NAMR comments	0.36	0.19	3.53 ^a	1.43	[0.99, 2.06]
Secure					
SES	-0.03	0.02	2.30	0.97	[0.94, 1.01]
Maternal sensitivity	-0.13	0.22	0.39	0.88	[0.57, 1.33]
AMR comments	0.31	0.11	7.16*	1.36	[1.09, 1.70]
NAMR comments	-0.65	0.15	18.05**	0.52	[0.39, 0.70]

Notes. OR = odds ratio; CI = confidence interval; AMR = appropriate mind-related; NAMR = non-attuned mind-related; SES = socioeconomic status.

^a $p = .060$. * $p < .01$. ** $p < .001$.

the disorganized and avoidant groups did not differ on either index of mind-mindedness. Expressed in terms of *SD* increments in each mind-related scale, for a single *SD* (3.64) increment in a mother's score for appropriate mind-related comments, her infant was 3.1 times more likely to be classified as secure. Conversely, for a single *SD* (1.88) increment in a mother's score for non-attuned mind-related comments, her infant was 3.4 less likely to be classified as secure. As for the regression analyses above, the addition of an interaction term (appropriate mind-related comments \times non-attuned mind-related comments) did not improve the overall model, $\chi^2(3) = 2.87$, *ns*.

Predictors of two-way (secure/insecure) attachment

Despite the relatively large sample, the distribution of attachment subtypes meant that there were few insecure-resistant dyads and a modest number of insecure-disorganized dyads. Because of the sensitivity of multinomial logistic regression models to small classes of the dependent variable, we examined whether the findings based on the three- and four-way attachment classification were consistent with a more conservative dichotomous classification into secure and insecure groups. When SES and sensitivity were entered at the first step, the overall model was not significant, $\chi^2(2) = 0.29$, *ns*, Nagelkerke pseudo- $R^2 = .00$. At the second step, the mind-mindedness variables were added and the resulting model was significant, $\chi^2(4) = 60.76$, $p < .001$, Nagelkerke pseudo- $R^2 = .36$, with both appropriate and non-attuned mind-related comments making significant, independent contributions to dichotomous attachment security ($ps < .001$). The addition of an interaction term (appropriate mind-related comments \times non-attuned mind-related comments) did not improve the overall model, $\chi^2(1) = 0.24$, *ns*.

To put this finding in perspective, 50.4% of secure-group mothers exceeded the overall mean percentage (5.34) of appropriate mind-related comments, whereas only 27.3% of insecure-group mothers exceeded this mean. For non-attuned mind-related comments, only 21.9% of secure-group mothers exceeded the overall mean percentage (1.58), compared with 62.1% of insecure-group mothers. In fact, the percentage of discourse classified as non-attuned mind-related comments was lower than 2% for 90% of secure-group mothers.

In keeping with the meta-analysis of De Wolff and van IJzendoorn (1997), in the context of a secure-insecure distinction, we explored the combined influence of SES and sensitivity on attachment security. A binary logistic analysis was run, the same as above but with the addition of an interaction term: SES \times sensitivity. The overall model, including all predictors, was significant, $\chi^2(5) = 64.30$, $p < .001$, Nagelkerke pseudo- $R^2 = .38$, and

revealed a marginal effect for the interaction between SES and sensitivity, $\chi^2(1) = 3.69$, $p = .055$. The impact of mind-related comments was unchanged at the final step, with both appropriate and non-attuned mind-related comments independently predicting dichotomous security at the $p < .001$ level. Inspection of the interaction revealed that mothers of secure infants were more sensitive than mothers of insecure infants only in the low SES context. Further examination of this relation revealed a robust correlation between SES and sensitivity in the context of insecure attachment, $r(66) = .43$, $p < .001$, and a weaker correlation in the context of secure attachment, $r(136) = .22$, $p = .010$. The difference between these correlation coefficients approached significance, $z = 1.54$, $p = .0618$.

Finally, we explored whether SES interacted in a similar fashion with the two mind-related comments variables in predicting dichotomous attachment security. A binary logistic analysis was again run as above, but replacing the SES \times sensitivity interaction term at the final step with SES \times appropriate mind-related comments and SES \times non-attuned mind-related comments interaction terms. The overall model, including all predictors, was significant, $\chi^2(6) = 63.37$, $p < .001$, Nagelkerke pseudo- $R^2 = .38$, but the addition of the interaction terms did not improve the model, $\chi^2(2) = 2.61$, *ns*. The impact of mind-related comments was unchanged at the final step, with both appropriate and non-attuned mind-related comments independently predicting dichotomous security at the $p < .001$ level.

DISCUSSION

The aim of the study reported here was to establish whether mothers' use of appropriate and non-attuned mind-related comments independently predicted subsequent infant–mother attachment security over and above any contribution of maternal sensitivity. Both indices of mind-mindedness predicted unique variance in attachment security at ABC, organized/disorganized, four-way, and secure/insecure levels, and associations were independent of maternal sensitivity and SES. Secure-group mothers obtained higher scores for appropriate mind-related comments when compared to avoidant-group mothers, and lower scores for non-attuned mind-related comments compared with both avoidant- and resistant-group mothers. However, although the mean scores were in the predicted direction, we failed to find support for the hypothesis that resistant-group mothers would attain higher scores for appropriate mind-related comments compared with their avoidant-group counterparts. Rather, the difference between the resistant- and avoidant-group mothers lay in the markedly elevated scores for non-attuned comments in mothers in the resistant group.

In addition, we explored whether the mind-mindedness indices distinguished disorganized attachment from the organized insecure categories. Differences in the two mind-mindedness indices were significant only between the secure and disorganized groups, with mothers in the insecure-resistant group using marginally significantly more non-attuned comments than their disorganized-group counterparts, but no differences between the disorganized- and avoidant-group mothers. In terms of the forced-choice classifications of the disorganized infants, the majority (63%) were given a secure secondary classification, with the remainder being classified as avoidant. It is therefore interesting to note that the only significant differences in appropriate and non-attuned comments were between the disorganized and secure groups, despite the fact that the underlying strategy of most disorganized infants was secure.

Both indices of mind-mindedness also independently predicted organized versus disorganized attachment status. Mothers of disorganized infants were more likely to produce non-attuned mind-related comments and were less likely to comment appropriately on their infants' internal states than were mothers whose infants demonstrated organized patterns of attachment. A final set of analyses was performed using secure versus insecure attachment as the outcome variable. These last models confirmed the basic division between secure- and insecure-group mothers: compared with their insecure-group counterparts, secure-group mothers obtained higher scores for appropriate mind-related comments and lower scores for non-attuned comments. As in the previous analyses, attachment-related differences were more marked for non-attuned than for appropriate mind-related comments. Non-attuned mind-related comments were very uncommon in secure dyads, with such comments accounting for 2% or less of the total number of comments for 90% of the secure-group mothers. Taken together, these findings highlight how mind-mindedness becomes a considerably more powerful predictor of attachment when it is treated as a multidimensional construct.

The implications of these findings are potentially far-reaching. As discussed in the Introduction, the novel feature of mind-mindedness, which we argue contributes to its power as a predictor of attachment, is that it is a construct at the interface between representational and behavioral operationalizations of caregiver-child interaction. Mind-related comments provide a unique insight into caregivers' representations of their infants' internal experiences and how caregivers' use of such representations governs their interactions with the child. While appropriate mind-related comments were positively associated with sensitivity, non-attuned mind-related comments were unrelated both to sensitivity and to appropriate comments, replicating previous findings (Arnott & Meins, 2007; Meins et al., 2001, 2002). It could be argued that infant-centered factors might go some way to

explaining the lack of association between non-attuned comments and sensitivity. For example, if certain infants' internal states are difficult to "read," this may lead to higher levels of non-attuned comments, but would not necessarily impact on the mother's behavioral response to the child. However, recent research suggests that infant characteristics are unrelated to maternal mind-mindedness. Meins et al. (2011) found no associations between infant temperament and either appropriate or non-attuned mind-related comments. Moreover, Meins et al. reported that both types of mind-related comment increased in maternal discourse between the ages of 3 and 7 months. Given that the behaviors of 7-month-olds are presumably more directed and skillful (and thus "readable" in term of their underlying intentions) than those of 3-month-olds, the increase in non-attuned comments as infants got older suggests that such comments are unlikely to be determined by how easily the infant's behavior can be interpreted. Rather, the observed lack of association between non-attuned mind-related comments and maternal sensitivity supports our argument that a sensitive response does not necessarily require the caregiver to have accurately interpreted the infant's internal state: behaviors may be classed as sensitive despite the fact that the accompanying discourse shows the caregiver's non-attunement to the infant's psychological state.

It is important to note that non-attuned mind-related comments tap into subtle failures of attunement that are different from the more overt behaviors—intrusion, withdrawal or disengagement, and hostile or frightening behaviors—that have been associated with insecure attachment in previous research (Hesse & Main, 2000, 2006; Isabella & Belsky, 1991; Lyons-Ruth et al., 1999). Assessing failures in attunement that are only evident in the caregiver's discourse may be one reason why mind-mindedness was successful in predicting attachment at the fine-grained level. Our findings highlight the strikingly high scores for non-attuned mind-related comments in mothers of resistant infants, a group which has previously proved difficult to distinguish from other categories in terms of sensitivity. For example, in Ainsworth et al.'s (1978) sample, sensitivity scores of avoidant- and resistant-group mothers did not differ, and more recent research using Pederson et al.'s (1990) Maternal Behavior Q-Sort (MBQS) has been unable to distinguish resistant-group mothers from their secure-group counterparts (Pederson et al., 1998; Raval et al., 2001). Similarly, resistant- and secure-group mothers did not differ significantly in terms of appropriate mind-related comments in the present study. Rather, the unique characteristic of resistant-group mothers lay in their lack of attunement to their infants' psychological states as indicated by their high scores for non-attuned mind-related comments.

Some previous studies have fruitfully adopted a multidimensional approach to predicting different patterns of attachment. For example, Moran, Forbes, Evans, Tarabulsky, and Madigan (2008) reported that maternal sensitivity and AMBIANCE scores independently predicted attachment both at the secure/insecure and organized/disorganized level. Isabella and Belsky's (1991) findings highlight how distinct aspects of non-optimal parenting characterize avoidant and resistant groups. Avoidance was associated with mothers being non-responsive and intrusive (indexing classic insensitivity), whereas resistance was associated with a tendency for mothers not to coordinate their behavior with that of the infant. In a similar vein, Tomlinson, Cooper, and Murray (2005) investigated whether maternal sensitivity (responsiveness, acceptance, and warmth), when compared to coercive-intrusive and remote-disengaged behavior, independently predicted infant-mother attachment. Regression analyses showed that early coercive-intrusive and remote-disengaged behaviors independently predicted dichotomous attachment security even when sensitivity was controlled for. Indeed, early sensitivity was not found to predict attachment security. The results of the present study show that the operationalization of mind-mindedness in terms of appropriate and non-attuned mind-related comments allows for a multidimensional assessment of caregiving without necessitating multiple assessments of caregiver behavior. However, it would be interesting to establish how non-attuned comments relate to these atypical caregiving behaviors. For example, it may be that high levels of non-attuned comments in a low-stress observational context (as used here) are indicative of more overtly hostile or intrusive behaviors when the caregiver is under stress, and future research should investigate this possibility.

The observational context in the present study required mothers only to play with their infants with no other demands on their attention. The nature of the observation may help explain another noteworthy finding of the present study: in the context of dichotomous secure/insecure attachment, there was a small combined influence of SES and sensitivity on attachment security. Inspection of this interaction showed that the relation between SES and sensitivity was stronger for insecure dyads, and mothers of insecure children had lower sensitivity ratings than their secure counterparts only in the context of low SES. In contrast, no such interaction was found between SES and either of the two indices of mind-mindedness. One potential explanation for the observed pattern of findings is that middle-class mothers may be more likely than their low SES counterparts to behave in what they perceive to be an optimal manner during the relatively short free-play interaction used here. Perceptions of such optimal behavior are likely to involve responding to their infants in a timely and positive manner and perhaps structuring play didactically. However, it appears less likely that caregivers

will adapt how they talk about their infants' internal states to present themselves in a more favorable light, hence the interaction between SES and sensitivity in predicting dichotomous attachment security and lack of interaction between mind-mindedness and SES.¹

Despite our clear-cut findings on the predictive relation between mind-mindedness and attachment security, more work needs to be carried out to establish the precise mechanisms via which mind-mindedness may influence patterns of attachment. Given that parents' ability during pregnancy to talk about their future child's likely characteristics relates to their mind-mindedness during infant–parent interaction at 6 months postpartum (Arnott & Meins, 2008), it is important also to consider how mind-mindedness may be influenced by factors that predate the birth of the child. The present study's results may thus speak to the issue of the transmission gap (van IJzendoorn, 1995) between caregivers' states of mind with regard to attachment and infant–caregiver attachment security. Caregivers who reflect on the intentions and motives governing their own attachment figures' behavior during the AAI may be more likely to comment appropriately on their infants' internal states and to refrain from misinterpreting their thoughts and feelings during online interactions. Although Arnott and Meins' (2007) small-scale study provided preliminary support for the suggestion that mind-mindedness may mediate the relation between caregivers' AAI-derived attachment representations and infant–caregiver attachment security, more research is required to explore relations between caregivers' mind-mindedness and their state of mind with regard to attachment.

However, links between caregivers' attachment state of mind and mind-mindedness during infant–caregiver interaction do not necessarily help to explain the mechanism via which mind-mindedness predicts attachment security. One possibility is that mind-mindedness results in more consistent and sensitive behavioral responses to the child, which in turn facilitate secure attachment. In support of this proposal, Laranjo et al. (2008) reported that maternal sensitivity as assessed using the MBQS mediated the relation between mind-mindedness and attachment security. However, Laranjo et al.'s study focused on specific subtypes of appropriate mind-related comments and did not include non-attuned comments in the analyses. In addition, attachment security was assessed using the Attachment Q-Sort (Waters, 1987), which yields only a sensitivity score, precluding the exploration of predictors of specific attachment categories.

Alternatively, it may be that aspects of caregiver behavior other than those encapsulated by traditional conceptions of sensitivity mediate the

¹We thank an anonymous reviewer for this suggestion.

relation between mind-minded comments and attachment security. For example, caregivers' emotional tone and willingness to engage with the child as a collaborative partner are factors that could potentially mediate the relation between mind-mindedness and attachment security. In a recent study on mind-mindedness in mothers with severe mental illness, Pawlby et al. (2010) reported how one mother noted correctly that her child was fascinated by the straps on the baby-seat, but appeared irritated with the child because this fascination was at odds with what the mother ostensibly wanted the child to attend to. In this situation, the mother's ability to comment appropriately on the child's internal state did not lead to a positive exchange owing to the mother's apparent unwillingness to let the child set the agenda for their interaction.

Additionally, it is possible that infants demonstrate a nascent response to the linguistic content of the mind-related comment. At first glance, this may seem unlikely, but a proposal that 8-month-olds comprehend some aspects of what is said to them gains support from certain findings on language development. By 7 months of age, infants can segment speech into separate words and recognize familiar words in a stream of speech (Jusczyk & Aslin, 1995). In the last quarter of the first year of life, infants can comprehend language and respond to simple verbal requests and demands. Although experimental research on infants' early word comprehension has tended to focus on concrete nouns, the fact that emotion and volition words are acquired during the one-word phase (Bretherton & Beeghly, 1982) highlights the salience of these more abstract concepts from the very beginnings of language. It is therefore conceivable that exposure to the language of appropriate versus non-attuned mind-related comments will result in infants responding differently to the mother. For example, we know that insecure-avoidant infants dampen down their responses to attachment distress (Spangler & Grossmann, 1993) and tend to avoid initiating shared attention with the caregiver (Meins et al., in press). These responses are presumed to result from infants having adapted their behavior in response to their caregivers' psychological unavailability. Infants' adaptation of their exploration and attachment behaviors, on the basis of feedback from their mothers' level of attunement to their internal states, may thus be the mechanism via which mind-mindedness influences attachment security.

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