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Parental Embodied Mentalizing and its Relation to Mind-Mindedness, Sensitivity, and Attachment Security

Dana Shai
School of Behavioral Sciences
The Academic College of Tel Aviv-Yaffo

Elizabeth Meins
Department of Psychology
University of York

Relations between two forms of parental mentalizing—maternal mind-mindedness (appropriate and nonattuned mind-related comments) and parental embodied mentalizing (PEM)—and their role in predicting infant attachment security were investigated. Maternal PEM and mind-mindedness were assessed at 8 months (N = 206), and infant attachment security was assessed at 15 months. PEM was positively correlated with appropriate mind-related comments and was unrelated to nonattuned mind-related comments. Multinomial regression analyses showed that higher PEM distinguished between secure versus insecure–avoidant infants and between insecure–resistant versus insecure–avoidant infants over and above the contributions of appropriate and nonattuned mind-related comments. These results suggest that both verbal and nonverbal indices of parental mentalizing make independent contributions in predicting the security of the infant–mother attachment relationship.

> The movements of expression give vividness and energy to our spoken words. They reveal the thoughts and intentions of others more truly than words do, which may be falsified.
>
> (Darwin, 1872/1998, p. 359)

Over the last three decades, developmental researchers have increasingly emphasized the importance of parental mentalizing—the ability to adopt the intentional stance and represent children in terms of their internal states—for children's social-cognitive and social-emotional development (e.g., Fonagy, Gergely, Jurist, & Target, 2002; Meins,

Correspondence should be sent to Dana Shai, School of Behavioral Sciences, The Academic College of Tel-Aviv-Yaffo, Rabenu Yerucham 2, T.D. 8401, Yaffo, 6818211 Israel. E-mail: danamc@mta.ac.il

1997; Shai & Belsky, 2011a, 2017; Slade, 2005). This study examined two aspects of parental mentalizing—maternal mind-mindedness (Meins, 1997) and parental embodied mentalizing (PEM; Shai & Belsky, 2011a, 2011b, 2017; Shai & Fonagy, 2014)—to investigate whether both verbal and nonverbal facets of mentalizing predict independent variance in infant–parent attachment security.

In the first year of life, mind-mindedness is operationalized in terms of the appropriateness of caregivers' comments about their infants' internal states (Meins, Fernyhough, Fradley, & Tuckey, 2001; Meins et al., 2012). Appropriate mind-related comments index an accurate interpretation of the infant's internal state (e.g., saying that the infant wants the car if she gestures toward it, or that the infant is surprised if he startles in response to an event), whereas nonattuned mind-related comments index a misinterpretation of the infant's thoughts or feelings (e.g., saying that the infant wants the book when she is already engaged with the mirror, or that he is confused in the absence of any outward sign of confusion). High scores for appropriate mind-related comments indicate mind-mindedness, as do low scores for nonattuned mind-related comments (Meins & Fernyhough, 2015; Meins et al., 2012).

Maternal mind-mindedness has been shown to predict various positive aspects of children's development, including attachment security (e.g., Arnott & Meins, 2007; Laranjo, Bernier, & Meins, 2008; Lundy, 2003; Meins et al., 2001, 2012), executive abilities (Bernier, Carlson, & Whipple, 2010; Bernier, McMahon, & Perrier, 2017), early language abilities (Bernier et al., 2016; Meins, Fernyhough, Arnott, Leekam, & de Rosnay, 2013), theory of mind (Kirk et al., 2015; Laranjo, Bernier, Meins, & Carlson, 2010, 2014; Meins et al., 2013), emotion understanding (Centifanti, Meins, & Fernyhough, 2016), and in children from low socioeconomic status backgrounds fewer behavioral difficulties (Meins, Centifanti, Fernyhough, & Fishburn, 2013) and higher school attainment (Meins, Fernyhough, & Centifanti, 2017).

However, less is known about the correspondence between what the mother says to her infant and how she interacts with him or her nonverbally. As explained above, mind-mindedness is now operationalized purely in terms of what caregivers say about their infants' internal states, but the original conceptualization of mind-mindedness additionally included a number of measures of caregiver behavior (Meins et al., 2001). However, none of the behavioral measures of mind-mindedness predicted subsequent infant–mother attachment security (Meins et al., 2001) or children's later mentalizing abilities (Meins et al., 2003). Indeed, Meins' (2013) reanalysis of these data showed that mind-related comments were more successful in predicting attachment security than a composite index based on both behavior- and speech-based indicators of mind-mindedness. For these reasons, mind-mindedness has evolved into a measure based solely on how caregivers comment on their infants' internal states.

However, the conclusion that children's development is predicted by what mothers say about their infants' internal states rather than how they respond behaviorally to their infants is somewhat counterintuitive. The first aim of the study reported here was to explore whether the subtle and complex behavioral ways in which parents could indicate attunement to their infants' thoughts and feelings related to parents' mind-mindedness. We operationalized behavioral attunement to infants' internal states in terms of PEM. The measurement of PEM taps the caregiver's nonverbal appreciation of the infant's mind as reflected in the bodily movements of caregiver and infant (Shai & Belsky, 2011a, 2017). To be regarded as PEM, the movement must convey evidence that the caregiver understands or is trying to make sense of what the infant wants and

feels. The following interactive sequences are examples of a parent showing high PEM. The parent intends to move the baby from a sitting to a supine position and approaches the infant gradually and relatively slowly in an indirect "path" in space, thus allowing the infant to anticipate the approaching change in position, and places both hands on the infant's midtorso. The parent begins to move the infant backward. In response, the infant tenses up his extremities and shrinks his body inward, toward his body center. The parent quickly stops moving the infant toward the floor and decreases the muscle tension in her arms and fingers. She pauses her movement, and then stops holding the baby's body when the infant sits up and extends herself toward a toy on the mat.

We propose that PEM may be a behavioral manifestation of mind-mindedness. Meins, Fernyhough, and Harris-Waller (2014) argued that mind-mindedness is a quality of close relationships rather than being an individual caregiver trait. Similarly, the central aspect of PEM is that parents' mentalizing capacity is evaluated on the basis of their ability to modify and amend their embodied responses vis-à-vis those of the infant. PEM captures the bidirectional, mutually responsive nature of the interaction, thus taking into account the child's experience of and response to the parent's interactional behavior. This theoretical stance is reflected in the operationalization of PEM, wherein the dyadic exchange is being coded, rather than the individual behaviors of the infant or the parent. Whereas mind-mindedness captures the parent's proclivity in speech to attribute appropriate internal states to the child, PEM complements this capacity by focusing on the parent's ability to mark the infant's intentionality via their behavior. Both PEM and mind-mindedness thus entail the caregiver monitoring the infant's cues and behavior moment by moment to inform the interaction. If PEM is a behavioral manifestation of mind-mindedness, we should expect (1) a positive correlation between PEM and appropriate mind-related comments, and (2) no relation between PEM and nonattuned mind-related comments.

In line with the proposal that PEM is a behavioral manifestation of mind-mindedness, PEM and mind-mindedness have been found to relate to maternal sensitivity (Ainsworth, Bell, & Stayton, 1971, 1974) and infant–mother attachment in similar ways. Appropriate mind-related comments are positively associated with concurrent measures of maternal sensitivity, whereas nonattuned mind-related comments are unrelated to sensitivity (Meins et al., 2001; Meins et al., 2003, Meins et al., 2012). Similarly, PEM is positively correlated with maternal sensitivity (Shai & Belsky, 2017), with the magnitude of the correlation identical to that reported between appropriate mind-related comments and sensitivity in Meins et al.'s (2012) study ($r = .39$). Both PEM and mind-mindedness have also been shown to predict attachment security independently of maternal sensitivity. Shai and Belsky (2017) reported that higher PEM (1) distinguished secure infants from their counterparts in the avoidant and disorganized groups at 15 months, and (2) distinguished secure children from their counterparts in the avoidant, resistant, and disorganized groups at 36 months. Meins et al. (2012) reported that appropriate and nonattuned mind-related comments at age 8 months each accounted for independent variance in predicting 15-month attachment at the four-category level. Of note was the finding that nonattuned mind-related comments distinguished between infants in the avoidant versus resistant insecure groups, with mothers of resistant infants producing higher levels of nonattuned comments compared with mothers of avoidant infants. Recent research has shown that nonattuned

comments continue to predict attachment security at age 3 via their effect on infant attachment (Meins, Bureau, & Fernyhough, 2017).

This study was the first to include measures of both PEM and mind-mindedness in exploring the predictors of attachment security and was designed to address two main aims. First, we investigated concurrent, cross-sectional relations between PEM and maternal mind-mindedness; PEM was expected to be positively correlated with appropriate mind-related comments and unrelated to nonattuned mind-related comments. Second, we examined whether mind-mindedness and PEM predicted independent variance in infant–mother attachment security.

METHOD

Participants

Participants were 206 infant–mother dyads (108 girls), recruited through mother-and-baby groups and local healthcare professionals. The majority of the mothers (n = 203) were White, and 86 (41.7%) infants were firstborn. 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) was classed as low SES. This study was conducted according to guidelines laid down in the Declaration of Helsinki, with written informed consent obtained from the parent for each child before any assessment or data collection. All procedures involving human subjects in this study were approved by local National Health Service (NHS) Ethics Committees and the Research Ethics Committee at Durham University.

At Phase 1, infants were 8 months (M = 8.5 months, SD = 0.48, range = 7.0–10.2 months), and at Phase 2, infants were 15 months (M = 15.5 months, SD = 0.60, range = 13.7–17.3 months). 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

All data were collected in the university's developmental laboratories. At Phase 1, PEM, mind-mindedness, and sensitivity were coded from a 20-min free-play session, in which mothers were instructed to play with their infants as they would do if they had spare time together at home. Infant–mother attachment security was coded at Phase 2. Note that separate coders conducted the PEM, mind-mindedness, and sensitivity coding, with no individual being responsible for coding more than one of the assessments.

Parental embodied mentalizing

The PEM coding involves the sole focus on the caregiver's kinesthetic behaviors and is therefore performed with the sound muted throughout. Coding PEM proceeds in four stages (Shai, 2011; Shai & Belsky, 2017).

1. PEM-related interactions, termed Embodied Circles of Communication (ECC), are identified. An ECC is a nonverbal, movement-based, interactive communicative exchange that includes at least three consecutive bodily based action–reaction sequences. An ECC can be regarded as a body-based conversation, in which one party expresses kinesthetically their mental states, and the other party responds kinesthetically to these manifestations of mental states. An example of an ECC event is as follows: (1) The mother presents the infant with a rattle, using rapid and spread-out movements and brings it very close to the infant's chest; (2) the infant moves back and shrinks his or her body toward its center; (3) the mother slows her movements' tempo, reduces their range, and withdraws the toy slightly away from the infant's chest; (4) the infant reaches her hand out toward the rattle and moves her torso forward toward the object. Due to the nature of the task, in which the mothers were asked to interact with their infant in the developmental laboratory while being filmed, there were almost no sequences that did not qualify as segments composing ECCs.

Note that the PEM coding focuses on those communicative sequences in which the content of the mother's or infant's mind is evident in the kinesthetic patterns. For instance, in the example described earlier, the infant's mental state of being overwhelmed and beginning to be dysregulated is evident in her withdrawing, her muscles tensing up, and her tempo decreasing. The mother's mind, and appreciation of that of her infant, is reflected in her ability to reduce the intensity of her movement qualities. Moments that are not coded include absence of interactive exchange between the parent and the infant (e.g., the mother not interacting with the infant, turning away from the infant to get a new toy, or otherwise being unable to see the infant's signals), or functional interaction (e.g., wiping infant's face). Noteworthy is that in the current work, and as will shortly be discussed in further detail, ECCs were identified throughout the interactive sequences, and no segments were left uncoded.

2. The different steps of each ECC in terms of movement qualities are described. Accounting for the kinesthetic properties of the interaction is then used to examine the degree to which the parent displays—through her movement—that she acknowledges the infant's mind and responds to it appropriately. The kinesthetic qualities used to describe the ECC components are tempo (speed or beat of the movement), space (the positioning of the movement in relation to the infant's body), pathways (the imaginary line in space the movement creates, being rounded or linear), pacing (the extent to which the movement changes abruptly or gradually), directionality (whether the movement is toward or away from the torso), and tension flow (the muscle tone used in the movement). For further details and description of the movement qualities used to evaluate PEM, see Shai (2011) and Shai and Belsky (2017). Note that while all components of each ECC are described and narrated in kinesthetic terms, they are not scored or rated, but rather serve to assist the coder in their initial careful observation of the interaction.
3. The quality of ECC events is rated. Based on the careful analysis of kinesthetic qualities outlined in Stage 2, the coder evaluates each ECC in terms of the degree to which it reflects the mother's ability to modify her kinesthetic response in light of the infant's kinesthetically manifest mental state. Rating the

quality of each ECC is based on an ordinal scale, with scores ranging from "very low" (1) to "very high" (9) (See Shai & Belsky, 2017, for further details about factors considered when assessing individual PEM rating).

4. A global PEM score, ranging from very low ("1") to very high ("9"), is assigned. The PEM global rating is the parent's overall, typical, mentalizing capacity, considering all the individually rated ECC events of the dyadic interaction. The global PEM rating reflects the degree to which the mother typically manifests—through her body movements—an acknowledgment of the infant's internal world and an ability to be responsive and thus modify her own kinesthetic patterns to better suit the infant's mental states. Assigning a global PEM score uses the mean of the individual ECC scores as anchor points, yet further consideration of elements capturing aspects of the interaction as a whole is needed in order to determine the final global score. These considerations are (1) interactive syntax: Lowering a score in cases where individual ECCs receive a relatively high PEM rating, but the overall transition between one ECC to another is fast or disjointed; (2) Frequency of extremely low PEM manifestations: In cases where there is more than one ECC rated "1," the global PEM rating could not be higher than "3"; (3) Dominance of premature termination of ECCs: Cases where parents appear to intervene with the infant' s activity before the infant shows signs of fatigue or desire to change activity. In such cases where parents seem unable to follow the infant's mental state to fruition, the global PEM score is lowered by one point (See Shai, 2011; Shai & Belsky, 2017 for further details regarding the PEM coding scheme).

Two graduate students were trained to become reliable PEM coders and were blind to all other measures and to the hypotheses of the study. A randomly selected 20% of the mother–infant interactions ($n = 43$) was coded by both coders. Percentage agreement for the duration of the ECCs was 74.88%. For global PEM mean, inter-rater reliability was calculated using a two-way random absolute agreement intraclass correlation coefficient (ICC) model (Shrout & Fleiss, 1979); its mean was 0.83. Disagreements were resolved by discussion.

Mind-mindedness

Mind-mindedness was coded using the procedures outlined by Meins and colleagues (Meins & Fernyhough, 2015; Meins et al., 2001, 2012). 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. Comments in which the mother spoke in the first person on the infant's behalf (e.g., "I'm just playing with this, thanks") were also classed as mind-related. Mind-related comments were then coded dichotomously as appropriate or nonattuned by viewing the infant–mother interaction.

A comment was classified as an appropriate mind-related comment if: (1) The independent coder agreed with the mother's reading of her infant's internal state, (2) the internal state comment linked the infant's current internal state to a relevant event in the past or future, (3) 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 (4) the mother voiced (using the first person) what the infant might say if he or she could speak.

Comments were coded as nonattuned mind-related if: (1) The coder judged that the mother was misinterpreting her infant's internal state, (2) the internal state comment referred to a past or future event that had no obvious relation to the infant's current state, (3) 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 showed a clear preference for a particular object, or (4) the referent of the mother's internal state comment was not clear.

Mind-mindedness was coded by a researcher who was blind to all other measures and to the hypotheses of the study. A second, similarly blind researcher coded a randomly selected 25% of the mother–infant interactions. Raters achieved perfect agreement on which comments were mind-related. Inter-rater agreement for dichotomous appropriate versus nonattuned coding was $\kappa = 0.70$; disagreements were resolved by discussion. Scores for appropriate and nonattuned mind-related comments were expressed as a percentage of the total number of comments made in the session to control for maternal verbosity.

Maternal sensitivity

Maternal sensitivity was assessed 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. Inter-rater reliability (ICC) was .83.

Attachment security

Infant–mother attachment security was assessed using the strange situation procedure (Ainsworth, Blehar, Waters, & Wall, 2015). All of the strange situations were classified by a trained and reliable researcher who was blind to all other measures and to the hypotheses of the study. A second blind, reliable researcher coded a randomly selected 25% of strange situations. Inter-rater reliability using the four-way (secure, avoidant, resistant, and disorganized) classification system was $\kappa = 0.82$.

RESULTS

Descriptive statistics and preliminary analyses

Table 1 shows the descriptive statistics for all variables. PEM, mind-mindedness, and sensitivity data were unavailable for one mother because of a technical recording difficulty. Attachment data were unavailable for two dyads due to the strange situation procedure being terminated because of undue infant distress. Attachment classifications were as follows: 137 secure, 36 insecure–avoidant, 11 insecure–resistant, and 19 insecure–disorganized. Complete data were available for 203 dyads. Child gender was unrelated to the PEM, mind-mindedness, and sensitivity variables (ts < 1.81, ds < .25) and to attachment classification, $\chi^2_{(3)} = 1.65$, $p = .649$.

TABLE 1
Descriptive Statistics for all Variables

Variables	*Mean*	*Range*
PEM global mean	4.79 (0.99)	3–7
Appropriate mind-related comments (%)	5.34 (3.64)	0–18.67
Nonattuned mind-related comments (%)	1.58 (1.88)	0–8.94
Sensitivity	5.64 (1.48)	2–9
Socioeconomic status	34.00 (14.03)	11–66

Note. PEM = parental embodied mentalizing.

How does PEM relate to mind-mindedness and maternal sensitivity?

Table 2 shows the correlations between PEM global mean, mind-mindedness, and sensitivity scores. As shown in Table 2, PEM was positively correlated with appropriate mind-related comments and maternal sensitivity and unrelated to nonattuned mind-related comments. Table 2 also shows that PEM was positively correlated with SES. Note that the correlations among mind-mindedness, sensitivity, and SES were previously reported in Meins et al. (2012).

Do PEM and mind-mindedness predict independent variance in attachment security?

Table 3 shows scores for PEM global mean, mind-mindedness, sensitivity, and SES as a function of infant–mother attachment security. Table 3 also includes the results of one-way ANOVAs testing differences in scores for these variables among the four attachment groups. As shown in Table 3, there was a main effect of four-way attachment for PEM global mean, appropriate mind-related comments, and nonattuned mind-related comments, but no main effect for maternal sensitivity or SES.

Predictors of four-way attachment (avoidant, secure, resistant, and disorganized) were investigated using multinomial logistic regression, with secure attachment as the reference category. The model was significant, accounting for 39% of the variance, $\chi^2_{(15)} = 82.54$, $p < .001$, $R^2 = .39$. Table 4 summarizes the results of this regression.

TABLE 2
Correlations (Pearson's *r*) between Parental Embodied Mentalizing, Mind-Mindedness, Sensitivity, and Socioeconomic Status

	1	*2*	*3*	*4*	*5*
1. PEM global mean	–				
2. Appropriate mind-related comments	.28**	–			
3. Nonattuned mind-related comments	−.01	.07	–		
4. Sensitivity	.36**	.39**	.04	–	
5. Socioeconomic status	.26**	.16*	−.05	.30**	–

Notes. PEM = parental embodied mentalizing.
*$p < .05$, **$p < .001$.

TABLE 3
Mean (Standard Deviation) Scores for Parental Embodied Mentalizing, Mind-Mindedness, Sensitivity, and Socioeconomic Status as a Function of Attachment Security

	Avoidant (n = 36)	*Secure (n = 137)*	*Resistant (n = 11)*	*Disorganized (n = 19)*	*F statistic*
PEM global mean	4.42 (0.87)	4.90 (1.00)	5.18 (0.41)	4.68 (1.11)	3.00, $p = .032$
Appropriate MRC (%)	4.26 (3.32)	5.85 (3.76)	5.00 (2.57)	4.02 (3.42)	2.88, $p = .037$
Nonattuned MRC (%)	2.36 (2.11)	1.01 (1.26)	4.66 (2.14)	2.54 (2.51)	23.43, $p < .001$
Maternal sensitivity	5.75 (1.61)	5.63 (1.46)	6.09 (1.76)	5.53 (1.12)	0.44, $p = .728$
Socioeconomic status	32.75 (15.71)	33.83 (13.16)	33.09 (14.34)	38.00 (17.43)	0.62, $p = .600$

Note. PEM = parental embodied mentalizing; MRC = mind-related comments.

Secure group infants were distinguished from their counterparts in each of the insecure groups by lower scores for nonattuned mind-related comments and higher scores for appropriate mind-related comments. Higher PEM distinguished the secure group from the avoidant group. Finally, higher sensitivity distinguished avoidant group infants from those in the secure group.

To establish whether the predictor variables could distinguish among the insecure groups, the multinomial logistic regression was rerun with insecure–avoidant as the reference category. Resistant-group infants were distinguished from avoidant group

TABLE 4
Results of Multinomial Logistic Regression Analysis for Variables Predicting Four-way Attachment Classification (with Secure as Reference Category)

Variables	*B*	*SE B*	*Wald*	*p level*
Insecure–avoidant				
PEM global mean	−.63	.25	6.14	.013*
Appropriate MRC	−.25	.08	8.87	.003*
Nonattuned AMRC	.59	.13	20.14	<.001*
Maternal sensitivity	.44	.18	6.14	.013*
SES	.00	.02	0.05	.828
Insecure–resistant				
PEM global mean	.61	.48	1.61	.205
Appropriate MRC	−.33	.16	4.48	.034*
Nonattuned AMRC	1.07	.21	26.98	<.001*
Maternal sensitivity	.39	.29	1.82	.178
SES	−.01	.03	0.21	.646
Insecure–disorganized				
PEM global mean	−.27	.29	0.84	.359
Appropriate MRC	−.30	.11	6.80	.009*
Nonattuned AMRC	.66	.16	17.84	<.001*
Maternal sensitivity	.17	.22	0.62	.431
SES	.03	.02	2.79	.095

Note. PEM = parental embodied mentalizing; MRC = mind-related comments.

infants by higher scores for nonattuned mind-related comments, Wald = 6.33, $B = .48$, $p = .012$, and higher PEM, Wald = 5.90, $B = 1.24$, $p = .015$. None of the variables distinguished between the avoidant and disorganized groups.

DISCUSSION

The present study investigated relations between the verbally operationalized measure of mind-mindedness and the nonverbal measure of PEM, and their role in predicting attachment security. PEM was positively correlated with appropriate mind-related comments and was unrelated to nonattuned mind-related comments. The lack of association between nonattuned mind-related comments and PEM is in line with previous research showing that comments indicating subtle failures in caregivers' attunement to their infants' internal states appear to index a form of caregiver behavior that is orthogonal to traditional conceptualizations of sensitivity (Meins, 2013). These findings are the first to suggest that these verbal and nonverbal assessments index the same capacity of parental mentalizing. The results also showed a moderate positive correlation between PEM and maternal sensitivity, replicating Shai and Belsky (2017) finding with correlations of very similar magnitudes (.36 versus .39).

Turning to predictors of infant–mother attachment security, PEM was found to distinguish between mothers of secure versus insecure–avoidant infants, with higher PEM predicting secure attachment. Higher PEM also distinguished insecure–resistant infants from their insecure–avoidant counterparts. These results were over and above the contributions of the two mind-mindedness indices, maternal sensitivity, and SES in predicting attachment security. With PEM included in the regression *p < .05, **p < .001 equation, the mind-mindedness indices continued to predict attachment security. Higher appropriate mind-related comments and lower nonattuned mind-related comments distinguished secure group infants from their counterparts in the avoidant, resistant, and disorganized groups, and higher nonattuned comments additionally distinguished between infants in the resistant group from those in the avoidant group.

These findings indicate that both verbal and nonverbal operationalizations of parental mentalizing account for independent variance in infant–mother attachment. These results suggest that early parental mentalizing is multifaceted, and multimodal, and that it is useful to explore this interpersonal complexity in verbal and nonverbal, explicit and implicit, and behavioral and representational ways when studying parent–infant relationships.

The results on the analyses distinguishing mothers of avoidant and resistant infants are worthy of further discussion, as maternal sensitivity has been found not to differentiate between these two forms of insecure attachment (e.g., Ainsworth et al., 1971). Mothers of insecure–resistant infants scored highest for both PEM and nonattuned mind-related comments. Given that PEM is considered to be indicative of attunement to the infant's internal states, whereas nonattuned comments indicate the reverse, this pattern of finding appears somewhat puzzling at first glance.

The resistant pattern of attachment is considered to reflect a history of inconsistent maternal responsiveness (van IJzendoorn, Goldberg, Kroonenberg, & Frenkel, 1992). It is possible that, on a purely behavioral level, mothers of resistant infants appeared responsive to their infants' internal state, resulting in higher average PEM scores. In contrast, verbal exchanges may be better suited to pick up on the mother's inconsistent

response to the infant. For example, the mother's behavior may appear sensitive and attuned to the infant's need (e.g., comforting the infant if he or she cries), but her comments may nevertheless betray a misrepresentation of the infant's internal state (e.g., stating that the infant is crying because he or she is tired when in fact the mother observed the infant topple over, and the infant is hence crying because of pain). If inconsistent responsiveness is characterized as a mismatch between the parent's behavioral response and the appropriateness of the verbal comment about the infant's internal state, the observed pattern of high PEM and high nonattuned mind-related comments in resistant-group mothers is more comprehensible.

This pattern of high bodily responsiveness and attunement predicting resistant attachment also resonates with Beebe et al.'s (2000) finding that a midrange degree of parent–infant (and stranger–infant) vocal rhythm coordination at four months was associated with secure attachment at 12 months, whereas tightly coordinated vocal exchanges were associated with insecure–resistant attachment, and loosely coordinated exchanges were indicative of insecure avoidant attachments (see also Belsky, Rovine, & Taylor, 1984; Gergely & Watson, 1996; Isabella & Belsky, 1991; Smith & Pederson, 1988). It is possible that resistance emerges when the parent's behavior is too closely coordinated with the infant's intentions, in such a way that the infant does not acquire a sense of feeling safe with the parent while also having enough space to discover and explore (Fonagy et al., 2002; Slade, 2005). However, it is important to note that there was a relatively small number of infants classified as insecure–resistant ($n = 11$), and further research is required to verify the role played by PEM and nonattuned mind-related comments in predicting this particular pattern of insecure attachment.

A final aspect of the results that is worthy of further discussion is the finding that the multinomial regression showed that insecure–avoidant infants were distinguished from their secure group counterparts by higher levels of maternal sensitivity. It should be noted that sensitivity in itself did not relate to four-way attachment security (see Table 3); it was only when sensitivity was included with the other independent variables in the regression analysis that this finding emerged. While meta-analytical data highlight the danger in assuming that sensitivity is the most important determinant of infant–caregiver attachment security (e.g., Verhage et al., 2016; Zeegers, Colonnesi, Stams, & Meins, 2017), the finding that higher levels of sensitivity distinguished the avoidant group from the secure group is somewhat counterintuitive. However, given the fact that this effect emerged only in the multivariate analyses, without independent replication of this effect, it would be premature to draw strong conclusions from this finding.

Parental embodied mentalizing and mind-mindedness were coded entirely independently in the study reported here, and so it was not possible to establish the co-occurrence of PEM and appropriate versus nonattuned mind-related comments, or how these different aspects of parental mentalizing mapped on to one another in relation to specific exchanges between the mother and infant. Nonetheless, this is an interesting avenue for future research. It is also important to examine whether it is possible to assess the appropriateness of PEM in the way that mind-mindedness is indexed by appropriate versus nonattuned mind-related comments. Currently, indices of parental negation or dismissal of the infant's mind result in lowering the global PEM score. However, it is very possible that the appropriate PEM exchanges—which demonstrate the parent's marked bodily appreciation of the infant's mind and his or her ability to adjust to it—and the nonattuned PEM exchanges—which capture the evident body-

based dismissal, mistreating, or distortion of the infant's mind—can operate independently. This approach to PEM may distinguish between two continua, that in the case of mind-mindedness, prove to be orthogonal, each contributing to the understating of parent–infant interactive processes.

It should also be noted that the present study assessed mind-mindedness and PEM from the same free-play, laboratory-based interaction. It is thus important to replicate the observed relations among the mind-mindedness and PEM variables when these two aspects of parental mentalizing are assessed from separate free-play interactions. Moreover, it is important to broaden the observational context of research on parental mentalizing. The vast majority of research on mind-mindedness has focused on play interactions, and little is known about parental mentalizing in other contexts. Farrow and Blissett (2014) reported that mind-mindedness at age 6 months predicted more sensitive and positive maternal behavior during feeding interactions at age 12 months, but research has yet to investigate mind-mindedness or PEM during feeding itself. Exploring mind-mindedness, PEM, and their inter-relations in caregiving or more stressful contexts—as well as how they relate to parental mentalizing in free play—would therefore be worthwhile.

The fact that both PEM and the mind-mindedness indices made independent contributions in distinguishing between certain attachment groups is relevant to the issue of the role of explicit versus implicit mentalizing in predicting development. Explicit mentalizing—operationalized as mind-mindedness—is revealed in what parents say to their infants. Nonverbal, implicit mentalizing—operationalized as PEM—is reflected in how parents interact and respond to the infant on the bodily level. Explicit mentalizing reflects a relatively slow process, which is typically verbal and requires reflection, awareness, and effort (Allen, Fonagy, & Bateman, 2008; Fonagy & Luyten, 2009; Lieberman, 2006). In contrast, implicit mentalizing involves faster processing, is typically reflexive, and requires little or no awareness or effort (Allen et al., 2008; Satpute & Lieberman, 2006; Shai & Belsky, 2011a, 2011b; Van Overwalle & Vandekerckhove, 2013). These forms of mentalizing may differ not only phonologically and theoretically, but in terms of the associated activation of neural circuits (Frith & Frith, 2008; Keysers & Gazzola, 2007). Our findings are in line with proposals that real-world social inferences such as parent–infant interactions rely on the activation of both the implicit and explicit processing (Van Overwalle & Baetens, 2009) and suggest that parental mentalizing is optimally studied via both verbal and nonverbal means.

The current sample was community-based and overwhelmingly White, reflecting the ethnicity of the local area. Little is currently known about parental mentalizing in different cultural and ethnic groups, with research in this area still in its infancy. In the first study published on cultural differences in mind-mindedness, Hughes, Devine, and Wang (2017) reported that mind-mindedness was lower in parents of preschoolers in Hong Kong compared with their British counterparts. However, in both cultures, mind-mindedness was positively correlated with children's theory of mind abilities, and group difference in parental mind-mindedness accounted for the observed cultural difference in children's theory of mind. There is also evidence indicating that the neural activity involved in mentalizing tasks in both adults and children differs as a function of their cultural background (Han & Northoff, 2008). Further examination of cultural differences in both PEM and mind-mindedness would thus be valuable.

Future research would also benefit from examining how psychopathology relates to caregivers' PEM, and whether the patterns of association are similar to those found in

relation to mind-mindedness. Meins, Fernyhough, Arnott, Turner, and Leekam's (2011) results from a community sample suggested that self-reported maternal depression was unrelated to mind-mindedness. However, deficits in mind-mindedness have been reported in mothers hospitalized for severe mental illness (Pawlby et al., 2010; Schacht et al., 2017). For example, Schacht et al. found that on admission to hospital, mothers with severe mental illness made significant more nonattuned mind-related comments compared with psychologically healthy controls. These authors also reported on the efficacy of a video-feedback intervention that aimed to facilitate mind-mindedness in mothers with severe mental illness. Despite the highly elevated levels of nonattuned comments on admission, the intervention was successful in reducing mothers' nonattuned comments such that they did not differ from psychologically healthy mothers postintervention. Future research should examine whether PEM is lower in mothers with severe mental illness, as well as investigating whether it is possible to intervene in order to facilitate PEM.

Lastly, the present study focused solely on parental mentalizing in mothers. In exploring the lines of enquiry for future research discussed above, it is important to include fathers as well as mothers. A few small-scale studies have reported on mind-mindedness in both mothers and fathers (Arnott & Meins, 2007, 2008; Barreto, Fearon, Osório, Meins, & Martins, 2016; Lundy, 2003, 2013), but research has not yet investigated PEM in fathers. Investigating mind-mindedness and PEM in the context of the family unit rather than only the mother–infant dyadic relationship will allow for a more complete understanding of how early parental mentalizing predicts children's development and evolving family relationships.

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