MOTHERS' ATTUNED RESPONSES TO INFANT AFFECT EXPRESSIVITY PROMOTE EARLIER ACHIEVEMENT OF LANGUAGE MILESTONES

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To investigate infants' affective expressivity and maternal attuned responsiveness to infant expressivity in relation to early language achievement, 77 dyads were visited in their homes at 9 and 13 months, and mothers were interviewed about their children's language between 9 and 21 months. Maternal responses that were attuned to infant affect, by selectively matching either the gradient features or the valence of infants' affective expressions, were more predictive of children's language achievement than maternal nonmatching responses; and maternal matching responses at 9 months were more predictive of children's language achievements than maternal responses at 13 months. Moreover, maternal matching responses at 9 months predicted second-year language achievements over and above infant affect expressivity at 9 and 13 months, and over and above maternal matching responses at 13 months. Infants' affective expressivity per se was not predictive.

mother-infant interaction affect maternal responsiveness child language

Children's first- and second-year achievements in language constitute remarkable accomplishments that evolve out of multiple developing systems in children and their social contexts, including perception, cognition, action, affect, and responsive verbal and nonverbal interactions with primary caregivers. As one feature of this complex and dynamic in-

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terplay of multiple forces, infants' experiences sharing subjective states with parents may serve as an important foundation for language acquisition. Stern (1985), Trevarthen (1993), and Bloom (1993) have proposed, in this vein, that early language is acquired in the context of interpersonal interactions that involve sharing subjective states, such as affect, attention, and intentions. In empirical studies, shared attention has been linked to the development of lexical style and vocabulary (Baldwin, 1993; Bornstein, 1985; Tomasello & Barton, 1994; Tomasello & Todd, 1983), but shared affect has received less attention in relation to language acquisition.

In this longitudinal study, we investigated mothers' attuned responses to their infants' affect, termed "affect attunement" by Stern (1985), in relation to language acquisition, because affect attunement is thought to play a role in infants' emergent intersubjective capacity. Mothers' attuned responses, in contrast to their nonattuned responses, are believed to foster infants' emergent ability to share others' inner states, preceding and contextualizing later intersubjective and communicative interactions, such as sharing actions and intentions (Stern, 1985; Trevarthen, 1993; Užgiris, 1991). Frequent episodes of shared affect between mothers and infants might foster greater motivation for infants to use language in the service of communication, because through their mothers' attunement infants have had more opportunities to share inner states with others and thus have more interest in and appreciation for communication. If so, then higher rates of attuned maternal responses might predict earlier or more advanced child language achievements. Moreover, if attuned maternal responses are a salient influence on child language achievements, they ought to predict language achievements over and above infant affect expressivity.

This study focused on infants' expressions of affect and maternal attuned responses when infants were 9 and 13 months, because qualitative changes in infants' understanding of persons (Stern, 1985; Tomasello, 1995) and communicative abilities (Bates, Bretherton, & Snyder, 1988; Baumwell, Tamis-LeMonda, & Bornstein, 1997) are thought to occur around this time. In the first year, we assessed the time of onset of children's *first words in comprehension* and *first words in production*. In the second year, we assessed the time of onset of *children's production of 50 words*, as the acquisition of words has been found to accelerate after children reach the 50-word mark (see Bloom, 1973, 1993; Reznick & Goldfield, 1992); moreover, this achievement is thought to demarcate the end of the early word learning period (Bloom, Margulis, Tinker, & Fujita, 1996). In the second year we also assessed the onset of *combinatorial speech*, or multiword utterances, as this milestone is thought to indicate a child's ability to infer and symbolically encode relations between entities, setting the stage for a number of other important semantic and grammatical advances (Fenson et al., 1994). Last, we assessed the age at which children *talk about the past* to mark an advanced skill in symbolizing a past experience independent of the immediate context (Tamis-LeMonda, Bornstein, Kahana-Kalman, Baumwell, & Cyphers, 1998).

Infants express affect through facial expressions, vocalizations, and bodily movements; and affect has both categorical and gradient features. A categorical approach to affective expressions follows Darwin's classification of emotions, such as sadness, joy, and so on (e.g., Ekman, 1982; Izard, 1982), and expressions may be categorized by valence (i.e., as positive or negative affect). In a gradient approach, affect is rated on continuous dimensions, such as intensity (e.g., Bloom, 1993). In this investigation, we rated gradient dimensions, including *intensity* (i.e., the force or muscular tension involved in the expression), *tempo* (i.e., timing, on a continuum from gradual to rapid), *rhythm* (i.e., a regular beat or patterns of beats characterizing infants' behavior), and *inflection* (i.e., patterned changes in intensity).

Infants' expressions of affect may elicit different possible reactions from their moth-

ers. Mothers often respond to an infant's affective expression with behavior that is congruent with qualities in the infant's expression. Stern (1985) believes that by tuning into the gradient qualities present in infants' affective expressions—qualities that are core, transmodal features of affective expressions—mothers are able to convey to the infant that something of the infant's inner experience has been observed and shared. We focused on mothers' attuned responses that matched selected gradient features *or* the positive or negative valence of the infant's affect expression, terming these responses "matches." [1] When a mother smiles following her infant's smile, or when a mother grimaces or groans sympathetically in response to her infant's expression of anger or frustration, she matches the *valence* of her infant's affect. When a mother softly whispers, "Nice," after her infant gently pats a doll's hair, the mother matches her infant's behavior on the *gradient dimension* of intensity, that is, the behaviors are matched in their low intensity qualities—a softly delivered comment in response to her infant's soft pat. In a further example**,** a mother may match her infant's vigorous banging by singing loudly with the same rhythm. Alternatively, mothers can respond in a nonattuned, emotionally neutral way. For example, a mother might say "Yes, sweetie" in a neutral tone in response to her infant's excited squeal; such responses have no congruence to either the gradient qualities or the valence of the affective expression. (See Nicely, Tamis-LeMonda, & Grolnick, 1999, for more discussion of gradient features in affect and of maternal responses to these expressions.)

In this study, we assessed the gradient features and the valences of infant expressivity and maternal matching and nonmatching responses at 9 and 13 months for their predictive validity with regard to five language achievements in children. Our main goal was to evaluate and compare the relative short- and long-term influences of infant affect expressivity and mothers' attuned responses with regard to children's achievement of language milestones.

Method

Participants and Setting

The participants were 77 Caucasian mother-infant dyads (approximately half male and half female). One dyad did not participate in the 9-month visit, two dyads did not participate in the 13-month visit, and four dyads were not interviewed for the language milestones: data from these participants were not included in the study. Consequently, the participants included in the study had complete data for 9-month and 13-month affect measures and for the language milestones first words in production, first words in comprehension, and 50-word production. However, a subset of these participants who were interviewed for language milestones did not achieve either the language milestone combinatorial speech (11 children) or the milestone talk about the past (13 children) by the study's end (and 6 did not achieve both milestones). Analyses for these two later milestones used smaller subsamples (discussed further below).

The participants came from higher-income, well-educated socioeconomic groups. The socioeconomic status of each family was evaluated using the Four-Factor Index of Social Status developed by Hollingshead (1975). The distribution of social status for the sample was heavily weighted in the upper social class strata, with nearly 50 percent of participants in the top 10th percentile. Forty-two percent of the mothers completed 4 years of college, and an additional 49 percent attended at least one year of graduate school. Thirty percent of fathers completed 4 years of college, and an additional 56 percent attended at least one year of graduate school. Infants were on average 9.6 months ($SD = 0.3$) and 13.7 months ($SD = 0.4$) at the time of two home visits.

Procedure

At each visit, the experimenter spoke briefly with mother and child, then let the child play alone for 10 minutes with a set of toys provided by the experimenter. After this warm-up period, the dyad was provided with a different set of toys that were standard for all participants, and the experimenter began videotaping the dyad for 10 min of collaborative play. Mothers were asked to remain with their children, to disregard the observer as much as possible, and to do whatever they ordinarily would do as their children played. In addition to the home visits, mothers were interviewed about their children's language achievements over the telephone every two weeks from when their infants were 9 through 21 months. Language interviews included the Early Language Inventory (ELI; Bates et al., 1988) at earlier interview ages (i.e., 9 to 12 months), as children at these ages uttered few words and had relatively limited receptive language. In the second year, the MacArthur Communicative Development Inventories (MCDI; Fenson et al., 1994) was used, as well as checklists exemplifying various semantic usages of words and phrases (Tamis-LeMonda & Bornstein, 1994), plus a modification of the MacArthur to include receptive language. These language checklists were incorporated into a telephone interview format to enhance the accuracy of the data. Over the telephone, an interviewer read the mother specific lexical items taken from general verbal categories and first asked about the child's receptive language and then about the child's productive language, as mother followed along on her own copy of the checklist. Specifically, mothers were queried as to whether each of the child's lexical items was "flexible" or "specific in terms of context," i.e., saying or comprehending "cup" with regard to all cups, present or not present, as opposed to saying or comprehending "cup" only in regard to a specific cup. Only "flexible" words were counted for analysis (Tamis-LeMonda & Bornstein, 1994; Tamis-LeMonda et al., 1998). Guidelines for what constituted a word/phrase in children's receptive and/or productive vocabulary otherwise followed conventional criteria (e.g., Bates et al., 1988; Goodwyn & Acredolo, 1993; Nelson, 1973; Vihman & McCune, 1994). Early interviews were conducted relatively quickly (15–30 min), whereas later interviews utilizing the full MCDI took up to 2 hr.

Measures

From the language interviews, the following language measures were calculated: (1) the timing of first words in comprehension, defined as the age at which the child acquired minimally one new flexible word in comprehension in two consecutive interview periods; (2) the timing of first words in production, defined as the age at which the child acquired minimally one new flexible word in production in two consecutive interview periods; (3) the timing of 50 words in productive language, defined as the age at which the child accumulated a total of 50 flexible words in his/her productive vocabulary; (4) the timing of combinatorial speech, defined as the age at which the child first combined two words in a single utterance; and (5) the timing of talk about the past, defined as the age at which the child used a word or phrase to refer to a past experience (e.g., "Daddy cook," meaning yesterday Daddy cooked dinner). Inter-rater agreement for language measures was calculated by having two independent observers assess children's language from the same language interviews. Agreement, calculated by dividing the number of agreements by the number of agreements plus disagreements, consistently exceeded 90 percent.

Infant affect expressivity and maternal responses to infant affect expressivity were coded from the videotaped play sessions at the two ages with an event-based coding system. Infant expressivity coding comprised two steps. First, all instances of infant affect expressivity were identified. A display of infant

affect expressivity was defined as any marked change in the valence of the affect (i.e., positive or negative), or in one or more gradient dimensions (i.e., intensity, tempo, rhythm, or inflection) of the infant's facial expression, vocalization, or bodily tension or movement, relative to the infant's immediately preceding state. The displays identified were then classified as Positive, Negative, or Dimensional (i.e., having one or more gradient dimensions). Positive affective displays were coded when infant expressions included a marked change in the infants' affective expressions, in which the infant smiled, laughed, or so forth. Similarly, Negative displays were coded when the infant frowned, cried, whined, or so forth. Dimensional displays were coded each time a marked change in one or more gradient features in the infant's expression was identified relative to the infants' immediately preceding behavior. A change in intensity involved the use of force, such as when an infant struggled with a puzzle piece with a grunting, straining shove. Tempo changes involved acceleration or deceleration, such as an infant quickly and exuberantly flinging up his or her arms. Rhythmic behaviors, such as banging, involved any regular beat or patterns of beats. Inflected patterns in vocal pitch involved a distinctive "melody," such as a vocalization with pitch moving up or down the scale or describing a smooth arc, or inflected patterns in movement involved a patterned change in intensity. Displays coded that included both positive affect and gradient features were classified as Positive (e.g., forceful banging accompanied by smiling). Similarly, displays that included both negative affect and gradient features were classified as Negative.

Coders determined whether the infant's expression was spontaneous (i.e., initiated by the infant) or prompted (i.e., following some maternal verbal or nonverbal behavior that was intended to elicit infant expressivity, like tickling). Prompted affective expressions were coded no further, nor were instances during which either the infant's or the mother's face was not visible. Spontaneous infant expressive displays were coded as positive or negative (i.e., by valence category) or as dimensional (i.e., including one or more gradient dimensions).

For all spontaneous infant affective expressions, a maternal response was coded whenever the mother displayed a contingent verbal or nonverbal behavior within 5 s of the infant expression (Bornstein et al., 1992); however, most instances of maternal responses occurred within 1 to 2 s. Finally, each maternal response was coded as either matching or nonmatching. Matching responses were defined in two ways: (1) those responses that matched the preceding infant expression with regard to either the valence, or type, of the expression (i.e., positive or negative); or (2) those responses that matched the infant on one or more gradient features of the infant's affective expression (i.e., intensity, tempo, rhythm, or inflection). For example, if a mother followed or joined in with her infant's forceful banging by singing or vocalizing loudly, a matching response was coded because she had matched the infant's behavior on the gradient dimensions of intensity and rhythm. Or, if a mother smiled in response to her infant's chuckling, a matching response was coded because she had matched the positive valence of the infant's expression. Nonmatching responses included other contingent but neutral behaviors, such as praise, comments, or questions expressed in response to the infant's affective expression.

A summary measure of the total number of spontaneous infant affective expressions was calculated. For maternal responsiveness, frequencies were obtained for nonmatching responses and for matching responses.

Inter-rater agreement was assessed by having two raters independently code five tapes; agreement for type of infant affect expression, based on Cohen's κ was .75; and for type of maternal response, .73.

Prior to any formal analyses, univariate and bivariate distributions were checked for outliers and normalcy. Three cases were found to have extreme values for the Studentized residual, leverage, and Cook's distances indices

TABLE 1
Maternal responsiveness and infant expressivity at 9 and 13 months

	9 Months			*13 Months*		
	M	*SD*	*Range*	*M*	*SD*	*Range*
			Infant Expressivity			
Positive	4.59	3.94	(0–21)	5.48	3.75	(0–15)
Negative	.70	1.83	(0–10)	.75	1.60	(0–8)
Dimensional	10.33	5.65	(1–23)	8.07	4.35	(1–21)
Total	16.46	6.75	(4–30)	15.57	6.94	(3–33)
			Maternal Responses			
Nonmatching	6.01	3.80	(0–17)	5.77	4.09	(0–17)
Matches	4.43	3.13	(0–14)	4.67	3.26	(0–16)
Total	9.01	4.84	(1–23)	9.31	4.87	(1–24)

N = 67

associated with each case (Judd & McClelland, 1989). All these cases were bivariate outliers with Studentized residuals greater than 3.00 and Cook's distances greater than 1.00. After these outliers were deleted, remaining participants that had completed both home visits and been interviewed for language milestones numbered 67 dyads (32 male and 35 female infants). The subset of these participants whose children had not reached the milestone combinatorial speech by the study's end numbered 11, so that analyses of this variable included 56 dyads. The subset whose children did not talk about the past by the study's end numbered 13, so that analyses of this variable included 54 dyads. The core sample with complete data for all variables included 49 dyads. These unequal sample sizes were used in order to maximize power within each of the analyses.

Results

Descriptive data for infant affective displays and for maternal responses are presented in Table 1. At both ages, infants spontaneously expressed affect 15–16 times, on average, in the 10-min period. About half of these displays had gradient dimensions, and about one-third had positive valence; negative affect displays were least frequent (unsurprisingly so, as the study used no specific procedures to elicit negative affect). Mothers responded to about 60 percent of infant affective displays. Of these responses, approximately half were matching responses and half were nonmatching responses.

Mean age in months for language milestones were: time of onset for first words in comprehension was 10.4 (*SD* 0.7, range = 9.5–13.0, *N* = 67); time of onset for first words in production, 12.9 (*SD* = 2.4, range = 10–21, *N* = 67); time of onset for 50 words in production, 17.7 (*SD* = 2.2, range = 13.4–21.5, *N* = 67); for combinatorial speech, 17.8 (*SD* = 1.8, range = 13.5–20.5, *N* = 56); and for talk about the past, 18.0 (*N* = 55, *SD* = 2.2, range = 13.6–21.9, *N* = 54).[2]

As the language outcomes used in this study were assumed to be correlated, aggregated language measures were derived by performing two principal components factor analyses, each time extracting one factor from the language outcomes. At 9 months, 5 language outcomes were obtained, and at 13 months 3 language outcomes were obtained, as the language outcomes age of first words in comprehension and in production occurred prior to 13 months on average, thereby creating a ceiling effect for these two measures. The two unitary factors extracted both had eigenvalues greater than 1.0, and both comprised positive loadings

TABLE 2
Prediction to timing of child language factors from infant affect expressivity and maternal responsiveness at 9 and 13 months†

Criterion/Predictor	R^2 Total	β	β *t*-value	*Model F*
5-Outcome Language Factor	.20			3.73*
9-mo. Infant Affective Expressivity		.27	1.34	
9-mo. Maternal Matching Responses		−.44	−2.67*	
9-mo. Maternal Nonmatching Responses		−.33	−1.98	
3-Outcome Language Factor	.05			.73
13-mo. Infant Affective Expressivity		−.27	−1.25	
13-mo. Maternal Matching Responses		.07	.40	
13-mo. Maternal Nonmatching Responses		.05	.26	

$N = 49$
* $p < .05$
† Earlier timing (negative sign) reflects greater advances in language

greater than 0.4 (first factor: time of onset of first words in production = .72, time of onset of first words in comprehension = .39, time of onset of 50-word production = .90, time of onset of combinatorial speech = .79, time of onset of talk about the past = .81; second factor: time of onset of 50-word production = .91, time of onset of combinatorial speech = .84, time of onset of talk about the past = .84). Simultaneous regression analyses were then conducted with the two aggregated language factors at each of the two ages separately (see Table 2). At 9 months, a set of hierarchical regressions was conducted using a factor extracted from all five language outcomes, and at 13 months a set of hierarchical regressions was conducted using a second factor extracted from the three later language outcomes (50 words in production, combinatorial speech, and talk about the past).

As indicated in Table 2, at 9 months infants' expressions of affect did not relate uniquely to the first aggregated language factor. Maternal matching responses at 9 months, however, were uniquely and inversely associated with this language factor, explaining 20 percent of the variance in language outcome. The inverse relationship indicated that greater frequency of maternal matching responses predicted earlier achievement of language milestones. At 13 months neither infant affect expressivity nor maternal matching or nonmatching responses predicted the second aggregated language outcome measure. Because maternal responses at 13 months were not predictive of the later language factor, further analyses regressing the individual language outcome measures on 13-month maternal responses were not conducted.

Given that a significant association for maternal matching responses was obtained at 9 months using the aggregated language measure, the unique and joint contributions of infant affect and the two forms of maternal responsiveness (i.e., matching and nonmatching responses) to each of the five language outcomes were assessed using simultaneous regression analyses, conducted for each language milestone at 9 months (see Table 3). At 9 months, five separate regressions were conducted (one for each language outcome). As indicated in Table 3, at 9 months infants' expressions of affect per se did not relate uniquely to any of the language measures. However, maternal matching responses were uniquely and inversely associated with the time of onset of all language milestones, again with the inverse relationship indicating that more frequent matching responses predicted earlier achievement of these language milestones. On average, 15 percent of the variance in language achievements was explained by

TABLE 3
Prediction to timing of language milestones from infant affect expressivity and maternal responsiveness, 9 mo.‡

Criterion/Predictor	R^2 Total	β	β *t*-value	*Model F*
First Words Comprehension ($N = 67$)	.14			3.38*
9-mo. Infant Affective Expressivity		.29	1.68†	
9-mo. Maternal Matching Responses		−.41	−2.97**	
9-mo. Maternal Nonmatching Responses		−.27	−1.79†	
First Words Production ($N = 67$)	.13			3.05*
9-mo. Infant Affective Expressivity		.17	.98	
9-mo. Maternal Matching Responses		−.35	−2.52*	
9-mo. Maternal Nonmatching Responses		−.26	−1.72†	
50 Words Production ($N = 67$)	.20			5.28**
9-mo. Infant Affective Expressivity		.29	1.74†	
9-mo. Maternal Matching Responses		−.52	−3.92***	
9-mo. Maternal Nonmatching Responses		−.20	−1.34	
Combinatorial Speech ($N = 56$)	.13			2.52†
9-mo. Infant Affective Expressivity		.34	1.79†	
9-mo. Maternal Matching Responses		−.37	−2.39*	
9-mo. Maternal Nonmatching Responses		−.30	−1.82†	
Talk about the Past ($N = 54$)	.19			4.03*
9-mo. Infant Affective Expressivity		.33	1.77†	
9-mo. Maternal Matching Responses		−.43	−2.89**	
9-mo. Maternal Nonmatching Responses		−.38	−2.32*	

* $p < .05$
** $p < .01$
*** $p < .001$
† $p < .10$
‡ Earlier timing (negative sign) reflects greater advances in language

mothers' matching responses at 9 months. Maternal nonmatching responses were significantly associated only with the timing of talk about the past.

To evaluate the unique role of 9-month maternal matching responses as *distinct* from the influence of maternal matching responses at 13 months, a further set of three hierarchical regressions was conducted for the three second-year language outcomes (i.e., 50 words in production, combinatorial speech, and talk about the past). The purpose of these analyses was to test whether maternal matching responses at 9 months would continue to predict second-year language achievements over and above infant affect expressivity at 9 and 13 months, *as well as* over and above maternal matching responses at 13 months. Again, mothers' matching responses at 9 months uniquely predicted age at 50 words in production ($\beta = -.43$, $t = -3.00$, $p = < .01$), age at combinatorial speech ($\beta = -.37$, $t = -2.13$, $p < .05$), and marginally predicted when language was first used to talk about the past ($\beta = -.31$, $t = -1.77$, $p = .08$), and did so above the other infant and mother measures.

Discussion

Overall, these findings indicate that mothers' early attuned affective matching responses to young infants' expressivity are associated with children's first- and second-year language achievements, but that neither infants' affect per se, mothers' nonmatching responses, or mothers' later matching responses

are associated with these achievements. These associations lend evidence to the idea that, by fostering a general interest in and understanding of interpersonal communication, mothers' and infants' attuned affective exchanges in the first year motivate infants to put emergent symbolic capacities in the service of linguistic communication, thereby building a foundation for language (Bloom, 1993; Dore, 1983; Stern, 1985; Trevarthen, 1992). It has also been suggested that nonverbal expressivity and attunement constitute a communicative format in their own right, as gradient features in expressivity evoke lived experiences of bodily processes and environmental dimensions of weight, space, and time, conveying experience by "live performance" in a manner similar to abstract dance and music (Kestenberg & Sossin, 1979; Stern, 1985). Attuned interaction, as an exchange of messages about felt life through gradient features of expressivity, may be understood as an initial and immediate form of communication in and of itself. By inaugurating affective dialogue within the infant-mother dyad, this more immediate communication prepares the way for the formal or symbolic forms of communication that emerge later.

Moreover, our findings suggest that there may be a crucial period for the effectiveness of mother-infant shared affect in early language acquisition. Specifically, 9-month maternal matching responses, and not 13-month matching responses, predicted the timing of children's second-year achievements in language, suggesting that shared affect in the first year influences later language achievements, but thereafter shared affect per se decreases in predictive value for language development. It may be that that close affective attunement—matching gradient features and valences in mother-infant interaction (as opposed to nonmatching but contingent responding)—becomes less salient for language acquisition as children's cognitive-representational abilities develop and are reflected in such behaviors as verbal labeling, advanced exploration, and pretend play. Recent findings in the area of maternal responsiveness and language acquisition are consistent with this interpretation. In one study, mothers' *affect* responses to their children's emotional responses decreased from 9 to 13 to 17 to 21 months as maternal *talk* in response to their child's emotional responses increased (Capatides & Bloom, 1993). In another study of mothers' contingent verbal responses (rather than affective responses) to children's vocalizations and exploratory play (rather than affective expressions), maternal responsiveness at 9 months to infant vocalizations and exploration did not predict combinatorial speech or time when toddlers talk about the past, whereas 13-month maternal responsiveness to vocalization or exploration uniquely predicted these achievements (Tamis-LeMonda et al., 1998). In other cohorts, 13-month maternal verbal responses to infant vocalizations have been linked to 36-month language skills in healthy term (Kelly, Morisset, Barnard, Hammond, & Booth, 1996), as well as preterm children (Beckwith & Rodning, 1996).

Generalizability of these findings (i.e., the ages at which the various milestones were achieved, as well as the factors found to predict those achievements) to other populations may be limited by the fact that participants in this study came from homogeneous, intact, higher-income, and well-educated families. In addition, this study relied on maternal report for data on child language. It could be that mothers who are highly responsive to their infants are also likely to observe language achievements early, elevating correlations between observed maternal responsiveness and mothers' reports of child language. Maternal reports of child language, however, have been found to covary significantly with child test assessments and spontaneous language samples (Bornstein & Haynes, 1998). Moreover, the fact that maternal responsiveness at 13 months did not predict child language indicates that associations between maternal responsiveness and child language are not entirely mediated by general maternal sensitivity.

In summary, maternal responsiveness to children's early language and exploration supports children's later language achievements, but shared affect in the first year appears to make an early contribution to child language achievements, perhaps by providing an intersubjective foundation for emerging communicative abilities or by affording an early medium for communication. Of course, maternal responses that support language acquisition may change in form in the second year, becoming less closely linked to the infant's affective expressions. When mothers share their infants' affect, however, infants may advance in their understanding of interpersonal possibilities, and this supports abilities requisite to advances in communication and language. Overall, our study suggests that a dialogical approach to language acquisition, in which language is investigated in the context of shared intent, affect, and attention within the dyad, appears worthy of further consideration.

NOTES

1. Stern (1985, p. 141) observed that attuned maternal responses matching gradient features of infant behavior are "largely cross-modal" (e.g., a high intensity infant *vocal expression* followed by a high intensity maternal *postural movement*), and he distinguished between cross-modal attunements and imitative responses in the same modality, which he did not believe reflected shared affect. However, there is no empirical evidence to date that, by matching a gradient feature of an infant's affective expression in the same modality (e.g., infant vocalizes with an uplifted pitch inflection and mother vocalizes with the same inflection), mother is perceived as merely mimicking the infant without sharing her affect. We use the term "match" in the present study to designate maternal responses that *match* one or more gradient features of infants' expressions, taking either the same or a different modality, as well as maternal responses matching the valence of the infant expression (e.g., infant positive affect expression, such as smiling, followed by some expression of maternal positive affect such as smiling).
2. The age of combinatorial speech in this sample is younger than that found in other studies. Several factors unique to this study may have contributed to this. First, the average age of this language achievement is based on the subset of children who had achieved this milestone by the study's end; as 11 children had not, their data could not be averaged into the score. Second, families were from exceptionally high socioeconomic strata, as discussed in the section describing participants; third, the experience of being interviewed every two weeks about language milestones might have sensitized parents to their children's language gains.

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