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Caregivers' contingent comments to 9-month-old infants: Relationships with later language

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ABSTRACT
This prospective longitudinal study examined the relationship between caregiver input to 9-month-old infants and their subsequent language. Mother–infant dyads were videotaped at ages 9, 12, and 30 months. Language comprehension (at 12 and 18 months) was measured by parent report and correlated with an independent language measure. Three maternal style variables were reduced from the 9-month data. Only caregivers' contingent comments (CCC) related to infants' later language. These findings held after infants' skill with coordinated joint attention (CJA) was taken into account. The total number of words the mothers used when their infants were 9 months predicted vocabulary; however, the predictive power was encapsulated in the words the mother used during CCC. Because studies have typically examined maternal input once infants' CJA has emerged, this work contributes to current efforts to understand variations in early language development.

There is mounting evidence indicating strong links between the social environment during the 2nd year of life and later language development. Studies have found contributions from the nature of the language interactions in which the child engages: the quantity of maternal language heard (Hart & Risley, 1999; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991), and/or the usefulness of that language as a source of information (as mediated by parental maintenance of semantic contingency and use of a conversation style, see Gallaway & Richards, 1994; Snow, 1989, for reviews). An overwhelming number of these studies have focused on language interaction with children aged 12 months and older, the age at which other important social/cognitive skills are emerging. In particular, by 12 months of age typical infants routinely engage in coordinated joint attention (CJA) with their caregivers (Bakeman & Adamson, 1984; Carpenter, Nagell, & Tomasello, 1998), a skill that is important in social–pragmatic theories of language (Tomasello, 1999).

Unfortunately, there are very few studies devoted to understanding the communicative environments of infants *younger* than 12 months.[1] The study by

Carpenter et al. (1998) is a notable exception, but these authors did not find an effect of maternal language in children as young as 9 months. Therefore, the relationship between the social/communicative environment and subsequent language accomplishments remains unclear in young infants whose skill at CJA with caregivers is still fragile. The purose of this prospective longitudinal study was to (a) understand the individual variation in caregiver input while interacting with their 9-month-old infants, (b) examine how caregiver input in these different communcative contexts may relate to subsequent language learning, and (c) explore whether maternal input to 9-month-old infants continues to be associated with linguistic skill once joint attention emerges. We hypothesize that linguistic processing strategies change as the infant ages. Specifically, language learning for 9-month-old infants is facilitated by caregivers' talk about the infant's focus of attention, and only later (12 months) by a more specific placement of talk during periods of coordinated joint attention. Nine-month-old infants have been described as being more passive in their processing of linguistic information (Baldwin & Moses, 1996). Information acquisition at 9 months of age is more likely to occur when there is an exact match between caregivers' input, and the infants' focus of attention to a reference in the immediate environment (Moore, 1998). Accordingly, linguistic input to 9-month-olds should facilitate language acquisition when embedded in adult–child interactions while the infant is attending to objects. On the other hand, 12-month-old infants routinely incorporate a third element into dyadic interactions, marking the emergence of the understanding that others have intentions and attentions that may be actively shared, followed, or directed (Tomasello, 1999). This new achievement is thought to mark the beginning of intentionality (Baldwin & Moses, 1996; Tomasello, 1999) and has been found to facilitate the acquisition of language by creating a shared referential framework in which the child may ground the caregivers' language input (Bruner, 1983; Nelson, 1973; Snow, Perlmann, & Nathan, 1987; Tomasello, 1999).

Typical children rapidly move to understanding words in bouts of CJA in a matter of a few months. The more swiftly the child progresses, the more obscure the lines between these two linguistic-processing strategies may seem. Nonetheless, understanding the contributions of more primitive socially constructed word learning is important when we consider individual variation in vocabulary for both typical children and those with language disorders. Children with autism provide a strong case for understanding the potential effects of early caregiver input. These children have protracted periods before CJA emerges, and it is an even longer time before CJA becomes part of the routine adult–child interaction (Baron–Cohen, 1989; Rollins, 1999). However, contrary to what social pragmatic theories of language would suggest, children with autism are capable of acquiring several words in the absence of joint attention (Rollins, 1999). If language is first rooted in a social system, then it is important to extend our knowledge of social correlates of language to infants who developmentally are not yet engaging in robust amounts of CJA.

To this aim, we conducted a prospective longitudinal study to explore the relationship between maternal language in different communicative interactions

and subsequent language developments. Specifically, we evaluated maternal communicative input to 9-month-old infants, as well as child CJA at 9 months (when still fragile) and at 12 months (when more robust) as predictors of language comprehension at 12 and 18 months of age. In keeping with our objective, we were particularly interested in measuring vocabulary comprehension (as opposed to vocabulary production) because production is much more variable than comprehension in the 12- to 18-month age range. Some children produce more than 500 words and put together two- to three-word sentences by 18 months, whereas others use only a few words (e.g., "uh-oh!") at this age (see the standard errors in Carpenter et al., 1998; Fenson et al., 1993). Because this type of variability is a characteristic in early vocabulary production, it is difficult to differentiate those children who will ultimately catch up by 30 months of age from those children who will end up with language disorders. On the other hand, vocabulary comprehension has been found to be a strong predictor of later language (Thal, 2000; Thal, Tobias, & Morrison, 1991). Unfortunately, language comprehension is difficult to assess during the second year of life. This has led many investigators to turn to parent report measures like the MacArthur Communicative Development Inventories (CDI; Fenson et al., 1993). The CDI has been considered a reliable and valid measure of vocabulary comprehension by some (Bates, Bretherton, & Snyder, 1988; McCathre, Warren, & Yoder, 1996; Ring & Fenson, 2000; Thal, O'Hanlon, Clemmons, & Fralin, 1999) and has been used by other investigators to address similar questions (Carpenter et al., 1998). Nonetheless, the construct validity of parent report measures, like the CDI, has been questioned. It is possible that in studies such as ours, the relationship between maternal input to their 9-month-old infants and parent reported vocabulary comprehension at 12 and 18 months has more to do with parents and their attitudes toward their children's language development than it does with specific language learning processes used by the child. If a comprehensible pattern of relations between the maternal input variables and later language outcomes is to be found, measures collected by some method other than parent report must be included. Thus, we turn to examining the relationship between maternal input variables and an observational measure of each child's productive language at 30 months. By providing a language measure independent of parent report, greater confidence may be placed on the validity of the findings.

Thus, this paper seeks to contribute to current efforts to understand variations in early language development by examining two aspects of object-focused mother–infant communication, maternal language input and infant CJA. We hypothesize that maternal input to the child's focus of attention would be related to language learning when the infants' skill at CJA was still fragile. Accordingly, we would expect that, on average, differences in maternal input to 9-month-old infants would be associated with individual differences in the infants' vocabulary at 12 months. Next, we explore whether early differences in maternal input to their 9-month-old infants continue to be associated with subsequent language outcomes once infants engage in robust amounts of coordinated joint attention, which can be actively recruited for language learning. Thus, we examine the multivariate relationship between caregivers' input at 9 months and the

12-month-old infants' use of CJA on subsequent language skill. Finally, we examine the relationship between parent report measures of language comprehension when infants were 12 and 18 months of age and an observational measure of each child's productive language at 30 months.

METHOD

Participants

The study presented here utilized a prospective longitudinal design. Participants were 11 mother–child dyads recruited by mail as part of the University of Texas at Dallas Language and Communication Database Project. For the current study, only full-term (38–42 weeks gestation) monolingual, normal birthweight children (at least 2500 g), who did not experience extensive medical complications at birth, other major illnesses, hospitalizations, or developmental disabilities, were included. The participants (3 girls, 8 boys) were all from well-educated families. Years of maternal education ranged from 12 to 18 with a mean of 16.45 years and a standard deviation 1.75 years.[2] All children were learning English as their first language, and none of the parents reported that their child experienced substantive exposure to another language (i.e., more than 7 hr per week). All participants were brought into the lab within 1 week of their 9-, 12-, and 30-month birthdays, where they were engaged in a parent–child interaction. In addition, parents completed a commercially available parental report instrument, the MacArthur CDI: Words & Gestures (CDI W&G; Fenson et al., 1993). Each CDI W&G was either mailed directly to the parents along with a cover letter or given to the parents during their visit to the laboratory. Parents completed the CDI W&G when the infants were between 11 and 14 months of age (M = 12.27, SD = .79) and again when they were between 17 and 18 months (M = 17.8, SD = .42) and returned them to our facilities in a postage-paid envelope. Parents were told that they could contact the project if they had any questions at any point.

Data collection and procedures for laboratory visits

Parent–child dyads were brought to the laboratory when the infants were 9 and 12 months. In addition, 10 dyads returned at 30 months. All dyads were mother–child pairs. Laboratory visits were held in a child-friendly observation room with two-way mirrors on the front and back walls. Parent–child dyads sat facing each other and engaged in spontaneous play interactions using a standard set of age-appropriate toys (see Appendix for a list of toys used at each age). Parents were instructed to play with their child as they would typically. At 9 months the infants were seated in an infant seat with a tray where toys could be placed, and at 12 and 30 months they were seated on the floor. For all sessions, split-screen images were videotaped for later data reduction and analyses.[3]

Transcription

For each mother–infant dyad at the 9-month visit, 10 min of toy-mediated play was transcribed onto computer files and formatted in accordance with the CHAT transcription conventions of the CHILDES system (MacWhinney, 1991). Tran-

scripts were verified by a second transcriber for content and checked for adherence to transcription conventions using the automatic checking facilities of the CHILDES system. Utterance boundaries were based primarily on intonation contour and, secondarily, on pause duration. No attempt was made to distinguish the number of unintelligible words in a string. Discrepancies in the transcription were resolved by consensus.

Measures

Pragmatic input. The Inventory of Communicative Acts—Abridged (INCA-A; Ninio, Snow, Pan, & Rollins, 1994) was used to code the mother's communicative intents. This system is a shortened and modified version of the system developed by Ninio and Wheeler (1984; see also Ninio & Snow, 1996). The system is based both on speech act theory (Austin, 1962; Searle, 1976) and studies of face to face interaction (Goffman 1974; Streeck, 1980) that emphasize the importance of socially constructed communicative interchanges. Thus, the system identifies and codes communicative intent at two different levels, the level of the social interchange and the level of the utterance, thus acknowledging the existence of an organization of talk at a level higher than the single utterance (c.f. Dore & McDermott, 1982; Streeck, 1980). An interchange is defined as one or more rounds of talk, all of which serve a unitary interactive function implicitly agreed upon by the interlocutors. Within this social interchange, speakers express specific intents at the utterance level. The INCA-A, then, actually consists of two subsystems, each of which codes for a different component of communicative intent. Because the system was designed to provide exhaustive coding of the communicative attempts expressed by children of varying ages (as well as their mothers), it can reflect development and continuity across a wide age range.

Inspection of the interchange speech act combinations used by mothers to their 9-month-old infants revealed that they could be characterized by three theoretically motivated categories: (a) child-centered acts that were sensitive to the infants' focus of attention, (b) other child-centered acts, and (c) directive acts. We called the first category caregivers' contingent comments (CCC). The CCC were child-centered acts where the mother discussed an object of joint focus of attention or narrated an ongoing activity. These included utterances coded in INCA-A as Discuss Joint Focus of Attention in conjunction with any speech act and Negotiate Immediate Activity (NIA) with a statement. The second category, other child-centered acts, included routines in which the mothers engaged the child in social exchanges (e.g., wave bye-bye, peak-a-boo) and feeling state interchanges in which the mother talked about her own feelings or the child's feelings ("you like that?"). These included utterances coded in INCA-A as Perform a Verbal Move in a Game, Mark an Event, responses to questions in practiced formats (coded on the speech act level), and Discuss Hearers, or Speakers' Feelings. Our last category was child-directive acts, which included directive interchanges in which the mother communicated instrumentally to negotiate which actions would be carried out and by whom (e.g., "Can

you take the next one off?" "Put the blue one on."), direct attention in which the mother directed the infants attention to an object or event (e.g., pointed to an object or event, "look at this") and recent event interchanges where the mother discussed an immediate past event (e.g., "it rolled away"). Directives included utterances coded in INCA-A as NIA with all speech act categories except for statements, proformatives, and markings; plus Direct Hearers Attention and Discuss Immediate Recent Event. Other communicative acts prescribed by the Ninio et al. (1994) system were seldom used by the mothers in the current study (e.g., all other interchanges with the exception of Discuss Clarification (DCC interchange) accounted for less than 1% of the 2,338 maternal communicative acts. DCC accounted for 4% of the data).

Finally, because there were several interchange–speech act combinations within each category of the three categories previously described, we chose to numerically reduce the information within each of the three categories using Principal Component Analysis (PCA). PCA solves many of the problems associated with compositing variables by other techniques such as simple frequency counts. Specifically, PCA (a) standardizes the variables so that the variable with the largest variance does not dominate the composite, (b) weights the standardized variables by the correlation between the variable with the largest variance and the standardized sum so that all of the variables point in the same direction, and (c) iterates the process for maximal internal consistency and reliability (see Afifi & Clark, 1984). Thus, we were left with three pragmatic input composites (a) CCC, (b) other child-centered acts, and (c) directives.

Lexical input at 9 months. Four measures of lexical input were calculated for each mother: the total number of words (TNW) the mother produced in 10 minutes (Klee, 1992; Miller, 1991) as well as the TNW each mother used while engaging in each of the interchange speech act combinations associated with the three pragmatic input categories. Specifically, we calculated for each mother the TNW used while engaging in contingent comments, other child-centered acts, and child-directive acts.

CJA at 9 and 12 months. CJA was coded by reviewing the original videotapes. The coding procedure strictly adhered to the rules formulated by Bakeman and Adamson (1984) and Carpenter et al. (1998). Specifically, CJA episodes were coded in which the mother and infant share attention to an object of mutual interest for at least 3 s. CJA was coded when the infant looked from an object to the mother's face and back to the same object. Episodes in which the infant clearly looked at the mother's face as a response to an adult action, vocalization, or language were not coded because this would be more accurately described as an alternation of attention and not coordination of attention. The total durations of CJA in 10 min at 9 months and at 12 months were used as measures of CJA (see Carpenter et al., 1998).

Child vocabulary comprehension at 12 and 18 months. The MacArthur CDI W&G (Fenson et al., 1993) was used to assess vocabulary comprehension at both ages. The CDI comprehension measure has been found to be a valid and

reliable measure of vocabulary comprehension for children in this age range who have mothers of similar educational background (Bates et al., 1988; Ring & Fenson, 2000; Thal et al., 1999). The CDI W&G contains a vocabulary checklist of 396 words organized into categories such as animals, food and drink, body parts, people, and action words. At both ages we computed a measure of vocabulary comprehension based on the sum of the items that parents marked on the checklist that their child "understands." All 11 parents completed the CDI forms when the infants were between 11 and 14 months (M = 12.27, SD = .79) but only 9 CDIs were returned when infants were between 17 and 18 months (M = 17.8, SD = .42). Because the "12-month" comprehension data spanned 3 months (11–14 months), we statistically controlled for age in the analyses using this data.

Child productive language skill at 30 months. Ten of the original 11 children were observed in the laboratory at 30 months. Each of these children's productive language skill was assessed using the Index of Productive Syntax (IPSyn; Scarborough, 1990). The IPSyn score assesses emerging morphosyntactic skills and is a composite score, based on 100 utterances, that reflects the child's use of 56 syntactic and morphological forms, including elaborations within noun and verb phrases, questions, negations, and various sentence structures. Our rationale for using IPSyn was twofold: first, lexicalist approaches to grammar suggest that vocabulary and grammar are continuous (see Bates & Goodman, 1997); second, at 30 months of age, vocabulary has typically leveled off and combining words and morphemes mark advances in language.

Reliability

A second rater independently coded 781 of 2338 (33%) of the mother's communicative intentions. Cohen's kappa statistic, which takes account of chance agreement, was calculated. The kappa values ranged from .80 to .73 (M = .77), which is considered "substantial" to "almost perfect" agreement according to guidelines established in Landis and Koch (1977). A second rater also coded 20% of the tapes for both episodes and duration of child CJA at 9 and 12 months. Point by point reliability ranged from 94 to 100% (M = 96.7%) agreement at 9 months and 94 to 97% (M = 96%) agreement at 12 months. Finally, a second rater independently rescored all of the 30-month videotapes for IPSyn. A point by point reliability on the item level codes was 93.6%.

RESULTS

Descriptive statistics for the original pragmatic input measures, TNW in 10 min and the TNW associated with each of the maternal input composites, are found in Table 1. Mothers of 9-month-old infants varied considerably in their use of communicative contexts, their total verbosity (TNW in 10 min), and their verbosity while engaging in each of the communicative contexts.

Consistent with previous studies, infants' use of CJA at 9 months was just beginning to emerge. All of the 9-month-old infants engaged in at least one

Table 1. *Univariate statistics for original maternal pragmatic input variables and lexical input variables* (n = *11*)

	Variable	Mean	Standard Deviation	Minimum	Maximum	Skewness
CCC	Joint focus	42.9	20.0	13	73	0.08
	Narrate activity	18.0	8.94	5	32	0.17
Other child centered	State feelings	11.8	10.4	0	32	0.84
	Routine	48.8	15.3	21	74	–0.04
Directives	Behavioral directives	29.7	16.4	7	58	0.23
	Attention directives	22.2	11.18	6	41	0.30
	Recent event	7.45	5.98	0	16	0.16
Total no. words	CCC	224.7	96.5	80	376	0.09
	Other child centered	110.3	53.6	45	198	0.46
	Directives	264.7	114.7	131	473	0.52
	10 min	756.1	328.2	374	1440.0	0.90

episode of CJA while interacting with their mothers. While the mean total duration spent in CJA at 9 months was 21.9 s, there was enough variability in this measure (range = 5.93–78.02 s; *SD* = 21.6) to suggest that a null finding with CJA at 9 months could not be attributed to a floor effect. As we expected, infants engaged in CJA for considerably longer duration at 12 months. On average, during the 10 min of toy mediated dyadic play interactions, infants engaged in 191.9 s of coordinated joint attention at 12 months (range = 51.4–215.3 s; *SD* = 112.3).

All child language measures were also variable. It is noteworthy that the mean percentile ranking for the 12-month-old children was lower than expected from the general population (40.4 vs. 50th percentile). Nonetheless, the children represented a full range of abilities from the 0 to 86th percentiles (*M* = 40.4, *SD* = 26.2). At 12 months, vocabulary comprehension ranged from 9 to 154 words (*M* = 69.4, *SD* = 43.9). By 18 months, vocabulary comprehension ranged from a minimum of 78 words to a maximum of 337 (*M* = 191.9, *SD* = 98.3).

Next, we used correlation and regression analyses to understand the relationship between each of the maternal input variables when infants were 9 months, infants' CJA at 9 and 12 months, and subsequent language outcomes.[4] Results revealed, after controlling for age, that only CCC in conversation with 9-month-old infants was predictive of infants' language comprehension at 12 months ($r = .89$, $p = .003$). Specifically, on average, mothers who spent more time talking about objects in the child's focus of attention at 9 months had children with better vocabulary comprehension at 12 months.

Further, we found, on average, that the total number of words mothers used in 10 minutes predicted children's vocabulary comprehension at 12 months,

after controlling for age ($r = .87$, $p = .004$). The pattern of results, however, suggested that mothers' TNW while engaging in CCC was driving the effect. Specifically, vocabulary comprehension at 12 months of age was associated with mothers' total words when engaging in contingent comments at 9 months ($r = .89$, $p = .004$), but not mothers' TNW within other child-centered acts and child-directive acts.

Thus far we have found that maternal input to the child's focus of attention is associated with initial language learning when the infant's skill at CJA is still fragile at best. Next, we explored whether early differences in maternal input to 9-month-old infants continue to relate to subsequent language outcomes once infants have more developed social/cognitive skills.

Estimated correlations were consistent with many previous studies: there was a positive concurrent relationship between CJA and words understood at 12 months ($r = .69$, $p = .03$, controlling for age) and a predictive relationship between CJA at 12 months and words understood at 18 months ($r = .67$, $p = .05$). In keeping with Spearman's law of reliability, which states a measure cannot correlate with another measure higher than it does itself, words understood at 12 months had the highest predictive relationship with words understood at 18 months. It is noteworthy for the hypothesis under investigation that the strength of the relationship between CCC at 9 months and vocabulary comprehension at 18 months is strikingly similar to the strength of the relationship between CJA at 12 months and vocabulary comprehension at 18 months ($r = .70$, $p = .03$; $r = .67$, $p = .05$, respectively). Furthermore, multiple regression revealed that 64% of the variance in words understood at 18 months was attributable to the combined effects of CCC at 9 months and CJA at 12 months F (2, 6) = 5.32, $p = .05$. This suggests that the way mothers talk to their prelinguistic infants continues to be associated with language comprehension even after CJA is used with some frequency.

In order to assuage the alternative hypothesis that early maternal input is related to mother's judgment about the infant's comprehension (as opposed to the infant's true language abilities), an independent measure of child language was introduced. More specifically, we investigated the relationship between infants' comprehension (as measured by parent report) at 12 and 18 months with children's IPSyn scores obtained during mother–child conversation at 30 months of age. The children's IPSyn scores at 30 months ranged from 28 to 72 ($M = 54.9$, $SD = 13.6$). We found a positive relationship between parent report of infants' comprehension at 12 and 18 months and children's IPSyn scores at 30 months ($r = .78$, $p = .02$; and $r = .87$, $p = .002$, respectively). Furthermore, we found that, on average, mothers who spent more time using contingent comments when the infant was 9 months had children with higher IPSyn scores at 30 months ($r = .74$, $p = .01$). CJA at 12 months was not related to IPSyn at 30 months ($r = .53$, $p = .12$), but the null effect was due to one child, without whom there was an estimated correlation ($r = .92$, $p = .001$).

DISCUSSION

This study highlights the relationship between caregiver input to 9-month-old infants and subsequent language development. Although the positive effects of

child-centered utterances have been demonstrated repeatedly for infants in the second year of life (Carpenter et al., 1998; Rollins & Snow, 1998; Tomasello & Todd, 1983, to name a few), this association has not been found for infants as young as 9 months. As expected, we did not find infants' use of coordinated joint attention at 9 months predictive of early vocabulary comprehension. Thus, we found that even before infants routinely engage in CJA, the social/linguistic environment was associated with later language development. At 9 months the infants engage in very few instances of CJA and do not appear to actively recruit their newly learned social skill to promote language learning. Thus, these findings are in accord with theories that suggest that 9-month-olds use a more passive linguistic information processing strategy (Baldwin & Moses, 1996).

Moreover, we did not find CCC to 9-month-old infants to be a fleeting influence. CCC related to language outcomes at 12, 18, and 30 months, even when joint attention was taken into account. It is noteworthy that our child language measures at 12 and 18 months were obtained through parent report and as such may have been biased by the mothers' attitudes toward their infants' language abilities. However, our parent report measures were highly correlated with an independent observational language measure obtained when the children were 30 months old. We interpret this finding as evidence of the validity of our parent report measures of language. Stated differently, these findings do not simply indicate that mothers who think more highly of their children's language abilities speak more supportively. Rather, they suggest a relationship between caregiver input to 9-month-old infants and later language development. Specifically, at 9 months of age the caregivers' temporally contingent comments about the infants' focus of attention is associated with infants' ability to perceive the relationship between words and their referents. This finding was particularly striking when you consider we studied a group of educated mothers and the pattern of results remained unchanged when maternal education was partialed out (refer to note 4). That is, we would expect maternal input to be more variable if we had sampled families with more diverse social–economic backgrounds (Hart & Risley, 1999).

The type of learning described here does not imply that infants are developing true language at 9 months. As Tomasello (1999) points out:

> Infants this young may on occasion, of course, learn to associate one of these noises with a perceptual event in much the same way a household pet may understand that the sound *dinner* heralds the arrival of food. But this is not language. Sounds become language for young children when and only when they understand that the adult is making that sound with the intention that they attend to something. (pp. 100–101)

Thus, the issue is not whether infants are learning true language at 9 months but whether the social environment is important for later language. Nine-month-old infants are probably only capable of comprehending a few words as a result of immediate contingent reinforcement. However, the current study suggests that the early social/linguistic environment *prior* to the influences of infants' ability to share reference is related to children's later language skills. We offer two explanations for the association. First, the more vocabulary comprehension

infants have by the time they are able to share reference with their caregivers, the more distal from the immediate here and now of the communicative episode the shared object or reference can become. This is important as the infant becomes increasingly mobile. Thus, mothers and infants (with their increasing skill at CJA) can begin to share reference from across the room. What we are suggesting here is a dynamic assembly of early learning supported by environmental influences with infants developing understanding of others as intentional beings.

An alternative explanation is that mothers who are initially adept at using contingent comments also use more facilitative features (e.g., child-centered conversation style, semantically contingent utterances) as the child gets older. Carpenter et al. (1998) found only moderate correlations between maternal input to 9-month-old infants and to the same infants at 12 and 15 months (.52 and .56, respectively), thus accounting for about 25% of the variability. Nonetheless, it is important to address this question empirically.

Another area of further research suggested by the current study is the relationship between maternal talkativeness and vocabulary in slightly older infants. Our study suggests that the relationship between overall caregiver talkativeness and subsequent language development may be unduly influenced by caregivers' verbosity within specific communicative contexts. This finding has important ramification for evidence-based treatment approaches in early intervention. As such, it is important to understand whether communicative context has biased the relationship between overall maternal talkativeness and language outcomes in slightly older children.

A weakness of this study is the small sample size. However, because the study is both longitudinal and microanalytical in nature, the results add to our understanding of a socially constructed communication system and lend further support to a social pragmatic theory of language development. Of course, these correlations do not prove causality. However, the prospective nature of these cross-lagged correlations suggests that, for normally developing children at least, caregivers' contingent comments to 9-month-old infants contribute to the development of early language skill.

A more powerful test of our hypothesis would have been to study rate of vocabulary development. Unfortunately, we were unable to take advantage of growth modeling techniques because vocabulary scores were collected at only two time points. It is noteworthy, however, that past research has shown that vocabulary growth is linear from 12 to 18 months; thus, the rate of change would not yield sufficient additional information in a study of this size.

In summary, this paper highlights the vital role of caregivers' input to their 9-month-old infants and subsequent language skill. That is, even before an infant can actively attend to the referent about which the caregiver is talking, caregivers' comments on the infants' focus of attention are associated with subsequent language. Furthermore, the facilitative effects of CCC on the infants' focus of attention did not disappear once a child used a robust amount of CJA. Thus, this study contributes to the current efforts to understand variations in very early language development.

APPENDIX

TOY LIST

Nine-month toys

1. happy bird toy (large wobble toy that jingles when tipped)
2. Big Bird stuffed animal
3. ring stacker
4. book on colors
5. plastic book of faces with holes for eyes
6. hat
7. hand-shaped chew toy
8. foot-shaped chew toy
9. plastic pig, cow, and sheep figurines
10. plastic toy car
11. candy-striped rattle with blue balls in it
12. doll

Twelve-month toys

Included are all toys listed for 12+ months.

10. telephone
13. ball
14. toy (like carousel) that revolves when the top is pushed

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NOTES

1. It is noteworthy that some researchers have begun to link other aspects of the infants' social environment at 9 months, such as mother's responsiveness to the child's affective signals, with subsequent language outcomes (Bornstein & Tamis–LeMonda, 1997).
2. Maternal education was used as an indicator of socioeconomic status because it can be easily and reliably obtained and has been found to be strongly correlated with other measures of socioeconomic status (Hart & Risley, 1999).
3. Specifically, two Panasonic digital 5100 video cameras were used for filming, which

were mounted on Bogen tripods with fluid heads outside the observation room next to front and back mirrors. The cameras were controlled with a Panasonic Remote Controller WV-CR12 and signals sent through a Panasonic Digital AV Mixer WJ MX12 in order to capture split-screen images from both cameras. The split-screen image was recorded on Hi 8 videotape using a Sony CCD-TR700 Hi 8 video recorder.

4. It is noteworthy that all of the assumptions of correlation and regression analyses were met in our analyses. Furthermore, except for the one instance noted, no outliers drove the results. In addition, the pattern of results remained unchanged when analyses were conducted while controlling for maternal education.

REFERENCES

Afifi, A. A., & Clark V. (1984). *Computer-aided multivariate analysis.* New York: Van Nostrand Reinhold.

Austin, J. L. (1962). *How to do things with words.* Cambridge, MA: Harvard University Press.

Bakeman, R., & Adamson, L. (1984). Coordinating attention to people and objects in mother–infant and peer–infant interaction. *Child Development, 55,* 1278–1289.

Baldwin, D., & Moses, L. (1996). The ontogeny of social information gathering. *Child Development, 67,* 1915–1939.

Baron–Cohen, S. (1989). The autistic child's theory of mind: A case of specific developmental delay. *Journal of Child Psychology and Psychiatry, 30,* 285–298.

Baron–Cohen, S., Baldwin, D., & Crowson, M. (1997). Do children with autism use the speaker's direction of gaze strategy to crack the code of language? *Child Development, 68,* 48–57.

Bates, E., Bretherton, I., & Snyder, L. (1988). *From first words to grammar: Individual differences and dissociable mechanisms.* New York: Cambridge University Press.

Bates, E., & Goodman, J. (1997). On the inseparability of grammar and the lexicon: Evidence from acquisition, aphasia, and real-time processing. *Language and Cognitive Processes, 12,* 507–584.

Bornstein, M., & Tamis–LaMonda, C. (1997). Maternal responsiveness and infant mental abilities: Specific predictive relations. *Infant Behavior & Development, 20,* 283–296.

Bruner, J. (1983). *Child's talk: Learning to use language.* New York: Norton.

Carpenter, M., Nagell, K., & Tomasello, M. (1998). Social cognition, joint attention, and communicative competence from 9–15 months. *Monographs of the Society for Research in Child Development, 63.*

Dore, J., & McDermott, R. P. (1982). Linguistic indeterminacy and social context in utterance interpretation. *Language, 58,* 374–398.

Fenson, L., Dale, P., Reznick, J. S., Thal, D., Bates, E., Hartung, J., Pethick, S., & Reilly, J. (1993). *The MacArthur Communicative Development Inventories: User's guide and technical manual.* San Diego, CA: Singular Publishing Group.

Gallaway, C., & Richards, B. J. (1994). *Input and interaction in language acquisition.* New York: Cambridge University Press.

Goffman, E. (1974). *Frame analysis: An essay on the organization of experience.* Harmondsworth, UK: Penguin.

Hart, B., & Risley, T. (1999). *The social world of children: Learning to talk.* Baltimore, MD: Brookes.

Huttenlocher, J., Haight, W., Bryk, A., Seltzer, M., & Lyons, T. (1991). Early vocabulary growth: Relation to langauge input and gender. *Developmental Psychology, 27,* 236–248.

Klee, T. (1992). Development and diagnostic characteristics of quantitative measures of children's language production. *Topics in Language Disorders, 12,* 18–41.

Landis, J., & Koch, G. (1977). The measurement of observer agreement for categorical data. *Biometrics, 33,* 159–174.

MacWhinney, B. (1991). *The CHILDES Project: Computational Tools for Analyzing Talk.* Hillsdale, NJ: Erlbaum.

McCathre, R., Warren, S. F., & Yoder, P. J. (1996). Prelinguistic predictors of later language devel-

opment. In K. N. Cole, P. S. Dale, & D. J. Thal (Eds.), *Assessment of communication and language* (Vol. 6, Communication and Language Intervention series). Baltimore, MD: Brookes.

Miller, J. F. (1991). Quantifying productive language disorders. In J. F. Miller (Ed.), *Research on child language disorders* (pp. 211–220). Austin, TX: Pro-Ed.

Moore, C. (1998). Commentary, Social cognition in infancy. *Monographs of the Society for Research in Child Development, 63,* 167–174.

Nelson, K. (1973). Structure and strategy in learning to talk. *Monographs of the Society for Research in Child Development, 38* (Serial No. 149).

Ninio, A., & Snow, C. E. (1996). *Pragmatic development.* Boulder, CO: Westview.

Ninio, A., Snow, C. E., Pan, B. A., & Rollins, P. R. (1994). Classifying communicative acts in children's interactions. *Journal of Communications Disorders, 27,* 157–188.

Ninio, A., & Wheeler, P. (1984). *A manual for classifying verbal communicative acts in mother–infant interaction* (Working Papers in Developmental Psychology, No. 1). Jerusalem: Hebrew University, Martin and Vivian Levin Center.

Ring, E. D., & Fenson, L. (2000). The correspondence between parent report and child performance for receptive and expressive vocabulary beyond infancy. *First Language, 20,* 141–159.

Rollins, P. R. (1999). Early pragmatic accomplishments and vocabulary development in preschool children with autism. *American Journal of Speech Language Pathology, 8,* 85–94.

Rollins, P. R., & Snow, C. E. (1998). Shared attention and grammatical skills in typical children and children with autism. *Journal of Child Language, 25,* 653–674.

Scarborough, H. (1990). Index of productive syntax. *Applied Psycholinguistics, 11,* 1–22.

Searle, J. (1976). A classification of illocutionary acts. *Language in Society, 5,* 1–23.

Snow, C. E. (1989). Understanding social interactions and language acquisition: Sentences are not enough. In M. Bornstein & J. Bruner (Eds.), *Interactions in human development* (83–103). Hillsdale, NJ: Erlbaum.

Snow, C. E., Perlmann, R., & Nathan D. (1987). Why routines are different: Toward a multiple-factors model of the relation between input and language acquisition. In K. Nelson & A. van Kleeck (Eds.), *Children's language* (Vol. 6). Hillsdale, NJ: Erlbaum.

Streeck, J. (1980). Speech acts in interaction: a critique of Searle. *Discourse Processes, 3,* 133–154.

Thal, D. (2000). *Late-talking toddlers: Are they at risk?* San Diego, CA: San Diego State University Press.

Thal, D. J., O'Hanlon, L., Clemmons, M., & Fralin, L. (1999). Validity of a parent report measure of vocabulary and syntax for preschool children with language impairment. *Journal of Speech, Language and Hearing Research, 42*, 482–496.

Thal, D. J., Tobias, S., & Morrision, D. (1991). Language and gesture in late talkers: A 1-year follow-up. *Journal of Speech and Hearing Research, 34,* 604–612.

Tomasello, M. (1999). *The cultural origins of human cognition.* Cambridge, MA: Harvard University Press.

Tomasello, M., & Todd, J. (1983). Joint attention and lexical acquisition style. *First Language, 4,* 197–212.