

Mother-infant object involvement at 9 and 15 months: relation to infant cognition and early vocabulary*

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ABSTRACT

This study investigated maternal verbal and nonverbal behaviours during mother-infant object involvement episodes and their relation to infant cognitive level and productive vocabulary. Thirty mother-infant dyads were observed at home during 20 minutes of play at 9 months and 10 minutes of play at 15 months with two different toys. Developmental change in maternal scaffolding behaviours was sensitive to toy difficulty. Scaffolding at both ages was related to the Bayley Mental Development Index (MDI), and scaffolding at 15 months was related concurrently to infant vocabulary. Labelling at 15 months, under both joint and non-joint attentional conditions, was related both to Bayley MDI and to concurrent infant vocabulary. Verbal behavioural directives at both ages were related to Bayley MDI and at 15 months were related concurrently to infant vocabulary. Attention-getting directives decreased with age and were unrelated to either MDI or vocabulary. Somewhat different results were obtained with frequencies vs. proportional frequencies of types of maternal verbalizations,

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particularly with regard to gender effects. Joint attention during object involvement was not directly related to infant cognitive level or to vocabulary size but did provide a context in which mothers verbalized more to their infants.

Mother-infant object involvement episodes are pictured as contexts rich for problem solving, language learning and the transmission of cultural meanings (Adamson & Bakeman 1992). Vygotsky (1978: 90) has defined these contexts as a potential zone of proximal development, a place where learning is organized by an adult who 'sets in motion a variety of developmental processes.' The adult often engages in a 'scaffolding' process that 'consists essentially of the adult "controlling" those elements of the task that are initially beyond the learner's capacity' (Wood, Bruner & Ross 1976: 90). Adult scaffolding activities include simplifying the task, maintaining attention and motivation, demonstrating, and marking critical features. As the child's skills mature, this support is gradually diminished (Bruner 1975). These theories have challenged developmental researchers to consider the relationships between types of mother-infant interactions and *infant* skill acquisition at different points in development.

Towards the end of the first year, the infant's capacity to co-ordinate attention to people and objects develops (Adamson & Bakeman 1984). This ability is viewed as the culmination of a developmental path that begins with face-to-face interactions and continues as objects are introduced into infants' social interactions (Tronick 1982). At the end of this sequence, infants are able to engage in joint visual attention to objects or events involving intentional sharing with their social partners. It appears likely that infants must be at least 9 months of age before they can do so (Corkum & Moore 1995, Tomasello 1995a).

Adults play an important role as they encourage, support and elaborate on the development of these abilities. For example, they initiate and maintain episodes so that a shared attentional focus can be reached by the infant and adult (Tomasello 1988). They also scaffold infant behaviour in object play by attention-getting and stage-setting behaviours to ensure joint attention and by channelling 'the infant's approximations of a desired skill into its optimal form' (Hodapp, Goldfield & Boyatzis 1984: 780).

While adults must take responsibility for the management of joint attentional episodes, the efficacy of this management depends on adults' sensitivity to their infants' developmental level, activities and attentional focus (Adamson & Bakeman 1984, Adamson, Bakeman, Smith & Walters 1987, Belsky, Gilstrap & Rovine 1984, Raver &

Leadbeater 1992). Normative data indicate that mothers tailor their communicative actions to their infants' developmental level. Adamson & Bakeman (1984: 475) observed that mothers of 6-month-old infants were 'more likely to highlight themselves and their social link to the object'; if they acted on objects, 'it was often to make them come alive with sound and movement' (i.e., literal actions). Mothers of older infants (over 12 months) tended to act more as narrators and engaged in more conventional, object-focused acts, such as book reading and give-and-take games. Thus, as infants develop, mothers gradually shift the balance between self and object marking, and literal and conventional acts.

In terms of the relationship between object-involvement activities and infant development, some research has suggested that joint attentional activities provide infants with experiences which enhance communicative and cognitive development (Bruner 1975, Tomasello & Farrar 1986, Vibbert & Bornstein 1989). Tomasello & Farrar (1986) note that these interactions provide infants with a predictable referential context which increases the meaningfulness of the mother's language. The recurring format allows infants to deduce the correspondence between the verbal labels introduced and the objects of the child's interest (Bruner 1985).

Evidence to support a relationship between joint object involvement and language development has been accumulating. Ruddy & Bornstein (1982) found that mothers who frequently encouraged their infants' attention to stimuli at 4 months (by handing them a toy or by pointing to an object) had infants with larger productive vocabularies at 12 months. Tomasello & Todd (1983) reported that the amount of time that 12- to 18-month-old infants and their mothers were engaged in joint attentional episodes was positively related to the child's vocabulary size at 18 months. Similarly, Smith, Adamson & Bakeman (1988) found that the more time 15-month-olds spent in joint object play with their mothers, the larger were their productive vocabularies, both concurrently and three months later.

In contrast to the facilitative effect that joint attention appears to have on infant development, a directive interaction style has been found to hinder language acquisition (Akhtar, Dunham & Dunham 1991, Dunham, Dunham & Curwin 1993, Tomasello 1988, Tomasello & Farrar 1986). Akhtar *et al.* (1991) found that maternal directiveness (as measured by the use of prescriptives to direct attention) was related to slow vocabulary development in 13-month-olds. In contrast, prescriptives which followed infants' attentional focus were related to faster vocabulary acquisition.

Tomasello & Todd (1983) have argued that directiveness makes establishing a joint attentional focus more difficult. If an adult's label

follows a child's attentional focus, the child does not have to determine the adult's intended referent. However, if an adult is directive when referring to an object, the child must shift his/her attention to co-ordinate with the adult's focus. In support of this argument, Tomasello & Farrar (1986), in a naturalistic observational study of mother-infant interaction at 15 and 21 months of age, found that object references which followed the child's attentional focus were positively related to the child's lexical development, particularly of object labels. Conversely, directive object references were negatively related. Experimental work also supported these observational findings. Tomasello & Farrar (1986) taught novel object labels to 17-month-olds and found that labels which were applied to objects on which the child's attention was already focused were learned better than those presented in an attempt to redirect the child's focus. Dunham *et al.* (1993) specifically controlled the introduction of novel object labels using either an attention-following strategy or an attention-switching strategy. They found that 18-month-old infants who were taught the object labels in the attention-following condition were more likely to learn them.

The purpose of our study was to examine mother-infant object involvement longitudinally during the transition to language, between 9 and 15 months. We were interested in how maternal scaffolding and playful behaviours, as well as maternal verbalizations, might change between these two ages, which are prior to language onset and at early onset. Based on Adamson & Bakeman (1984), we predicted that mothers would shift away from more literal (playful) acts to more conventional (scaffolding) activities. We also added a variable of toy difficulty, not included in previous studies. Mothers and infants spent equal time with a less challenging toy (a circus train) and a more challenging toy (a shape fitter). We predicted that mothers' scaffolding activities would change as a function of toy difficulty, but that this change would be affected by infant age. Thus, toy effects were thought to tap maternal sensitivity to toy difficulty and to developmental change with age.

Our coding of object involvement was quite microanalytic in comparison with previous studies. We coded every object manipulation initiated by mother or child or both (i.e., each time either one or both touched an object) and, at the same time, coded whether or not both members of the dyad were looking at the same precise object. This coding yielded a measure of the proportion of object manipulations that occurred with joint attention and a ratio of mother-initiated actions to child-initiated actions. We predicted that both measures would be affected by toy difficulty and age, such that they would decrease with age for the easier toy and increase with age for the more difficult toy.

We also coded maternal verbalizations to the infant as either labels, suggested actions, praise, comment/questions, or attention-getting statements. Each verbalization was coded as occurring with or without joint attention to an object. It was expected that labels, suggested actions, and comment/questions would increase with age and developing comprehension abilities and that attention-getting directives would occur more under conditions of non-joint attention.

Measures of scaffolding, playfulness, joint attention, ratio of mother-to-child initiated actions, and types of maternal verbalizations were related to infant cognitive development at 10 months and to infant vocabulary size at 15 months. Based on past research (e.g., Akhtar *et al.* 1991, Ruddy & Bornstein 1982, Smith *et al.* 1988, Tomasello 1988, Tomasello & Farrar 1986, Tomasello & Todd 1983), it was expected that infant vocabulary size would relate positively to the proportion of joint attentional activities, would relate positively to labelling under joint attention only, and would relate negatively to attention-getting directives.

This study is novel in examining simultaneously maternal scaffolding, joint attention, dominance of the interaction, and types of maternal verbalizations in relation to early vocabulary acquisition. It also investigates these variables at somewhat younger ages, before and after language onset, than previous studies and adds the variable of toy difficulty. Finally, we also looked at potential gender effects on mother-infant object involvement. Mothers of elementary school boys have been found to combine control (e.g., helping) with encouragement of autonomy in daily activities more than mothers of girls, who tended to use control alone (Pomerantz & Ruble 1998). A recent meta-analysis of observational studies of mothers' differential language to girls vs. boys (Leaper, Anderson & Sanders 1998) showed an effect size for supportive language, including praise, in favour of girls. Mothers also used more directive speech (imperatives or direct suggestions) with school-age girls but not with younger girls. However, these findings concern children of preschool age or older, already well advanced in their language development. Little is known concerning possible gender effects in the use of directives to children at the early stages of language. One purpose of the present study was to investigate whether similar gender effects obtain in interactions with infants.

METHOD

Research participants

Participants were 30 mother-infant dyads. The mothers ranged in age from 25 to 38 years, with a mean age of 29. They were of Italian origin

but most (21) had been born in Canada. Half of them spoke primarily Italian to their infants, one-third spoke English, and the remainder spoke a mixture of Italian and English. The degree of bilingualism, i.e., the amount of Italian vs. English spoken to the infants, was not related to any of the measures in this study and therefore will not be further discussed in this paper.

Fifteen of the infants were female and 15 were male; 17 were first-born, 10 were second-born and the remainder were later-born. The infants were visited three times at home to film mother-infant interactions, twice at 9 months and once at 15 months. They were visited once at 10 months to administer the Bayley Mental Scale of Infant Development (Bayley 1969). At the time of the first visit, the infants' mean age was 9.07 (SD = 2.5 days), and at the second visit their mean age was 9.20 (SD = 2.9). At the third visit, their mean age was 10.08 (SD = 5.5), and at the fourth visit it was 15.19 (SD = 3.7).

Procedure

The first, second and fourth visits to the home were observational sessions in which mother-infant interactions were videorecorded in unstructured and structured situations. This paper will report observations from 10 minutes of the structured situations, consisting of 5 minutes during which mother and infant played with a shape fitter and 5 minutes during which they played with a circus train. Mothers were told to stay in the same room as their infants and to play with the toy with their infants, if they did not spontaneously do so. However, they were not told to teach their infant how to use the toy. Only behaviour that was focused on the appropriate toy was coded; off-task behaviour was not coded.

Toys

The shape toy was a Playskool Form Fitter with 18 coloured shapes. The train was a three-caboose Fisher-Price circus train with an elephant, lion, tiger, monkey, and two miniature figures representing a conductor and a passenger. The train could be pulled with a string and made a 'toot-toot' noise when a button was pressed down. These two toys presented differential demands on the infants, since the shape toy was more difficult. Thus, the mother's scaffolding role was expected to be particularly important in aiding the infant to master this toy.

Measures

Object involvement coding scheme Mother-infant interactions with the toys were coded using a three-part scheme developed for this study.

TABLE 1. *Coding scheme for object involvement*

Initiator. The initiator is the person who starts to manipulate an object (e.g., picks it up). Each separate manipulation is coded.

MATERNAL BEHAVIOURS

Scaffolding

Gives/offers object to infant.

Demonstrates appropriate action to infant, e.g., putting shape in hole, tooting train horn.

Helps infant, e.g., moves infant's hand to correct hole for shape, helps infant blow train horn.

Points to place for infant to insert shape.

Facilitates manipulation, e.g., by bringing toy closer.

Playfulness

Makes game of toy, e.g., bangs blocks together, builds houses with blocks.

Animates toy, e.g., makes bear growl.

Verbalizations

Labels toy or its properties.

Suggests actions to infant.

Praises infant.

Comments or questions.

Attention-getting statements (infant's name, 'look!').

ATTENTIONAL FOCUS

Joint attention: mother and infant looking at same part of toy.

Non-joint attention: mother and infant not looking at same part of toy, infant looking at mother, direction of gaze cannot be determined.

The unit of analysis was an object-directed action, and coding began when one member of the dyad began to manipulate any part of the toy. That episode ended when the object was released or when the baby put it in his/her mouth. The three aspects of the coding scheme were the initiator of the action, maternal behaviour (scaffolding, playfulness, type of verbalization), and joint vs. non-joint attention between mother and infant at the beginning of any infant or maternal object manipulation and maternal verbalization. Table 1 describes the coding scheme in detail.

This coding scheme was applied to the three observational sessions, two at 9 months and one at 15 months. It yielded the following dependent variables at each age to be used in the statistical analyses: ratio of mother-to-child initiations, frequency of maternal scaffolding and playful behaviours, proportion of object manipulations with joint attention, and frequency of each type of maternal verbalization with

and without joint attention. Due to the recent controversy over whether or not maternal verbalizations should be analysed in terms of frequency or proportions (Hoff-Ginsburg 1992, Pine 1992a), maternal verbalization types were also converted to proportions of total maternal verbalizations at each age.

Inter-coder reliability was determined on five different mother-infant dyads at each age level (approximately 18% of the observations). Percentage agreement was used for those measures that involved only two categories: mother vs. infant as initiator, joint vs. non-joint attention, and occurrence vs. non-occurrence of maternal scaffolding and of maternal playfulness. For initiator, percentage agreement was 92%; for joint attention, it was 80%; for maternal scaffolding, it was 82%; and for maternal playfulness, it was 86%. Reliability for the five categories of maternal verbalizations was determined using Cohen's Kappa (Bakeman & Gottman 1986) to be 75%, which is considered to be acceptable.

Vocabulary measure

During the fourth visit at 15 months, mothers provided a list of words which their infant had spoken to date in English and in Italian. To this list were added additional words that were videorecorded during this visit. As in previous work (Blake & Fink 1987), a word was defined as an utterance with some phonetic similarity to an adult word and used in an appropriate situation. For most infants, few additional words were heard on the videorecording. However, for two female infants, a larger number of words, mostly in Italian, was added. The mean number of added words was 4.2 across all infants and 2.5 without these two infants.

Bayley Mental Scale of Infant Development

The Bayley Mental Scale was administered during the third visit when the infants were 10 months of age. The administration of the scale was videorecorded and scored by two observers working in collaboration to ensure consistency. Results from the Bayley are expressed as a standard score which is the Mental Development Index (MDI).

RESULTS

Maternal scaffolding and playful activities, toy difficulty and infant age

The first set of analyses addressed the hypotheses regarding changes in maternal scaffolding and playful activities with infant age, as well as the hypothesized effects of toy difficulty. Two 2 (Age) \times 2 (Toy) \times 2

TABLE 2. *Frequency of maternal scaffolding across toys, infant age and infant gender*

	Shape toy		Train toy	
	Mean (SD)		Mean (SD)	
<i>9 months</i>				
Male	24.77	(12.78)	31.03	(13.06)
Female	31.30	(12.57)	36.97	(12.09)
<i>15 months</i>				
Male	30.80	(16.10)	21.80	(13.91)
Female	36.40	(18.03)	24.27	(15.18)

(Gender) analyses of variance with repeated measures on the first two factors were performed on (1) the total frequency of maternal scaffolding activities, and (2) the total frequency of maternal playful activities. All frequency measures at 9 months were divided by 2 because observation time was double that at 15 months.

The means for the analysis of maternal scaffolding are presented in Table 2. The Age \times Toy interaction was significant, $F(1,28) = 62.58$, $p < 0.0001$. Comparison of means using the Tukey test indicated that this interaction was due to greater scaffolding with the train than with the shape toy at 9 months, but a significant increase in scaffolding with the shape toy and a significant decrease with the train between 9 and 15 months, such that at 15 months there was greater scaffolding with the shape toy. This interaction is depicted in Fig. 1.

For playfulness, only the main effects of Toy and Age were significant, $F(1,28) = 26.07$, $p < 0.0001$ and $F(1,28) = 6.66$, $p < 0.02$, respectively. Maternal playful activities occurred more often with the train toy ($M = 9.12$) than with the shape toy ($M = 3.66$) and decreased from 9 months ($M = 7.55$) to 15 months ($M = 5.23$).

Thus, as predicted, mothers engaged in more scaffolding activities with the easier toy at the younger age and with the more difficult toy at the older age. They also decreased their playful activities at the older age. There were no gender effects.

Joint attention, dominance of the interaction, toy difficulty and infant age

Two $2(\text{Age}) \times 2(\text{Toy}) \times 2(\text{Gender})$ analyses of variance with repeated measures on the first two factors were also performed on (1) the ratio of mother-initiated actions to child-initiated actions, and (2) the proportion

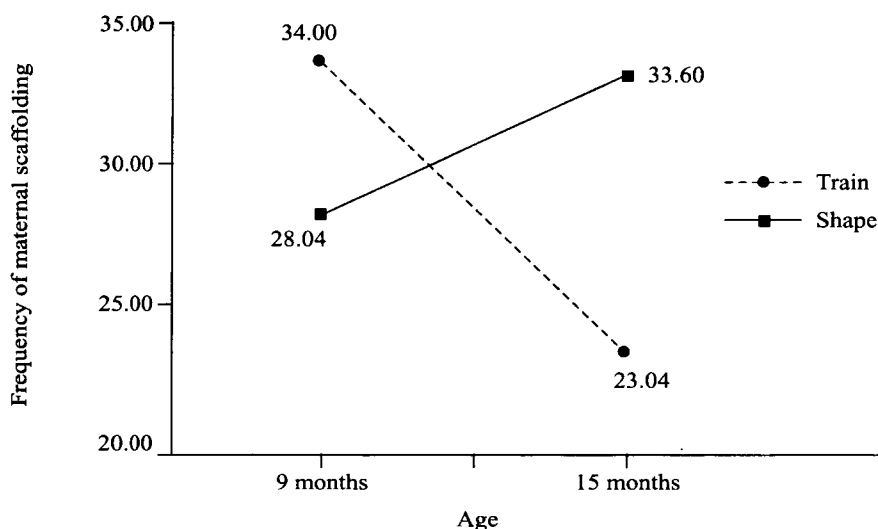


Fig. 1. Frequency of maternal scaffolding as a function of Age and Toy

of object manipulations that occurred with joint attention, to address the hypothesized changes in these measures with infant age and toy difficulty. For the ratio of mother-to-child initiated actions, only the interaction of Toy and Age was significant, $F(1,28) = 20.62$, $p < 0.0001$. From Fig. 2, it can be seen that the ratio increased somewhat across age levels for the shape toy, while decreasing a great deal for the train toy. Tukey tests confirmed that the small increase for the shape toy was not significant, while the decrease for the train was significant. The ratio was similar for both toys at 9 months, but significantly different at 15 months. Thus, as predicted, maternal dominance of the interaction decreased for the easier toy at the older infant age. It did not, however, correspondingly increase for the more difficult toy. There were no gender effects; maternal dominance of the interaction was not greater for female infants.

Similarly, for the proportion of joint attention to object manipulations, only the Toy x Age interaction was significant, $F(1,28) = 17.47$, $p < 0.0001$. Figure 3 shows that the proportion of object manipulations with joint attention increased from 9 to 15 months for the shape toy, while decreasing for the train. Tukey tests revealed that the increase for the shape toy was significant, while the decrease for the

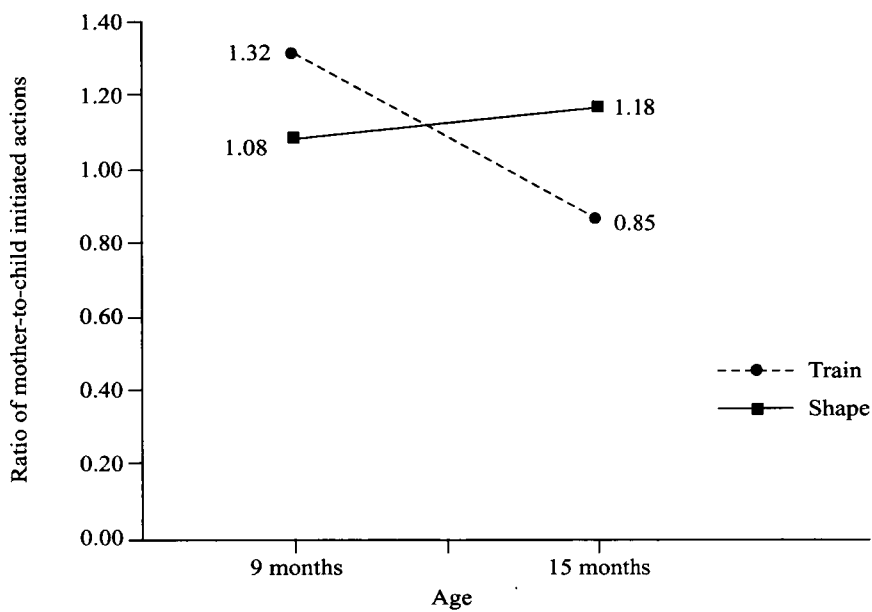


Fig. 2. Ratio of mother-to-child initiated actions as a function of Age and Toy

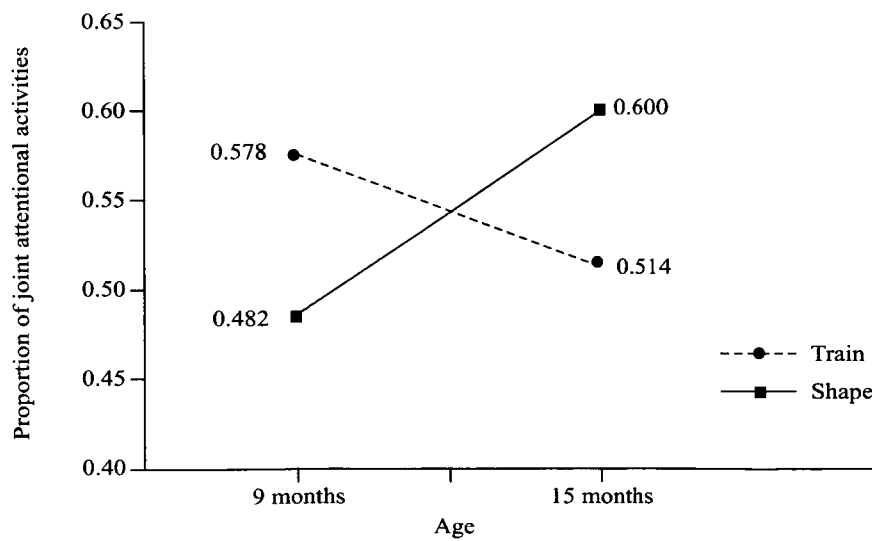


Fig. 3. Proportion of joint attentional activities as a function of Age and Toy

train was not. Also, joint attention to the train was greater at 9 months, while it was greater to the shape toy at 15 months. Thus, as predicted, joint attention increased for the more difficult toy at the older infant age. Joint attention to the easier toy was greater at the younger age compared with the more difficult toy, but did not, as expected, decrease at the older age.

These two measures of mother-infant object involvement, mother-to-child ratio of initiated object manipulations and joint attention, thus behaved quite similarly at the older age: they were greater for the more difficult toy than for the easier toy. At the younger age, maternal dominance was similar for both toys, while joint attention was greater for the easier toy.

Maternal verbalizations, joint attention and infant age

To address the hypotheses about changes in types of maternal verbalization with age, five 2 (Age) \times 2 (Joint vs. non-joint attention) \times 2 (Gender) analyses of variance with repeated measures on the first two factors were performed first on the *frequency* of each of the maternal verbal categories: Labels, Suggests action, Praise, Comment/Questions, and Attention-getting statements. Again, all frequency measures at 9 months were divided by 2 because observation time was double that at 15 months. The means for these analyses are given in Table 3.

For all verbal categories except Attention getting, only the main effects of Age and Joint vs. non-joint attention were significant: for Labels, $F(1,24) = 14.15$, $p < 0.001$ and $F(1, 24) = 10.06$, $p < 0.004$, respectively; for Suggests action, $F(1,24) = 16.50$, $p < 0.0001$ and $F(1,24) = 5.55$, $p < 0.027$, respectively; for Praise, $F(1,24) = 12.86$, $p < 0.001$ and $F(1,24) = 24.50$, $p < 0.0001$, respectively; and for Comments/questions, $F(1,24) = 19.30$, $p < 0.0001$ and $F(1,24) = 5.51$, $p < 0.027$, respectively. As predicted for Labels, Suggests action, and Comments/questions, use of these types of verbalizations, as well as Praise, increased with infant age. They were also more frequent under joint attention.

The ANOVA on Attention getting also revealed main effects for Age, $F(1,24) = 10.06$, $p < 0.004$, and for Joint vs. non-joint attention, $F(1,24) = 38.99$, $p < 0.0001$. However, they were the reverse of those obtained for the other categories: they occurred more frequently under non-joint attention, as predicted, and also were directed more to younger infants. In addition, the main effect of Gender was significant, $F(1,24) = 4.93$, $p < 0.036$; Attention-getting comments were directed more to female infants.

These analyses were repeated using proportional frequencies, e.g.,

TABLE 3. *Mean frequency of maternal verbal categories under joint vs. non-joint attention by infant age and infant gender*

	Joint attention		Non-joint attention	
	Mean	(SD)	Mean	(SD)
LABEL				
<i>9 months</i>				
Male	7.37	(5.42)	4.20	(2.42)
Female	9.23	(6.63)	6.90	(4.45)
<i>15 months</i>				
Male	8.13	(5.55)	7.73	(6.80)
Female	15.40	(9.40)	10.60	(9.68)
SUGGESTS ACTION				
<i>9 months</i>				
Male	10.20	(7.12)	8.83	(5.32)
Female	11.63	(10.67)	10.37	(10.30)
<i>15 months</i>				
Male	17.53	(12.18)	14.40	(9.34)
Female	19.87	(13.77)	13.13	(11.15)
PRAISE				
<i>9 months</i>				
Male	1.67	(2.01)	0.53	(0.90)
Female	1.67	(1.53)	0.83	(1.08)
<i>15 months</i>				
Male	3.27	(2.73)	1.13	(1.06)
Female	3.87	(4.72)	1.53	(1.60)
COMMENTS/QUESTIONS				
<i>9 months</i>				
Male	12.80	(11.06)	9.57	(4.87)
Female	12.03	(8.88)	10.03	(6.45)
<i>15 months</i>				
Male	21.00	(11.05)	16.13	(9.21)
Female	19.60	(14.31)	13.07	(11.52)
ATTENTION GETTING				
<i>9 months</i>				
Male	3.57	(2.24)	7.53	(5.81)
Female	6.40	(4.67)	10.23	(6.19)
<i>15 months</i>				
Male	1.73	(2.84)	5.53	(3.18)
Female	1.93	(1.49)	8.13	(5.26)

frequency of maternal labels at 9 months as a proportion of the total frequency of all types of maternal verbalizations at this age. For two categories, Suggests action and Praise, the pattern of results was identical. For Attention-getting directives, the two main effects of Age and of Joint vs. non-joint attention found with frequencies were replicated. However, with proportional frequencies, the main effect of Gender was not at all significant. Conversely, for the remaining two categories, Labels and Comments/questions, Gender now yielded a significant main effect, $F(1,28) = 5.75, p < 0.02$ and $F(1,28) = 4.70, p < 0.04$. This was opposite for the two categories: mothers addressed more labels to female infants but more comment/questions to male infants. The gender effect did not interact with age. For Labels, an increase with age was no longer found with proportional frequencies. For Comments/questions, a greater proportion under joint attention was no longer found. Thus, the use of frequencies vs. proportions did produce somewhat different results, particularly with regard to gender effects.

Relations between infant outcome measures and both object involvement variables and types of maternal verbalizations

The hypothesized relations between infant vocabulary size and joint attention and types of maternal verbalizations were examined with correlational analyses. Two sets of correlational analyses were conducted. The first examined the relation of frequency of maternal scaffolding actions, frequency of maternal playfulness, proportion of joint attentional activities, and ratio of mother-to-child initiated actions at the two age levels to the infant outcome measures: infant Bayley MDI scores and infant vocabulary size. These are given in Table 4. The second looked at the relation of each type of maternal verbalization under joint vs. non-joint attention at both ages to infant Bayley MDI and vocabulary size. These are given in Table 5.

It can be seen in Table 4 that scaffolding at both ages was significantly related to Bayley MDI, but that a relationship between scaffolding and vocabulary size was found only at 15 months. Neither maternal playful behaviours nor the ratio of mother-to-child initiated actions correlated with either of the infant outcome measures. The proportion of joint attentional activities also did not correlate with infant cognitive level or vocabulary size, the latter disconfirming the hypothesized relation between joint attention and infant vocabulary.

With regard to maternal verbal categories, Table 5 presents correlations with only Labels and Suggests action at both ages, since the other categories were unrelated to infant cognitive and vocabulary

TABLE 4. *Correlations between interactive behaviours at two age levels and infant outcome measures*

		Infant measures	
		Bayley MDI	Vocabulary size
Scaffolding:	9 months	0.42*	0.26
	15 months	0.48**	0.48**
Playful:	9 months	0.28	0.22
	15 months	0.07	0.08
Ratio:	9 months	0.12	-0.03
	15 months	0.33	0.23
Joint attention:	9 months	-0.01	-0.03
	15 months	0.24	0.06

* $p < 0.05$; ** $p < 0.01$

TABLE 5. *Correlations between maternal verbal categories at two age levels and infant cognitive and language measures*

		Infant measures	
		Bayley MDI	Vocabulary size
<i>9 months</i>			
Labels:	joint	0.25	0.22
	non-joint	0.31	0.35
Suggests action:	joint	0.37*	0.25
	non-joint	0.45*	0.34
<i>15 months</i>			
Labels:	joint	0.41*	0.41*
	non-joint	0.61***	0.48**
Suggests action:	joint	0.47**	0.51**
	non-joint	0.41*	0.39*

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

measures. The Bayley MDI was significantly related to Suggests action at 9 months under both attentional conditions. It was related to both Labels and Suggests action at 15 months under both attentional conditions, but particularly highly to Labels under non-joint attention.

Vocabulary size was also related to Labels and Suggests action under both attentional conditions at 15 months. Thus, the hypothesized relation between infant vocabulary and Labels under joint attention only was not supported, nor the hypothesis that vocabulary size would be negatively related to Attention-getting directives.

DISCUSSION

Developmental change between 9 and 15 months was reflected in an increase in most of the maternal variables examined. Mothers tailored their interactions, however, to their apparent perception of the differential difficulty of the two toys. They increased their scaffolding behaviours with the shape toy and decreased them with the train. Similarly, they decreased their initiated manipulations, relative to their infant's, for the train. These two measures of maternal behaviour are necessarily correlated with each other in that a mother who is actively attempting to teach her infant a task must initiate a large proportion of the object-directed actions. Mothers acted as if they believed that at 9 months, the train was more within their infants' zone of proximal development, and they concentrated their teaching efforts on this toy. They also were more playful with both toys at 9 months than at 15 months, as if believing that such playful activities as removing the lid of the shape toy and throwing in the shapes were more likely to engage the child. The decrease found in such playful activities is congruent with Adamson & Bakeman's (1984) finding of a decrease in 'literal' object-directed maternal actions. By 15 months, mothers apparently believed that their infants were ready to learn how to manipulate the shape toy appropriately and engaged in more scaffolding behaviours with this toy. Rome-Flanders, Cronk & Gourde (1995) also found that mothers adapted their scaffolding to the infant's capacity as well as to the type of task, which in their study involved two games also varying in difficulty, peek-a-boo and ball.

Scaffolding at both 9 and 15 months was related to Bayley MDI at 10 months. This relationship is probably reciprocal, with mothers both influencing their infants' cognitive abilities and responding to them. Bayley MDI was unrelated to maternal playfulness, to ratio of mother-to-child initiated actions and to proportion of joint attentional activities.

Infant vocabulary size at 15 months was also related concurrently to maternal scaffolding, but not to playfulness, ratio of mother-to-child initiated actions or joint attentional activities. Thus, mothers who engaged in more teaching activities, i.e., helping, demonstrating, facilitating, pointing and giving, had infants with a greater number of early words.

Maternal verbalizations to their infants showed the increases in frequency that might be expected from 9 to 15 months as infants increasingly comprehend. These occurred in all categories except Attention-getting statements, which decreased with age. Rome-Flanders *et al.* (1995) also found that attention-getting behaviours (both verbal and nonverbal in their study) decreased with age for one of their games (peek-a-boo) but not for the other (ball). Labels as a proportion of total maternal verbalizations were not found to increase with age. At 15 months, frequency of Labels and of Suggests action under both attentional conditions was related to both Bayley MDI and vocabulary size; while at 9 months, frequency of Suggests action under both attentional conditions was related to Bayley scores. These results appear to reflect a reciprocal influence between verbal behavioural directives and cognitive level, similar to the earlier discussion about the Bayley and maternal scaffolding. Frequency of maternal labelling at 15 months, in contrast, may simply have been a response to infant productive vocabulary.

Two discrepant findings should be noted. The first is that the relationship between maternal labelling and infant vocabulary size was found under conditions of both joint and non-joint attention. Previous studies have found that only labelling with *joint* attention is related to infant vocabulary acquisition (Dunham *et al.* 1993, Tomasello & Farrar 1986). Our finding is more in agreement with the results of an experiment by Baldwin (1995) showing that infants can learn nonsense labels when the label is uttered while the infants are looking at an incorrect object. While this was true primarily of older infants (18–20 months), infants of 15 months at least followed the speaker's gaze to her object of focus (the object labelled). As Tomasello (1995a, 1995b) puts it, all word learning depends on the child reading the intention of the adult, independent of eye gaze; they must ignore unintended objects and activities in this process. Although in the present study labelling was related to infant vocabulary whether or not it occurred with joint attention, it is important to note that mothers engaged in all types of verbalizations, except attention getting, significantly more when they shared an attentional focus with their infant (except for proportional frequency of comments/questions). Also, the definition of joint attention in this study was very precise: mothers and infants had to be looking at the same exact object, i.e., the same shape, the same animal, and not just the general display.

The other discrepant finding is that verbal behavioural directives in this study were positively related to both cognitive and vocabulary measures in infants whether or not they occurred with joint attention.

According to Akhtar *et al.* (1991), only prescriptives which focus on what the child is attending to can have beneficial effects on vocabulary development. It should be noted, however, that suggested actions in the present study were not just commands. As in Pine (1992*b*, 1994), they could also be questions that contained an implicit suggested action. Because this category appears to be broader than verbalizations termed directives in much of the previous research, suggested actions, like scaffolding and maternal initiations, seemed to indicate the mother's involvement with the task and with her infant. Instead of being negative indicators of maternal dominance or insensitivity, these maternal measures all appear to reflect a positive maternal commitment to fostering her infant's development.

Attention-getting statements, in contrast to suggested actions, were unrelated to infant cognitive and vocabulary measures and decreased with age. The different results obtained with these two types of directives support the necessity of distinguishing between them (Pine 1992*b*, 1994), especially since we also found them to be uncorrelated. However, the present findings did not replicate Pine's (1994) negative correlation between attentional directives and vocabulary size at 16 months.

Attention-getting directives were addressed more frequently to female infants, but not as a proportion of mothers' total verbal output. Since this type of directive was unrelated to the infant outcome measures in this study, the gender difference was not shown to have a negative impact. Rome-Flanders *et al.* (1995) found that mothers of girls at 9 months used Attention-maintaining (but not Attention-getting) behaviours more frequently than mothers of boys. In the present study, labels as a proportion of mothers' total verbal output were also addressed more frequently to female infants, while comments/questions were used proportionately more often with male infants. The use of frequencies vs. proportional frequencies thus yielded different results primarily with regard to gender effects. Female infants heard more attention-getting statements, but not relatively more, and they heard relatively more labels than males, who heard relatively more comments/questions. If the mothers were allowing their sons more autonomy with the toys, then a greater proportion of comments/questions might be expected as a general commentary on the situation. However, we found no gender differences in variables that might reflect more autonomy granting, such as the ratio of mother-to-child initiated actions. It may be that mothers of female infants use relatively more labels with them in response to their more advanced language abilities, while mothers of male infants use relatively more general comments

and questions to expose them to an enriched language stream. Since both genders were in the early stages of the process of actively acquiring vocabulary, however, this interpretation seems tenuous.

The present findings support a view of mother-infant object involvement as a process of co-construction in which maternal scaffolding, playful behaviours and verbal behavioural directives before one year act to keep infants on task and to increase their task competence, while in turn being influenced after one year by infant task competence and general cognitive ability. Joint attention, when precisely defined, did not itself directly impact on either infant cognitive level or vocabulary acquisition. It did, however, provide a context in which mothers tended to engage in more verbalizations with infants. Long-term effects of these features of mother-infant object-involvement episodes on later child language need to be assessed.

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