

The Development of Infants' Responses to People and a Doll: Implications for Research in Communication

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The behavior of eight babies was studied longitudinally when facing people and a doll. The eight babies were observed biweekly from 3 to 25 weeks. Among them, five continued to be observed on a monthly basis up to 45 weeks. At each visit the babies were presented with their mother, a female-stranger, and a doll who were alternately active and inactive. Each condition lasted 45 s at 3, 5 and 7 weeks and 60 s thereafter. The results showed that by 5 to 9 weeks the proportion of time babies looked, smiled and vocalized as well as moved their arms toward people differed significantly from those produced to the doll when confounding variables such as familiarity and activity of the stimuli were manipulated. This pattern of early differential responsiveness, together with important developmental changes over the 10-month period, suggests that infants are reacting to communication-related cues in the presence of social stimuli. The implications of these findings for the development of communication are discussed.

social perception	communication	adult-infant interaction
	object-infant interaction	

The present research originated from a general question: When do babies first begin to communicate? The primary function of language consists of communicating with one or several persons; distinguishing between people and things would seem an important prerequisite. When 2-year-old children want something from their parents they will communicate a need to them. If the parent does not respond for some reason, they will continue with great persistence. These children may talk to their toys at times, but will not get upset when they don't receive an answer. Indeed, 2-year-olds take the absence of communication by nonsocial objects as a matter of fact. If, on the other hand, they want their toys to move, they will manipulate them. These children clearly differentiate between people and things for purposes of communication. They know

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that the two classes have different functions and require different ways of interacting. One communicates with people, and one manipulates things. When and how does this distinction, and thus the ability to communicate, develop in children? Researchers that have addressed this question have provided contradictory results. According to some observational studies, 2-month-old babies communicate with people and not with things. Faced with a responsive adult, they produce expressive facial movements and make prespeech sounds (Brazelton, Koslowski, & Main, 1977; Trevarthen, 1977), repeat adults' linguistic forms through interactional motor synchrony (Condon & Sander, 1974), and participate in conversational turn-taking (Stern, Jaffe, Beebe, & Bennett, 1975). Faced with a graspable, nonsocial object, babies initiate prereaching movements defined as hand and arm activity directed toward it (Bower, 1979; Bruner & Koslowski, 1972; Rader & Stern, 1982; von Hofsten, 1984).

Furthermore, they are reported to stare almost continuously at things while alternating their gazes when facing people. Remarkable differences in responding are also noted when mothers are asked alternately to communicate with their baby and to be silent. Confronted with their "still-face" mothers, infants gaze away and may begin to cry. It has been suggested that the babies' distress reflects in part their expectation that people will engage in reciprocal acts of communication with them (Bloom, 1977; Gelman & Spelke, 1981; Tronick, Adamson, Wise, Als, & Brazelton, 1975). Taken together, these findings suggest that very young babies are capable of responding differentially toward people and things. The desire to communicate seems to be present at birth or shortly thereafter.

On the other hand, some authors view such data as merely preferential responding to some type of stimulation originating from people but not from things. Young babies are known to be sensitive to the familiarity (Jackson, Campos, & Fisher, 1978), movement (Frye, Rawling, Moore, & Myers, 1983), and contingent responsiveness (Watson, 1972) of people as well as things. In the Brazelton and Trevarthen studies, differential responding was found when a familiar, contingently responsive social object (the mother) was compared to a nonfamiliar, noncontingent nonsocial object (a toy monkey). In contrast, Watson (1972) found that when the nonsocial object moved contingently upon the babies' actions, they would respond with similar social responses (they smiled and cooed) as when they were engaged in natural interaction with their caretakers.

Several studies (Décarie & Ricard, 1982; Frye et al., 1983) have shown that the distinction between social and nonsocial objects, when the two are responding contingently, is firmly established in 10-month-old infants. These babies exhibited differential exploratory behavior when put into contact with a novel social and a nonsocial object that responded contingently upon their actions. They smiled and vocalized at a female stranger, although they remained at a distance. However, they hurried toward the nonsocial object—a large toy turtle—whose eyes lit and that made sounds when touched (in both situations

the mother was present) (Décarie & Ricard, 1982). Similarly, observers who coded the babies' responses from video did note differential responding in 10-month-olds, but not in 3-month-old babies, facing their responsive mother and a familiar interactive toy (Frye et al., 1983). Together, these observations suggest that for very young babies, familiarity and contingent movement of the stimuli influence their social responses, whereas for the oldest, the social characteristics of the stimuli are determinants.

The present research aimed at examining the evolution of this distinction by observing at what age the babies' behavior would become specific and appropriate to people and to a toy. In order to evaluate the effects of contingent responding of social and nonsocial stimuli, we (inspired by Watson, 1972) presented the infants with an inactive toy and one that moved contingently upon their actions, as well as with inactive people and people that interacted with them in face-to-face situations. It has been suggested that when facing young babies, adults naturally seem to respond in a contingent fashion to the infants' actions (Papousek & Papousek, 1984; Trevarthen, 1977, Watson, 1972). Following Watson (1972) we expected to find some social behaviors in the presence of a contingently responding toy, while expecting no such behaviors in the presence of the inactive toy. By comparing the infants' behaviors in the contingent nonsocial situation to the "natural" social situation we hoped to distinguish those behaviors that are specific to social stimuli from those that are due to contingent responding only. In order to rule out that differential responding to the mother as compared to the doll could be interpreted as being attributable to familiarity of the social stimulus, we introduced a female-stranger condition to our experiment.

Our study sample consisted of firstborn babies and their middle-class mothers from a particular cultural group. Although this limits the generalizability of our findings, it usually makes sense to look first for support for a particular hypothesis in a relatively homogeneous sample (see Bakeman & Brown, 1980).

METHOD

Subjects

Eight infants (5 boys and 3 girls), participated in the study. All were term babies and healthy (Apgar ratings between 9-10). Seven babies were 21 days old at the beginning of the study (range = 19-23 days), and one girl was 48 days old. Their weight averaged 3060g at birth (range = 2780-3250g). All babies were firstborn, had normal deliveries, and came from middle-class French-speaking families. Mothers averaged 26 years of age (range = 24-27). One group of babies and their mothers (4 boys, 1 girl) was studied from 3 to 45 weeks. A second group of babies (1 boy, 2 girls) and their mothers, contacted at a later time, was observed from 3 to 25 weeks. The experimenter first met with the mothers at the hospital after the birth of their infant. They were told that the study, of a 6- or 10-month duration, dealt with the reactions of babies when presented

with objects, strangers, and their mother. The eight babies and their mothers visited the laboratory biweekly from 3 to 25 weeks. The study was continued on a monthly basis with the five remaining infants. Transportation costs to and from the university were reimbursed.

Procedure

The interactions were videotaped in a laboratory partially furnished as a child's room. Babies were filmed when content, alert, and healthy. In order to reduce distraction, cameras and furniture were placed out of the visual field of the infant. Babies were seated in a specially constructed infant seat tilted upward at a 45° angle. This seat supported the head and the trunk and permitted free movement of arms and legs. Minimal physical restrictions seemed most conducive to infant vocalizations (Lewis & Freedle, 1973) and promoted bodily movement (Trevarthen, 1977).

Two cameras and a split-screen generator recorded the infants' and adults' behaviors simultaneously on videotape. The cameras were positioned 1.8m away from the participants. At each visit, the babies were presented with the six experimental conditions: (1) active mother, (2) inactive mother, (3) active stranger, (4) inactive stranger, (5) active doll, and (6) inactive doll. The six conditions were presented in random order to control for sequence. In the social conditions, the mother or the stranger would sit in front of the baby at 50 cm distance or less. Different female strangers were presented at each visit. In the active condition, the adults were asked "to speak with the babies as they normally do." In the inactive condition, they were asked "not to talk, but to remain smiling." Inactive but smiling faces were expected to prevent the babies from becoming upset as had been reported in studies where mothers and strangers were impassive (Bloom, 1977; Tronick et al., 1975). In the nonsocial conditions, a commercially available stuffed doll, 40 cm long with a smiling face and big black eyes, was suspended in front of the baby at a distance of 50cm or less. Three little bells were attached to the doll's back. In the active condition, the experimenter, hidden behind a screen, would make the doll dance and sound each time the baby fixated the doll's face; in the inactive condition, the doll was suspended in an immobile position. This particular toy stimulus had been chosen because it had on previous occasions attracted sustained attention in very young infants (see Pomerleau & Malcuit, 1980). In order to familiarize the infant with the doll, each experimental session began with a 60-s period in which the baby was allowed to interact with the doll.

Since the attention span of very young infants is short, each of the six conditions lasted 45 s at 3, 5, and 7 weeks. From 9 to 45 weeks, the conditions were extended to 60 s each. Due to experimental error, fatigue or persistent crying, not all sessions were completed for some babies. The amount of missed stimulus presentations represents less than 22% of the total number of presentations of all babies.

Dependent Variables

Videotapes were coded via microcomputers (OS-3) by trained students naive to the experimental design. The durations of the babies' gazes, vocalizations, smiles, and arm movements were calculated for each of the six conditions.

Gazes were defined as eyes aligned with the stimulus face. Because it is difficult to determine from video records where babies are looking, a naive observer was placed behind the stimulus. She illuminated a small light, visible on camera, each time the baby looked at the stimulus face. A recording of gaze direction was thus present on the screen. Smiles were scored when babies turned up the corners of their mouth (mouth may be open or closed). Vocalizations were of three types: positive, negative, and neutral. Positive vocalizations were scored when babies vocalized with happy faces (eyebrows and lips turned up). Negative vocalizations were scored when babies vocalized with unhappy faces (frowning, lowering of the corners of the mouth) and neutral vocalizations were scored when babies' faces showed no expression (equal tendency to progress in a negative or positive direction). Two types of arm movements were scored as reaching behaviors: (1) forward arm extensions, and (2) arm archings toward the midline. Since babies do not accurately reach for objects until 4 to 5 months of age (Pomerleau & Malcuit, 1980; von Hofsten, 1984), the latter behavior was added to capture the arm movements characteristic of babies prior to the development of reaching (e.g., Rader & Stern, 1982). Forward extensions and arm archings toward midline were scored separately for the right and left arm.

Scoring

The videotapes were scored at normal speed from a T.V. monitor with a 21-inch screen. The right side of the screen was covered so that only the responses of the baby were visible. All behaviors (except vocalizations) were scored without sound. The coder used the microcomputer (OS-3) to decode the duration and frequencies of each dependent variable. This information was then fed into the computer for statistical analyses.

Interobserver reliabilities using the scoring method were calculated for 10% of the experimental sessions (two sessions per baby). Pearson correlation coefficients in the .80's and above were found for all behaviors.

RESULTS

In order to account for the varying durations of the sessions, the total duration of each response was transformed in the proportion of time (total duration of a response/total duration of the session) the babies showed a certain behavior. Given our main hypothesis (babies will display reliably different behaviors towards social and nonsocial stimuli from an early age), we expected to find

increasingly more of the social behaviors (vocalizations, smiling, etc.) in the presence of people, than in the presence of the doll. Accordingly, the data were submitted to analyses of variance (ANOVAs) (repeated measures design), with Age (16), Stimuli (3), and Activity level (2) as independent variables. To discern whether there were developmental differences in right and left arm movements, an additional independent variable (Laterality) was included when analyzing these behaviors. Tukey's HSD (Honestly Significant Difference) was used to compare the group means for each of the independent variables. In order to ascertain that the data of infants who contributed up to week 25 and continued in the study through week 45 were not different from the data of infants who did not contribute beyond week 25, a comparison of the response patterns of the two groups up to 25 weeks was effected. This comparison did not reveal any major differences among the infants. To accommodate for the unbalanced design, the data were analyzed using the statistical program (SAS) which takes into account missing data. For economy of presentation, only p -values are given here, although complete ANOVA statistics are available from the authors.

Visual Fixations

Infants showed a significant decrease in looking time toward people with age (overall age effect $p < .0001$). As shown in Figure 1, by 9 weeks infants looked significantly longer at the doll than at mother and stranger ($p < .002$). This trend remained until 17 weeks when infants began looking significantly less at the mother than at the stranger and the doll ($p < .0001$). The activity level of the stimuli had a significant influence on the infants' behavior ($p < .0001$). Between 5 and 21 weeks the infants looked significantly longer at active than inactive people and directed their gazes almost without interruption at the doll whether it was active or not.

Smiles

Smiling showed a significant age effect ($p < .03$). As Table 1 shows, there is a peak in responding toward people until 15 weeks. During this period infants smiled significantly more at active people than at inactive people ($p < .0001$). Further, they smiled significantly more at their active mother at 40 weeks ($p < .03$).

Vocalizations

Positive Vocalizations. These vocalizations were produced more frequently when infants were younger (overall age effect $p < .0016$). Throughout the period of observation these behaviors were produced more to people than the doll ($p < .001$) and more to active than inactive people ($p < .001$). Again the infants showed a peak in responding toward people, ($p < .001$) and differentiated people from the doll as early as 7 weeks as opposed to the doll between 9 weeks ($p < .04$)

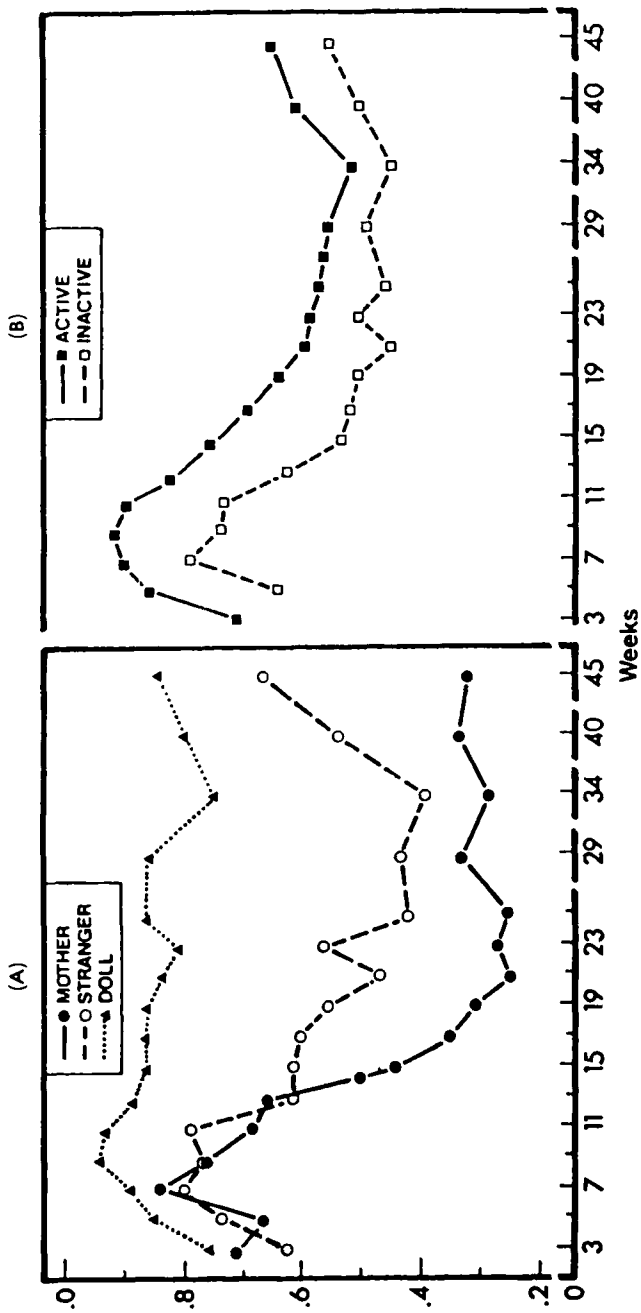


Figure 1. Visual fixations toward the doll, the mother, and the stranger (A); and toward active and inactive stimuli (B).

TABLE 1
Mean Proportions of Time of Smiling to Mother, Stranger and Doll at 16 Age Levels

Age	Mother	Stranger	Doll	HSD ^a	FST ^b	F _d ^c
3	.00	.00	.00	C	n.s.	n.s.
5	.05	.05	.00		n.s.	n.s.
7	.13	.06	.00		3,68*	n.s.
9	.15	.13	.02	A	8,13**	13,31***
11	.13	.14	.00	A	5,37**	10,71**
13	.15	.18	.01	A	7,27**	13,81***
15	.12	.12	.00		5,32**	7,39**
17	.05	.08	.01		n.s.	7,52**
19	.08	.13	.01		4,07*	6,37*
21	.05	.05	.02		n.s.	
23	.02	.06	.01		n.s.	6,28*
25	.02	.05	.00	C	3,96*	
29	.05	.03	.01		n.s.	
34	.06	.01	.03		n.s.	
40	.12	.03	.01		n.s.	6,31*
45	.00	.03	.00	C	n.s.	

^a Tukey's HSD: A=Significant upper range, C=Significant lowest range

^b Significant effects due to stimulus, $F(2,35)=00.00$

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

^c Significant effects due to activity, $F(1,35)=00.00$

* $p < .05$, ** $p < .01$, *** $p < .001$

and 15 weeks ($p < .04$). During this period babies vocalized significantly more toward active than inactive people at 9 weeks ($p < .05$), 11 weeks ($p < .05$), and 13 weeks ($p < .02$). No positive vocalizations were observed in front of the doll throughout the period of observation.

Negative Vocalizations. As Table 2 shows, infants showed an increase in this response when they became older (overall age effect $p < .0003$), in particular toward inactive people ($p < .0001$) as compared to active people and the doll. At 17 weeks, the infants produced these vocalizations significantly more to the inactive mother than to all other stimuli ($p < .03$), whereas at 34 weeks these vocalizations appeared with equal frequency toward the inactive mother and inactive stranger rarely in front of the doll ($p < .05$).

Neutral Vocalizations. Overall, these vocalizations were produced more in front of people than the doll ($p < .001$), particularly when the mother and the stranger were inactive ($p < .001$). Again the overall age effect was significant ($p < .009$). There was an increase in production of these responses toward people as opposed to the doll between 5 weeks ($p < .01$) and 11 weeks ($p < .04$), with more of the neutral vocalizations occurring toward inactive people at 5 weeks ($p < .006$) and 13 weeks ($p < .04$), than to the active people or the doll.

TABLE 2
Mean Proportion of Time of "Negative Vocalizations" to Mother, Stranger and Doll
at 16 Age Levels

Age	Mother	Stranger	Doll	FST ^a	F _a ^b
3-9	.00	.00	.00		
11	.03	.08	.01		
13	.07	.01	.00		
15	.02	.02	.02		
17	.04	.02	.02		3.82*
19	.03	.02	.01		
21	.04	.01	.01		10.78**
23	.08+	.01	.01	3.88*	
25	.10+	.00	.00	3.22*	
29	.08	.08	.00		4.58*
34	.13+	.11+	.02	3.28	12.76**
40	.02	.00	.00		
45	.04	.02	.02		

^a Significant effects due to stimulus $F(2,35)$

* $p < .05$

^b Significant effects due to activity, $F(1,35)$

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

+ Tukey's HSD significant upper range

Arm Movements

Arm Archings. Infants emit this type of arm movement at high frequency shortly after birth (see Table 3) but decrease production with age (overall age effect $p < .0001$). Babies produced this behavior significantly more toward the inactive mother between 5 and 13 weeks ($p < .009$) than toward all other stimuli.

Arm Extensions. Unlike arm archings, these behaviors appear in low frequency shortly after birth but increase dramatically with age in favor of the doll (overall age effect $p < .0001$). At 17 weeks there is a significant increase in responding to the toy as compared to people ($p < .001$, right arm, and $p < .009$, left arm; difference between arms: $p < .03$). Since the developmental course is similar for both arms, Figure 2 shows the means of the right and left arm responses. Virtually no arm extensions are shown in front of people throughout. As with the other dependent variables, arm extensions do not seem to be influenced by the activity level of the doll.

DISCUSSION

Generalizations must be limited due to the relatively small sample size, the limited sample of settings and behaviors, and homogeneity of the cultural group studied. However, the present data indicated that by two months babies

TABLE 3
Mean Proportion of Time for Archings to Mother, Stranger and Doll at 16 Age Levels

Age	Mother	Stranger	Doll	GM	FST ^a	Fa ^b
3	.21	.11	.10	.14		
5	.29	.24	.15	.23	5.59**	4.89*
7	.40	.36	.26	.34+		11.97**
9	.34	.27	.17	.26+		4.62*
11	.19	.20	.15	.18		4.28*
13	.33	.18	.12	.21	3.55*	
15	.11	.08	.17	.12		
17	.23	.18	.31	.24		
19	.17	.15	.37	.23	9.97***	
21	.27	.09	.12	.16	3.56*	
23	.19	.12	.23	.18		
25	.13	.09	.23	.15		
29	.15	.11	.01	.09		
34	.21	.04	.05	.10		
40	.08	.00	.00	.03		
45	.03	.00	.00	.01		

^a Effects due to stimulus, $F(2,35)=00.00$

* $p < .05$, ** $p < .01$, *** $p < .001$

^b Effects due to activity, $F(1,35)=00.00$

* $p < .05$, ** $p < .01$, *** $p < .001$

+ Tukey's HSD significant upper range

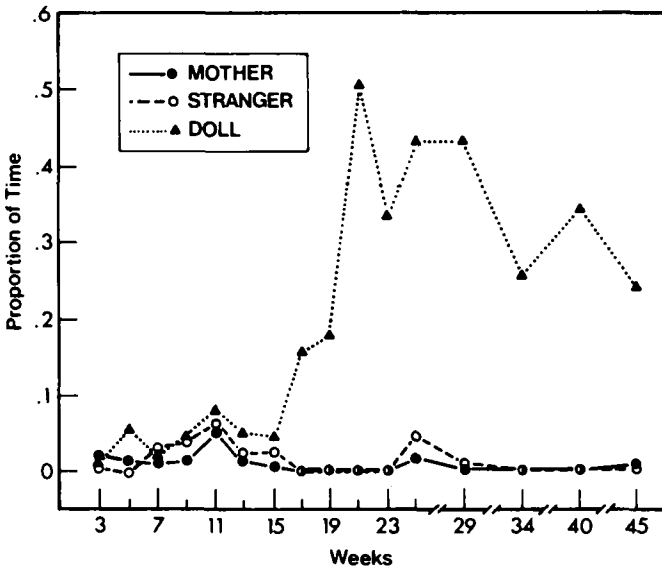


Figure 2. Forward extensions toward the doll, the mother, and the stranger (means of right and left arm).

consistently responded differentially toward people and a doll. As early as 5 weeks, babies produced significantly more neutral vocalizations toward people than toward the doll. At 7 weeks babies began to smile and vocalize positively toward people. Virtually no such behaviors were produced toward the doll throughout the experiment. In contrast, babies looked significantly less at people than at the doll from 9 to 45 weeks. Field (1979), in studying 3-month-old babies, also found that they looked less at the mother's than at the doll's faces, but directed more social behavior such as smiles and vocalizations toward the mother. By 17 weeks babies extended their arms significantly more to the doll than toward people. Very few such extensions were noted toward people throughout development. Other researchers also noted complete reaches toward three dimensional toys between 17 and 19 weeks (Appleton, Clifton, & Goldberg, 1975; Pomerleau & Malcuit, 1980; von Hofsten, 1984). The fact that babies began to reach significantly more to the doll than to people at 17 weeks seems related more to their motor development than to their ability to differentiate between social and nonsocial stimuli. The differentiations observed with respect to the other responses support this assertion.

That babies are capable of responding differentially toward people and things had been suggested by other authors (Bower, 1979; Brazelton et al., 1974; Field, 1982; Gelman & Spelke, 1981; Trevarthen, 1977, 1979) but had received little systematic study. Very young infants are known to be sensitive to contingencies between their actions and movements of nonsocial stimuli (Papousek, 1979; Watson, 1972) as well as social stimuli (Trevarthen, 1977). This research was designed to provide information about the relative importance of contingent responding and other variables inherent in communication. This was done by having the doll and people provide contingent stimulation to the babies' actions in one session (active) and not in another (inactive). Although some smiles and vocalizations were noted toward the contingently responding doll, these responses were produced significantly more toward active people. Thus, although contingent movement of nonsocial stimuli may elicit smiling and cooing in the infants as suggested by Watson (1972), the present results suggest that when people communicate with children they provide, in addition to contingent responses, other communication-related cues that in infants attract substantially more and varied social behaviors. For instance, although babies smiled and vocalized positively more to active people than to the active doll, they spent less time looking at them. Our videotapes revealed that babies spent less time looking at people because they alternated their gazes. Peery and Stern (1976) have suggested that this alternation in the gaze behavior of prelinguistic babies is similar in its regularity to behavior between adults engaged in communication. Young infants seem to regulate the gazes of people, thereby establishing the cyclical framework of face-to-face interaction (Stern, 1977) that allows for the mutual sharing of expressions of arousal and affectivity (Adamson & Bakeman, 1982). Furthermore, the 1- to 2-month-old infants seem capable of modulating this affectivity. Faced with a responsive person the babies displayed

signs of pleasure (e.g., they smiled, vocalized positively, etc.). Faced with the inactive person the infants rapidly became displeased. They turned away their gazes while arching their arms and vocalizing angrily. The infants seem to reserve these positive to negative dimensions of emotional display uniquely for people. No such modulation of affect was noted in front of the active and inactive nonsocial stimulus throughout the developmental period studied. In sum, although contingent responding of nonsocial objects may elicit some smiling and cooing in babies, it does not seem to produce other types of behaviors essential to the development of communication.

The differential responding we found toward people and a doll could not have been due to the greater familiarity of the mother as opposed to the doll. The babies responded differentially toward stranger and doll and toward mother and doll throughout the period of observation with significantly more social responses (vocalizations, smiles, etc.) being directed to the adults. In effect, the mother-stranger distinction did not produce as readily as the doll-person distinction differential responding in babies. Three out of the seven measures showed significant differences between mother and stranger. The first was arching of the arms. Babies produced these more to their inactive mother than to all other stimuli between 5 and 13 weeks. Fogel (1981) also reported an increase in gesturing toward the inactive mother prior to six months of age. The fact that arm archings were movements produced in high frequency soon after birth but declined with age, together with the data indicating that arm archings were produced significantly more towards the inactive mother during the first half year of life supports the suggestion by Fogel (1981) and McGuire and Turkewitz (1979) that these behaviors may indicate arousal or avoidance. Thus, as early as five weeks of age, babies seem somewhat more distressed at seeing their inactive mother than all other stimuli. After 13 weeks there is a consistent increase in negative vocalizations toward the inactive mother; this difference becomes significant by 17 weeks. The infants also began to look significantly less at their mother at 17 weeks. Klein and Jennings (1979) and Sherrod (1979) also found longer looking times toward the stranger than toward the mother around 4 to 5 months. It seems that the babies in this study were sensitive to differences between their inactive mother and stranger from an early age on, but only consistently began to differentiate in their responses by 17 weeks.

Our results replicate and extend findings by Klein and Jennings (1979) on differential responding to people and toys in 2-month-old infants but contradict those of Frye, Rawling, Moore and Myers (1983). Our study suggests that differences in the 3-month-old infants' behavior were either missed by the observers of the Frye et al. study, or that their experimental situation was not adequate to show differential responding in 3-month-olds. The authors apparently presented the experimental stimuli at a 100 cm distance. The optimal distance to elicit interactive responses in young infants appears to be 50 cm or less (Brazelton et al., 1974; Field, 1982; Papousek & Papousek, 1984; Tronick, 1981).

Unlike the previous studies, our research provides information about the evolution of the specific reactions of babies toward people and a doll during the first 10 months. The infants showed a peak in responsiveness toward people from approximately 5 to 19 weeks. However, when by 17 to 19 weeks babies became capable of grasping the doll, they showed a decrease in their display of affectivity and attention to adults. Similar developmental changes have been reported in normal children by Bruner (1975), Kaye and Fogel (1980), Newson and Newson (1970), and Trevarthen and Hubley (1978), and in deaf children by Pieraut-Le Bonniec (1983), and have been attributed to the babies developing motor and cognitive skills permitting more effective interactions and explorations with an expanding environment. However, rather than being a pause in communication development, it seems that this object-oriented phase prepares the way for a new mode of communication involving objects. For instance, whereas the infants would now begin to explore their seat, the cameras, and other objects in the environment during the person sessions, the adults would begin naming and describing the items. By making the objects part of the conversation, the mother or female stranger is showing the infants the beginnings of referential communication. Adamson and Bakeman (1982, p. 219) call this period in communication development of the infant the nonverbal referencing phase, when "gaze patterns, vocalizations, and gestures increasingly serve the referential function of introducing a new topic for discussion, a new message that, that thing over there is what I want to communicate about, to comment on."

Towards 29 weeks, the infants again increased responding to the social stimuli (in particular the mother) with gazes, vocalizations, and smiles, although maintaining attentiveness to the nonsocial stimuli (gazes, neutral vocalizations and arm extensions). Had our experimental design allowed for the use of toys during the person sessions, we might have found that the babies were beginning to coordinate their attention between people and the toy. The ability to alternate attention between people and things external to the social interaction makes it possible for the infants to engage in nonverbal referential communication (Bakeman & Adamson, 1984; Bates, 1979; Harding & Golinkoff, 1979).

In summary, the babies of this study differentiated in their responses between people and a doll as early as two months of age. It is not unreasonable that there is an early onset of this particular distinction. In order for babies to learn the specific features of this multimodal stimulation that is communication (verbal and nonverbal), it is essential that a more global awareness of human communication precede full-fledged communication.

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