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A Developmental Study of Infant Vocalization and Mother's Speech

Yuko Kanaya

Summary

This research paper on the development of infant vocalization concerns the relationship between a mother's speech and her infant's vocalizations. The data was obtained through the research team's observations. Home observations were carried out from the viewpoint of mother-infant interactions of 14 infants (7 boys and 7 girls), who were born into a nuclear family in Tokyo. The data obtained from eight pairs of infants (4 boys and 4 girls) from one month to twelve months of age was analyzed. The author paid particular attention to the developmental changes of infant vocalizations and interactions after 6 months of age, especially after the stage of fear of strangers.

To investigate language development in early infancy, the data was analyzed from two points. The first point is concerned with the developmental changes of infant communicative behaviors. The results reveal that those behaviors appeared regularly: 1) Vocalization (at an early 1 month of age) 2) Vocalization and Social Vocalization (at 1~5 months of age) 3) Vocalization, Social Vocalization and Vocal imitation (at about 6~11 months of age) 4) Vocalization, Social Vocalization, Vocal Imitation, and Verbalization (at about 9~12 months of age). There were differences of the onset time and frequency between male infants and female infants. Generally the female infants developed those behaviors earlier and exceeded the male infants in frequency.

The second point is concerned with the factors of language development. One factor may be related to the biological foundation, namely maturation. Another factor may be related to the quantity and quality of mother-infant interaction in their daily lives. As for the frequency of mother vocalization, there were three types: 1) consistently high throughout the year, 2) consistently low throughout the year, 3) irregular. As a whole the frequency of male babies' mothers was higher than female babies' mothers. Regarding the frequency of interactions, however, female babies and their mothers exceeded the male babies and their mothers. Moreover there were qualitative differences. The more female babies imitated their mothers' gestures or vocalizations, the more they developed their verbal behavior. But male babies did not always show such a trend. They often used pointing and presenting as a substitute for vocalization. These differences of interactive style may play an important role in language development.

The research team has been observing 14 babies at their homes since 1979, making a longitudinal study of mother-infant social

interactions. Kawakami (1980) made a developmental research on social behaviors in infancy. Suda and Kawakami discriminated between

social behavior and non-social behavior, and defined social behavior as person-directed behavior. From this viewpoint even newborn infants show social behavior.

The infants being observed by the team are now from 18 to 20 months of age, and its aim is to closely investigate the nature of interaction and its developmental changes. The term "interaction" is used for expressing a reciprocal relationship between a mother and her infant in a broad sense.

As pointed by Kawakami (1978), the method of natural observation has some merits. The author believes that the development of behavior can be observed and seized appropriately by home observations. But this method is not necessarily sufficient for describing the atmosphere of each family which influences infant development of affection and cognition. These qualitative aspects require further study. To clarify the importance of caregiver-infant interaction, another supplementary study about the development of interaction of institutionalized infants is now being made by Kanaya, Kawakami, Suda, and Takai (1980). The author is interested in the possibility of developmental changes of caregiver-infant interactions in institutions. If a caregiver-infant relationship fails in its social interaction at an early stage, what will happen in the future? Will the future relationship be able to undo the past? For answering these questions, the author has to compare our longitudinal study on home-reared infants and our cross sectional study on institutionalized infants in detail.

Other recent studies on developmental psychology and pediatrics also point out the importance of social interaction in very early infancy (Klaus & Kennel, 1970; and Brazelton, Koslovski & Main, 1974). Condon & Sander (1974) indicated by experiment that newborn infant kinesics (body movements) synchronized with an adult's speech. They regard a human infant as an active and highly organized social being, that is to say he behaves according to his own internal rhythms from birth. His mother learns to harmonize her behavior with him by rearing him. Therefore a mother and an infant can interact and influence each other.

The author agrees to the above findings about human infants.

From the viewpoint of caregiver-infant interaction, much recent research has been done on language development. The author also takes this interactive standpoint. Much of the research has been focussed on infant years from one and a half to four (for example, regarding mother's speech to toddlers Snow, 1972; Nelson, 1973). This research focussed the first year of an infant's life, because the author believes that an infant develops his communicative behavior through the interaction with his mother at a very early monthly age. Some anthropological data reveals that baby babbling is universal stage of child development, and the onset of this form of behavior is fairly regular, appearing in the 5th or 6th month of an infant's life. This universality might lead us to minimize the importance of environment for language development. But the author cannot agree this opinion. From the viewpoint of social and non-social behavior, not only social vocalization but also vocalization will be developed and influenced by mother's sensitive and affectionate verbal behavior. According to a cross-cultural study, mother verbalization at 8.7 months of age and infant babbling at 10 months correlated to each other (Beckwith, 1971). Some cross-cultural research has been performed on mother speech and infant vocalization (for example, in Israel by Greenbaum & Landau, 1977). As these cross-cultural studies were done in a variety of contexts, it is difficult to compare them. The author's main aim in this paper is to clarify the development of the relationship between an infant's vocalization and his mother's speech. The very fact that an infant can vocalize with his mother and respond to her speech at a very early monthly age shows his desire for social participation and interaction. It really makes no sense to think about language development outside of an interactive perspective. Needless to say, close and elaborate examinations must be done on this complex language development mechanism.

Method

1. Subjects

Eight babies (4 boys and 4 girls) born into a nuclear family in Tokyo were used. All were physically and psychologically normal. Their mothers have no special jobs or part-time jobs. Both their fathers and mothers received our home visits favourably. Two girls were born in January, 3 boys in February, 1 boy and 2 girls in March of the same year.

2. Procedures

a. Home observations:

Observations were done at the infants' homes, in natural setting every month. Two observers (a male and a female) visited these homes. Each observation lasted for one and a half hours, using a stop watch and simple observation sheets in order to note the actions of both infants and mothers. The observers sat near the infant and they usually participated minimally in the infant activities. But almost always the observers responded to the infant's smile or vocalization to them. The main observational situations included feeding changing diapers and dressing, and playing.

With the mother's permission, a tape recorder was also used in order to record the mother's speech and her infant's vocalization.

b. Observational indexes:

Several observational indexes were used for recording behaviors. The indexes used to indicate infant verbal behavior are: V (Vocalization); SV (Social Vocalization); Voc. Imi (Vocal Imitation); and Verb (Verbalization). The number "1" indicates infant vocalization to inanimate things (toys for example) or animals. The number "2" indicates infant vocalization to persons. The number "3" indicates infant imitation of mother's speech or intonation. The number "4" is used when the infant speaks a meaningful word. Other behaviors which are thought to be related to the development of infant vocalization are: Imi (Imitation), Present (Presenting), and Point (Pointing). SS (Social Smile) and SL (Social Laugh) which are defined as person-directed behavior are also recorded.

Indexes for recording mother's behavior are:

CV (Caregiver's Vocalization including Verbalization), CVR (Caregiver's Repetition of Infant Vocalization), CS (Caregiver's Smile), CL (Caregiver's Laugh), and CT (Caregiver's Touch).

	Infant		Caregiver	Situation
0:10	SV	→ M	CV	Hold
0:20	V	→ toy		CT Diaper
0:30	SS	←	CV	"

Figure 1. An example of a recorded observation sheet.

The arrow indicates the order of interaction. SV→CV, for example, means that the infant vocalized to his mother, and his mother responded to him by speech. She held her baby during the first 10 seconds. During the next 10 seconds the mother changed a diaper, and her baby vocalized to a toy. In this way behaviors during 10 second periods are recorded.

Results and Discussion

1. Development of Verbal Behavior

1-1. Infant Frequency of Verbal Behavior

Table 1 represents the mean scores of infants and mothers. As for Vocalization, Social Vocalization, and Interaction, the scores were calculated from the summed up data from 1 month to 12 months of age. The other mean scores were obtained from the data from 6 months to 12 months of age.

A group tendency, a sex difference in other words, emerged as a result of data analysis. That is the female infants exceeded the male infants in mean scores. Taking standard deviations into consideration, the female infants and their mothers were generally standardized. Regarding standard deviations of CVR and interactions, however, the result reversed. That depended on a female infant and her mother whose frequency of CVR and verbal

Table 1. Mean Scores of Infants and Mothers

Index	Mean Scores	
	female	male
Vocalization (V)	350.5	251.3
Social Vocalization (SV)	320.3	237.5
V+SV+Voc. Imi+Verb	689.0	495.8
Mother's Vocalization	540.8	872.5
Mother's Repetition of Infant VC (VR)	45.3	22.5
CV+CVR	586.1	895.0
Interaction (I→C)	111.5	85.3
Interaction (I←C)	37.3	32.8

interactions was exceptionally low compared with other pairs. Even so the female infant developed her verbal behavior smoothly. The result of this case implies that the quality of interaction plays an important role in language development.

Figures 2 and 3 reveal the developmental changes of infant Vocalization and Social Vocalization from 1 month to 12 months of age. The author summed up the number of behaviors in the observation sheets. The

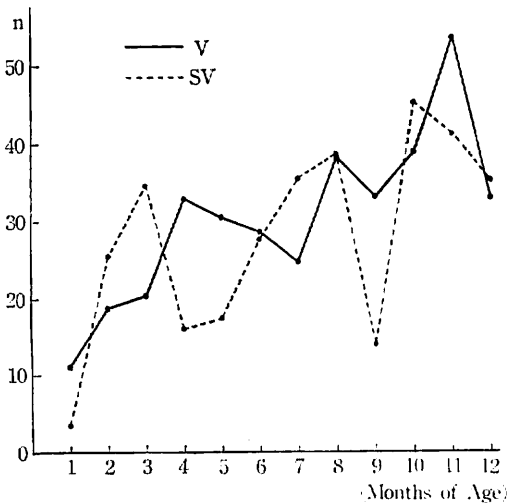


Figure 2. The development of Vocalization and Social Vocalization from 1 to 12 months of age, the mean frequency in male infants.

female monthly increase and decrease of Vocalization and social Vocalization traced almost the same curve. The difference between the male mean Vocalization scores and females' was significant ($p < .01$). As for Social Vocalization, the difference between the mean scores at the 9th month and at the 12th month of age were significant ($p > .05$).

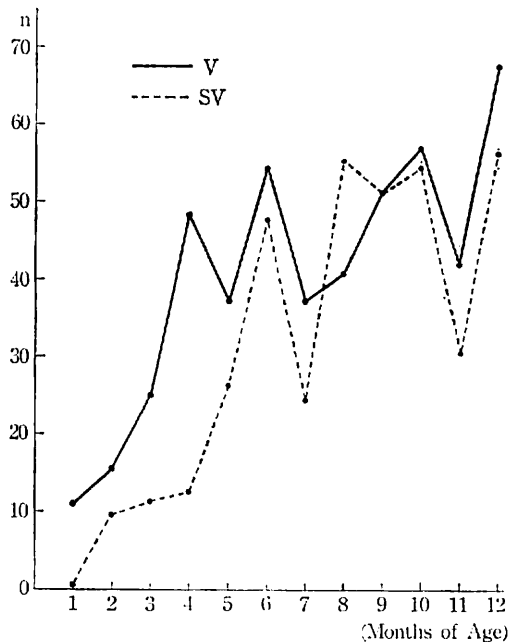


Figure 3. The development of Vocalization and Social Vocalization from 1 to 12 months of age, the mean frequency in female infants.

Figure 4 shows that the female infants' summed frequency of communicative behaviors which included Vocalization, Social Vocalization, Vocal Imitation, and Verbalization, were always (except for the 11th month) higher than males.

1-2. Mother's Frequency of Verbal Behavior

Figure 5, on the contrary, shows that the male infant mothers' frequency of summed verbal and vocal behavior was always much higher than the female infant mothers. In other words, male infant mothers talked more to their infants than female infant mothers did. As for Caregiver's Vocalization including verbalization, however, the difference between

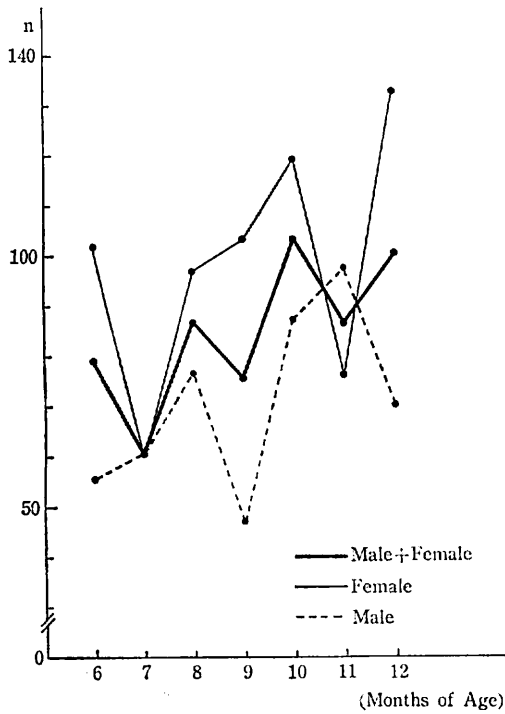


Figure 4. The development of communicative behavior represented by the summed frequency of Vocalization, Social Vocalization, Vocal Imitation, and Verbalization, from 6 months to 12 months of age, the mean frequency in all the 8 infants, the mean frequency in male infants, and the mean frequency in female infants.

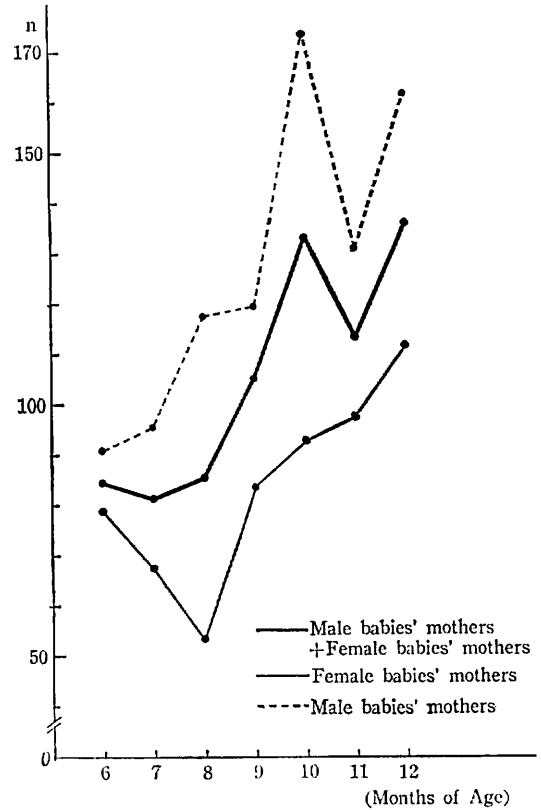


Figure 5. Changes in mothers' verbal behavior, from 6 to 12 months of age, the mean frequency of 8 mothers, the mean frequency in male babies' mothers, and the mean frequency in female babies' mothers.

the two mean scores was a little short of significant level ($p < .1$), but the direction of difference was predicted.

1-3. The correlational Relationship between Infant Vocalization and Mother's Vocalization.

Figures 6 to 9 represent the plotted correlational relationship between a mother's verbal behavior and her infant's communicative behavior (V, SV, Voc. Imi, and Verb). Eight infants were numbered in order of birth (i.e. females numbered 1, 2, 3, 4, males numbered 1, 2, 3, and 4). When the difference between the mother scores of verbal behavior and infant scores of verbal behavior was under 30, and the number of infants was over half

of the infants present (i.e. 4), the two scores were plotted. Figures 6, 7, 8 and 9 reveal that the female verbal behaviors were more closely related to their mothers' speech than the males. Although the f-1 pair did not vocalize with each other very much, their behaviors were synchronized. Two male infants i.e. m-2 and m-3 showed the same tendency as females. But as for m-1 and m-4 pairs, the mothers' frequency of verbalization was much higher than the infants' every month.

1-4. Frequency of Other Communicative Behaviors

Figure 10 represents the mean scores of Imitation, Vocal Imitation, Presenting, Pointing and Verbalization, from 7 to 12 months

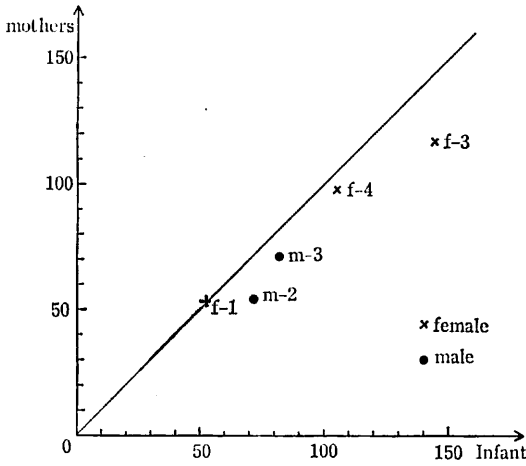


Figure 6. At 6 months of age

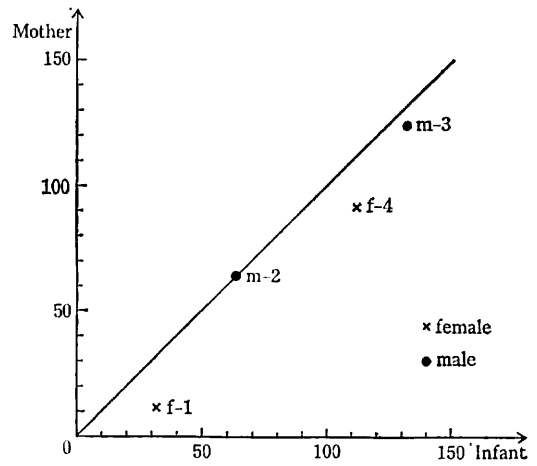


Figure 7. At 8 months of age

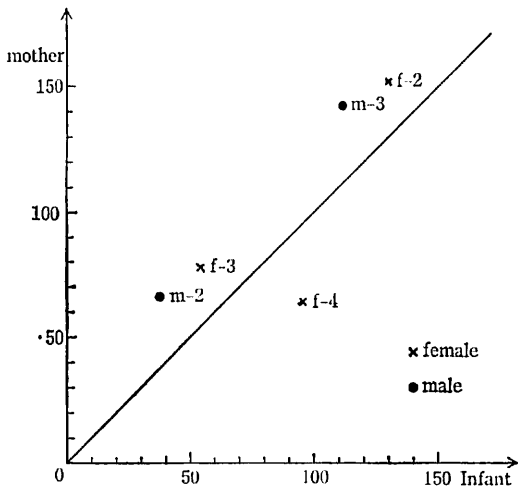


Figure 8. At 9 months of age

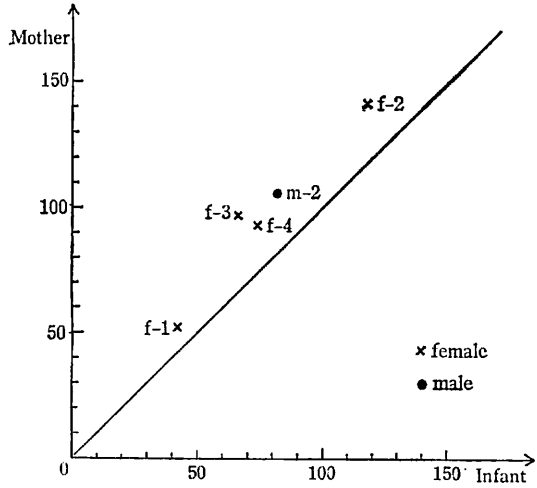


Figure 9. At 11 months of age.

Figures 6~9. The correlational relationship between a mother's verbal behavior and her infant's vocal behavior. When the differences between the mother's scores of verbal behavior and the infant's scores of vocal behavior were under 30, and the number was over half of the infants present (namely 4), the two scores were plotted.

of age. Except for Pointing the female infant mean frequency was always higher than males'.

1-5. The Onset Time of Behavior

Figure 11 represents the onset time of the

behaviors shown in several indices. We found that female infants began to imitate or verbalize earlier than male infants; however with presenting and pointing, male infants began earlier than female infants.

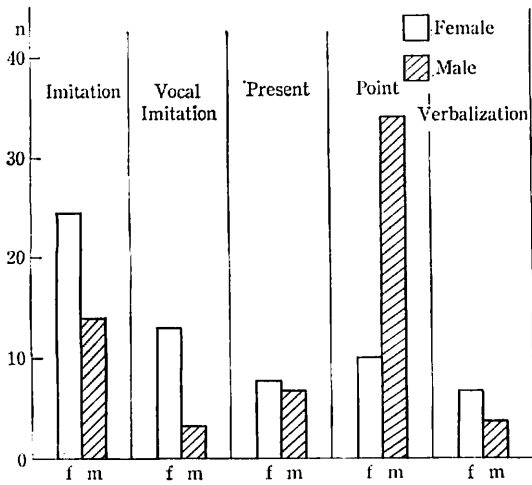


Figure 10. The mean scores of Imitation, Vocal Imitation, Presenting, Pointing and Verbalization, from 7 to 12 months of age.

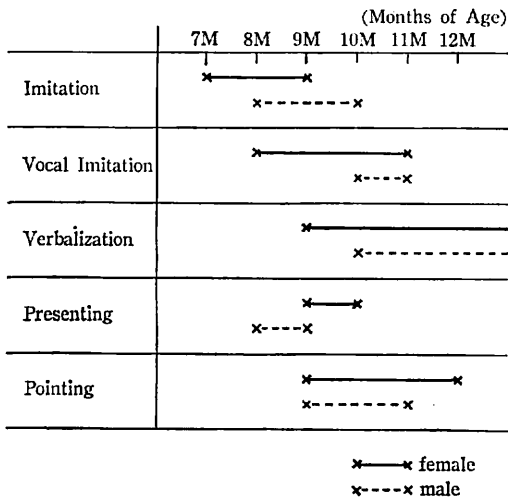


Figure 11. The onset month of Imitation, Vocal Imitation, Presenting, Pointing, and Verbalization. x—x represents the appearance of these behaviors, the left x is the onset month and the right x means that the latest baby showed such behaviors, x— means that one or two babies did not display such behaviors yet.

2. Development of Verbal Interaction

2-1. Frequency of Verbal Interaction

Figures 12 and 13 represent the frequency of mother-infant verbal interactions. When

an infant vocalized to his mother, and the mother responded to him, the author defined that a social interaction occurred. In this case the initiator was the infant. On the other hand when the mother talked to her infant and the infant responded to her, the author defined this too as a social interaction occurring; however, in this case the initiator was the mother. Even when the infant vocalized to a toy, his mother responded to him. This case is defined as non-social interaction. I calculated the number of verbal interactions (i.e. V→CV, SV→CV, Voc. Imi→CV, Verb→CV and V←CV, SV←CV, Voc. Imi←CV, Verb←CV) in each 10 second unit of observation. It was noted that at about the 4th or 5th month of age frequency of males and females were reversed; and at about 8th, 9th, and 10 month of age, the females interacted with

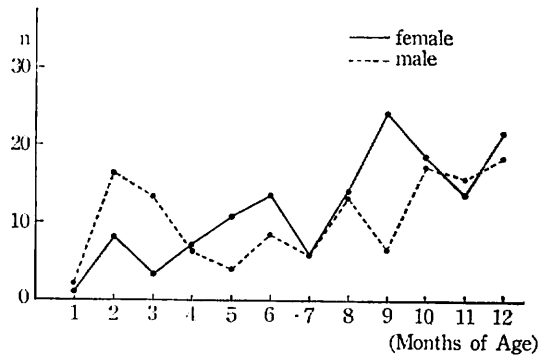


Figure 12. The developmental changes of mother-infant interaction (when infants were initiators).

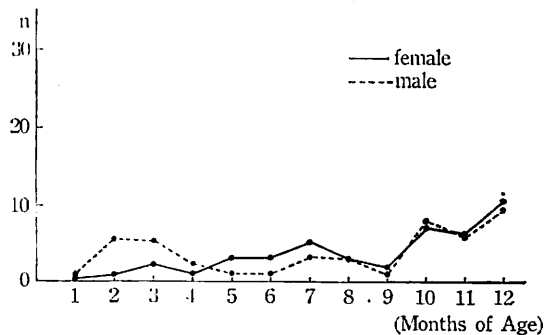


Figure 13. The developmental changes of mother-infant interaction (when mothers were initiators).

their mothers more often than males. The correlation between I→C interaction (i. e. infants were initiators) and I←C (i. e. mothers were initiators) was fairly high ($r=.621, p<.1$)

2-2. Qualitative Aspects of Interaction
 About the mother's attitude and family atmosphere, some analytical viewpoint can be pointed out. They are: (1) Opportunity for verbal expression; (2) Direct teaching of language; (3) Mother's involvement; (4) Models of language development; and (5) Models of intellectual interests. From these five points above, the data must be analyzed intensively by tape analysis. In this paper, only a case study was done. Mothers and infants of f-2 and f-3 played with each other very often. Infant f-2 smiled and laughed every time that her mother played peekaboo. Whenever her mother read a picture book, she pointed the picture or vocalized imitatively. She always imitated her mother's gestures or vocalization. The mother of f-3 gave easy names to each stuffed animal and taught the names of things very often. The infant f-3 also vocalized imitatively very often. These two pairs had much opportunity for verbal expression. As for male infants they interacted with their mothers by pointing or presenting. This tendency might be revealed in some female infants who do not vocalize very much.

there are three turning points for language development. They are at 3 to 4 months of age, 8 to 9 months of age and 12 months of age. Concerning the developmental turning points, my results are not inconsistent with the findings by Kawakami (1980), although in case of male infants, the onset month was one or two months later than female infants. The author believes that the most important turning point for female and male infants is at about 8th to 9th month of age, and 11th to 12th month of age. Mother-infant interaction increased and infant vocal imitation and verbalization appeared for the first time at these months of age.

Figure 14 represents my model concerning the developmental changes of an infant vocalization and the relationship between an infant verbal behavior and his mother's verbal behavior. Whether the non-social interaction (V→CV, for example) occurs or not depends on the mother's sensitivity for her infant behavior. In other words, how to catch her infant vocalization, how to give much experience to him and how to share common experience cause the differences of mother-infant interactive style. After all such differences influence language development in early infancy. The data after 12 months of age will clarify when and how vocalization and social vocalization give place to verbalization.

Concluding Remarks

Judging from the results above mentioned,

Footnote

The data of this study was gathered in colla-

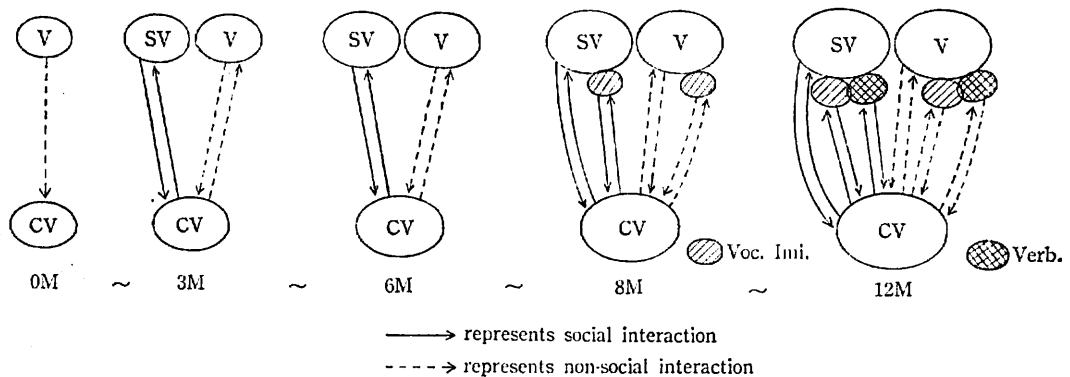


Figure 14. The developmental changes of an infant vocalization and the relationship between an infant verbal behavior and his mother's verbal behavior (My model). —→ represents social interaction, - - - -→ represents non-social interaction.

boration with Kiyobumi Kawakami, University of the Sacred Heart; Osamu Suda, Toyoko Gakuen Women's Jr. College; Kiyoko Takai, Japan Women's University; Yoko Sato, Ochanomizu Women's University; and Reiko Kawano, Musashino Red Cross Hospital.

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