

12. PARENTAL BEHAVIOUR

12.1. INTRODUCTION :

Parental care is an important trait in most vertebrates and in some invertebrates either by the mother or by the father or by both. Among mammals, however, it is mostly a prerogative of the female parent as her contribution towards the development of the embryo is immensely greater in comparison to the male parent. Trivers (1974) used the term 'parental investment' instead of parental care. I shall however, confine my present discussion only to the external manifestation of parental behaviour in rhesus. Parental care ensures optimal conditions for the development of the infants : providing them with nutrients, protecting them from unfavourable climatic conditions and from the attack of enemies.

In rhesus, mothers assume major responsibility for rearing their infants. Mother-infant association forms a crucial unit and established strong relationship between them . Such bonds create conditions favourable for the survival of the young and its eventual integration into the community (Harlow and Harlow, 1965 , Lee, 1984). Other individuals who care for infants are also important part of social context for the mother-infant relationship (Johnson, 1986). It may be mentioned that the infant does not always benefit from contacts particularly with other adults of the group (Pal, 1983 and Tanaka, 1980).

This chapter deals with general trends in infant development over the first 24 weeks of life. Descriptive and quantitative analysis of mother-infant relationship was done. Data were collected on time spent on different special and postural states in mother-infant association, various maternal and infant activities and time spent by non-mothers towards infants of low and high ranking mothers and on female and male infants.

12.2. METHODS :

The problem of observing parental behaviour without disturbing the

animals was a difficult task in the wild. Because mothers were found to be extremely alert when accompanied by their infants. Again infants were also highly sensitive to even the slightest disturbance of any kind. As such necessary precautions were taken during observations on maternal behaviour so that the animals were not disturbed.

Data were obtained from 30 rhesus macaque mother-infant pairs among 5 groups (Table - 12.1). A variety of behaviours pertaining to infant development were recorded. Deng and Zhao (1991) defined the following terms such as Ventro-Ventral contact (V-Vc) : infant in ventral surface contact with mother's abdomen; Ventro-lateral and ventro-dorsal contact (V-L/VD) : infant with lateral or dorsal contact with the ventral surface of the mother ; contact off lap (Co); the infants out of the mother's lap but in contact with the mother ; proximity (Pr) : the infant out of contact with the mother but within one metre of the mother, and far off (FO): the infant is further than one metre from mother ; nipple contact (NC) : infant in oral contact with the mother's nipple.

Data were collected by 'Point Sampling' method. Point samples of infant activity, mother's activity and distance between mother and infant were recorded. The infant remained as the focal animal if the mothers moved out of sight. The sample period was 10 minutes in length. All observations were done from 06.00 hour to 18.00 hours and a total of 400 hour of observation was made during the study period. Observations were done during the months of June, July, August, September, October and November, 1989 and the development of mother-infant relation was observed during the first 24 weeks of infant life.

The approximate distance between mother and infant was recorded. Records on distance were, however, taken only when suitable natural markings to indicate it were available. An index indicating which individual is responsible for maintaining proximity (Pr) was calculated after Hinde, 1983 which is shown as follows :

$$I_p = \left(\frac{API}{API+APM} \times 100 \right) - \left(\frac{LI}{LI+LM} \times 100 \right)$$

Where API/LI and APM/LM are frequency of approaching and leaving behaviour by the infant and the mother respectively. If $I_p > 0$ the infant is more responsible for maintaining proximity than the mother ; if $I_p < 0$, the mother is responsible for maintaining proximity.

12.3: RESULTS AND DISCUSSION

12.3.1. Maternal Relationship :

Lactation, one of the processes through which a female mammal invests resources in her offspring, is of great importance in the biology of mammal (Pond, 1977). Measurement of the amount of milk transferred to the young by the mother is not, however, possible. Not much is known on lactation in free living mammals. Jensen et al., (1975) and Chance et al, (1978) suggested that the association of mother-infant is through sucking and nursing. Lynch and Alexander (1973) advocated that immediately after birth there is a short period during which the neonate must learn to find the teats and suckle them successively. The different behavioural states of mother-infant association are tabulated in Table - 12.2 and Table - 12.3.

12.3.1.1. Suckling Behaviour :

On the first day after birth, some infant turned their heads and peered out at the surroundings, but most of them remained within the safe-zone of mother's arms, and clung to her chest for the first few days. From the first day infants were able to cling to the mother's chest though they needed some support from the mother, particularly at movement. Nipple contact was observed at early infancy by rooting with eyes closed. When asleep infants were observed to relax their grips, their heads fell back and contact with the nipple was broken unless the mother held it up. The mothers held the infants upright in her lap, infants were capable of finding, and sucking the nipple through the very first day after birth probably as a result of guidance by tactile and scent stimuli. Later, still in their first week,

the infants were observed to grasp the nipple directly possibly through visual guidance (Plate 12.1).

Infants attempted to gain access to mother's nipple. The attempts to make contact with the nipple remained constant throughout the 24 weeks of infants' early life (Figure - 12.1). The percent of time that an infant spent in nipple contact with its mother was close to 100% in the 1st week and declined to 20% by the end of 24th week. The nipple contact drop was comparatively slower than that of VC, V-LC and V-DC since the infant could have oral contact with the mother's nipple. It has to be mentioned, that during observation, no reliable distinction could be made between just holding or sucking the nipple. The infants grasped the nipple possibly to obtain milk, or to find comfort or to get an extra point of support.

The nipple behaviour was always initiated by the infant. A mother did not orient her infant to the nipple. As the infant matured, the mothers became increasingly intolerant of infants' efforts to contact her nipples. The mother possibly allowed infant to be on nipple passively. Kemps et al. (1990) reported that mothers sometimes prevented the infant from holding or sucking the nipple in *Mcaca fascicularis*, which might have been due to infants relative role as responsive and mothers relative role as passive respectively.

12.3.1.2. Physical Contact :

Most mother carried the infant ventrally (Plate - 12.2). A newborn clung to its mother's belly by grasping the mother's lateral hair with its hands and feet. The infant was able to bring about and maintain this position on its own effort. While sitting, mother contributed to this position by enclosing infant. The mother supported her infant's back with one hand time to time during movement. As the infant grew up the mother's support decreased and V-VC and V-L/DC correspondingly declined (Figure - 12.1).

The percent of time that an infant spent in ventroventral contact with

its mother was 100% in the first week and declined to 2% by the end of the 24th week period (Figure - 12.1). During the 24th weeks of life, there was only a gradual rise in the rate of behaviour associated with increasing infant independence from the mother. During study period there was a more pronounced and rapid rise of far off (Figure - 12.2). Infants gradually spent less time in physical contact with the mother and spent less time with the mother nearby. As the time spent in physical contact declined, infants attempted to make nipple contact at higher rates and in turn were rejected more frequently.

A female continued to maintain a distinct relationship with her infant until the latter's maturity. By the 3rd weeks infants were observed to break contact with their mother for short period. The amount of time infants spent out of contacts at different distance from their mother's were plotted in Figure - 12.2. The proximity and contact off, were two important relative role of infants early development. After breaking contact with their mothers, infants spent more time in far off (FO) from their mother.

12.3.1.3. Maternal Protection :

The mothers restricted their infants movement and social interactions upto the 12th to 14th week (Figure- 12.3). Infants attempted to crawl out of their mothers lap or to break contact with their mother by the 2nd week, but these efforts were completely restrained. The maternal restraint (R) peaked to a high frequency of 15/hour at the 4th week. Despite being prevented by the mother, the repeated efforts by the infants finally succeeded in breaking contact with mothers. When infants were out of mother's contact maternal guarding (G), behaviour appeared. The mothers were observed to enclose infants with arms, and often visually watched infants if they walked away (Plate-12.3). As the frequency of infant leaving increased, the frequency of restraining and guarding role by the mother rapidly declined (Figure - 12.3). Johnson and Southwick (1984) reported that maternal protection peaked during the 3rd and 4th week of infant life then diminished progressively thereafter possibly due to independence in the early weeks of life. The protective behaviour of *Macaca thibetana* showed the identical pattern to rhesus observed by Deng and Zhou (1991).

12.3.1.4. Maternal Rejection :

This was the stage through which mothers adopted various strategies for rejecting their infants, ranging from simply withdrawing the nipple to putting a finger in the infants mouth, vocally threatening and even slapping (Plate - 12.4). Again and again infant tried to come to the denying mother. It screamed, threw tantrums, jumped in desperation and indulged all sorts of tricks. The mother sometimes relented and sometimes remained unmoved. Maternal rejection appeared at the 9th week and continued thereafter (Figure - 12.3). By this time infants learnt to supplement mothers milk extensively with solid food. The process continued until shortly before the birth of next infant in vervet monkeys (Lee, 1981), Tartabini and Bartachini (1980) reported that high dominance mothers appeared to have a less rejecting relationship with their infants when the infants were sons. It can be presumed that rejection or rather weaning occurred due to change in mother-infant interactions leading to independence in the early weeks of life. Lindburg (1971) reported that nursing periods become progressively shorter, while the weaning period continued until shortly before the birth of the next infants in rhesus.

12.3.1.5. Proximity Index :

A female continued to maintain a distinct relationship with her offspring until the latter's physical maturity (Kaufmann, 1966). The proximity index of all observed approaches and leaving due to infants movements and mother's responses were plotted in Figure - 12.4. At the 3rd week, infants broke contact and got beyond 1.5 to 2 metres from mothers. At this time Ip was negative possible due to the mother being primarily responsible for contact maintenance. From 4th week to 8th week infants exhibited locomotion and travelled more frequently from their mothers. At the end of 8th week the Ip was close to zero. After 9th week mothers began increasingly leave their infants while infants sought maternal proximity more often. Ip was positive ($Ip > 0$) and peaked at the end of 24th week. As such there was a trend for infants to maintain proximity with mothers in measures of independence. Deng and Zhou (1991) reported that infants were

the primary initiator of independence during 7th week of life in *Macaca thibetana*. In case of Japanese macaques (Murray and Murdoch, 1977) and *M. nemestrina* (Jensen et al. 1973), there were high proportion of infant leaves from birth to the 7th week and the 5th week of infant life. Hinde (1975) and Altmann (1978) stated that responsibility for approaches and living has been laid on primarily with the mother in the earliest weeks of infant development in non human primates. It may be pointed out that the infants' relative role in its early behavioural development may be described as responsive, adjusting, active, moving and mothers' relative role as permitting, passive, protecting, possessing and correcting (Kemps et al, 1990).

12.3.2 Behaviour of Infant :

The infants usually kept close to the mothers but occasionally indulged in straying away from the mother. They, however, kept themselves within the space occupied by the group. Figure 12.5., represented activity profiles of infants within the group. All infants began to explore in the 1st week or 2nd week of life and exploring increased with the age of infant. The infants explored mothers' body orally, manually and visually. Infant's play with mother was seen in the 1st week of life. By the end of the 6th to 7th week 50% of the infants started playing with other members within the group (Plate- 12.5, Plate-12.6 and Plate-12.7). Plate 12.5 showed that infant's play was initiated through series of training schedule under mature individuals. One juvenile was seen on the top of telegraph post to supervise ascending and descending movements of the infant while an adult female sat on the ground to look after the training schedule. Plate-12.6 showed movements of infant under the supervision by adult female while Plate-12.7 represented independent swing movement of infants. Rhesus infants started to travel independently at 7th week of age (Plate-12.8). The infant locomotion curve represented same pattern as exhibited by social exploration course.

12.3.3 Activity Profile of Non-mothers :

The process of infant development and independence primarily rendered by mothers, but in the social group the adult females (Kaufmann, 1966, Rowell et al, 1964), males (Deag and Crook, 1974) and juveniles (Berman, 1978 and Smith, 1981) took crucial role in the development of early stages of infants life. Non-mothers especially adult females and juveniles took care of the infants in the absence of mothers (Plate-12.9). These individuals socially approached, attempted to contact, touched, hold or carried the infants. Percent different styles of mothering by non-mothers at all the observation hourse are shown in Table-12.4.

12.3.3.1. Attention :

Attention was the most prominent activity and was continued throughout the study period. It had a bimodal distribution with peakes at 7th weeks of early infancy. Non-mothers' (adult female) attention of the group was observed from early stages of infant life, but other individuals did not come close to the infants upto the 5th week. The Figure 12.6 showed that in each and every week the attention towards lower ranking infants remained below than that of higher ranking infants. Throughout the study period average percent attention towards higher ranking infant and lower ranking infant were 27% and 14% respectively. So, the curve of attention indicated that higher ranking infant got higher priority than lower ranking infant during mothering in a social group. Similar pattern have been reported for vervent monkeys (Lee, 1984). Different treatment towards infant regarding attention have been reported to be due to dominance of the mother in *Macaca mulatta* (Tartabini and Bartachini, 1980).

12.3.3.2. Care and Interest :

All other activities appeared to be somewhat related to mothering non-mothers, for example care and interest were observed during the study period. Figure- 12.7 exhibited that non-mothers treated male infant and female infant differently. Similar

pattern of behaviour was also observed in true mother-infant association. The average percent interest and care towards female infant were 21% and 10.4% while towards male infants interest and care were 25% and 14.7%. So, non-mothers cared and nursed male infants more than female infants. It can be suggested that mothers as well as non-mothers treated female-infant in different ways from male infant (Rosenblum 1974). Simpson et. al., (1981) reported similar observation in red deer. It may be pointed out that mothering and non-mother activity were influenced by age, sex, birth order and maternal dominance as observed in vervet monkey by Lee (1984) and Lancaster (1972). So, independency of infant is directly correlated with the gradual decrease of parental investment.

12.3.4. Other Behaviour :

Some interesting and important activities were found besides mother- infant interactions and non-mother's activity during development and independence of the infant .

12.3.4.1. Loss of Infant :

During observation period six cases of infant deaths were recorded. The death of infants was possibly due to accident ; disease or immature birth. Though actual reason was not known. I witnessed one case which has changed subsequent social behaviour of a mother (Plate - 12.10). An adult female of a group was found busy to collect food separately while maintaining a dead infant at her chest. The infant died two or three days ago and decayed due to high temperature. The adult female hugged the infant with one hand carefully and moved around. One of my co-workers tried to separate the deceased body from the mother with a stick. She came towards us with vigorous speed and then fled away towards a high tree. The mother with deceased infant moved separately from other individuals of the group maintaining considerable distance. For the next day too mother was observed to carry her deceased infant with special attention.

Dodsworth (1914), Prakash (1962) noted females carrying infants long-dead and stated that it was difficult to dislodge them from their mothers. Similar observation was also reported by Mukherjee (1969) in rhesus.

12.3.4.2. Loss of Mother, Orphans and Adoption :

Loss of mother was also found during the study period due to runover by a car near 7th mile forest area and the infant of the victimised mother was of 7th to 8th week of age. After the mother's death the infant was half-heartedly adopted by an adult female of the group. The adopted infant was allowed into foster mother's lap where he got grooming and nursing. However, the infant became abnormal and disappeared from the group after some time.

Orphans under one year of age did not survive in free ranging baboons and Japanese macaques. Infants were observed to be adopted by pre-reproductive males and females (4 to 5 years of old) in Chacma baboons. But older infants were not adopted. In langurs adult males of the troop and sub-adults related to the infant after assumed caretaker of the orphans (Oppenheimer, 1976).

Factors influencing infant responses to loss of mother included previous maternal care, availability of acceptance, care givers and peer competition (Tanaka, 1990). Offspring of all ages tended to have stronger association with their mothers than any other individuals (Lee, 1981). Thus, with the death of mother the major associative pattern was not lost.

Table - 12.1 : Composition of groups A,B, C, D and E.

	A	B	C	D	E
Adult males	05	06	10	04	12
Adult females	12	18	20	08	27
Juveniles	04	04	07	02	08
Infants	07	08	10	04	15
Total	28	36	47	18	62

Table - 12.2 : Percentage of time spent in different spatial and postural states in mother-infant association.

Week	*NC	V-VC	V-L/DC	CO	FO	Pr
1.	100.0	100.0	04.4	---	---	---
2.	80.0	91.0	12.0	---	---	---
3.	66.0	84.0	28.0	08.8	04.8	07.2
4.	59.0	72.0	45.5	20.8	10.6	10.6
5.	58.0	65.0	58.0	25.0	30.0	10.0
6.	52.0	59.0	55.0	30.7	36.7	15.3
7.	50.0	55.0	50.0	35.0	38.0	23.0
8.	49.0	49.0	45.6	30.0	45.0	26.0
9.	48.5	45.0	42.0	28.0	51.0	29.0
10.	47.0	42.0	41.0	25.0	51.0	19.0
11.	46.0	41.0	40.0	23.0	54.0	17.0
12.	45.0	40.0	38.0	22.0	59.0	16.0
13.	44.0	40.0	36.0	20.0	55.0	14.0
14.	44.0	38.0	44.0	18.0	60.0	12.0
15.	45.0	35.0	40.0	17.0	64.0	11.0
16.	45.0	32.0	38.0	16.0	68.0	10.0
17.	40.0	30.0	30.0	14.0	70.0	08.0
18.	38.0	30.0	32.0	12.0	72.0	07.0
19.	35.0	25.0	30.0	10.0	74.0	05.0
20.	30.0	20.0	22.0	09.0	77.0	04.0
21.	25.0	15.0	18.0	08.0	80.0	03.0
22.	20.0	10.0	15.0	05.0	82.0	02.0
23.	22.0	06.0	17.0	04.0	83.0	01.9
24.	20.0	02.0	20.0	03.0	85.0	01.5

* Index : 'NC' = Nipple contact, V-VC = Ventro - ventral contact, V-L/DC = ventro lateral and ventrodorsal contact, CO = Contact off lap; FO = Far off, Pr = Proximity ; ' - ' = nil.

Table - 12.3 : Frequency of restraining, guarding, rejection, approaching-leaving by mother and leaving - approaching by infant of mother-infant association.

Week	*Res.	G	Rej	ApI	ApM	Li	LM
1.	---	---	---	---	---	---	---
2.	6.0	4.5	---	---	---	---	---
3.	12.0	7.2	---	---	---	---	---
4.	15.0	9.0	---	1.0	13.0	3.5	1.0
5.	10.2	6.0	---	1.0	2.3	2.0	1.0
6.	8.0	5.4	---	1.0	1.8	1.4	1.0
7.	5.5	4.8	---	1.1	1.5	1.0	1.04
8.	4.6	4.0	---	1.1	1.0	1.4	1.0
9.	4.0	3.6	1.5	1.4	1.0	1.5	1.0
10.	3.0	2.4	2.0	1.2	1.0	1.0	1.0
11.	2.5	2.0	2.5	2.1	1.0	1.5	1.0
12.	2.0	1.5	7.8	3.5	1.0	2.1	1.0
13.	1.5	---	3.0	1.7	1.0	1.0	1.0
14.	1.2	---	3.6	7.3	1.0	2.3	1.0
15.	---	---	4.2	3.0	1.0	1.2	1.0
16.	---	---	4.8	1.2	1.0	1.0	1.5
17.	---	---	6.0	5.6	1.0	1.5	1.0
18.	---	---	7.2	3.0	1.0	1.2	1.0
19.	---	---	7.8	5.7	1.0	1.5	1.0
20.	---	---	8.4	9.0	1.0	1.2	1.0
21.	---	---	9.2	1.8	1.0	1.5	1.0
22.	---	---	10.8	1.2	1.0	1.0	2.5
23.	---	---	11.5	9.0	1.0	1.5	1.0
24.	---	---	12.8	2.4	1.0	1.04	2.3

Index : Res. - Restraining , G- Guarding , Rej. - Rejection, ApI - Approaching of infant, ApM = Approching of mother, Li = Leaving of infant, LM - Leaving of mother.

Table - 12.4 Percent time spent by non-mothers of the group towards infants of low and high ranking mothers and male and female infants.

Week	Attention		Female infant		Male infants	
	*IDM	ILM	Interest	Care	Interest	Care
1.	10.0	05.0	---	---	---	---
2.	12.0	07.0	---	---	---	---
3.	15.0	10.0	---	---	---	---
4.	20.0	15.0	---	---	---	---
5.	25.0	20.0	---	---	---	---
6.	30.0	22.0	10.5	07.5	---	---
7.	55.0	38.0	15.0	13.5	13.5	09.5
8.	53.0	34.0	18.0	15.0	25.5	13.05
9.	50.0	32.0	22.5	16.5	29.0	20.0
10.	46.0	28.0	36.0	19.5	36.6	23.5
11.	41.0	25.0	46.5	16.2	43.5	25.8
12.	38.0	22.0	42.0	25.0	50.7	28.0
13.	35.0	15.0	37.5	12.6	53.7	28.5
14.	29.0	14.0	31.5	10.8	49.5	24.5
15.	28.0	12.0	28.5	07.5	42.6	22.5
16.	25.0	10.0	19.5	04.5	30.6	18.6
17.	24.0	09.0	13.2	02.4	26.0	16.8
18.	22.0	07.5	15.0	02.0	18.6	12.6
19.	20.0	05.4	17.4	01.8	12.6	09.0
20.	18.0	03.0	15.6	02.4	09.0	06.0
21.	14.0	02.4	13.8	01.2	06.6	01.2
22.	12.0	01.8	12.6	---	05.4	0.6
23.	10.0	01.2	10.5	---	03.6	---
24.	05.0	01.0	07.5	---	01.8	---

Index : IDM = Infant of dominant mother, ILM = Infant of lower ranking mother, ' - ' Nil

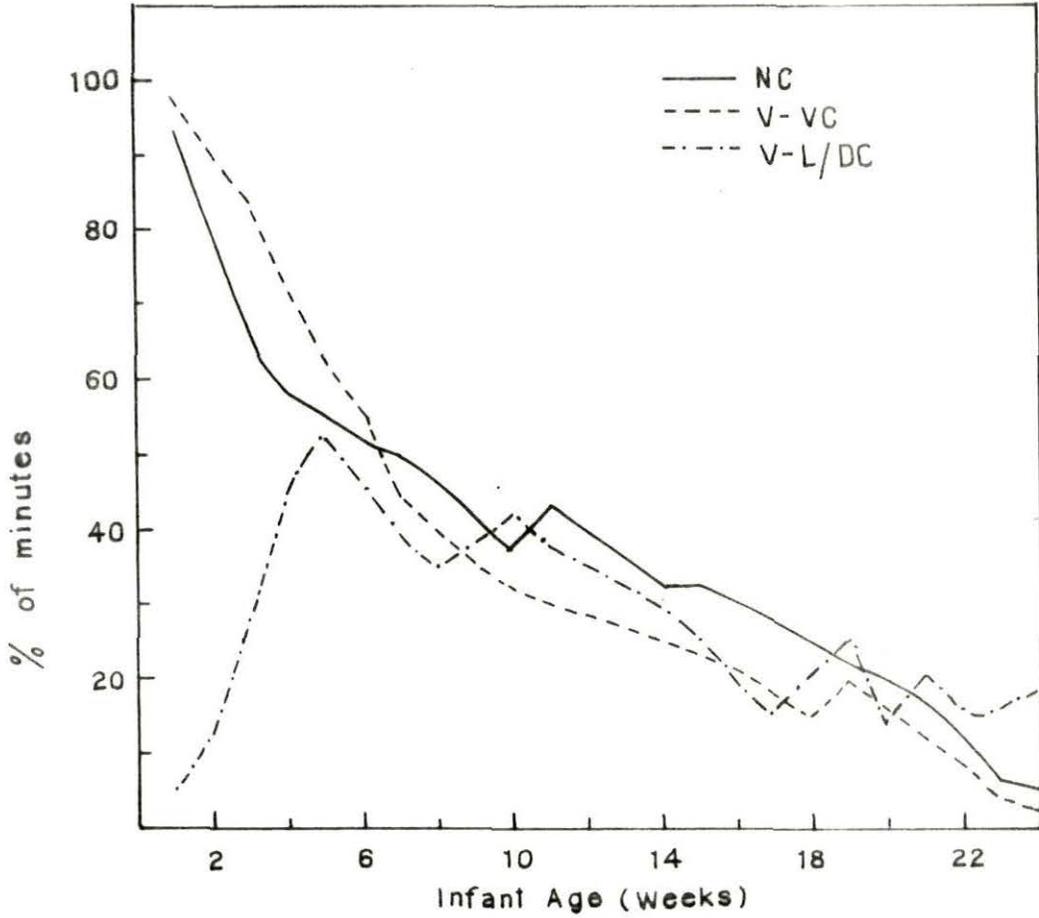


Fig.12-1. Percentages of time spent in nipple contact (NC) , ventroventral contract (v-vc) and ventrolateral-ventrodorsal contact (V-L/DC)

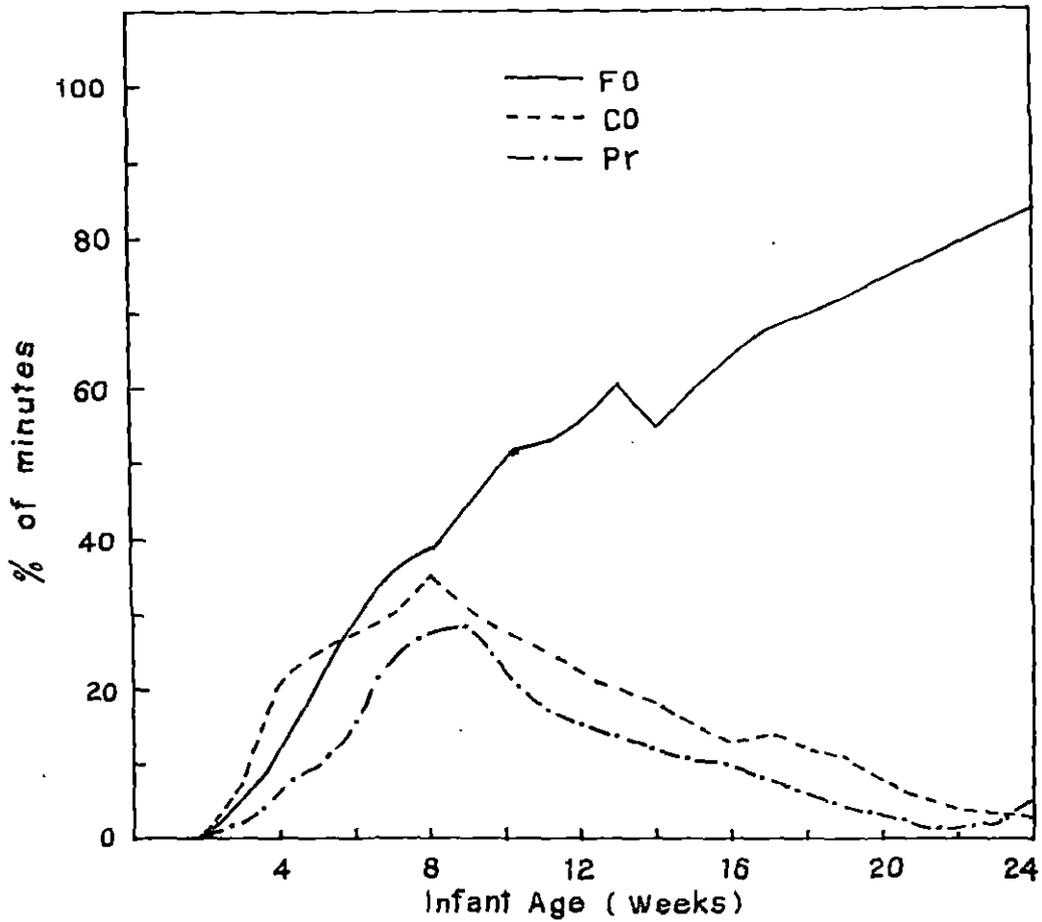


Fig. 12-2. Percentages of time spent in contact off lap (co), far off (FO) and proximity (Pr.)

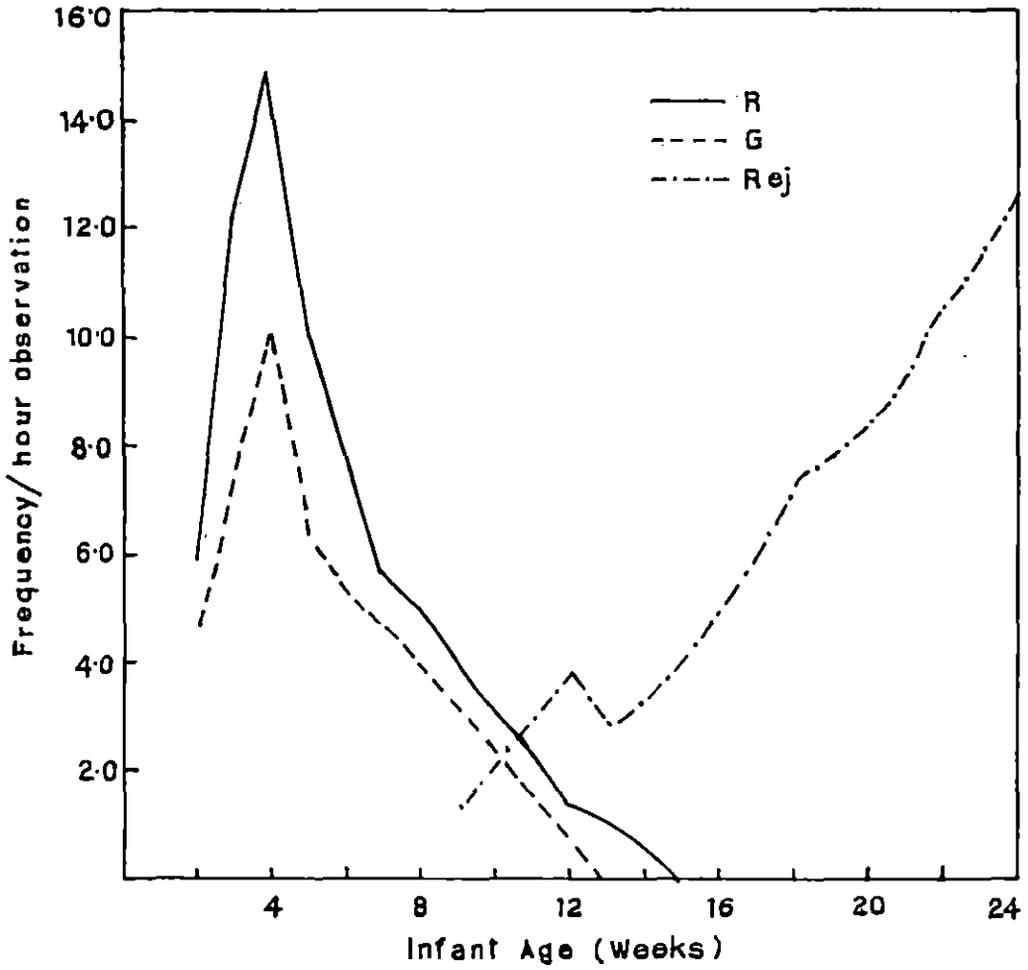


Fig. 12-3. Frequency of restraining (R), guarding (G) and rejection (Rej) of infant by mother.

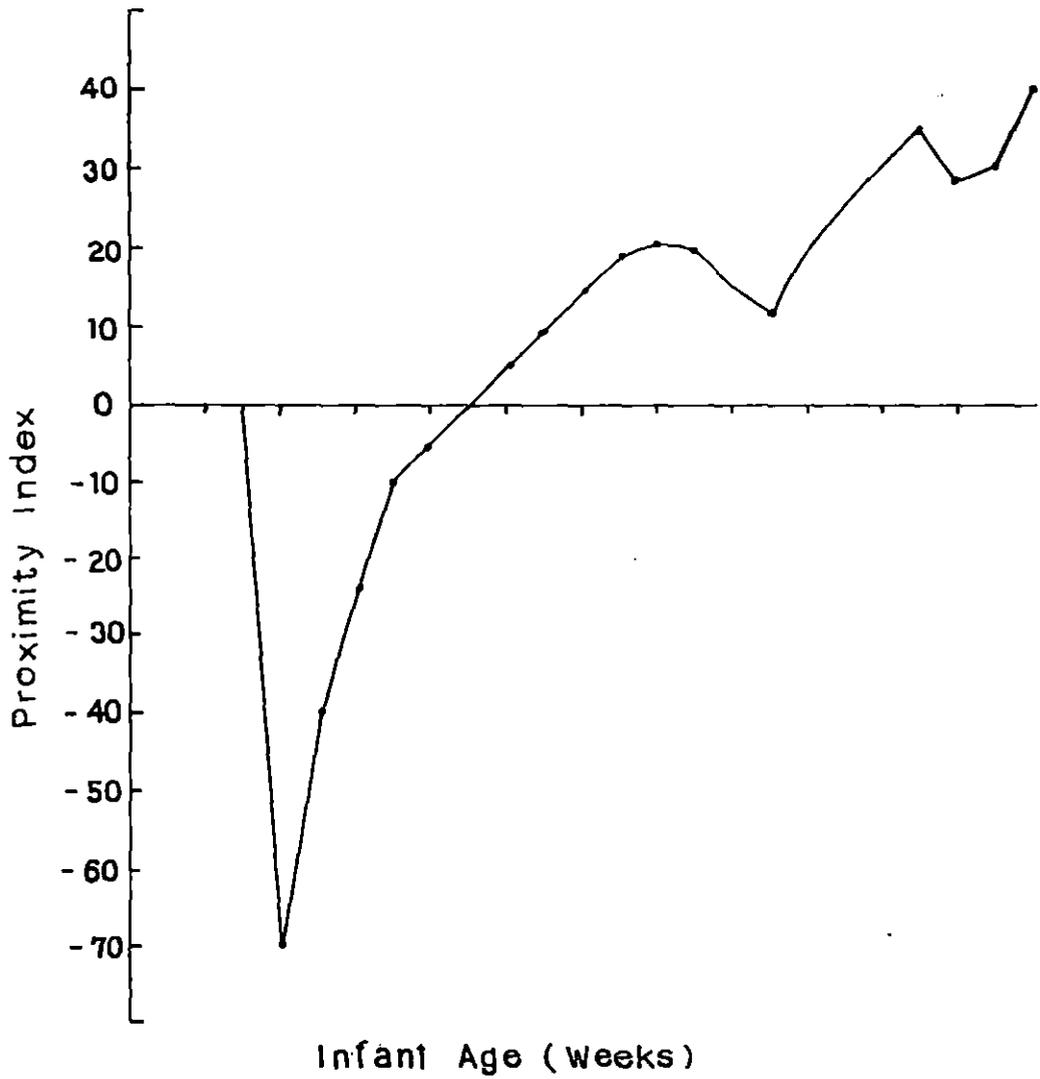


Fig. 12-4. Index of infant responsibility of proximity.

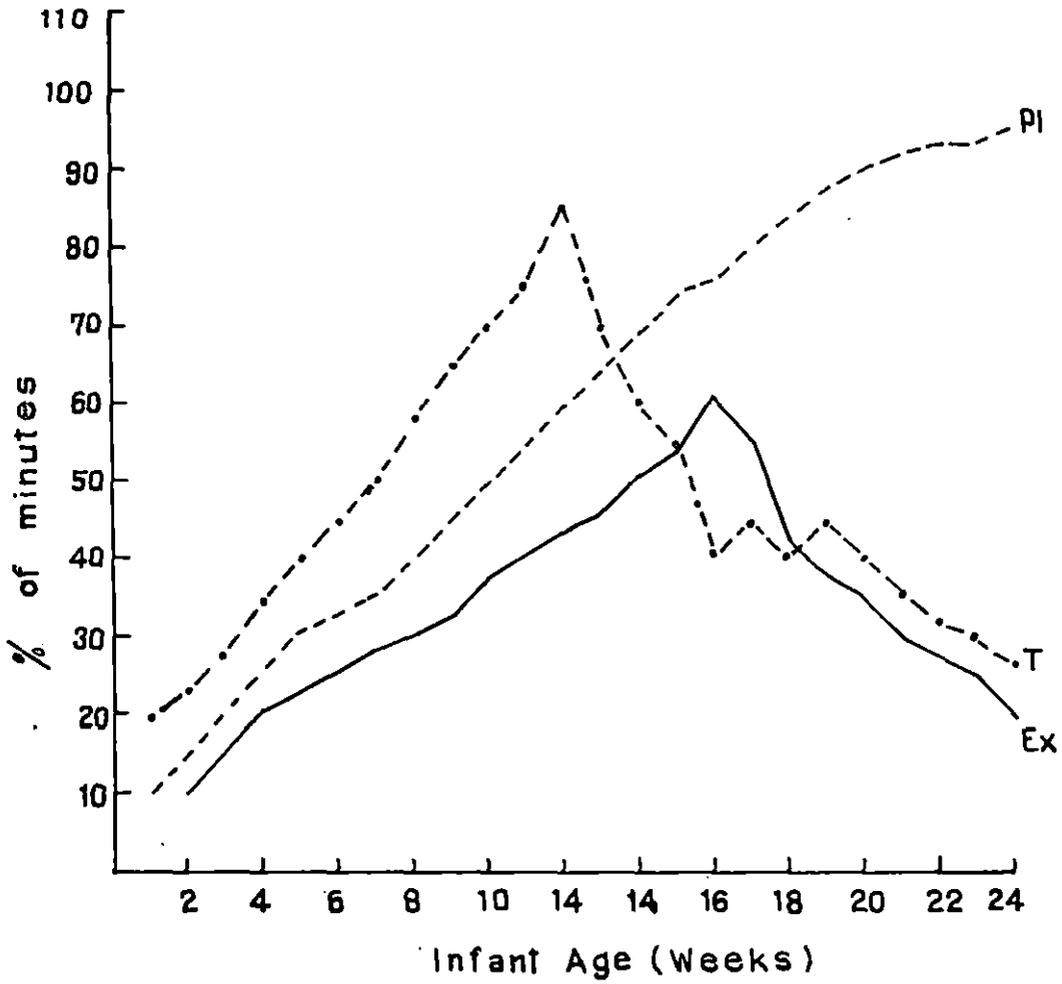


Fig. 12-5. Relative percentage of time spent in exploration(Ex), playing (Pl.) and travel(T) of infants.

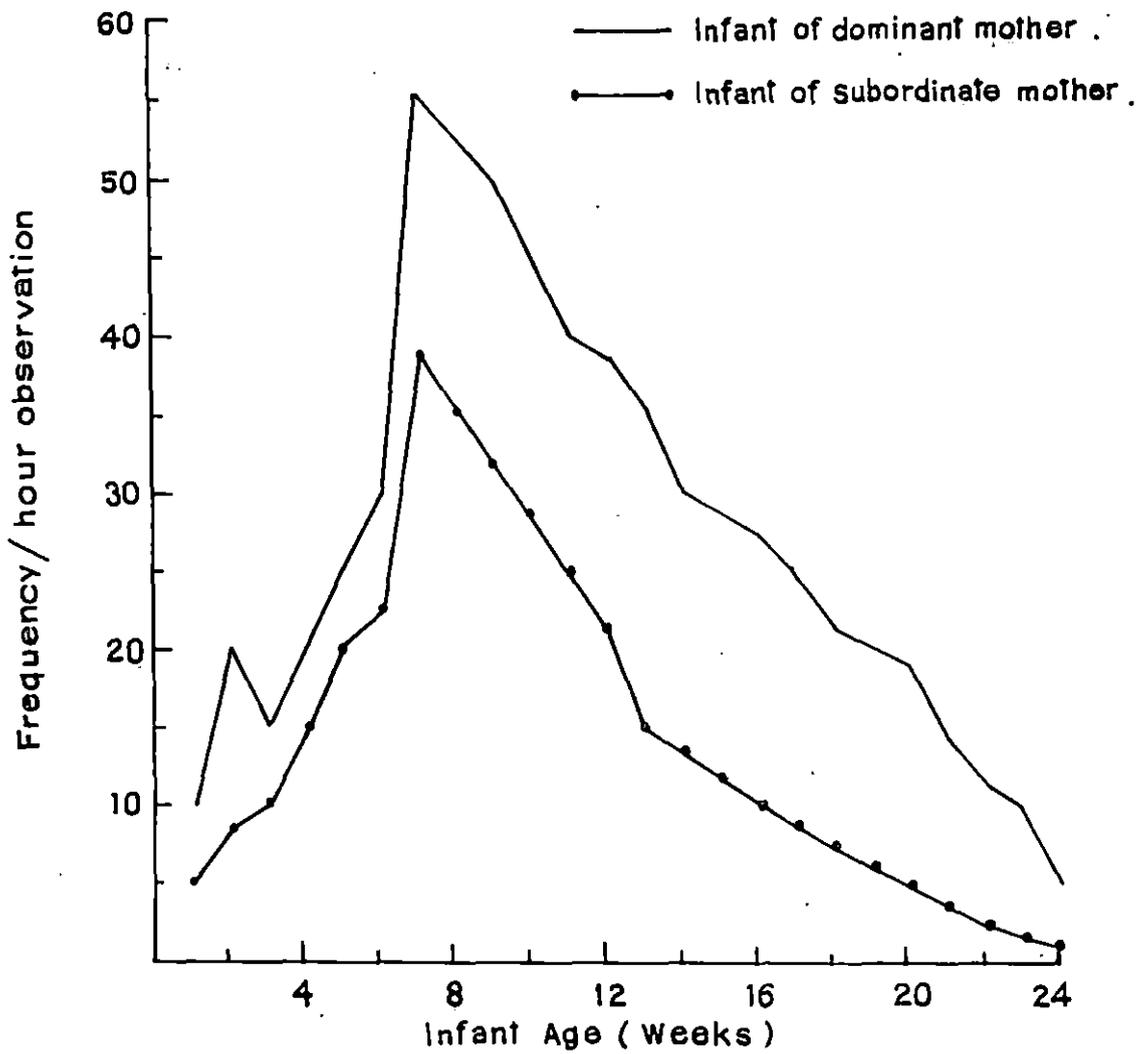


Fig. 12-6. Frequency of attention given towards infants of dominant and subordinate mothers by non-mother within a group.

Plate - 12.1 : Adult female encircling her newly infant. Arrow shows mother-infant physical contact. Some infants are out off mother's lap.

Plate - 12.2 : An infant sucking nipple of his mother. Arrow shows infants' nipple contact of mother. Some infants are out of mother's lap.

Plate - 12.3 : Guarding and protecting of an infant by his mother.



Plate – 12.1



Plate – 12.2



Plate – 12.3

**Plate - 12.4 : Rejecting of an infant through threatening by his mother.
Arrow shows running away infant.**

Plate - 12.5 : Play training of infants through telegraphic post and wire at river edge's forest. Arrow shows trainer juvenile on the top of post.

Plate - 12.6 : Independent upward and downward movement through telegraphic wire of infants.



Plate – 12.4



Plate – 12.5



Plate – 12.6

Plate - 12.7 : Independent swinging movement of infants.

Plate - 12.8 : Locomotion of rhesus infants on the ground at the morning period of a day.



Plate – 12.7



Plate – 12.8

Plate - 12.9 : An adult guarding strictly two infants of a group at a mid-day period.

Plate - 12.10 : An isolated adult female who has recently lost her infant on top of a telegraph post.



Plate - 12.9



Plate - 12.10