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Regressive Periods in Primate Behavioral Development with Reference to Other Mammals

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ABSTRACT. Studies on behavioral development in 12 species of monkeys indicate normal fluctuations of high frequency of nipple contact. These periods decrease in intensity as the infant develops and occur at similar times in development in the 12 species. Literature on 11 species of primates and three species of non-primates indicates similar regressions in mother-infant contact, which implies a common genetic basis for the phenomenon.

INTRODUCTION

Behavioral ontogeny has generally been described in terms of gradual undirectional changes (HARLOW et al., 1963; JENSEN et al., 1967): either a pattern of behavior emerges and occurs with increasing frequency until maturity, or infant behaviors gradually decrease and finally disappear. On the basis of my observations of primates and interpretation of patterns in development of other mammals, I believe that normal behavioral development is a series of stages of progressive growth followed by regressive periods. This idea has been briefly mentioned in psychoanalytic literature (GLOVER, 1956). In developmental studies of human infants GESELL (1939) has proposed a similar method of growth based on his findings of an interweaving of developmental periods of muscle flexion with muscle extension behaviors. "The organism at times seems to retreat from a locus of maturity which it had already attained." But the course of development spirals back, returning to a higher level of development from that which it had departed.

I use FREUD's definition of regression as "a return to a former phase of development" (FREUD, 1938). Regression in this paper specifically refers to the return to a high frequency of mother-infant contact, characteristic of the earliest period. I contend that the regressive periods, which appear to reflect an underlying emotional state, are common in mammalian development. Intensity of regression, as measured by frequency of certain behavior patterns, and the time of appearance of these periods, is affected by differences among individuals (SCHNEIRLA et al., 1963), subspecies (KING, 1963), and species (KAUFMAN & ROSENBLUM, 1969), as well as environmental factors (HANSEN, 1966; KLOPFER & KLOPFER, 1970).

OBSERVATIONS

Observations of infants of 12 primate species at Brookfield and Lincoln Park Zoos show clear evidence of regressive periods. Each individual was observed for 1- or

2-hour periods, generally at intervals of 3 to 15 days for a total of more than 1300 hours of observation. The behavioral measure used in this section is the amount of time the infant spends in contact with his mother's nipple.

Figure 1a shows that a young male spectacled langur, *Presbytis obscurus*, spent most of its time on the maternal nipple during the first month of life. During the next two months, it indulged in other activities, such as oral and manual exploration, scratching, and briefly moving short distances off the mother. By the third month it showed an initial regression to high nipple contact followed by a period of low nipple contact and frequent play. Successive regressive peaks occurred at 5 and 7 months. Other infant behaviors fluctuated in relation to nipple contact (e.g., periods of finger mouthing and play occurred in periods of low nipple contact) (HORWICH, 1974).

Two related Colobines, a male *Colobus guereza*, and a female *C. polykomos* were also studied (Fig. 1b). Although females other than the mother carried the infants and thus interferred with nipple contact, slight regressive peaks occurred 3–5 weeks earlier than in the langur. Change from natal to adult coloration in the *Colobus* also occurred earlier. These earlier peaks may indicate species differences within the Colobinae.

Data on mandrills, *Mandrillus sphinx*, baboons, *Papio hamadryas*, and a sooty mangabey, *Cercocebus atys*, show consistent regressive peaks at about 2, 4, 5–6, and 8 months (Fig. 2); the peaks are more apparent in certain individuals than in others. There is a general dampening effect so that each regressive peak is lower than the preceding one. These data seem to indicate consistency despite individual, gender, species, or situational differences. For example, in the two mandrills (Fig. 2a), though the peaks are similar, the situations were very different. The Brookfield infant (♂) had a primiparous mother who had been isolated from her mate after conception. The Lincoln Park infant (♀) was raised with an adult male (father) and a young adult female (sister). The regressive peaks are remarkably constant at 2, 3.5, and 5.5 months.

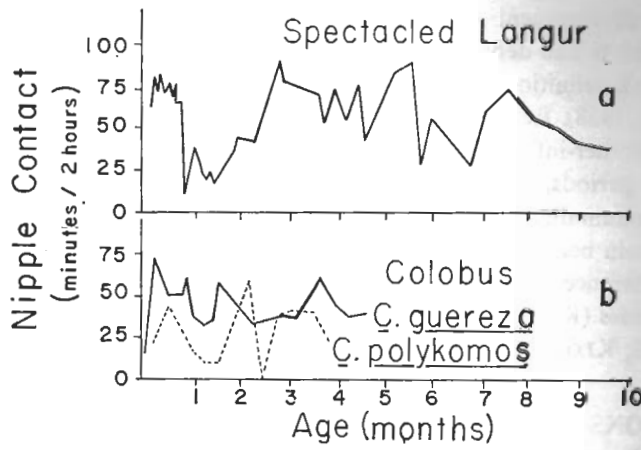

Fig. 1. Time spent on the mother's nipple as a function of age by three species of Colobinae. (a) Male spectacled langur, *Presbytis obscurus*; (b) Male *Colobus guereza* and female *Colobus polykomos*.

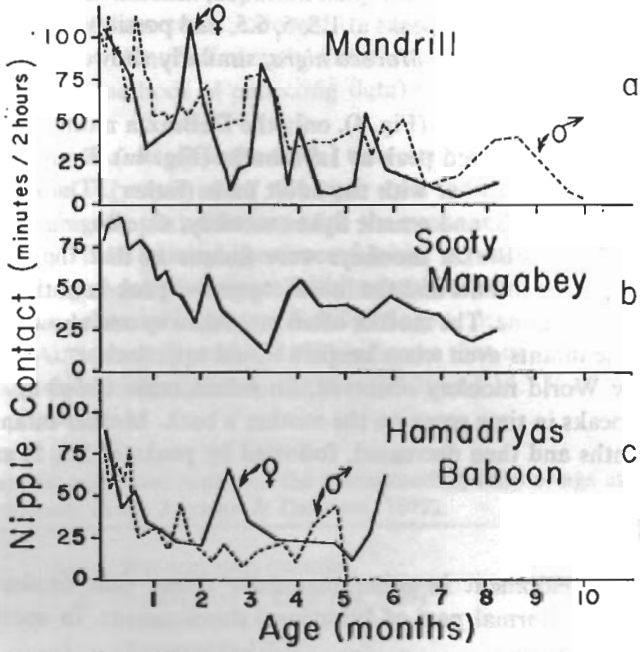

Fig. 2. Time spent on the mother's nipple as a function of age by three species of Cercopithecinae. **(a)** Male and female mandrill, *Mandrillus sphinx*; (b) Female sooty mangabey, *Cercocebus atys*; **(c)** Male and female hamadryas baboon, *Papio hamadryas*.

In contrast, the infant male and female hamadryas baboons were reared in successive years by the same mother and grew up in a cage with an old adult male (father) and three siblings. The graphs of nipple contact in these two siblings may indicate sexual or individual difference. The female's regressive peaks are both 1 month later than those of the male (Fig. 2c). One social difference that influenced the cessation of mother-infant contact in the infant male was that at 5 months the old male prevented the infant from returning to his mother. The mother did not retrieve her son at this age and nipple contact ceased abruptly.

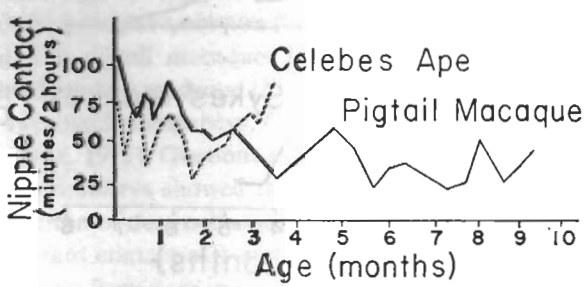

Fig. 3. Time spent on the mother's nipple as a function of age by two species of macaques, a female pigtail macaque, *Macaca nemestrina*, and a female Celebes black macaque, *Macaca nigra*.

Data on nipple contact in a female pigtail macaque, *Macaca nemestrina*, raised with conspecifics, exhibited regressive peaks at 1.5, 5, 6.5, and possibly at 8 months (Fig. 3). Data from a female Celebes ape, *Macaca nigra*, similarly showed peaks at 1.5 and 4 months.

Of the three species of guenons (Fig. 4), only the DeBrazza monkeys, *Cercopithecus neglectus*, showed a pronounced peak at 1.5 months (Fig. 4a). Both female and male were raised by the same mother with the adult male (father). The other guenons, a male blue monkey, *C. mitis*, and a male Sykes monkey, *C. albogularis*, showed lesser regressive peaks. The DeBrazza monkeys were unique in that the mother showed almost no interest in her infants and the initial regressive peak in both infants was due to the infant's actions alone. The mother often moved away and showed no protective actions toward the infants even when keepers would approach.

The only New World monkey observed, an infant male *Cebus apella*, exhibited large regressive peaks in time spent on the mother's back. Mother-infant contact was high until 2 months and then decreased, followed by peaks at 3.5, 5, and 7 months.

DISCUSSION

Literature on development in other mammals shows that similar regressional periods seem to be a normal part of behavioral development. In species for which

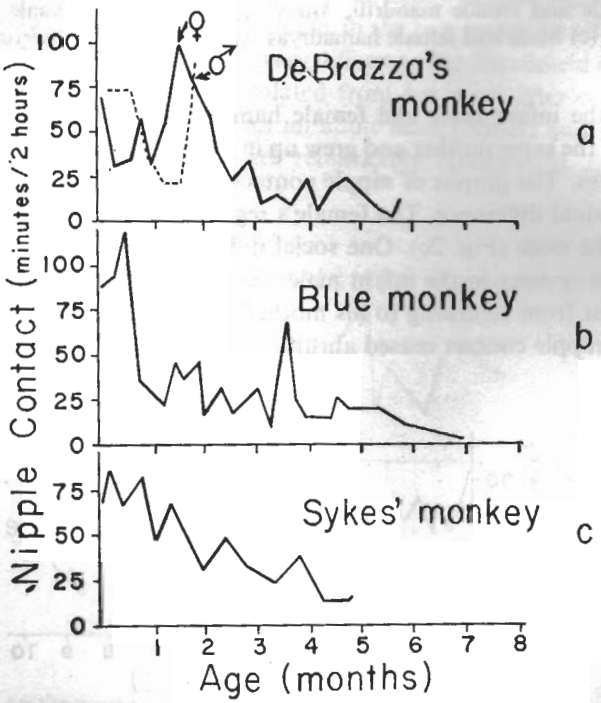

Fig. 4. Time spent on the mother's nipple as a function of age in three species of guenons. (a) Male and female DeBrazza's monkey, *Cercopithecus neglectus*; (b) Male blue monkey, *Cercopithecus mitis*; (c) Male sykes' monkey, *Cercopithecus albogularis*.

quantitative data on mother-infant contact are available, there are distinct periods of infrequent mother-infant contact followed by regressive peaks of high mother-infant contact. Although not identified as such, this phenomenon is evident in: (1) monkeys (despite the different methods of collecting data) (2) other primate species (3) non-primate mammals.

These regressive patterns differ in actual time scale between species. Thus in comparing species as in Figures 6 and 7, the time scale for each species was modified so that the initial regressive peak lined up with the peaks in the other species. Based on this modification, Table 1 shows the time of initial regressive peaks for each species studied. This arrangement of comparative time scales agrees with a comparison of the age of each species at sexual maturity. A ratio of age at first regression to age at sexual maturity (from ALTMAN & DITTMER, 1972) indicates that in all species except the rat, the initial regression occurs between the first 7.3% and 16.7% of the infancy period (Table 1).

Table 1. Age at first regressive peak and the corresponding ratio of age at first regression to age at sexual maturity (from ALTMAN & DITTMER, 1972).

	Age of first regression (months)		% of infancy at first regression
Rat	.5	(ROSENBLATT & LEHRMAN, 1963)	32.0
Cat	1	(SCHNEIRLA et al, 1963)	12.0
Dog	1	(RHEINGOLD, 1963)	14.8
Galago	1, 2	(DOYLE et al, 1969; ROSENSON, 1972)	7.5
Lemur	3	(KLOPFER & KLOPFER, 1970)	16.7
Monkeys	2–3	(ROSENBLUM & KAUFMAN, 1967; HORWICH, pers. obs.)	7.3
Gibbon	6–8	(BERKSON, 1966)	8.3
Chimp	10–12	(VAN LAWICK-GOODALL, 1967)	10.8
Human	18	(KUNST, 1948)	11.5

The measure of mother-infant contact in these studies varied with the species studied. For the rats, cats, and chimpanzees the measure of contact was nursing. For the macaques it was nipple contact and for humans it was finger-sucking. A measure of physical contact between infant and mother was also observed for dogs, galagos, lemurs, and a gibbon.

As examples of regression in monkeys, nipple contact in infant bonnet macaques, *Macaca radiata,* and pigtail macaques, *M. nemestrina,* show fluctuations (ROSENBLUM & KAUFMAN, 1967; Fig. 5). Despite lumping data of individuals with variable regressive periods which tends to obscure fluctuations, peaks occur in their data at 2, 4, 6.5, and 9 months in pigtail macaques (Fig. 5). These are comparable to peaks I observed in a female pigtail macaque (Fig. 4).

Additionally, two black mangabeys, *Cercocebus albigena,* showed a regressive peak at 1.5 months (HINDE, 1971). Guenons show less variation than other monkeys. Two *Cercopithecus mitis* monkeys showed the beginning of an increase of contact at 3.5 months at the cessation of data collection. Observations on five vervets showed slight peaks of mother-infant contact at 1 and 2.5 months (HINDE, 1971).

Figure 6, transposed from data in the literature, exhibits examples of regressions in other primates, a lemur, *Lemur catta* (KLOPFER & KLOPFER, 1970), a chimpanzee, *Pan troglodytes* (VAN LAWICK-GOODALL, 1967), and human infants (KUNST, 1948).

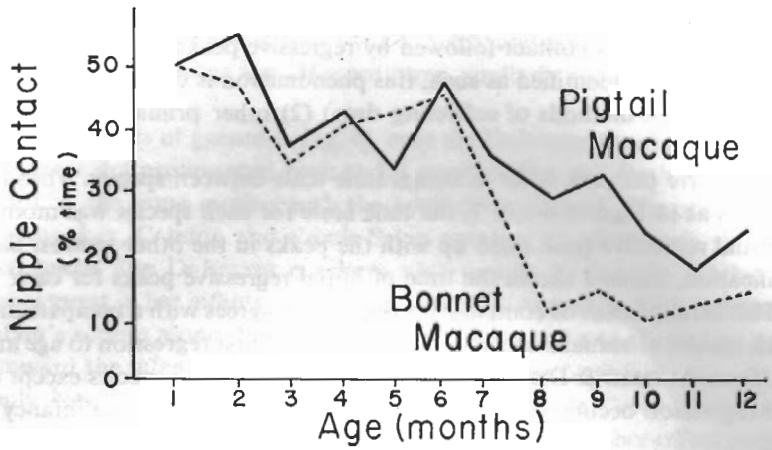

Fig. 5. Percentage of time spent on the mother's nipple as a function of age in two species of macaques, *Macaca nemestrina* and *Macaca radiata* (reconstructed from ROSENBLUM & KAUFMAN, 1967).

The time spent on its mother by an infant lemur increased to a natural regressive peak at 3 months (Fig. 6a). In addition, this same animal when subjected to a change to an outdoor cage immediately responded by maintaining a great deal of contact with its mother. The high level of contact dropped after a few weeks. Frequency of sucking bouts in a wild infant chimpanzee showed an increase after 6 months (Fig. 6b).

Finally, in consideration of non-primates, Figure 7 indicates the same tendency for regression. In the rat (ROSENBLATT & LEHRMAN, 1963), regressive periods in nursing occur at 0.5 and 1 month. In the dog (RHEINGOLD, 1963) a regression occurs at 1 month. In the rats it is clear that the cycle is related to both the mother's behavior and the infant's presence.

Data on dogs (Fig. 7b) are means for minutes of contact between mother and pups.

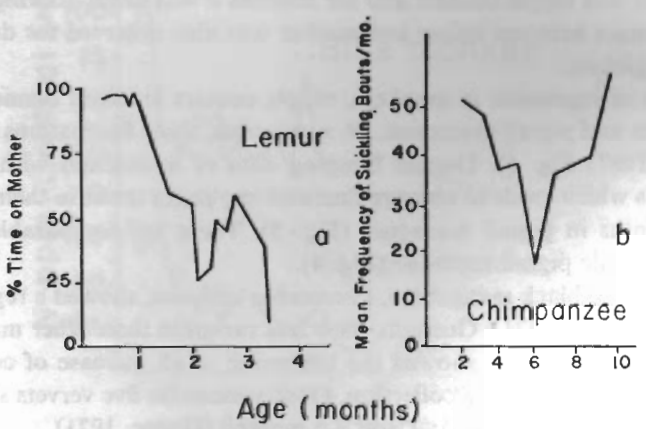

Fig. 6. Measures of sucking or contact as a function of age in two examples of primates. (a) Percentage of time spent on the mother in a female ringtail lemur, *Lemur catta* (reconstructed from KLOPFER & KLOPFER, 1970); (b) frequency of sucking bouts in a wild male chimpanzee, *Pan troglodytes* (reconstructed from VAN LAWICK-GOODALL, 1967).

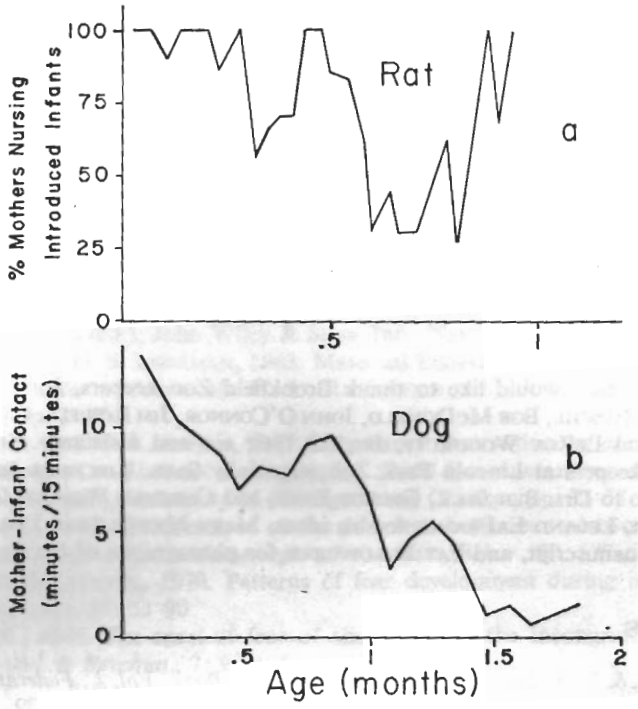

Fig. 7. Measures of nursing or contact as a function of age in two examples of non-primate mammals. (a) Percentage of female rats, *Rattus norvegicus*, nursing introduced infants (reconstructed from ROSENBLATT & LEHRMAN, 1963); (b) Minutes of mother-infant contact per 15 minutes in dogs, *Canis familiaris* (reconstructed from RHEINGOLD, 1963).

Each of the breeds studied showed regressions which varied in intensity and time of occurrence. Other measures of contact such as number of pups in contact with the mother, minutes of nursing, and numbers of pups suckling showed similar regressions.

CONCLUSIONS

What are the characteristics and meaning of these regressive tendencies? (1) They seem to be a general characteristic of development in many mammals which implies a common genetic base and also normality in development. (2) Mother-infant contact shows regressions that dampen as the infant develops. (3) Since the nipple functions as a security base in Old World monkeys and apes, regressive periods of nipple contact rest on graded emotional states of insecurity. (4) Although the precise occurrence of regressive periods may be determined by individual genetic variations, it is obvious that species and subspecies genetic variation, gender, and environmental conditions have an effect on the emotional state of the individual and presumably also on these regressive periods. (5) Regressive periods are more pronounced and evenly spaced during early ontogeny, possibly because fewer behavioral options are open to younger infants. Later regressive periods seem more spread out and not as intense and are perhaps more influenced by environmental stimuli and learning. External stimuli

would have a greater effect and might even cause abnormal fixations, as in FREUD's idea of regression in humans. (6) Critical periods and imprinting phenomena may be related to these peaks and depressions. (7) Due to the common occurrence of regressive periods in so many species, it makes intuitive sense that they are functional. They may stabilize the infant and prepare him for the next progressive period, or they may be a normal, healthy defense against specific environmental failure (WINNICOTT, 1958). (8) Examination of data on finger sucking (KUNST, 1948), fear toward strangers (SCARR & SALAPATEK, 1970; FREEDMAN, 1971; SCHAFFER, 1966), and anxiety (WHITING, 1954) in human infants reveals possible regressive periods in human development.

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