

SHORT COMMUNICATION**Do Rhesus Mothers Suggest Friends to Their Offspring?**

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ABSTRACT. Rhesus mothers (*Macaca mulatta*) may hold their own infant together with the infant of another female in a so-called double-hold. This behavior was observed 240 times in 23 individual females in two independent captive groups. Approximately nine out of ten times, the second infant was from a dominant matriline. It is suggested that females try to promote future association between their own offspring and high-ranking youngsters.

Key Words: *Macaca mulatta*; Mother-infant; Socialization; Development; Cognition.

OBSERVATIONS

Female rhesus macaques (*Macaca mulatta*) were observed to pick up another female's infant to hold it together with their own infant, resulting in a so-called *double-hold* (Fig. 1). Conceivably, double-holds may promote future social bonds in much the same way as early association in the presence of the mother may underlie the life-long kinship bonds of macaques.

Data on double-holding were collected in a brief preliminary study, in 1985, followed by a longitudinal study of female ontogeny, from 1987 through 1989. In the second study, 24 female infants were the subject of an intensive program of focal animal sampling and *ad libitum* observation from the day of birth to more than 1 year of age. Subjects were born into two captive groups of similar size (50-60 individuals) and composition, kept under identical conditions; DE WAAL and LUTTRELL (1985) describe one group and the living conditions.

Double-holding typically involved the performing female's own infant of less than 3 months, attached to the female's ventrum, and a straying infant of another female. The second infant's mother was usually at a distance when the interaction occurred; double-holds never resulted from a direct transfer of an infant between mothers. The double-hold itself lasted from several seconds to 10 min, and consisted of little else than a holding together (and sometimes carrying) of both infants in a ventro-ventral position. The holding female might groom the second infant or inspect its genitals. Other individuals, particularly immature females, often approached the scene. These individuals generally showed friendly behavior towards the infants (e.g. lipsmacking, baby-grunting). The mother of the second infant largely ignored the interaction; interferences by this mother were not observed.

Of the 240 observations of double-holding during the main study, 229 followed the above pattern. Exceptions were six instances in which a female picked up another female's infant first, after which her own infant joined the contact, and five double-holds not involving the

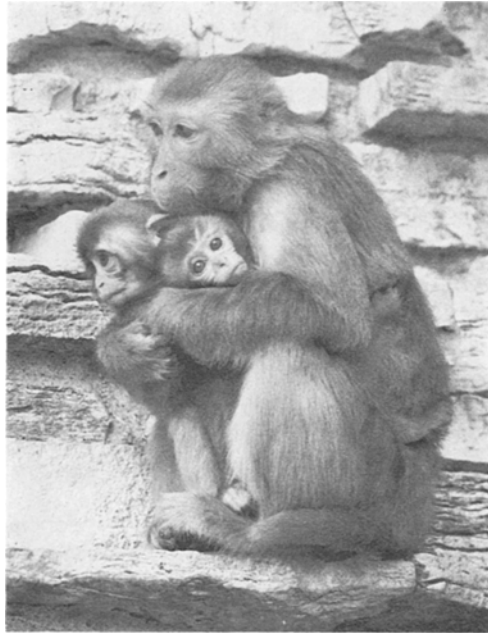


Fig. 1. A rhesus mother holds her own infant daughter (right) together with the infant son of a dominant female (Photo: F. DE WAAL).

performer's own offspring. Double-holds were observed in 21 different adult females as well as in two 3-year-old females. Although the phenomenon of double-holding has not been reported before, it can hardly be considered an isolated idiosyncrasy because of the large number of females exhibiting the behavior in two independent groups.

The following analysis tests the hypothesis that double-holding disproportionately involves infants of matriline ranking above the mother performing the double-hold. This hypothesis was based on the high proportion of such contacts in our preliminary study, with the most frequent double-hold triad being a socially climbing female, named *Tip*, holding her daughter together with the alpha female's daughter. *Tip*'s attempts at association with and recruitment of high-ranking non-relatives have been described in detail elsewhere (DE WAAL, 1989a). Similarly, SMALL (1989) describes an "ingratiating" strategy of a female Barbary macaque (*M. sylvana*) towards monkeys of high rank during a period of social upheaval. This also involved special attention to the newborns of these individuals, but no double-holds.

In contrast to the above studies, our main study occurred in the context of hierarchical stability. The 235 instances with a mother as the holder of two infants involved 65 different triadic combinations: 56 with an infant from a mother ranking above the double-holder, and 9 with an infant of lower descent (social dominance was measured by teeth-baring displays; cf. DE WAAL & LUTTRELL, 1985). This difference was in the predicted direction, yet a statistical evaluation requires a correction for the number of infants of different matriline available to each individual mother. In order to apply this correction, the analysis needed to be limited to 186 double-holds by the mothers of female infants (our ontogeny study was limited to female subjects). In addition to the predicted rank effects, possible effects of kinship and infant sex were investigated.

In this subset of the data, one female, named *Ropey*, was responsible for 61 % of the double-

Table 1. Double-holds by mothers of their own female infant with an infant of a matrilineally related vs. unrelated mother, with a male vs. female infant, and with an (unrelated) infant of a dominant vs. subordinate matriline.*

	<i>N</i>	Observed (%)	Expected (%)	Individual trend
Kin	186	6.5	3.8	5+, 5-
Non-kin		93.5	96.2	
Male	186	43.0	54.3	8+, 6-
Female		57.0	45.7	
Dominant	174	91.4	33.2	9+, 0-
Subordinate		8.6	66.8	

*The table compares observed relative frequencies with those expected on the basis of the available infants of each kind. Trends per individual mother are in the main (+) or opposite direction (-) of difference between observation and expectation. *N* is the total number of double-holds.

holds. She was followed by two females responsible for approximately 10% each, and ten females performing the remaining 19% of the instances. For each mother the number of available other infants of the same cohort (rhesus monkeys are seasonal breeders) was used to calculate the expected frequency of double-holds with (a) matrilineally related vs. unrelated infants; (b) male vs. female infants; and (c) offspring of unrelated females of dominant vs. subordinate matrilines. Observed and expected frequencies of double-holds were compared for each mother separately, as well as for all mothers combined after summation of individual expectations. The expected ratio of double-holds with dominant vs. subordinate infants was skewed largely because *Ropey* (see above) was 4th-ranking among the 20 adult females of her group (consequently, most infants available to her were of subordinate descent). For the same reason, the expected frequency of double-holds with related infants was rather low, as *Ropey* had no adult female relatives in the group.

The discrepancy between observed and expected frequencies in Table 1 was evaluated by a comparison of individual trends, i.e. the number of mothers for which observation and expectation differed in one or the other direction. This comparison excludes mothers showing no difference, or mothers to whom infants of only one kind were available (e.g. mothers of top- and bottom-ranking matrilines in the analysis of rank-effects). As can be seen, the effect of maternal rank was considerably stronger than the effects of sex and kinship. Only the rank effect was observed in a significant majority of individual mothers (Binominal test, $p = 0.002$, one-tailed).

At the proximate level, discrimination among infants according to maternal rank may be explained in various ways. One possibility is that infants of high-ranking females are less restricted, hence more available for contact (e.g. TARTABINI et al., 1980; SIMPSON & HOWE, 1986). Another explanation is that rhesus monkeys know to which female each infant in their group belongs. Experimental evidence for such knowledge in relation to juvenile offspring has been produced by CHENEY and SEYFARTH (1980) and DASSER (1988). In agreement with this explanation, double-holds occasionally appeared to be deliberately arranged. For example, the infant of the alpha female approaches an adult female. This female lipsmacks to and touches the infant, glancing repeatedly at her own infant which is playing with her peers at the other side of the pen, meters away. The female then rushes to her own offspring, picks her up, and brings her right back to the alpha's infant, performing a double-hold with the two infants.

If double-holds function to selectively promote future social bonds of one's offspring, the

almost exclusive interest in infants of higher-ranking matriline would be explained if association with dominants carried greater benefits than association with subordinates. The potential value of good relations with dominant individuals includes the receipt of tolerance at feeding sites and effective agonistic support (e.g. SEYFARTH, 1977; KUMMER, 1979; DE WAAL, 1989b). According to this hypothesis, we would expect monkeys to associate more frequently with peers with whom they have been held together as infants than with peers whom their mother ignored. Our study's purpose being the longitudinal observation of maternal influences on social development, this prediction will be tested when our subjects have grown up.

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