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POSTCONFLICT RECONCILIATION AND INTERACTIONS WITH THE THIRD INDIVIDUALS IN ANUBIS BABOONS

ABSTRACT: A study of post-conflict behaviour of aggressor and victim was performed in a group of anubis baboons at the Institute of Medical Primatology. The following three aims have been set: 1) the analysis of post-conflict interactions between the aggressor and victim; 2) the analysis of post-conflict interactions of aggressor and victim with the third individuals; 3) the analysis of post-conflict interactions of any third individual with an aggressor or a victim. The mean conciliatory tendency evaluated according to Veneema et al. *(1994) was 27.3±2.4 (n=47). The value of conciliatory tendency varied in different classes of conflicting dyads from 23.8 (male/female) to 27.9 (female/female). In most cases the reconciliation took place during the first two minutes after the termination of a conflict. In the class male/male the affiliation of former opponent males with other (third) animals occurred in the post-conflict observations approximately with the same frequency as during the matched-control period. Nevertheless, it was established that during the post-conflict period the males preferred to affiliate mostly with other males or to join to infants. The index of affiliation of opponent males with the third party – other males, was significantly higher than that of affiliation of males with females. It was established that in the class female/female the index of affiliation of aggressors with any third animal was higher than that of victims; it is an evidence of a stronger motivation of females-aggressors to affiliate with third party during the post-conflict period. Females-aggressors preferred to join to other females, and females-victims picked out the males for consolation and support. Only the males actively performed a role of comforters of participants in conflicts; as a third party the males affiliated with the females-victims.*

KEY WORDS: Anubis baboons – Reconciliation – Affiliation – Consolation

INTRODUCTION

The behaviour of post-conflict reconciliation expressed as an increased rate of affiliative contact between the former antagonists has been described in many species of primates: the vervet monkey *Cercopithecus aethiops* (Cheney, Seyfarth 1989), the patas monkey *Erythrocebus patas* (York, Rowell 1988), the rhesus macaque *Macaca mulatta* (de Waal, Yoshichara 1983), the long-tailed macaque *Macaca fascicularis* (Aureli *et al.* 1989, Cords 1988), the stumptail macaque *Macaca arctoides* (de Waal, Ren 1988), the pig-tailed macaque *Macaca nemestrina* (Judge 1991), the chimpanzee *Pan troglodytus* (de Waal, van Roosmalen 1979) and bonobos *Pan paniscus* (de Waal 1987). A dramatically increased tendency to reconcile fights in juveniles rhesus monkeys as a result of their exposure to a more conciliatory model species, the stumptail macaques, was established (de Waal, Johanowicz 1993). There are several versions of this behaviour explanation. According to one of them reconciliation behaviour is regarded as serving the function of repairing of relationships between the opponents (de Waal, van Roosmalen 1979). As it was proposed by Aureli *et al.* (1989) reconciliation also leads to a reduction of an acute stress of the members of conflict.

They observed a reduction in scratching rate after reconciliation as well as a reduction of the reoccurrence of aggression. It is possible to suggest the existence of other variants of behaviour in conflict participants, directed to elimination of stress. Affiliation of conflict participants with the other (third) animal might be considered as an alternative strategy. The affiliation of any third individual with participants of a conflict may have the same function.

The goal of investigation was the study of post-conflict behaviour of semi-free-ranging anubis baboons (*Papio anubis*). The following three aims have been followed: 1) the analysis of post-conflict interactions between the aggressor and victim; 2) the analysis of post-conflict interactions of aggressor and victim with the third individuals; 3) the analysis of post-conflict interactions of any third individual with an aggressor or a victim.

MATERIAL AND METHODS

The data were collected in 1999–2001 on a group of anubis baboons (*Papio anubis*) at the Institute of Medical Primatology. The baboons were housed in a standard type corral in an area of 600 m^2. Standard pellet food and vegetables were provided once a day, but not during the hours of observation. Water was available ad libitum. During the observational period the group included 5 adult males, 19 adult females and about 30 juveniles and infants. The adult males and females were transported from their natural habitat in 1997, the juveniles and infants were born in the corral. The group size ranged from 39 to 51 during the study.

Observations took place between 10.00 and 19.00. The all occurrence sampling (Altmann 1974) was used, as well as the method of observations of post-conflict behaviour developed by de Waal and Yoshihara (1983). Post-conflict observations of 5 minutes duration were performed, starting right after the termination of the conflict. The aggressive interactions used to mark the beginning of post-conflict observations included only contact aggression and chase. The sampling was performed with the interval of 15 seconds. The behaviour of 2 focal participants of conflict – the aggressor and the victim has been observed simultaneously. We recorded social interactions of aggressor and victim, distance between aggressor and victim, the identity of their social partners (third individuals) and scratching. Affiliative social behaviour includes "grooming", "sitting in contact", "embrace", "hand touch", "playing", mounting", "genital present", "genital inspection", "inspection of female's infant", and "males' greeting". Infants under 12 months were excluded as subjects of focal observations.

The next day, a matched-control sample was taken at the same time. The aggressor and the victim were followed using the same procedure.

The analysis of the data included the comparison of post-conflict and matched-control observations. The dyads of aggressor/victim, in which the affiliation during the post-conflict period have been registered earlier than during the matched-control period, were considered as attracted ones. The dyads of aggressor/victim, in which the affiliation during the matched-control period occurred earlier, were considered as dispersed ones. And finally, the dyads in which the affiliation during the post-conflict and matched-control observations took place at the same time, or did not take place at all, were considered as neutral ones. The data were used for calculation of percent of attracted pairs as well as for calculation of conciliatory tendency by formula a–d/a+d+n (Veenema *et al.* 1994). Depending on sex of aggressors and victims, the analysis was performed according to 3 classes of conflict dyads: male/male, male/female, female/female.

This method of comparison was used for the analysis of post-conflict interactions between the participants in conflicts and any third individuals, too. Depending on the time when the affiliation of conflict participants with the third individuals took place, the attracted, dispersed and neutral dyads of the aggressor/third animal have been identified as well as the analogous dyads of victim/third animal. Using the same procedure the attracted, dispersed and neutral dyads of third animal/aggressor have been identified, as well as attracted, dispersed and neutral dyads of third animal/victim. Finally, the index of affiliation of focal animal with third animal was calculated according to formula a–d/a+d+n as well as the index of affiliation of third animal with focal animal. The identification of the third individual in all the cases was performed for three categories of animals: male, female, infant under 12 months.

The quality of relationships of the individuals was evaluated on the basis of frequency of grooming between the animals. Taking into account the extremely rare cases of "grooming" between the males, the quality of their relationships was evaluated on the basis of the analysis of a total number of affiliative interactions, including a rare "grooming", "greeting" and "play".

The hierarchical status of animals was evaluated using the analysis of supplement and avoiding in each dyad.

RESULTS AND DISCUSSION

General characteristics of aggressive interactions and post-conflict behaviour of anubis baboons

During the whole observational period we observed 1,225 conflicts in total. In most cases (92%), the conflicts looked like one-way directed aggression. As a whole, the group was characterized by a rather high level of contact aggression, which took place in 41% of cases of the conflicts observed. Nevertheless, there was a great variation in the level of contact aggression in different categories of animals depending on their sex and age. Particularly, of a total number of 112 aggressive interactions between the adult males, the contact aggression occurred in only

15 cases (12%). Most of the conflicts (85%) occurred in dyads of animals and included only 2 individuals. In the rest of cases the aggressive intervention of the third animals took place; in 61% of the same cases the third animals supported the victims and in 39% the aggressors. The aggressive support of victims was performed in 60% of cases by adult males; the relatives supported the victims only in 10% of cases. Adult males aggressively supported the aggressors in 30% of cases, and related animals in 3% of cases.

Post-conflict behaviour of aggressor and victim had been observed after 364 conflicts. In 127 cases a dyad – aggressor and victim was identified as an attracted one; in 25 cases as dispersed, and in 212 cases – as neutral. The attracted dyads accounted for 34.8% of all the dyads in a group, and the mean conciliatory tendency (Veenema *et al.* 1994) was 27.3±2.4 (n=47). The aggressor and victim joined significantly earlier during the post-conflict observations than during the matched-control period (Vilcoxon test: N=32, T=528, P<0.001). The aggressor and victim affiliated significantly more often during the first 2 minutes after the conflict, then during the subsequent 3 minutes (chi-square=32.5, d.f.=1, P<0.01). The time when the affiliation of aggressor and victim took place during the post-conflict period significantly differed from that during the matched-control period (Kolmogorov-Smirnov test: m=138, n=29, d max=0.287, P<0.05).

As a whole, the conciliatory tendency in anubis baboons could be considered as "moderate" in comparison with other species of monkeys. It is greater than the conciliatory tendency in vervet monkeys, similar to that in pigtail macaques but smaller than that of stumptailed macaques.

Post-conflict behaviour of males

In class male/male post-conflict behaviour has been registered in 44 cases. Eleven pairs were attracted (25%) and 33 – neutral. The mean conciliatory tendency for this class of dyads was equal 26.3±5.6 (n=14) and was close to a mean reconciliation index for a group. In 54.5% of cases reconciliation was initiated by victims. The reconciliation occurred during the first 2 minutes after the termination of conflicts significantly more often than subsequently (Vilcoxon test: N=8, T=38, P<0.01). The time of their first affiliation during the post-conflict period was significantly different from that during the matched-control period (Kolmogorov-Smirnov test: m=11, n=0, d max=1.0, P<0.001). During the reconciliation of males different forms of "greeting" were most common (33.3%), "playing" occurred in 25% of cases.

The affiliation of former opponent males with other (third) animals occurred in post-conflict observations with approximately the same frequency as during the matched-control period. The mean index of affiliation of males, with any third animal (which has been considered without division of males, females or infants) was 2.3. The third individuals relatively rarely affiliated with former opponent males. The mean index of affiliation of any third animal with the aggressor male was equal to 10.3, and with victim male –25.3. It was established that males – victims are characterized with significantly higher index of affiliation with the third animals as compared with the index of affiliation of the third animals with victim males (Vilcoxon test: N=12, T=69.5, P<0.01).

It was established also that the males, which were the participants in conflicts with other males, interact in post-conflict period predominantly with other males to get the support, or join to infants. The mean index of affiliation of former opponent males with the third animals – other males was equal to 10.1, with infants was 1.4, with females – 16.7. The index of affiliation of opponent males with the third animals – males is significantly higher than that of affiliation of males with the third animals – females (Vilcoxon test: N=10, T=50, P<0.05).

Significant differences have been found between the index value of affiliation of the third animals – friendly males with former opponent males and the index value of affiliation of the third animals which were not friendly ones (Vilcoxon test: N=7, T=23.5, P<0.05). Besides it was found that the index of affiliation of the third animals – high rank individuals with former opponent males, is significantly higher than that of low rank individuals (Vilcoxon test: N=8, T=33, P<0.05).

Post-conflict behaviour of males – participants of conflicts of a class male/female has been observed in 106 cases. The percent of attracted dyads in this class was 34.0%; mean reconciliation index (23.8±3.7, n=41) was the lowest as compared with the other classes. Nevertheless, the conciliatory tendency in class male/female did not differ significantly from the conciliatory tendency in class male/male (Mann-Whitney test: W=338.5, m=14, n=30, z=0.60, P>0.05) as well as from the index of reconciliation in class female/female (Mann-Whitney test: W=1165, m=30, n=41, z=1.00, P>0.05) Affiliation of male aggressor and female victim took place significantly earlier in post-conflict observations than during the matched-control periods (Vilcoxon test: N=32, T=528, P<0.001) and it also occurred predominantly during the first 2 minutes after the conflict's termination. In such conflicts males were more seldom the initiators of reconciliation than females (correspondently 47% and 53% of all cases). Such patterns as "genital inspection", "mounting", and "inspection of victim's infant" were typical for the males during the reconciliation with females.

The mean index value of affiliation of aggressor males, belonging to the class of conflicting dyads male/female with third animals, was –7.3. The males affiliated with the third animals significantly earlier during the matched-control period than during the post-conflict period (Vilcoxon test: N=10, T=43.5, P<0.05). Analogously, the third animals significantly earlier affiliated with the males, which were the initiators of aggression directed towards the females, during the matched-control period than during the post-conflict period (Vilcoxon test: N=10, T=48.5,

P<0.05), i.e. they preferred to contact with the aggressor males in a quiet situation during the matched-control period, but not immediately after the conflict.

Aggressive interactions in which the female was the aggressor and the male was a victim, are relatively rare in anubis baboons. So we have observed only 14 cases of post-conflict behaviour in the same dyads.

Post-conflict behaviour of females

Post-conflict behaviour of females has been observed after 200 conflicts of class female/female and after 106 conflicts of class male/female. For the class female/female the rate of attracted dyads was 37.5%, the mean conciliatory tendency was equal to 27.9±3.2 (n=30). The conciliatory tendency in class female/female did not differ significantly from that in class male/male (Mann-Whitney test: W=1165, m=30, n=41, z=1,00, P>0.05). The former opponent females significantly earlier affiliated with each other during the post-conflict period than during the matched-control period (Vilcoxon test, N=19, T=190, P<0.001). Most of reconciliation cases (73%) occurred during the first two minutes after the termination of conflicts (chi square=16.4, d.f.=1, P<0.01). The initiator of reconciliation most often was the victim, though the differences between the aggressors and the victims in this respect did not attain the level of significance. The former opponent females used for reconciliation such behaviour as various forms of "inspection of the infant of an opponent monkey" (24.8%), "sitting in contact" (9.2%), "genital inspection" (9.3%). Significant differences in the repertoire of conciliatory behaviour of females – the aggressors and the victims had been found (chi-square=43.7, d.f.=9, P<0.001). The aggressors most of all used for reconciliation the patterns of behaviour directed towards the infant of opponent female, while the victims often demonstrated for reconciliation such pattern as "genital present".

It is interesting that in our anubis baboons the rate of reconciliation was very similar in different classes of conflicting pairs. The minimal mean conciliatory tendency was found in class female/male (23.8), intermediate – in class male/male (26.3) and maximal (27.9) was found in class female/female. In this respect the level of reconciliation of anubis baboon differs from the characteristics of Guinea baboons (Petit *et al.* 1996) and is mostly similar to that of Crested macaques with their "homogenous" conciliatory tendency.

Analysis of affiliation of former opponent females with the third animal, irrespective of the category to which they belonged, has shown that the rate of attracted pairs "aggressor/third animal" was 42.0%, and that of the dyads "victim/third animal" was 25.4%. The mean index of affiliation of aggressors with the third animals was 4.6, for victims –18.1. It was established that the index of affiliation of aggressors with the third animals was significantly higher than that of affiliation of victims with the third animals (Vilcoxon test: N=25, T=249.4, P<0.05); it is an evidence of a stronger motivation of females-aggressors to affiliate with the third party during the post-conflict period. Besides it was found that aggressors and victims are characterized with different preferences in choosing the third party for consolation. Females–aggressors showed the highest mean index of affiliation with the third party – the other females (11.1), as compared with a lower index of affiliation with males (7.9), and the lowest was the index of affiliation with infants as the third party (–0.4). At the same time females – the victims showed the highest mean index of affiliation with the third party – the males (12.4), index of affiliation with infants was lower (–10.6), and the last to which they addressed for consolation and support were the females (–22.6). The index of affiliation of females-aggressors with the third animals – the females was higher that for females-victims (Vilcoxon test: N=25, T=281.5, P<0.01). Besides, the index of affiliation of females-victims with the third animals – the males, was significantly higher than that of females-aggressors (Vilcoxon test: N=25, T=281.5, P<0.01).

Similar to that was the behaviour of females – victims after the conflicts with males-aggressors; they preferred to affiliate first of all with the other males and the infants of other females. The last to which they wanted to join looking for consolation were the other females.

Analysis of affiliation of the third party with the females–victims has shown that males – third animals significantly earlier affiliated with females-victims during the post-conflict period than during the matched-control observations (Vilcoxon test: N=15, T=97, P<0.05). It means that the males actively performed the role of comforters of females – the victims of conflicts. On the contrary, the third animals – the females affiliated with the females-aggressors significantly earlier during the matched-control observations than during the post-conflict period (Vilcoxon test: N=21, T=173, P<0.05). They preferred to interact with females-aggressors in quiet situation.

Comparison of behavioural repertoire of females directed towards the third animals during the post-conflict and matched-control period shows significant changes in females – aggressors (chi-square=22.3, d.f.=11, P<0.05) and in females-victims (chi-square=29.5, d.f.=10, P<0.01). In females-aggressors these variations were expressed as an increase of frequency "sitting in contact" with the third animal and grooming during the post-conflict period. The behaviour of victims during the post-conflict period was characterized with an increased "sitting in contact", "embrace" and sharp increase of "genital present". Significant differences have been noted in the frequency of behavioural elements used by aggressors and victims during the affiliation with the third party in post-conflict period (chi-square=28.0, d.f.=11, P<0.01).

The interactions of third party with the females – aggressors were characterized also with significant variation in the frequency of different elements of behaviour (chi-square=35.6, d.f.=9, P<0.001). It was evidenced by the increase of frequency of "genital present" of the third animal to aggressor females as well as by the

increase of grooming frequency of aggressor females by the third party. Victim females also showed significant variations in frequency of occurrence of different behavioural patterns directed to them by the third party during the post-conflict and matched-control period (chi-square=34.7, d.f.=9, P<0.001). It was mostly associated with increasing of frequency of "sitting in contact" and "inspection of female's infant".

CONCLUSIONS

1. Anubis baboons are characterized with a moderate mean conciliatory tendency (27.3).
2. A similar conciliatory tendency has been found in different categories of conflicting dyads. The minimal mean significance of conciliatory tendency was shown for the dyads "male/female"(23.8); the maximal significance was found in the dyads "female/female" (27.9).
3. The males, irrespective of their role in the conflict, preferred to join to the third animal – another male or an infant.
4. Females-aggressors significantly more often affiliated with third party – other female; females-victims significantly more often affiliated with a male as a third party.
5. Only the males actively performed the role of comforters of participants of conflict; as a third party they affiliated with the females – victims of conflicts.

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