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SHORT COMMUNICATION

Patterns of Reconciliation Among Captive Gelada Baboons (*Theropithecus gelada*): A Brief Report

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ABSTRACT. Animals that live in groups are frequently exposed to conflict situations and must in some way maintain group cohesion. One mechanism that appears to restore social relationships after they have been disrupted by conflict is *reconciliation*. This study investigated reconciliatory behavior in the gelada baboon, *Theropithecus gelada*. The subjects were 11 adult geladas, housed in a large outdoor enclosure at the Bronx Zoo/Wildlife Conservation Park, New York. Five-minute focal animal samples following spontaneous aggression were compared with 5-min matched-control samples. The results of this study were: (1) geladas reunited in a friendly way after aggression; (2) former opponents were attracted to one another rather than dispersed from one another after a conflict; (3) most post-conflict reunions occurred within the first 2 min of the post-conflict period; and (4) geladas do not have any specific types of behavior associated with post-conflict reunions as do chimpanzees and macaques. The results of this study support the hypothesis that gelada baboons reconcile after aggression.

Key Words: Gelada baboons; Reconciliation; Post-conflict behavior; Aggression.

INTRODUCTION

Many primates appear to have mechanisms to cope with conflict within social groups. One such mechanism is *reconciliation* (e.g., AURELI, 1992; CORDS, 1992; DE WAAL, 1986, 1989, 1993), recognized by DE WAAL and VAN ROOSMALEN (1979) as non-agonistic contact between two opponents shortly after a conflict. Reconciliation appears to restore relationships after they have been disrupted by a conflict (AURELI et al., 1989; AURELI & VAN SCHAİK, 1991; CORDS, 1992). The aim of this study was to determine whether captive gelada baboons, *Theropithecus gelada*, reconcile after aggression.

METHODS

This study took place between October 1993 and May 1995, totaling 122 hrs over 31 days. The subjects were 11 adult gelada baboons, comprising two one-male units (Groups "A" & "B"), housed in a large outdoor enclosure at the Bronx Zoo/Wildlife Conservation Park, New York. Each of the two units had at least two females and no more than five females at a time. One female, CIS, was peripheral to Group B for most of the study period (October 1993 – November 1994) and was then successfully integrated into Group A (after

the death of its alpha female and removal of two other females) for the remainder of the study period (April – May 1995). All animals were born in captivity and were aged between 3 and 19 yrs in 1994. The only individuals that were known to be related were two pairs of females, *AR* and *BR* (siblings), and *CIS* and *BU* (half-siblings). In 1995, the individuals were regrouped for breeding purposes, and many of the pairs of individuals observed in this study were no longer in the same unit. Subsequent to these changes, the study was terminated.

With a few modifications, I used the observational procedure of DE WAAL and YOSHIHARA (1983). I defined an agonistic interaction as a vocal, visual, or tactile threat or act of aggression by one individual toward a second individual followed by an aggressive or submissive response by the second individual. When such an act occurred, I took the recipient of the first aggressive act as the focal animal and observed it for 5 min (preliminary observations of these groups showed that affiliative interaction following a conflict, if it occurs at all, always occurs within 5 min after the conflict). The focal follow began when the two opponents stopped exchanging agonistic behavior. If agonism resumed within 2 min, it was considered a continuation of the previous episode and I restarted the focal follow when the agonism ceased again. During the focal follow, I recorded the occurrence and timing of all social interactions of the focal animal.

Reconciliation was operationally defined as any friendly interaction between former opponents occurring sooner after a conflict than during control observations. In concordance with this definition, I conducted a matched-control observation corresponding to each post-conflict observation period. Matched-control observations were made on the next possible observation day, at about the same time, and the sampling methods were identical to those of the post-conflict periods. Matched-control observations began when the former opponents (1) were within 3 m of each other, (2) were not sleeping, (3) were not interacting with any other individuals, (4) were presumably aware of each other's presence (i.e., facing more toward each other than away from each other, with nothing blocking their view of each other), and (5) hadn't been involved in an agonistic interaction within the past 10 min. If these five conditions were never met that day, the matched-control period was postponed until the next observation day.

The only exception to condition (1) was in the case of *CIS*, who was peripheral to Group B during most of the study period. Since *CIS* was never within 3 m of any individual in Group B during this period, the matched-control periods involving her as the focal animal began when she was within 8 m of her former opponent. This adjustment resulted in a much more appropriate matched-control for dyads of which *CIS* was a member. During the last part of the study period, when *CIS* was successfully integrated into Group A, matched-control periods involving her were begun when the two former opponents were within 3 m of one another.

If the latency to first friendly interaction was shorter during the post-conflict period than during the control period, then that post-conflict interaction was called a reconciliation. I defined a friendly interaction as one in which the aggressor directed a non-agonistic signal (e.g., lip-smacking, presenting, grooming) towards the recipient and the recipient did not respond with aggression or departure. I excluded non-agonistic signals given only by the recipient from this definition because of the similarity, and thus potential confusion, between affiliative behavior and submissive behavior. A submissive signal by the victim was not considered part of a friendly interaction unless it was accompanied by a non-agonistic signal or approach on the part of the aggressor.

RESULTS

Out of a possible 27 dyads (pairs of individuals in the same one-male unit), 15 contributed to the data (Table 1). Within these 15 dyads, 47 aggressive interactions were observed (1 dyad, *JR* and *AR*, is represented twice in Table 1 because they interacted bi-directionally). Of the dyads that interacted aggressively, five had only one aggressive encounter and that encounter was reconciled, and one had two aggressive encounters, both of which were reconciled. In two dyads, two-thirds of the aggressive encounters were reconciled. In one dyad, there were two aggressive encounters, one of which was reconciled, and in another dyad, six out of seven aggressive encounters were reconciled. In four dyads, all of which included *CIS*, no aggressive encounters were reconciled. In a fifth dyad of which *CIS* was a member, 1 aggressive encounter out of 11 was reconciled.

Overall, former opponents interacted with one another sooner during the post-conflict periods than during the matched-control periods (Fig. 1). In 21 of 47 cases (45%), a friendly interaction between former opponents occurred sooner after the conflict than in the control period. These dyads were "attracted" (DE WAAL & YOSHIHARA, 1983), and their first post-conflict interactions were called "reconciliations." In 7 of 47 cases (15%), a friendly interaction occurred sooner during the control period than after the conflict; these dyads were "dispersed." The ratio of attracted to dispersed dyads was significantly different from the 50:50 null expectation (binomial test, $p < 0.01$). In 19 of the observations (40%), no interaction occurred between former opponents, either after a conflict or during the control period.

With one exception, all post-conflict first friendly encounters occurred during the first 4 min following the conflict, and 17 of 24 occurred within the first 2 min (Fig. 1). Of the

Table 1. Fraction of total aggressive encounters reconciled in individual dyads for each group ($N=47$).

Group A		Aggressors					
		<i>JR*</i>	<i>BR</i>	<i>AR</i>	<i>DI</i>	<i>SU</i>	<i>BU</i>
Recipients	<i>JR*</i>	—	1/1	1/1			1/1
	<i>BR</i>		—				
	<i>AR</i>	1/1		—			
	<i>DI</i>				—		
	<i>SU</i>					—	
	<i>BU</i>			2/3	1/2		—
Group B		Aggressors					
		<i>JOD*</i>	<i>VW</i>	<i>STE</i>	<i>RIO</i>		
Recipients	<i>JOD*</i>	—					
	<i>VW</i>	1/1	—				
	<i>STE</i>	1/1	4/6	—			
	<i>RIO</i>		1/1	6/7	—		
Peripheral female		Aggressors					
		Group B				Group A	
		<i>JOD*</i>	<i>VW</i>	<i>STE</i>	<i>RIO</i>	<i>JR*</i>	<i>AR</i>
Recipient	<i>CIS</i>	0/1	0/7	0/2	1/11		0/1

Within each group, individuals are listed in order of rank. *Male. *CIS* is in a separate matrix because she was only peripheral to Group B, then when she was successfully integrated into Group A, *BR* had died and the other three females of that group were temporarily being housed separately. Thus, the third matrix includes all the individuals with whom *CIS* had a chance to interact: *JOD*, *VW*, *STE*, and *RIO* from Group B, and *JR* and *AR* from Group A.

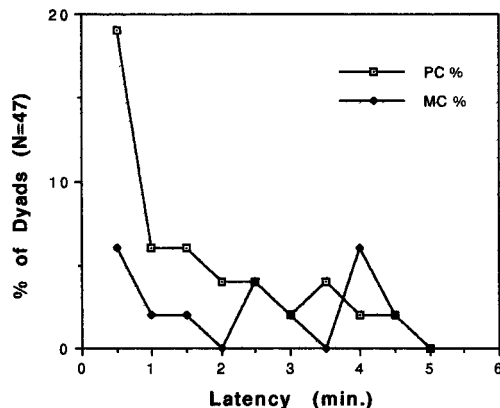


Fig. 1. Latency to first friendly interaction: percentage of dyads making first friendly contact within each 1-min interval during the post-conflict (PC) and matched-control (MC) periods.

first friendly interactions that occurred sooner during the post-conflict period than during the control period, i.e. those that were reconciliations, 16 of 21 occurred within the first 2 min after the conflict.

The initiator of post-conflict friendly encounters was that individual who either gave the first non-agonistic signal or made the first approach toward their former opponent. Of the post-conflict first friendly encounters that were reconciliations ($N=21$), the victim initiated contact more often (12 cases) than the aggressor (9 cases). During the first friendly encounters in the matched control periods ($N=12$), the aggressor initiated contact more often (8 cases) than the victim (4 cases). These differences, however, were not statistically significant.

Of the 21 reconciliations, 11 were lip-smacks, 5 were grooming bouts, 2 were mounts, 1 was a present, and 2 were approaches followed by bodily contact. Of the 11 lip-smacks, 3 occurred at a distance, 5 occurred after an approach to within 2 m, and 3 occurred after an approach to within arm's length. These behavioral elements were not qualitatively different from the first friendly encounters during the matched control periods.

DISCUSSION

These data show that geladas reunite in a friendly way after aggression. Of the 15 dyads that interacted aggressively, 10 dyads reconciled all or most of their conflicts. Almost all dyads including *CIS*, however, showed no reconciliation, even though the number of conflicts was especially high. For the majority of the study period, *CIS* was both spatially and socially peripheral to Group B and frequently received aggression from the females in that group. *CIS*'s peripheral status may explain the lack of reconciliatory behavior between her and the females of that group: reconciliation may occur only within groups, not between them. If reconciliation functions to restore affiliative relationships after aggression, and since *CIS* did not have any such relationships, then it would be expected that conflicts involving *CIS* would not be reconciled.

All reconciliations except one occurred within the first 4 min after the conflict, and most occurred within the first 2 min. This is consistent with previous studies that

have found elevated rates of interaction between former opponents mainly within the first 2 min after an aggressive encounter (DE WAAL & VAN ROOSMALEN, 1979; CORDS, 1988; DE WAAL & REN, 1988; YORK & ROWELL, 1988; AURELI et al., 1989, 1993; REN et al., 1991; KAPPELER, 1993).

Overall, geladas show a relatively high level of reconciliation, or greater conciliatory tendency, compared to previous studies on other cercopithecoid monkeys. In geladas, 45% of the observed aggressive interactions were reconciled, compared to a range of 9% in vervet monkeys (CHENEY & SEYFARTH, 1989) to 56% in stumptail macaques (DE WAAL & REN, 1988). Measures of interspecific differences in conciliatory tendency, however, are problematic in that neither duration of observation periods nor baseline levels of affiliation between individuals are controlled for (VEENEMA et al., 1994). Using a corrected measure of conciliatory tendency as outlined by VEENEMA et al. (1994), a conciliatory tendency of 30% is found for the geladas in this study. This is close to levels of conciliatory tendency (using the corrected measure) found for pigtailed macaques (20–40%), stumptail macaques (41%), and moor macaques (40%) (CASTLES et al., 1996; VEENEMA et al., 1994; MATSUMURA, 1996). The conciliatory tendency of geladas is most likely even higher than the results of this study suggest, since almost half of the observed aggressive interactions involved *CIS*, who showed a particularly low rate of reconciliation.

Reconciliatory behavior in geladas consisted of lip-smacking, grooming, presenting, bodily contact, and mounting. These behavioral elements were no different qualitatively from those observed during control periods. Behavior types varied between individual dyads, not between post-conflict and matched-control periods within the same dyad. Geladas do not appear to have any specific types of behavior associated with reconciliation as do chimpanzees, bonobos, and stumptail macaques (DE WAAL & VAN ROOSMALEN, 1979; DE WAAL, 1987; DE WAAL & REN, 1988).

Natural gelada groups are based on female kinship (DUNBAR, 1993), whereas the groups observed in this study were composed of unrelated or at least mostly unrelated females. Thus, the patterns of behavior shown by the animals in this study may not be typical of patterns of behavior found in gelada groups under natural conditions. Since most previous studies have found that kin reconcile more than non-kin (DE WAAL & YOSHIHARA, 1983; DE WAAL & REN, 1988; YORK & ROWELL, 1988; AURELI et al., 1989; JUDGE, 1991; KAPPELER, 1993), however, this study is likely to provide a conservative estimate of gelada reconciliatory behavior.

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