

## Reconciliation and Consolation Among Chimpanzees

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**Summary.** 1. After agonistic interactions among chimpanzees, former opponents often come into non-violent body contact. The present paper gives a quantitative description of such contacts among the chimpanzees of a large semi-free-living colony at the Arnhem Zoo, in order to establish whether these post-conflict contacts are of a specific nature.

2. Our data indicate that former opponents preferentially make body contact with each other rather than with third partners. They tend to contact each other shortly after the conflict and show special behaviour patterns during these first contacts. Data on contacts of the aggressed party with third animals indicate that such contacts are characterized by the same special behaviour patterns as first interopponent contacts. These patterns are: 'kiss', 'embrace', 'hold-out-hand', 'submissive vocalization' and 'touch'.

3. Such interactions apparently serve an important socially homeostatic function and we termed them 'reconciliation' (i.e. contact between former opponents) and 'consolation' (i.e. contact of the aggressed party with a third animal). According to our data, 'kissing' is characteristic of reconciliation and 'embracing' of consolation.

### Introduction

The usual effect of an aggressive action is a dissociation between individuals. Among group-living animals, however, the integrity of the society demands a dissociation to be followed by a decrease in distance. The conflict is not necessarily revived by an immediate approach between the opponents. An approach may even be the only way to terminate the conflict, as in the herding behaviour of hamadryas baboons (Kummer, 1957).

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In primate groups there evidently is more going on than mere distance decreasing after the initial increase caused by a conflict. The approach between former opponents may even take the form of a *run* towards each other (this study). Body contacts (involving patterns as kiss, embrace, and grooming) frequently occur in agonistic situations and seem to have a calming effect. Photographs illustrating the phenomenon can be found in Van Lawick-Goodall (1968 a), Okano et al. (1973) and Eibl-Eibesfeldt (1976). Descriptions have been given by Ellefson (1968), Blurton-Jones and Trollope (1968), Van Lawick-Goodall (1968 b), Poirier (1970), Lindburg (1973), Seyfarth (1976), Ehrlich and Musickant (1977) and Rijksen (1978) for primate species, and by Pfeffer (1967) and Rasa (1977) for non-primates.

Friendly behaviour during or after aggressive episodes is common also in our own species. It undoubtedly plays a major role in keeping down the level of social tension. "No one who has experienced great fright, grief, astonishment, or delight will deny the psychological stability brought about by physical contact with another person" (Nishida, 1970, p. 74). We failed, however, to find reports of systematic studies on human reassurance behaviour.

Affiliative behaviour in tense situations is not an easy subject to study. This behaviour may, for example, forestall the overt expression of an aggressive motivation (Sade, 1965; Marler, 1976) and it is rather difficult to distinguish such appeasing interactions from purely friendly ones. One should start with simple questions like: Does agonistic behaviour lead to socially positive interaction? Do such positive contacts involve special behaviour patterns, in comparison with contacts in non-agonistic contexts? The present investigation deals with *overt* agonistic interactions and non-agonistic body contacts occurring *after* these and involving: (a) both opponents or (b) one of the opponents and a third animal.

## Materials and Methods

### 1. *The Colony*

The colony of the Arnhem Zoo (the Netherlands) was founded in 1971 and comprised 20 chimpanzees during the period of our study (1976): 3 adult males, 1 adolescent male, 9 adult females, 4 juvenile females and 3 infant males (the latter born in the group)

The animals lived inside a hall (375 m<sup>2</sup> surface) during the winter and in an outside enclosure (about 7,000 m<sup>2</sup> surface) during the summer. They were fed twice daily, just before leaving and just after entering their night cages. For further details see Van Hooff (1973) and De Waal (1978).

### 2. *The Methods*

a) *Video Protocols*. Two simultaneous observers were positioned at different points and recorded their spoken reports on tape, while a third person recorded the behaviour and vocalizations of the chimps on a video recorder. This method was designed especially to provide data for a descriptive analysis of agonistic interactions. In the following section we will use data on interopponent distances which stem from these 'video protocols'. With respect to the majority of participants in agonistic interactions the (continuous) video pictures revealed which of them had been within 2 m from

their opponent during the 2 min preceding the first agonistic behaviour pattern. If a clearly directed approach by one of the two opponents immediately preceded the performance of the first agonistic behaviour, then we considered the shortest distance that existed before this approach had been made. Similarly we recorded the shortest interopponent distance observed during the 2 min after the last agonistic behaviour pattern (including flight and avoidance) had occurred between them.

*b) Paper Protocols.* The large majority of data presented here have been gathered with a special and simple procedure by the second author. Every protocol lasted 2 h and started at least half an hour after the apes had left their night cages. If an agonistic interaction occurred the observer started observing just one of the two opponents as described below, and continued for three-quarters of an hour, noting all its social interactions on a special checklist.

An interaction is called an 'agonistic interaction' or a 'conflict' if at least one of the following behaviour patterns occurred: 'tug', 'brusque rush', 'bite', 'grunt-bark', 'shrill-bark', 'flight', 'crouch', 'bared-teeth scream' and 'shrink, flinch'. These patterns were selected on the basis of a multivariate analysis of chimpanzee behaviour by Van Hooff (1974). His paper also provides descriptions of the social behaviour patterns mentioned above and in the following text. For further details on the definition of a conflict see De Waal (1978).

If an agonistic interaction involved more than two participants, the observer selected one pair of opponents, namely the pair with the lowest frequency of occurrence in the preceding protocols. The two opponents are called A and B. The first (and often only) performer of aggressive behaviour is called opponent A; the other, individual B, is the one that the observer followed after the last observed agonistic behaviour pattern between A and B. The time at which this last agonistic behaviour occurred is called  $t_0$ . Figure 1 gives a schematic representation of the observation procedure.

If the first A-B interaction following  $t_0$  was of an agonistic nature the observation started again with the end of this last interaction as the new  $t_0$ . Only behaviour during non-agonistic social interactions that involved *body contact* was recorded. These interactions will be called 'contacts' in the following text. As already mentioned in the introduction to this paper, we distinguish between two types of contacts: (a) A-B contacts were recorded till 45 min after  $t_0$ . In Fig. 1 there are two such contacts,  $t_1$  and  $t_2$ . (b) Contacts between B and others were recorded till 5 min after  $t_0$ . Figure 1 presents two such contacts. (It was not possible simultaneously to make reliable records of contacts between A and others.)

Such observations were made after 350 conflicts, of which 150 occurred during winter (indoors) and 200 during the following summer (outside). Contrary to our expectation we found no significant differences between data from winter and summer conditions. Therefore, we lumped together these data. Ninety different dyadic relationships were recorded at least once as a pair of opponents. In a relatively high number of cases (52%) the aggressor role (A) was played by one of the three adult males and the receiving role (B) by either one of the adult or one of the juvenile females.

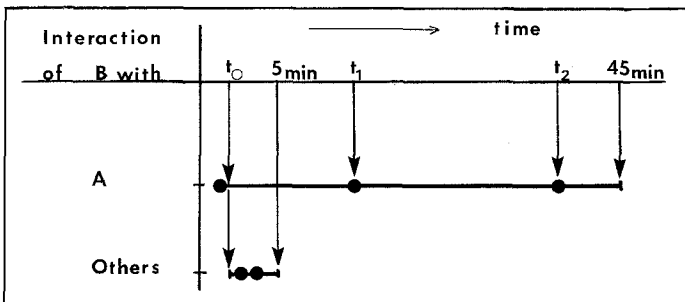


Fig. 1. Observation procedure (explanation see text)

## Results

### 1. Interaction Between Opponents

*a) Distance.* Just before a conflict arose, the distance between the two initial opponents usually was short. Individuals that joined in later, on the other hand, often came running along from relatively far away. During the agonistic interaction itself short interopponent distances and physical contacts were very common, but at the end of the exchange of agonistic behaviour the distance almost always exceeded several meters (after a hasty retreat by one of the partners). The maintenance of such a safe distance often did not last longer than a few minutes.

Although an increase in distance undoubtedly was the immediate effect of agonistic behaviour, our video data showed that it was a short-term effect, because interopponent distances more often were shorter than 2 m in the 2 min after the conflict than before (i.e. 30% as compared with 19%,  $n=1,484$ ,  $\chi^2=41$ ,  $p\ll 0.1\%$ ). So, on a time scale of a few minutes and considering shortest distances only, agonistic behaviour resulted in a *decrease* in distance. With respect to body contacts the results were even more striking. We observed 50 pairs of opponents making contact in the 2 min before their agonistic interaction, but no less than 179 doing so in the 2 min afterwards.

The shortest distance reached after the conflict may be affected by the shortest distance that had existed before it. The data reveal that opponents who had been within 2 m before the conflict started, more often were within this distance afterwards than those between which the distance before the conflict had exceeded 2 m ( $\chi^2=58$ ,  $p\ll 0.1\%$ ; McNemar's Chi-square test for matched samples; Everitt, 1977, p. 20).

*b) Contact Partners.* With respect to every observed agonistic interaction, we noted in our 'paper protocols' all the contacts of the aggressed party (B) during the first 5 min after it. Contacts with its aggressor (A) occurred far less often than contacts with other animals. This is not surprising, however, because in a group of 20 individuals, A is only 1 of the 19 contact partners available. In case of random contact distribution over the individuals we expect that the opponent (A) figures as contact partner in  $1/19$  or 5.3% of all B's contacts after the conflict. The percentage observed was higher than that, however. The animals in the B role had a total of 310 contacts during the 5 min after their conflict, and 92 (30%) of these were contacts with their opponent A. This is very frequent if compared with the expected number ( $\chi^2=371$ ,  $p\ll 0.1\%$ ). This trend was representative, as 18 of the individuals showed it, whereas 1 showed the opposite trend. So, after a conflict many individuals seemed to prefer a contact with their former opponent over contacts with third animals (see also Discussion).

*c) Time.* If the tendency to make a socially positive contact with a partner is increased after an agonistic interaction with this partner, one expects to find relatively short time intervals between the two interactions. If, on the

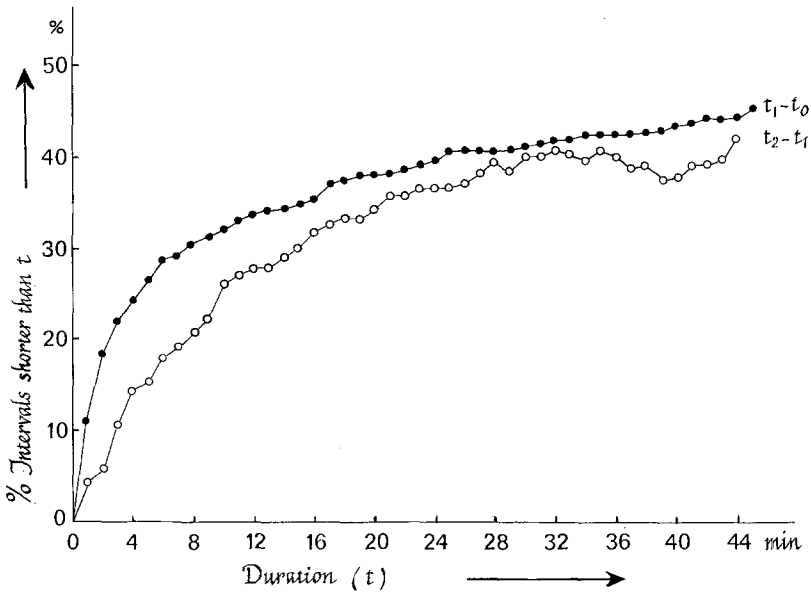


Fig. 2. The graph shows the percentage of intervals shorter than duration  $t$  of intervals  $t_1-t_0$  from the last agonistic behaviour until the first interopponent contact thereafter (dots), and of intervals  $t_2-t_1$  from then until the second such contact (circles)

other hand, a main effect of agonistic behaviour is spacing out of individuals, one expects to find relatively long intervals. In the following analysis we will consider the distribution of these intervals between the end of a conflict ( $t_0$ ) and the first interopponent contact following it ( $t_1$ ), and compare them with intercontact intervals between non-agonistic encounters, namely between the first post-conflict contact ( $t_1$ ) and the second ( $t_2$ ).

Figure 2 gives for all cases with an observation time limit,  $L$ , longer than or equal to duration  $t$ , the proportion,  $P(t)$ , of intervals shorter than  $t$ . As we used a fixed limit for the  $t_1-t_0$  intervals ( $L=45$  min; see Fig. 1), their  $P(t)$  is a cumulative percentage. The limit for the  $t_2-t_1$  intervals, on the other hand, is variable as it depends on the moment of the first contact ( $L=45-t_1$  min) and their  $P(t)$  therefore does not necessarily increase as  $t$  increases (Kaplan and Meier, 1958, p. 469).

The slope of the  $t_1-t_0$  curve in Fig. 2 indicates that interopponent contacts tended to occur shortly after the conflict (cf. Seyfarth, 1976, for feral baboons). In minute 4 the cumulative percentage is already half the value reached after 45 min. Also intervals between first and second contacts ( $t_2-t_1$ ) show such a tendency, but less pronounced. If we accept a significance level of 5% ( $\chi^2$ -test, two-tailed), the  $P(t)$  of  $t_1-t_0$  intervals is higher than that of  $t_2-t_1$  intervals till minute 9.

Also if we restrict the comparison to those cases for which we know the duration both of the interval from the conflict until the first interopponent contact and of the interval from then until the second such contact (i.e. the

**Table 1.** The frequencies of 11 different behaviour patterns during first interopponent contacts have been compared with those during second such contacts. The table presents the observed frequencies and 'adjusted residuals'. A plus indicates that the behaviour occurred relatively often during first contacts and a minus that it occurred relatively rarely.

A similar comparison has been made for contacts of the aggressed party (B) with third animals. Here the comparison is between contacts within 1 min and those during 2-5 min after the conflict

Behaviour pattern	Interopponent contacts			Contacts of B with third animals		
	First	Second	Adjusted residual	Min. 1	Min 2-5	Adjusted residual
Kiss	23	1	+2.62 <sup>a</sup>	5	3	+1.39
Subm. vocalization	10	0	+1.95	19	9	+3.38 <sup>a</sup>
Hold-out-hand	8	0	+1.78	11	8	+1.86
Embrace	19	4	+1.08	37	20	+4.59 <sup>a</sup>
Touch	29	8	+0.77	6	7	+0.65
Contact-sit	51	19	-0.02	18	37	-0.88
Inspect	25	10	-0.20	6	15	-0.93
Rapid ohoh	19	11	-1.19	0	14	-2.99 <sup>a</sup>
Play	14	9	-1.31	6	47	-4.39 <sup>a</sup>
Groom	37	20	-1.51	13	34	-1.59
Present	8	8	-2.12 <sup>a</sup>	2	6	-1.29
Overall comparison	$\chi^2=24, p<1\%$			$\chi^2=62, p\leq 0.1\%$		

<sup>a</sup> Adjusted residuals (a.r.):  $P < 5\%$  if a.r.  $> /1.96/$ ;  $P < 1\%$  if a.r.  $> /2.58/$ ; and  $P < 0.1\%$  if a.r.  $> /3.30/$

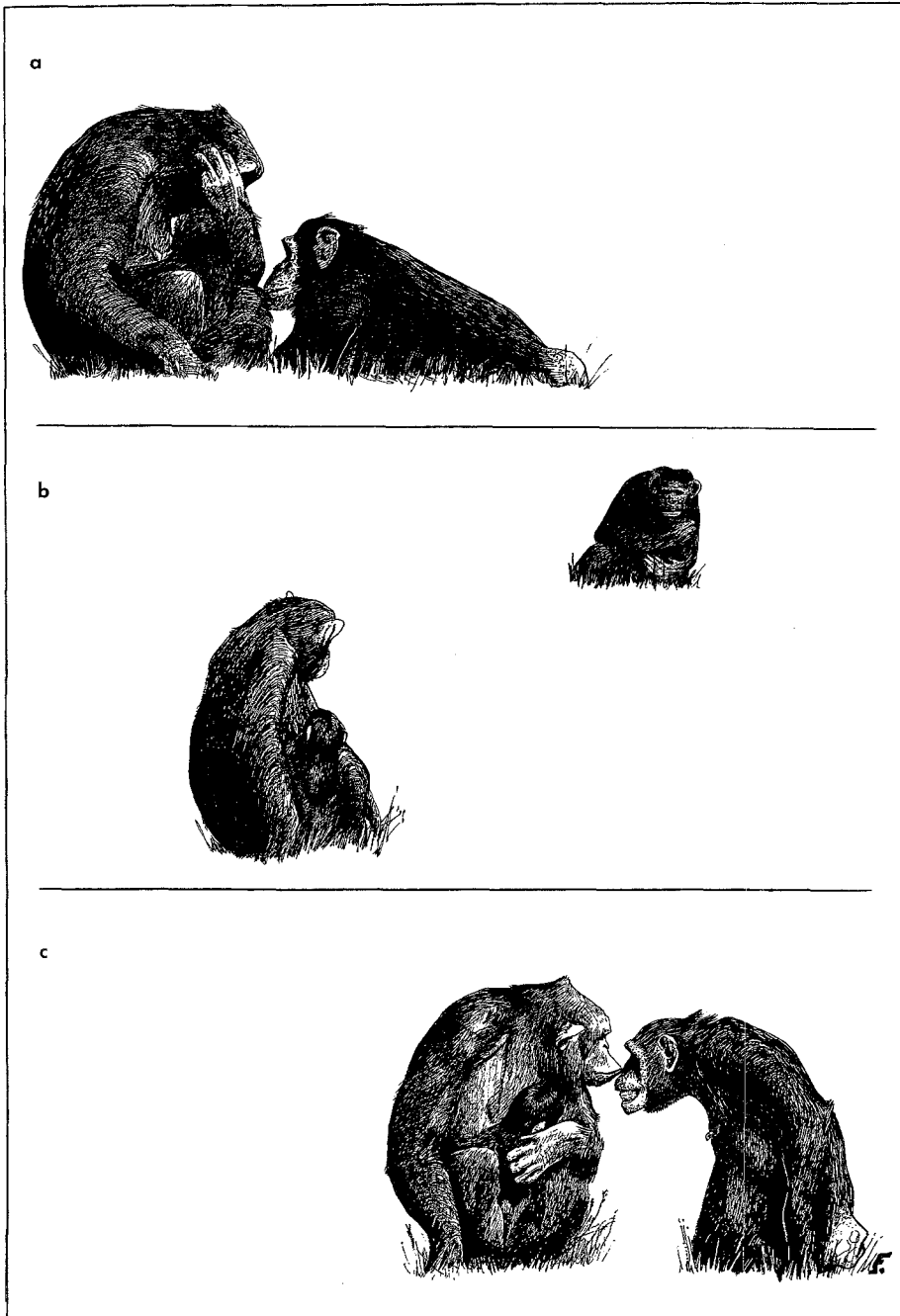
cases for which  $t_2 \leq 45$  min) we find a significant difference: the duration of the first interval usually was shorter than that of the following interval ( $\chi^2=12$ ,  $p < 0.1\%$ ).

*d) Behaviour.* If first interopponent contacts serve a special function (e.g. 'reassurance') these interactions could involve special behaviour. Table 1 shows that the behaviour during interactions with a first interopponent contact differed from that during second contact interactions. The 'adjusted residuals' (Table 1) express the discrepancy between observed frequencies of behaviour patterns and those expected if first and second contacts would not differ (Everitt, 1977, p. 46).

Although 'contact sitting' and 'grooming' were the most frequently observed behaviour patterns in first contacts, they were not characteristic of these if compared with second contacts. Characteristic patterns were 'embrace', submissive vocalization (i.e. 'scream' and 'yelp'), 'hold-out-hand' (begging), 'touch' and, most of all, 'kiss'. Figure 3 shows an example of a 'kiss' after an agonistic interaction.

*e) Initiative.* We found no significant difference between A and B partners concerning the frequency of initiation of first or second interopponent contacts.

Apart from the antagonists themselves, however, third individuals sometimes seemed to take initiatives leading to a contact between two former opponents.



**Fig. 3a-c.** A case of 'reconciliation' between adult female Mama (*left*) and adolescent female Amber (*right*). **a** Amber quietly looks at Mama's baby. **b** Presumably Amber came too close to, or even touched, the baby because she received a hit from Mama and screams at a distance of about 4 m. **c** Soon afterwards (about 1 min) Amber returns to Mama and yelps while receiving a kiss on her nose. After that she was tolerated close to Mama and her baby again.

Especially after serious conflicts between two adult males, the two opponents sometimes were brought together by an adult female. The female approached one of the males, kissed or touched him or mount-presented towards him and then slowly walked towards the other male. If the male followed her, he did so very close behind her (often inspecting her genitals) and without looking at the other male. On a few occasions the female looked behind at her follower, and sometimes she then returned to a male that stayed behind and pulled the male's arm to make him follow. When the female sat down close to the other male, both males started to groom her and they simply continued grooming after she went off. The only difference being that they groomed *each other* after that moment, and 'panted', 'spluttered' and 'smacked' more frequently and loudly than before the female's departure.

Unfortunately such cases of apparent 'mediation' do not occur frequently enough to allow a systematic quantitative investigation (i.e. we observed about 20 cases during 2 months with very frequent male-male conflicts).

*f) Male-Male Interactions.* The interactions between two of our adult males, Yeroen and Luit, are of special interest. After the period in which we collected our data these males went through a process of dominance reversal. Luit had the challenging role and showed frequent bluff displays, which often led to agonistic interactions with the leader, Yeroen, and his female supporters (De Waal, 1978). In spite of their very tense relationship, however, we know of only two serious conflicts in their night cage (Yeroen and Luit shared the same cage every night). Possibly, intense affiliative interactions in front of the building, just before entering, served as a kind of 'truce' for the evening spent indoors. The most long-lasting and dramatic of these interactions has been described in our diary as follows:

17.00 h. All chimps were indoors except Yeroen and Luit. They were still waiting outside and kept some distance between each other. Luit lightly bluffed (hair erection; stamping; swaying).

Yeroen approached Luit and panted to him. This panting became louder. He held out his hand to Luit and showed bared-teeth face. Luit walked around Yeroen with hair erection and bared-teeth face. This situation lasted several minutes: Luit several times walked around Yeroen, who begged for contact.

Luit approached Yeroen and then slowly walked backward with bared-teeth face and a penis erection. At about 20 m from Yeroen he lay down on his belly and made pelvic thrusts in the sand, while panting to Yeroen. Yeroen approached hesitantly with hair erection. Suddenly both Luit and Yeroen screamed, and Luit presented to Yeroen. Yeroen, panting very loudly, groomed Luit's anal region. They groomed each other till 18.00 h and then together entered their cage.

Another remarkable aspect of male-male contacts after conflicts was the attention others paid to them. The attention ranged from participation in the contact (e.g. the 'mediation' described in section 1.e.) to mere coming to the scene and watching (Fig. 4).

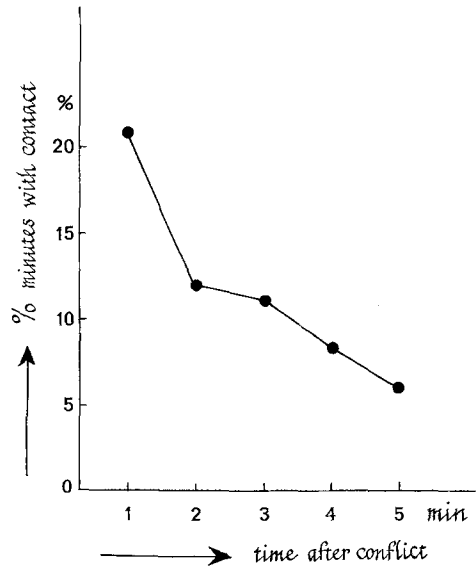
## 2. Interaction with Third Partners

With respect to the contacts of the aggressed party (B) with third animals, our 'paper protocols' contain data on the first 5 min after a conflict. Figure 5





**Fig. 4.** After a conflict between adult males Yeroen and Luit, Yeroen held out his hand towards Luit, who fled into a tree. The photograph shows this scene (Luit is not visible) and the attention others paid to it. Afterwards Luit came down and the two former opponents kissed and groomed each other



**Fig. 5.** For each of 5 min following a conflict ( $n=350$ ) this graph shows the percentage of minutes with at least one contact between the aggressed party (B) and a third animal

shows that such contacts often occurred shortly after the conflict. The proportion of first minutes during which at least one contact occurred was significantly higher than that for the later minutes ( $\chi^2 = 35$ ,  $p \ll 0.1\%$ ).

The next question was whether the social behaviour exchanged shortly after the conflict differed from behaviour during later contacts of B with third animals. We compared between contacts in the first minute and later contacts (i.e. during minutes 2, 3, 4 and 5) irrespective of whether they were the first or following contacts of the B partner after the conflict. Table 1 shows the frequencies of 11 behaviour patterns during first-minute and later contacts and the discrepancies, expressed in 'adjusted residuals', between the observed frequencies and those expected if there would be no difference between the two categories of contact.

Thus 'embrace' was both the most frequent and most characteristic behaviour pattern of first-minute contacts of the aggressed partner with third individuals. Other characteristic patterns were: submissive vocalization (i.e. 'scream' and 'yelp'), 'hold-out-hand' (begging), 'kiss' and 'touch'.

## Discussion

Former opponents tended to contact each other relatively shortly after the conflict and showed special behaviour patterns during these first contacts. The data on contacts of the aggressed party with third animals indicate that these also occurred more frequently shortly after the conflict. Contacts during the first minute were characterized by the same special behaviour patterns as first interopponent contacts. These patterns were 'kiss', 'embrace', 'hold-out-hand', 'submissive vocalization' and 'touch'.

In addition, the data seem to indicate that after an agonistic interaction many participants prefer contact with their opponent over contacts with other group members (Results, Sect. 1.b.). This point needs some discussion, however. One might object that our random expectation, namely that about 5% of B's contacts will involve its opponent A, is much too low. This would be the case if interopponent distances at the end of a conflict would be shorter than the distances between opponents and others. In summer, when the animals have ample space to separate, it occurs often indeed that others are so far away that one might disregard them as potential contact partners for the participants in a conflict. In winter, by contrast, this never is the case, because the apes live indoors in a state of artificial crowding. Nevertheless, the winter data very closely resembled those of summer, and this brings us to the rejection of this explanation of the results.

Another possible explanation is that animals tend to have conflicts with those whom they frequently contact. We do not have systematic data on all kinds of non-agonistic body contacts occurring in the group, but it is our impression that *if* a positive correlation between contact and conflict frequency exists it will not be strong enough for the explanation of the striking results presented in Section 1.b.

As post-conflict contacts involve special behaviour patterns we may give

them special names. First interopponent contacts will be called 'reconciliation', and contacts between the aggressed party and a third animal shortly after the conflict will be called 'consolation'. For reconciliation, 'kiss' is the most characteristic element, whereas 'embrace' is so for consolation. Table 1 shows that the kiss/embrace ratio for reconciliation is 23/19 (1.21) and for consolation 5/37 (0.13).

Although 'reconciliation' and 'consolation' are objectively defineable interaction types, the terminology clearly is functional rather than descriptive. These terms reflect our impression that such body contacts have a calming effect (cf. Mason, 1964) and serve an important socially homeostatic function. In the future we shall try to verify this impression. The most important question will be: does the chance of (re-)occurrence of agonistic behaviour between former opponents decrease after a non-agonistic body contact between them?

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