Evolutionary Ethics, Aggression, and Violence: Lessons from Primate Research

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This paper is unusual for this journal because most readers do not deal professionally with animals. Information from primatology, however, is relevant to consideration of violence between people. I will focus mainly on aggression and peacemaking among nonhuman primates, but will address related topics as well. I do not use the term "aggression" to refer only to violent behavior, but to any overt conflict between individuals.

Although I am a professor of psychology, I am a biologist by training. When I was a student many years ago, the major scholarly work on this topic was Konrad Lorenz's *On Aggression*.[1] It set into motion contemporary research on aggression from a biological perspective by making the controversial claim that aggression is an instinct not only in animals, but also in human beings. My own research and that of others suggests a slightly different view, namely, that aggression between individuals is a last resort when conflict resolution fails. Lorenz's understanding of aggression as a drive—aggression accumulates within us and eventually must come out—is no longer a dominant view; rather, aggression is now generally taken to be an option rather than a drive.

Counterintuitive Aspects of Aggression

From the contemporary perspective of conflict resolution, several aspects of aggression are counterintuitive. First, aggression increases contact between individuals. It was formerly believed to be entirely a negative force in animals, a dispersing mechanism. Insofar as aggression causes dispersal, it causes individuals to move away from each other. This is probably true of territorial species which use aggression to defend territory, but within groups of more social animals, aggression actually increases contact.

Much more aggression occurs between the closest relatives in primate groups than between strangers. Similarly, homicides in human society often are committed by an individual who is close to the victim. This probably is true not only for violence, but for all aggressive behavior; aggression is more often seen between individuals who are close than those who are distant.

Another counterintuitive observation is that crowding does not lead to aggressive behavior. My native country, the Netherlands, is among the most crowded industrialized nations in the world, yet our murder rate is 20 times lower than that of the U.S., one of the least crowded nations. Crowding among primates leads to much more grooming, an activity that keeps tension under control, than to aggression. The hypothesis that crowding leads to aggression is at best a simplification, at worst, mistaken.

The fact of forgiveness among people is itself counterintuitive; for example, the Pope visited the imprisoned assassin who tried to kill him.[2] Some research suggests that there are considerable health benefits to forgiveness. Forgiveness is difficult to define or detect in animals, so we instead evaluate reconciliation, a topic I will now discuss in more detail.

Aggression in Primates: The Individual Model

The most popular model for studying aggression in animals used to be what I call the "Individual Model"; it is still subscribed to by many investigators. Most of the aggression research literature has followed that model. Rats have often been studied with what is called pain-induced fighting. Two rats are placed on an electric grid and shocked. They attack each other, probably a form of frustration-

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induced aggression. If no other rat is present, the shocked rat will attack something else, for example, a rag doll that has been placed in the cage. If a rat is placed in a box and another rat is introduced after a couple of days, the first rat will attack the second. [3]

In an analogous human study using the Individual Model, a student subject was asked to apply a high voltage shock to another student. The shock is not actually delivered, but the students believe they are applying up to 2000 volts. These individuals do not know each other, do not need each other, and will never see each other again; there is no relationship between the two. That is typical of how aggression has been studied in the past, not within the social context in which it typically occurs, but between strangers who have no relationship and no need for each other.

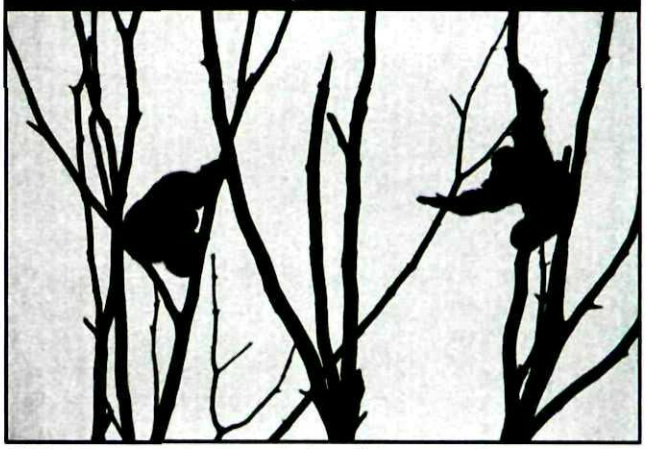
The Individual Model looks at aggression as it arises within the individual in isolation from the social environment, and has found a wide range of factors associated with aggression: influences of hormones and genes, learning, support for the frustration-aggression hypothesis, pain, television role models, and suppression of inhibitions through alcohol abuse, among others. Within the Individual Model, all of these factors feed into the individual and out comes aggression. As a result of this model, investigators have called aggression antisocial as opposed to what they call prosocial behavior. Yet what has been studied is essentially aggression separated from the social environment in which behaviors actually occur. Aggression, however, cannot be separated from its social milieu. More recent information, derived from a different kind of research, suggests that aggression is an integrated part of social relationships.

Aggression in Primates: the Relational Model

Primatologists began to deviate from the above views in the 1970s when they discovered the importance of social relationships, a fundamental issue that is impossible to miss when watching a group of monkeys, a group of chimpanzees, or a group of people. They are not a collection of compartmentalized individuals; all are connected in some way, and that is what primatologists began to study. About 25 years ago, I described the process that I called reconciliation. [4] When male chimpanzees fight, for example, they do not usually physically attack, but only yell and scream at each other. We know this posturing can potentially escalate to lethal aggression. Yet, 10 minutes after a fight, one male may hold out a hand to the other invitingly, leading to embracing and kissing, followed by mutual grooming. (Figure 1) This is reconciliation.

Reconciliation research now has become a major area of investigation in all sorts of animals. [5] Reconciliation is defined as a friendly reunion between former opponents immediately after conflict. Defined in this way, it is observable and can be studied, documented, and tabulated. For

Figure 1.



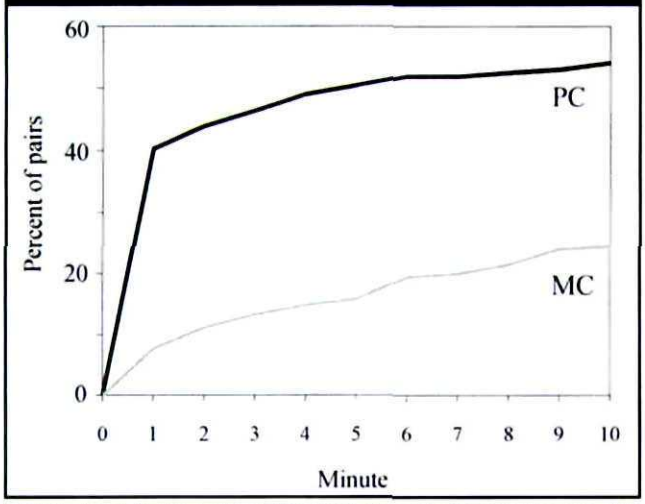
The situation ten minutes after a protracted, noisy conflict between two adult males at the Arnhem Zoo. The challenged male (left) had fled into the tree, but ten minutes later his opponent stretched out a hand. Within seconds, the two males had a physical reunion. Photograph by the author.

example, we now know that many animals have inhibitions and ritualizations of aggression. Most of the time male chimpanzees use their sharp canine teeth only on other males, but may beat females. A short time after such a beating, the female may come back to the male and offer her hand to the male for a hand kiss, a gesture of reconciliation which is also a way of testing his mood. Much testing, touching and kissing between the two comprises the reconciliation. So, reconciliation may be a tense and dangerous situation because the male could still be in a bad mood, and reconciliation could fail. That is a typical process in the chimpanzee, both in captivity and in the wild.

Chimpanzees also have a process that we call mediation, which basically achieves what the law and courts do in our civilization. For example, two male chimpanzees who have been in a fight sit opposite each other, deadlocked, not looking at each other, no eye contact, which is critical for reconciliation in chimpanzees. They appear very much like two angry men at a bar who do not get along. After a fight, a mediator often appears. The mediator is always an elderly female, who comes over and may groom one of the males for a few minutes. Then, they sit down, she gets up, and walks very slowly to the other male, and the first male will walk right behind her so he does not need to make eye contact with the opponent. If he does not follow, the female may turn and grab his arm, making him follow in what seems to be an intentional act on the part of the female. The female then grooms the second male, and after a couple of minutes, as the grooming continues, the first male will disappear. That kind of mediation has been observed in chimpanzees and other apes, but has not been observed in any monkeys. (Chimpanzees are not monkeys, but apes, which are our closest relatives.) Mediation may require more intelligence and sophistication than most other animals have.

The typical way we study reconciliation is in post-conflict

Figure 2.



Primates show a dramatic increase in body contact between former opponents during Post-Conflict (PC) as compared to Matched-Control (MC) observations. The graph provides the cumulative percentage of opponent-pairs establishing friendly contact during a 10-min time window following 670 spontaneous aggressive incidents in a zoo group of stumptail macaques. Based on de Waal & Ren (1988).

observational studies, which we call the PC/MC Method (Post-Conflict/Matched-Control). (See Figure 2) There are also experimental studies, which I will address shortly. In an observational study, after a fight between two animals, one of them is followed for 10 minutes to an hour to see whether they get together with their opponent. A control observation is done on the same individual the next day or another day in which no aggression has occurred (matched-control). In the typical macaque monkey society, 60% of fighting pairs make friendly contact after the fight, and friendly contact occurs in the control observation in about 20% of the pairs. And so we speak of post-conflict attraction. Most primates that have been studied have demonstrated post-conflict attraction; that is, they have friendly contact more often after aggression than without aggression. That is exactly the opposite of what I was taught as a student, which was that aggression causes dispersal. *Aggression actually causes individuals to come* together, a consequence of the reconciliation mechanism.

Chimpanzees achieve reconciliation with kissing, embracing, and so on, and bonobos, which are closely related to the chimpanzee, do it with sexual behavior. The principle is exactly the same in both cases: individuals who live in a society have a fight and have a reunion afterwards with some sort of intensive contact that settles their relationship. Reconciliation has now been studied in 25 primate species and it has been found in all of them (see Figure 3). A large group of scientists are now working on conflict resolution issues in non-primates and have consistently found reconciliation behavior to be present in domestic goats, hyenas, and dolphins. We expect to find such behavior, of course, in cooperative, highly social animals such as members of the dog family. The cat is a solitary

Figure 3.

Reconciliations allow rhesus monkeys to maintain tight kinship bonds despite frequent intrafamilial squabbles. Shortly after two adult sisters bit each other, they reunite sitting on the left and right of their mother, the alpha female of the troop, each female holding her own infant. The sisters lipsmack while the matriarch loudly grunts. Photograph by the author.

hunter and is the only animal that has been tested in which reconciliation behavior has not been found. Anyone who has cats will not be surprised by this observation. Investigators making the same kind of observations of children in schoolyards as we have done in primates have found similar reconciliation.[6] (Figure 3) It seems to be a nearly universal pattern in mammals, and perhaps outside of mammals as well, in animals that live in social groups.

The Valuable Relationship Hypothesis

The main hypothesis that has arisen from these lines of investigation and is strongly supported by them is called the valuable relationship hypothesis. It simply states that reconciliation will occur after conflict between members of the same community, especially between individuals who stand to lose a great deal if their relationship deteriorates. A corollary of this hypothesis says that individuals who have no valuable relationship, for whom reconciliation would be worth little, probably will not follow this kind of process. An international example of the valuable relationship hypotheses is the development of the European Union. The original European Community comprised the Benelux countries, France, Germany, and Italy, close neighbors who had a lot to lose from conflict. The European Community was established after World War II with the specific purpose of fostering economic ties between countries that have been fighting for centuries. It was intended to increase the value of relationships, reasoning that economic ties between these countries remove many incentives to attack each other and make such attacks costly. This new economic-political working arrangement, based on the valuable relationship hypothesis, has worked very well so far, even though underlying dislike and enmity among the participating nations remain.

In chimpanzees, reconciliation is often opportunistic in a very interesting process I call strategic reconciliation. This process lacks any suggestion of the forgiveness that motivates some human reconciliation; it is purely strategic, having to do with politics, especially power politics. For example, among chimpanzees, two males may collaborate in dominating a third male who is individually stronger than either one of the two. Two individuals who are in a collaboration that is very valuable to them in maintaining their hierarchical position reconcile very quickly after they fight with each other because they absolutely need each other.

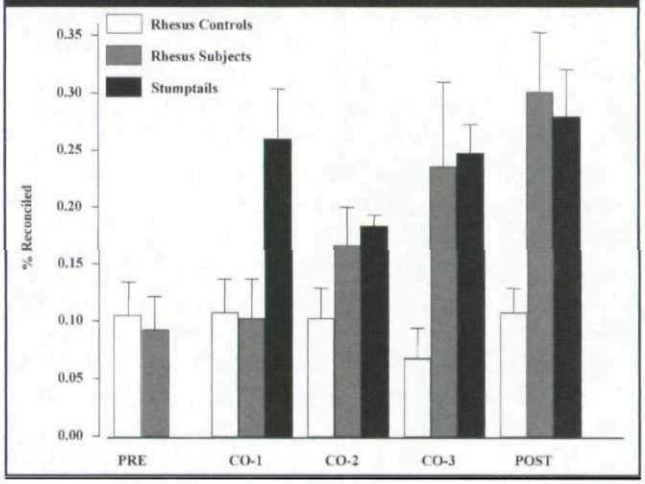
A human example of this kind of mutual support is the relationship between George W. Bush and John McCain. Bush and McCain had a very tense, acrimonious relationship during the Republican primary campaign of 2000, but immediately after Bush won the Republican nomination, they reconciled vigorously and publicly. The valuable relationship hypothesis tells us that this reconciliation was mandatory, for both opportunistic and strategic reasons, to prevent severe damage to both themselves and their political party. It will be interesting to watch the fighting between the 10 Democratic candidates in the current (2004) primary campaign, and, after one of them has becomes the uncontested leader of the pack, the reconciliation that will inevitably follow. Although many in the media ridicule this reconciliation, it is a very similar process to the kind of reconciliation that we have seen in chimpanzee politics, where males who absolutely need each other for their positions of power will reconcile under almost any circumstances.

The valuable relationship hypothesis has been tested in monkeys in an interesting experiment.[7] Pairs of monkeys lived together in a cage, and the only way they could get food was to operate a machine that required two individuals. Approaching the machine alone they could get nothing, greatly increasing the value of their relationship. A control group of pairs of monkeys were allowed to feed independently whenever they wanted, so they did not build the kind of relationships fostered in the experimental groups. Conflict between the individual monkeys in the pairs was induced with a standard method, and the rapidity and intensity of reconciliation was measured. The individuals who had learned to work together reconciled far more than the ones who had lived together as a pair but independently. Mutual dependency of individuals had an enormous impact on the probability of reconciliation between them, providing strong experimental support for the valuable relationship hypotheses.

Reconciliation as an Acquired Social Skill

There is a widespread belief that what animals do is based entirely on instinct and what humans do is learned within human cultures. This is a false contrast, because animals such as monkeys develop for five or six years before they become adults, and the childhood-adolescence of chimpanzee is 16 years, very close to that of humans. Primates have a very long developmental period, so should not be expected to be purely instinctive creatures; there is an enormous amount of learning in everything they do. We have done a study of rhesus monkeys and stumptail monkeys that demonstrated clearly the large learning component of reconciliation, specifically, of peacemaking skills.[8]

Figure 4.



Mean (± SEM) proportion per individual of aggressive conflicts followed within three minute by a reconciliation initiated by the individual. During the Pre- and Post-phase, subjects were housed with conspecifics only; no Pre-phase data are available on stumptail monkeys. The five-month co-housing phase has been divided into three equal parts. The graph shows that rhesus experimental subjects, which lived during co-housing with stumptails, increased their reconciliation rate and maintained this high rate in the Post-phase, when they lived with other rhesus monkeys only. Adapted from de Waal & Johanowicz (1993).

Rhesus monkeys are nasty, aggressive primates with rigid social hierarchies, while stumptail monkeys, closely related to the rhesus, are much more tolerant, conciliatory, and easy going. In our study, we housed eight rhesus monkeys together for some time, then housed them together with eight stumptail monkeys (which were a bit older and more dominant, therefore served as 'tutors') continuously for five months, day and night, and then separated them again. We induced conflict in a standard manner at several time intervals—before co-housing, at the beginning, the middle, and the end of co-housing, and after co-housing—and recorded the number of conciliatory responses to conflict by the study group. We did the same with a control group, in which the tutors were Rhesus rather than stumptail monkeys.

Figure 4 demonstrates the rate of conciliatory behavior after induced conflict at five time intervals: before co-housing, early, middle and late in the co-housing period, and after the groups were again separated. The control rhesus monkeys reconciled at about the same rate throughout the experiment; their behavior did not change. The experimental rhesus monkeys, however, started out at the same level as the controls early in co-housing, but exhibited conciliatory behavior progressively more during co-housing. After separation of the groups, both the

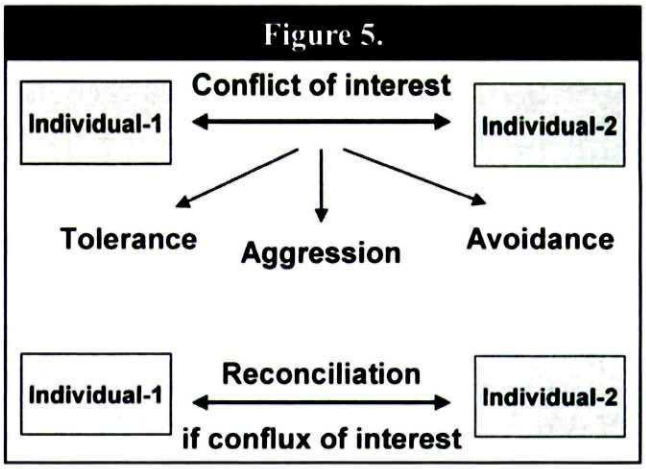
subject and the control rhesus monkeys lived under the same conditions, but the subject monkeys continued to reconcile at least as much as the stumptails. By changing their social experiences, we have created a new and improved rhesus monkey that reconciles three times more often then the control rhesus monkey. These data may have important implications for learning of conciliatory behaviors in children, and should be of interest to those who design educational systems.

The optimistic message of these data is that reconciliation following conflict is not a fixed behavior, but is a flexible tendency and can be learned. Many other studies in the animal literature have supported our findings, and the individual model I described previously has been essentially replaced by what is now known as the relational model.

Conflux of Interest and Reconciliation

Conflicts of interest may lead to several kinds of responses: tolerance, aggression, or avoidance. Tolerance is common in some species, avoidance is typical for hierarchical animals with a structure of dominance, and, if all else fails, conflict may escalate to aggression between individuals. Once aggression has occurred, reconciliation may follow, especially if there is a conflux, or overlapping of interests between individuals (see Figure 5). Relationships often cycle through aggression, reconciliation, aggression, reconciliation, as a way of negotiating the relationship. This pattern may have human parallels, particularly in the literature on marital relationships. John Gottman has suggested that cycles of conflict and reconciliation are a way of negotiating the marital relationship, and that the amount of conflict in a marriage is not necessarily an indicator of the stability of the marriage.[9] Family therapists used to argue that conflict is bad in a marriage, but Gottman argues that stability depends on what happens after the conflict, precisely the same as our conclusions regarding non-human primates. Aggression by itself does not necessarily have negative implications. Violent aggression definitely is negative, but the significance of aggression in general depends entirely on how it is integrated in a relationship. Conciliatory behavior found in non-human primates also has been seen in many cooperative mammals, such as elephants, dolphins, and hyenas, and even in some fish species.

Students of both animal and human behavior have often thought of conflict arising under zero-sum conditions; that is, the interests of conflicting parties are separate, everything is regulated by competition, and the conflict will end with a winner and a loser. What we have learned is that the zero-sum model really does not exist within society; conflicts often result in winners and losers, but there are also many situations that are nonzero-sum, in which the conflicting parties stand to lose or to win together. This is common in cooperative animals, such as



According to the Relational Model, aggressive behavior is one of several ways in which conflicts of interest can be settled. Other possible ways are tolerance (e.g. sharing of resources), or avoidance of confrontation (e.g. by subordinates to dominants). If aggression does occur, it depends on the nature of the social relationship whether repair attempts will be made, or not. If there is a strong mutual interest in maintenance of the relationship, reconciliation is most likely. Parties negotiate the terms of their relationship by going through cycles of conflict and reconciliation. After de Waal (1996).

two lionesses that depend on each other and help each other hunt. If they have a big fight between themselves, they would both lose all the advantages of their partnership, and that is the typical situation of many cooperative animals. That is where conflict resolution comes in, and the importance of reconciliation becomes very apparent.

Unfairness, Injustice and Aggression in Primates

I will end this discussion by describing a study we recently completed on the principle of fairness, using capuchin monkeys.[10] It may be that much aggression and open conflict in human society is related to unfairness and injustice, so this study of monkeys may be relevant to the topic of violence between people. We gave a monkey an object of no value, such as a pebble. We trained them to give the pebble back by holding up a hand and if they give it back, they get a reward, such as a piece of cucumber. This is a very simple task, they were very happy to do the exchange, and they would do it virtually all the time. After a sufficient number of them had been trained, we did several experiments with monkey pairs. The first group of pairs was the control group: we put two monkeys side by side and did the exchange task with cucumber pieces as we did before, but alternated between the two monkeys 25 consecutive times. Next, we did the same exchange task with one of the pair as we did before, pebbles for cucumber pieces, but the other one was given a grape for a pebble. Grapes are much more highly preferred by monkeys (the food preferences of monkeys seem to vary with the supermarket price: the more expensive the food, the better it tastes). The partner could see this all happening. Rewards were alternated between the two, one getting cucumber pieces, the other getting grapes. A third experimental group was also given cucumbers or grapes, but the second monkey

received his grapes without any effort: he did not need to exchange, he was simply given the grapes. Monkeys in the control group refused to do the task less than 5% of the time. When the second monkeys were rewarded with grapes, the task was refused nearly half the time, often with an aggressive reaction: throwing the food and the pebbles out of the cage, indicating great unhappiness with the task. The refusals became even more frequent, about 80% of the time, if the second monkey received grapes gratis. We believe these data suggest that monkeys may exhibit an aversion to inequity.

The fairness issue is closely related to the interests of economists, who have classically assumed that human beings are rational optimizers of the costs and benefits of their choices. Some economists, however believe that we are guided by emotions and passions that sometimes lead to irrational behaviors, at least in the short run, such as in this case of a monkey refusing its food. If a professor, for example, learns that a colleague in his department receives a salary that is twice his for the same kind of work, he may quite his job. That behavior is irrational, but nevertheless has happened. Some economists have become interested in such irrational human actions and have developed very interesting evolutionary explanations for it. The results of this study are aligned with that thinking, in the sense that monkeys behave in a similar manner, rejecting acceptable food when the rational strategy would be always to exchange. They exhibit emotions similar to humans, becoming very unhappy when someone else receives a better deal than they.

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