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Social Play in Coyotes, Wolves, and Dogs

Marc Bekoff
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Social play in both human and nonhuman animals has been relatively unstudied compared with other categories of social behavior. Fortunately, in the past few years investigators have been turning their attention to social play in a wide variety of species (e.g., Loizos 1966 and 1967, Dolhinow and Bishop 1970, Farentinos 1971, Steiner 1971, Müller-Schwarze 1971, Blurton-Jones 1972, McGrew 1972, Bekoff 1972a,b, 1973, 1974; Wilson, S.¹) One of the most exhaustive studies on play behavior has been conducted by Ternbrock (1958) on the red fox (*Vulpes vulpes*). I would like to report the results of some developmental studies conducted on infant canids which provide some insights into the dynamics of the development of social play. Among some of the questions I will consider are: "Why do some species play more than others?" and "How do animals know that they are playing?"

Scott (1967, p. 373) wrote that "one of the things which distinguishes different members of the family Canidae from each other is the differential development of social behavior." I decided to analyze the social development of four coyotes (*Canis latrans*), four wolves (*C. lupus*), and four beagles (*C. familiaris*), observed in same-species pairs during the first half of the period of socialization (see Scott and Fuller [1965] and Fox [1971] for information pertaining to stages of social development in canids). Coyote-beagle and wolf-malemute hybrids were also observed. This past spring, a litter of coyotes (four males and two females) was born in our facility, and the animals were left with their mother. They were observed for 253 hours between 18 and 72 days of age.

By observing captive animals, individuals could be positively identified at a very young age. Furthermore, observations on the intact coyote litter indicated that, from 18-35 days of age, approximately 85-90% of all social interaction occurred inside the nest box or immediately in front of it. The nest box had been oriented previously so that we could see what occurred inside. In the wild, it would be very difficult to gather such data.

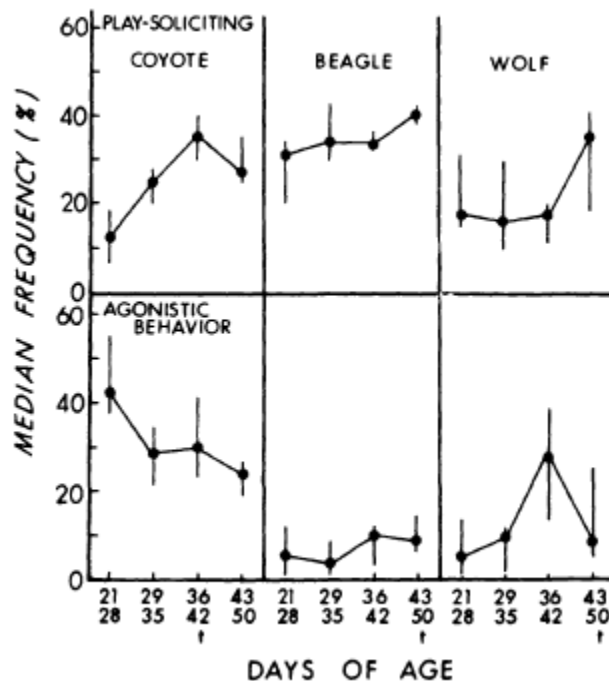
The animals, which were observed in pairs, were hand-reared from approximately 10 days of age and were all treated similarly. Earlier observations by Fox and Clark (1971) on coyotes had indicated that animals given only 15 minutes of interaction per day with a littermate followed the same course of development as did their littermates who were reared together. Similar data have been collected for the dog (Scott and Fuller 1965, Fox 1971). Therefore, social interaction was controlled by housing the animals separately and allowing each to interact for 15 minutes per day (at the same time each day, one hour after feeding) with a similarly treated littermate. They were housed together in pairs after dominance relationships were established (see Fig. 1, t) to determine behavioral changes due to cohabitation (e.g., food competition, increased proximity).

During previous observations, an ethogram (behavior repertoire) had been compiled. Thirty-five discrete motor action patterns (body postures, gestures, facial expressions) and vocalizations were catalogued (see Bekoff 1972b, Table 1). Coding the actions facilitated recording of the interactions. Detailed daily notes were also taken. The same co-observers and I were present and interobserver agreement was consistently over 95%.

Social play in canids and other mammals has been characterized as follows: (1) Actions from various contexts are incorporated into labile (unpredictable) temporal sequences (e.g., Ludwig 1965, Bekoff

1974). For example, inhibited biting accompanied by side-to-side head-shaking in the absence of prey or true aggression, "sexual" mounting in sequences that differ from those observed during typical courtship, and stalking during play-soliciting have been observed.² (2) A play bout is often preceded by a metacommunicative signal which indicates "what follows is play" (Bateson 1955). These actions are also observed during a play bout. The metacommunicative signal may involve changes in posture, a specific gesture, or a vocalization. It is possible that in those instances in which a play signal is not detected by the observer, the "signal" that "this is play" may be in the sequencing of the actions themselves (Chevalier-Skolnikoff 1973). (3) Certain actions may be repeated and exaggerated. (4) The activity appears "pleasurable" to the participants (Bertrand 1969, Bekoff,³ Csikszentmihalyi and Bennett 1971, Csikszentmihalyi,⁴ Reynolds⁵). I should stress that play is not characterized only by reference to adult behavior patterns (e.g., Loizos 1966). Infant coyotes, for example, perform species-typical predatory sequences (Fox 1969) and also engage in serious agonistic interactions. When these actions are performed by the same animals during social play, there is exaggeration of certain actions and the sequencing differs from that observed during real predation or aggression. In the animals observed in this and other studies, play-fighting could also be differentiated from true fighting by observing various play actions that are interspersed with aggressive and submissive actions.

Fig. 1. Coyotes, beagles, and wolves display differences in the ontogeny of social behavior. This graph presents the median frequency of occurrence (%) of action patterns observed during play-soliciting and agonistic interactions, in relation to the total number of action patterns performed during the stated time periods. t = animals housed together in pairs at the beginning of this time period. Vertical bars = range. (after Bekoff 1974)



The results of this study have provided interesting data concerning the development of social play behavior. In all animals, contact play (wrestling) preceded running and chase play, the latter increasing in frequency at approximately 4 weeks of age. At this age the animals showed better coordination and increased locomotor skill than at an earlier age. Throughout the course of observation of both the hand-

reared and mother-reared individuals, no sex differences were noted, although such differences have been observed in various primates (e.g., Latta et al. 1967, Harlow 1969).

One of the most striking findings was the differential development of behavior among the coyotes, the wolves, and the beagles. A developmental ethogram was compiled recording the age at which each of the actions first appeared for each of the animals (Bekoff 1972a, 1974). Extreme differences were detectable as early as 21 days of age (Fig 1). Coyotes engaged in more agonistic behavior earlier in life than the others. They formed their social relationships (dominance hierarchy) by means of severe, unritualized fights during the fourth week of life, and as social relationships became established, the frequency of agonistic behavior fell while that of play rose. In the intact litter of coyotes, dominance relationships were formed on day 30, and there was a negative correlation ($\rho = -.79$) between the rank of an individual and its ability to successfully initiate social play. The dominant male was the least successful (Bekoff and Jamieson⁶).

Fig. 2. This picture portrays a coyote (on the right) performing a "play dance" in front of a beagle. The coyote frequently does a quick "bow" and then dives at, and rolls in front of, its playmate.



The beagles were the most solicitous and playful of all the animals observed. They engaged in a total of 480 play bouts, while the wolves played 163 times, and the coyotes only 69 times. The beagles consistently demonstrated a high frequency of play and very low levels of agonistic behavior, and it was not possible to discern any social hierarchy throughout the course of the study.

The social development of the wolves was similar to that of the beagles. Although the wolves did show slightly higher levels of agonistic behavior, all of it was threat. No fighting was observed, and fights of the intensity, duration, and vigor of those observed in 1 month old coyotes have only been observed twice by Fox (pers. comm.) and by Mech (1970) in infant wolves. Zimen (1974), conducting extensive studies on wolf behavior, found that his wolves first had dominance fights at approximately 9 months of age. For my wolves, as the frequency of agonistic behavior precipitously fell, the frequency of social play soliciting concomitantly rose (days 43-50). The qualitative changes in behavior were remarkable as the animals became more playful.

How can we account for these differences in the social development of these closely related animals? The coyote is considered to be less social than either the beagle or wolf. At some time during the first year of life, coyote littermates usually disperse, and it is probable that the early development of agonistic behavior, along with undetermined factors, facilitates this dispersal. We have recently found that in our litter of coyotes, the highest ranking animal (the male previously referred to) was not only the least successful in initiating social play, but was also the only animal to kill prey at 8 weeks of age, and the most out-going and explorative (Bekoff and Jamieson⁶). The fate of this animal and his littermates awaits further observation.⁷

Fig. 3. The dog on the left performs a "bow" in front of her desired playmate (upper), and when this was unsuccessful in initiating social play, she began barking and wagging her tail (lower). Barking may function as an attention-getting device.



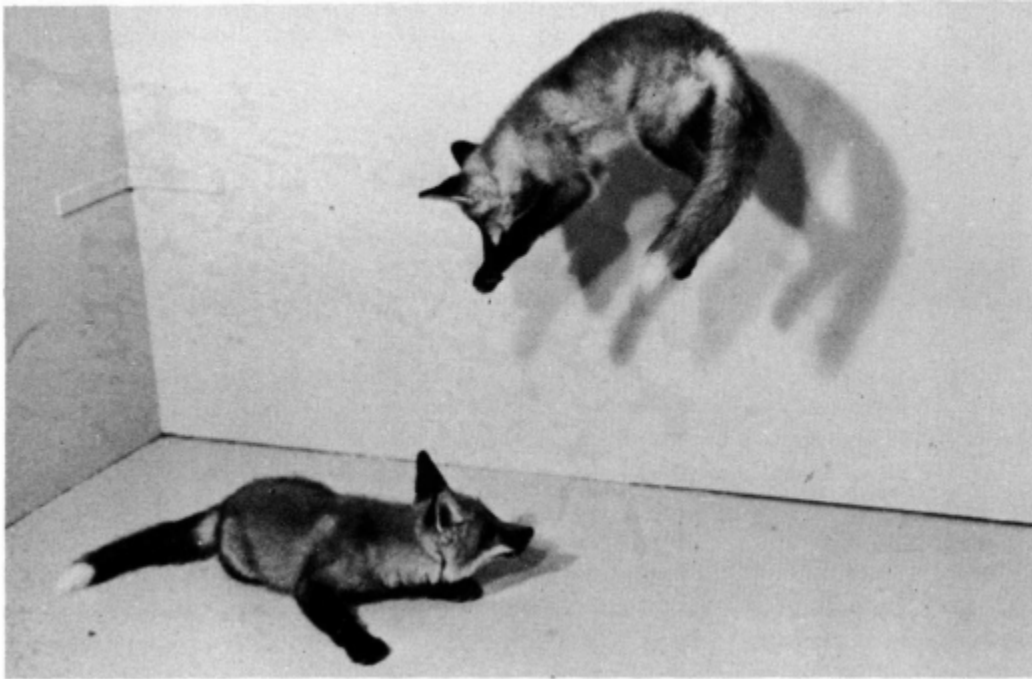
The beagle is a domesticated animal that has been artificially bred for purposes of pack-hunting (Scott and Fuller 1965). Increased sociability and decreased agonistic behavior would be important traits to maintain, and our findings and those of others (see Scott and Fuller 1965) support the fact that domestication of this animal, in terms of amicability towards littermates, has been successful. That the social development of the wolf in very early life appears not to be very different from that of the beagle is interesting, and comparison of their life styles reveals a marked similarity; namely, both species perform activities which require cooperation among group members. In general, it appears that "canids which play together tend to stay together." This is true within our litter of coyotes, and there are data which suggest this is also true in various groups of wolves (Lockwood, R., Social motivation in captive wolves, in prep.). Tembrock (1958) wrote that the frequency of play between two individual red foxes was a measure of "fondness."

Fortunately, in the past few years we have made observations on a number of canid hybrids-coyote-beagles ("coydogs") and wolf-malemutes ("moofs"). Observing the development of play behavior in these animals has provided us with some interesting data concerning the role of a particular species (breed?)-typical motor action pattern in the initiation of social play. This action was termed the *leap-leap*, two or more successive leaps of high-amplitude in which the forepaws are lifted simultaneously high off the ground as the animal approaches a prospective playmate. The leap-leap was performed significantly more frequently by the beagles than by the coyotes or the wolves, and also by hybrids, one of whose parents was a domestic dog. In the beagles, 80% of all leap-leaps were successful in the initiation of social play (Bekoff 1974). None of the coyotes were observed to perform this action, and the few which the wolves performed were of considerably lesser amplitude. The leap-leap appeared earlier in the "moofs" than in the "coy-dogs," and the "moofs" also performed a greater number. In the "moofs," leap-leaps were frequently used to initiate social play. Since a decrease in intraspecific aggressiveness and an increase in sociability would have been favored during domestication, the facts that this response has (1) never been observed in coyotes, (2) has been observed only rarely in wolves, and (3) is consistently seen in domesticated dogs and their hybrids, are noteworthy. The increased frequency of leap-leaps in the beagle, and the high success of this action in the initiation of social play is indicative that selection for the traits mentioned above may have also played a role in the elaboration of this action.

An aspect of social play that is basic to any discussion of the phenomenon concerns the question of how a "play mood" is established and maintained between interacting animals; what signals are used to convey readiness to play and ensure that this message is understood by a solicited animal? This exchange will increase the probability that the mood of the ongoing interaction will continue in a manner appropriate to the initial stimulus (e.g., a play invitation). Bateson (1955), while watching monkeys at play, concluded that "play could only occur if the participant organisms were capable of some degree of metacommunication, that is, of exchanging signals which could carry the message that 'this is play.'" This message is conveyed by body postures, various gestures, facial expressions, vocalizations, and odors in a variety of organisms (see Loizos 1966, 1967, Steiner 1971, Bekoff 1972b, 1974, Sade 1973, Wilson⁸, Wilson and Kleiman 1974), and further research will probably uncover similar types of messages in a still wider range of animals. In essence, metacommunication is a form of precommunication. Metacommunicative messages serve to alter the meaning of subsequent signals (Altmann 1967) and affect the way in which other messages are interpreted, allowing animals to distinguish between playful and nonplayful situations. For example, preceding and accompanying play encounters, canids will perform certain movements signalling to another animal that any aggressive-like behavior in the play situation (e.g., baring of the teeth, growling) will not be real aggression. It is common to observe inhibited biting and various aggressive behavior during a play bout, but the recipients do not respond to them as being true aggression since the play mood has already been established by an exchange of metacommunicative signals. It appears that metacommunicative signals increase the threshold for

retaliation. Furthermore, it is not uncommon to observe role reversals during play, that is, a dominant animal allowing itself to be "dominated" by a subordinate.

Fig. 4. Red foxes often perform high vertical leaps during play-soliciting and chase play.



An analogy of this type of communication in humans would be as follows: I approach another person giving off certain nonverbal signals; for example, a loose, bouncy gait, and a smile. As I get close to him, I reach out and slap him on the back, and he falls over. Because I had established that I was being friendly and not aggressive, his response would no doubt be different than if I had approached in an aggressive manner, and then slapped him. I had communicated my intent; the recipient had perceived and shared it, and had responded accordingly.

For the animals observed in this study, there were large differences in a number of aspects of play-soliciting. The coyotes were the least successful in soliciting play. However, when they did play, 90% of all bouts had been previously solicited. The coyotes also tended to use the most successful signals most often. When taking into account the fact that infant coyotes are much more aggressive than either infant wolves or beagles, the differential ontogeny of play is explainable. In short, the coyotes have to be able to differentiate "play" from "not play," and by preceding almost all attempts to play with a play signal, and also by using those signals which are most successful most often, the probability of play occurring is increased (see Bekoff 1974).

Play signals are rarely answered by aggression. R. Shideler (pers. comm.) recently observed that in two groups of wolves at Point Barrow, Alaska, unsuccessful play-solicitations were almost always met with indifference rather than aggression, and similar data have been collected by me and a number of undergraduates during our long-term study of the behavior of free-roaming dogs on the Washington University campus.

Play-soliciting sequences in canids often incorporate actions such as the "bow," the play "dance" (Fig. 2), *exaggerated approaches* (high-amplitude stepping with a loose gait; gamboling), rapid *approach/withdrawals* which are frequently used by one animal to initiate chase by another ("teasing"),

play-rushes consisting of one animal rapidly approaching another animal and stopping suddenly, perhaps followed by rapid turning-away and chase, and *pawing* (rapid extension and flexion of a forepaw toward the face or body of a prospective playmate). Some actions are more successful than others in the initiation of social play, the success rate depending on who is interacting with whom (Bekoff 1974). A "play-face" (Fox 1970) is typically worn during play-soliciting and is also observed during a play bout. Risking anthropomorphism, this gleeful expression appears to be an external indication of what the animal is feeling-the eyes are wide open, the lips are drawn back horizontally into a "smile," and often this expression is accompanied by barely audible panting.

Fig. 5. In the upper photograph (after Bekoff 1972b, with the kind permission of the *Quarterly Review of Biology*), the dog on the left is performing a face-oriented pawing movement and also appears to be threatening (vertical retraction of the lips) his "rival." Subsequently, the two animals played together (lower photograph) and never displayed any aggression toward one another. These photos provide an example of how actions from different contexts may be incorporated into a play bout, and that priority is usually given to the play invitation, in this case, face-oriented pawing. Priority to the play signal has also been observed in primates (Loizos 1966).



Very often a play signal will be accompanied or followed by barking (in dogs), and this barking may serve to call further attention to the solicitor, and may also be used to recruit other potential playmates (Fig.3). It appears that it is best to consider play-soliciting movements as intention movements and/or attention-getting devices (Steiner 1971).

We have recently had the opportunity to make some observations of play behavior of red foxes (*Vulpes vulpes*) and kit foxes (*V. macrotis*). Both of these species show more orientation to the tail of their partners than do coyotes, beagles, or wolves—frequently pulling the tail both to initiate play and during play bouts. In the red fox, high vertical leaps often accompany play soliciting (Fig. 4) and are also seen during chase play. Also, in the red fox, much biting is oriented toward the white cheek; this part of the body contrasts nicely with the deep red color of the rest of the body.

At this point, it is very important to mention that when two seemingly contradictory signals are given by one animal, priority is usually given to the play signal. This is nicely shown in Fig. 5. In this situation, the dog on the left is performing a face-oriented pawing movement and also appears to be threatening the other dog (lips vertically retracted and teeth bared). Subsequent interaction between these two animals, both immediately and throughout the course of my observations, were totally friendly, with no inkling of aggressive behavior on the part of either animal. Inhibited cheek biting, rearing, and wrestling were noted.

Maintenance of a play mood throughout an ongoing interaction appears to be accomplished by the rapid and efficient exchange of metacommunicative signals between the interactants. Many of these signals are extremely subtle and fleeting, and I am presently analyzing movie film (taken at the eye level of the animals) in order to better understand how signals are exchanged.

A full discussion of why animals play cannot be undertaken in the present paper. Various authors have considered the various functional aspects of social play, and it is safe to conclude that no one theory or explanation is applicable to all animals (Beach 1945). In canids, as in other mammals, social play experience appears to be necessary for the acquisition and/or elaboration of certain species-typical social skills. However, brief periods of social play are usually sufficient. For example, beagles, allowed minimal contact with conspecifics, show little difference in sexual behavior when compared to normally reared beagles (Beach 1968). In coyotes, individuals reared in isolation are able to successfully kill prey (Fox 1969). It appears that play experience provides the opportunity for young animals to develop more complex and varied social interaction patterns, but "...an adaptive modicum of competence can develop without play" (Baldwin and Baldwin 1974).

In addition, through play, a developing animal gets the physical exercise it needs for muscular growth, and develops coordination which will eventually be important for an activity such as hunting. In wolves, social play may serve to facilitate group cohesion necessary for group coordinated behavior. Finally, animals may engage in social play because it is a "pleasurable" experience (Bertrand 1969, Bekoff⁹, Csikszentmihalyi and Bennett 1971, Csikszentmihalyi¹⁰, Reynolds¹¹). Young animals in particular devote a lot of time and energy to social play, and perhaps the relaxed "feeling" is indicated by the looseness of their gait and the bouncy movements observed during play. External cues are frequently used to infer mood, and the overt behavior associated with social play indicates a "pleasurable" experience. Neurophysiological studies may provide some further support for this anthropomorphic point of view.

In conclusion, there is a growing interest in social play behavior. This was particularly obvious in a roundtable discussion at the recent ethology meetings held in Washington D.C. (August 1973) during which investigators familiar with a wide variety of organisms exchanged ideas and discussed pertinent issues relative to the characterization, functions, and methods of studying this important category of social behavior.

NOTES

¹ Wilson, S. Juvenile play of the common seal *Phoca vitulina vitulina* with comparative notes on the grey seal *Halichoerus gryous*. *Behaviour*, in press.

² This suggested characteristic of social play is being analyzed in great detail by using a computer program specifically designed to analyze temporal sequences of behavior. For further information please contact the author.

³ Bekoff, M. Social play in nonhuman mammals: Some perspectives and speculations, in prep.

⁴ Csikszentmihalyi, M. Flowing: A general model of intrinsically rewarding experiences in prep.

⁵ Reynolds, P.S. Play as a state of mind, in prep.

⁶ Bekoff, M., and R. Jamieson. The development of social behavior in coyotes: A hypothesis relating individual differences and later dispersal, in prep.

⁷ Current observations (February 1974) indicate that the high ranking male is virtually noninteractive as is the lowest ranking female.

⁸ see footnote 1.

⁹ See footnote 3.

¹⁰ See footnote 4.

¹¹ See footnote 5.

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