

AGGRESSIVE BEHAVIOR OF DOGS KEPT AS COMPANION ANIMALS: CLASSIFICATION AND INFLUENCE OF SEX, REPRODUCTIVE STATUS AND BREED

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ABSTRACT

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Data were obtained from a total of 245 cases of aggressive-behavior problems in dogs kept as companion animals. Aggression involved barking, growling and biting behavior. For each case, a home visit of one to several hours yielded a description of the sequences of aggressive behavior and the stimulus conditions in which they occurred. Eight major types of aggression were observed: aggression related to fear; dominance; possessiveness; protectiveness; predation; punishment; pain; and intra-specific aggression.

The incidence of each type of aggression is presented. More aggression problems occurred in males than females, with dominance and inter-male aggression showing the greatest likelihood of occurrence in males. Fear-elicited aggression and predatory aggression were the least influenced by the sex of the dog. Tabulation of associations among these problems revealed that dominance and possessive aggression frequently occurred together, fear-elicited and intra-specific aggression frequently occurred alone, and many of the aggression problems were associated with non-aggressive problems related to fear (phobias) and anxiety. The data indicated that aggressive-behavior problems are widespread across many breeds and suggest some breed \times problem interactions. Fewer instances of dominance aggression occurred in mixed than in pure breeds. A classification system, proposed to represent the functional sub-systems of aggression in the pet dog, is presented.

INTRODUCTION

There are an estimated 48 million dogs kept as companion animals in the United States (Frost and Sullivan, 1980). A significant proportion of them present behavior problems (Allen and Westbrook, 1979) which adversely affect the pet itself or the relationship between the pet and other animals, the pet and the owner, or the pet and the community at large. The most common

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and most serious of these problems involves aggression. For instance, biting in dogs has reached epidemic proportions in the United States, with over 1 million people reporting serious bites each year (Harris et al., 1974; Beck et al., 1975). Some of these bites result in human deaths (Winkler, 1977; Borchelt et al., 1983).

The economic, medical and public health implications of behavior problems in general, and the treatment of these problems (animal behavior therapy), has only recently drawn the attention of the behavioral sciences and veterinary medicine (Tuber et al., 1974; Tortora, 1977; Hart, 1978, 1980; Voith, 1979). Many treatment techniques have been successfully drawn from the animal behavior, animal learning, behavior modification and veterinary medical literature. However, to date, basic data about the diagnosis, classification and significant variables which influence these problems have been sparse.

The data described in the present paper were obtained from several hundred cases involving aggressive behavior in dogs kept as companion animals. Aggression is defined as the occurrence or likelihood of an escalating sequence of barking- growling- biting behavior. A preliminary classification scheme of aggressive behavior in the pet dog is offered, and the incidence of each type of aggressive problem is presented according to the sex of the dog, reproductive status (intact, castrated, or spayed) and breed.

METHODS

From May 1978 to May 1981, a total of 524 cases of behavior problems in dogs and cats were seen in the New York metropolitan area. Each case involved a home visit, ranging in duration from 1 to 7 h (average 1-2 h for cats, 2-3 h for dogs). A diagnosis of the behavior problem (s) was made and the clients (owners) were taught the appropriate behavior techniques to begin treatment. Extensive telephone follow-up was often required to adjust treatment techniques as necessary and ensure a high probability of success.

Diagnosis of behavior problems entailed relatively structured interviews with relevant family members to obtain a detailed behavioral analysis of the problem. Behavioral analysis includes descriptions of sequences of behavior, specification of stimuli (for example, eliciting, reinforcing, discriminative, aversive or contextual properties), history or development of the behavior, relevant medical history, and potential treatment constraints such as breed or stage of development, owners' life-style, etc. In most cases, an important element contributing to the accuracy of the behavioral analysis (diagnosis and classification) and to effective treatment was the opportunity to observe, elicit, or simulate the behavior problem in the natural environment (home).

RESULTS

Of the 524 cases, 152 (29%) involved cats and 372 (71%) involved dogs. Of the 372 dog cases, 245 (66%) included some degree of aggressive behavior

(bark—growl—bite). The 245 cases involved a total of 258 dogs. Some dogs exhibited more than one behavior problem. A total of 373 identifiable behavior problems was observed for an average of over 1.4 problems/dog. The results are divided into 3 sections. Section I gives a behavioral description of the aggressive-behavior problems observed. Section II presents data on frequency, sex and reproductive status for each problem type. Section III presents breed incidence in types of aggressive-behavior problems.

I. Behavioral description

The aggressive-behavior problems were classified according to a combination of eliciting stimuli, context, and behavioral components which accompany a bark, growl or bite. Eight major types were observed.

Fear-elicited aggression

Fear-elicited aggression is accompanied by postures of defensiveness, fear or submission, such as ears back, tail down or tucked between the legs, and approach/withdrawal. The dog typically barks to initial eliciting stimuli such as sounds outside the home, doorbell or knock, the sight of a stranger, children, animals, or an unusual-looking person. The dog growls or bites usually only when approached, particularly if approached quickly.

Dominance aggression

Dominance aggression is a highly complex and variable behavior problem. A dominant aggressive dog *may* exhibit one or more components of a constellation of species-typical dominant postures, such as “stand-over”, direct eye contact (stare), tail and ears erect, or a tense or rigid posture accompanied by the occurrence or likelihood of growling, baring the teeth, snapping or biting. These postures are highly likely to be directed towards family members and less likely to be directed towards non-family members. Often, a dominant aggressive dog will form a “dominance hierarchy” in the family. The position the dog may take in the hierarchy is variable; some dogs display dominance postures and aggression to all family members and other dogs display dominance aggression only to some members.

The topography of the “stand-over” posture is variable. If the owner, for instance, lies or crawls on the floor, the dog may in fact display the typical posture (Fox, 1971), but if the owner, for instance, sits or stands, the dog may attempt to climb in the owner’s lap, constantly paw at the owner, or block the owner’s movements in the home. The dog seems to finely adjust its dominance-related postures to the owner’s behavior. In some ambiguous cases, it is not easy to differentiate presumptive dominance related behavior from other behaviors such as attention-seeking.

Some dominant aggressive dogs do not exhibit overt signs and postures of dominance, but instead only resist being placed in submissive postures or situations. For instance, the dog may not “stand-over” or stare, but may

become aggressive if forcibly rolled over on its back. This may occur despite the fact that the dog rolls over readily to have its stomach rubbed or petted. Sometimes, a subtle behavior by the owner, such as petting the dog, patting it on the head, grooming it, putting on or taking off the leash, bending over the dog, picking it up, pushing it off the bed and so forth, will be interpreted by the dog as dominant behavior of the owner and will elicit aggression.

There is great variation and subtlety in the stimuli which elicit this problem. Owners often report the aggression as “unprovoked”, but in the vast majority of cases, one can identify and reproduce or simulate the eliciting stimuli for each instance of aggression.

Possessive aggression

This behavior problem involves growling, baring the teeth, snapping, or biting when the dog is in possession of some object (food, bone, toy, etc.) and someone (family, stranger, animal) approaches and/or attempts to take it away. Sometimes the dog will guard the possession and threaten any approach. In the extreme, and sometimes when accompanied by dominance aggression, the dog will actually steal an object (clothes, tissues, small objects) and guard it. Possessive aggression is frequently a feature of dominance aggression, but only dogs displaying possessive aggression with no other signs of dominance were included in this category.

Protective aggression

Protective aggression involves aggression in the context of protecting the home, yard, or owner (adults or children). The term “territorial” aggression does not entirely convey the range of contexts in which the dog is protective. In protective aggression, the dog’s postures can include ears and tail up, visual attending, and approach. The dog may bark, growl, lunge or bite. Eliciting stimuli include sounds outside the home or yard (for example, people or animals walking nearby), the sight or sounds of a stranger entering the home or yard, the doorbell or a knock at the door, a person (particularly of unusual appearance) approaching or apparently threatening (from the dog’s view) the owner, children, or other pets in the family, or family behaviors such as hugging, dancing, etc., which the dog may incorrectly interpret as threatening.

Predatory aggression

The initial components of predatory aggression involve intense visual scanning and attending to the area where “prey” are anticipated, followed by stalking and chasing of a wide range of moving stimuli. Barking, nipping, and/or biting complete the sequence; growling is apparently not observed. This behavior may be directed to cats, birds, squirrels, smaller dogs, etc. (and in these cases *may* involve killing), or towards children or adults who move in a particular way, usually quickly. In the cases included in the present paper, predatory aggression towards people did not involve more than inhibited biting and occurred only in dogs with histories of predatory behavior towards other animals.

Punishment-elicited aggression

When punished (yelled at, hit), or presented with stimuli which predict punishment (voice, approach), the dog may growl, bare the teeth, snap or bite. It is not necessary that the dog experience, or have experienced, pain during the punishment for this problem to occur.

Pain-elicited aggression

In this problem, the dog may growl, bare the teeth, snap or bite only when it experiences pain, for example, when groomed, medicated, or injured.

Intra-specific aggression

Typically, intra-specific aggression is inter-male or inter-female aggression. It may include barking, growling and biting in the context of dominance postures (for example, "stand-over" or staring), fear postures (for example, ears back, tail down), or in the context of possession. Thus, many cases involve dominance aggression, fear aggression, or possessive aggression, but directed to other dogs rather than (but sometimes in addition to) people. The aggression may occur over food or toys, in or out of the home, or with familiar or strange dogs outside of the home.

II. Incidence, sex and reproductive status

Table I depicts the total number and percentages of intact and castrated males and intact and spayed females observed, and the frequencies and percentages of each problem-type as a function of sex and reproductive status. Males which were castrated and females which were spayed at the time of the home visit, but which were intact at the time the problem developed, are included in the intact category. Several points are noteworthy.

First, fear-elicited aggression is the most common (23% of the cases), followed by dominance (20%), possessive (17%), and protective (17%) aggression. These four problem-types accounted for 77% of the aggressive behavior problems. Intra-specific aggression occurred in 12% of the cases, with punishment (7%), and pain elicited aggression (2%) and predatory aggression (1%) occurring infrequently.

Second, males (67.4%) are much more likely to be aggressive than females (32.6%). A binomial test, corrected for continuity, yields $z = 5.54$, $P < 0.00001$. The best comparison for these results is the sex ratio obtained from the 127 non-aggressive cases observed during the same period. For these cases, a total of 133 problem dogs were seen; 67 (50.4%) were male and 66 (49.6%) were female. A binomial test, corrected for continuity, yields $z = 0$, $P = 0.5$.

Third, it appears that intact males (86%) are much more likely to be aggressive than castrated males (14%), and that spayed females (68%) are more likely to be aggressive than intact females (32%). However, the comparable figures for the non-aggressive cases are, for males, 78% intact and 22% castrated, and for females, 70% spayed and 30% intact. The difference in the ratio of intact to castrated or spayed dogs between aggressive and non-aggressive cases is not statistically significant ($\chi^2 = 2.69$, $P > 0.10$).

TABLE I

The number and percentage of males (intact and castrated) and females (intact and spayed) displaying each type of aggressive-behavior problem

	N	Male 174 (67.4)		Female 84 (32.6)	
		Intact	Castrated	Intact	Spayed
<i>N</i> and % of total		149 (57.8)	25 (9.7)	27 (10.5)	57 (22.1)
% by sex		(85.6)	(14.4)	(32.1)	(67.9)
Type					
Fear	86	41 (48)	8 (09)	15 (17)	22 (26)
Dominance	73	62 (85)	4 (05)	2 (03)	5 (07)
Possessive	65	34 (52)	9 (14)	2 (03)	20 (31)
Protective	63	38 (60)	10 (16)	6 (10)	9 (14)
Punishment	27	19 (70)	3 (11)	2 (07)	3 (11)
Pain	9	6 (67)	0	1 (11)	2 (22)
Predatory	4	1 (25)	1 (25)	1 (25)	1 (25)
Intra-specific	46				
To males		19 (95)	1 (05)	0	0
To females		0	0	5 (36)	9 (64)
To both		6 (86)	1 (14)	0	0
Fear-related		3 (60)	1 (20)	0	1 (20)
Total <i>N</i>		229	38	34	72
Total %		61.4	10.2	9.1	19.3

Fourth, close inspection of Table I reveals that intra-specific and dominance aggression are more influenced by sex and reproductive status than are the other types of aggression. During intra-specific aggression, intact males are aggressive mostly to male dogs but sometimes to both males and females, and intact males show much more intra-specific aggression than castrated males. Females, on the other hand, are aggressive exclusively to females. Too few cases of fear-related intra-specific aggression are available, but this type of aggression may be best interpreted as a stimulus specific (to dogs only) form of fear aggression.

Dominance aggression is much more likely to occur in intact males than in castrated males, or in females in general. It is important to note that when dominance aggression did occur in intact females ($N=2$), both cases involved false pregnancies at the time the problem was evident. Moreover, in 4 of the 5 cases of dominance aggression in spayed females, the problem arose immediately (weeks to a few months at most) post-spaying. In the other case, the dog had been spayed at about 6 months of age and the problem did not develop until 1.5–2 years of age.

For protective aggression, and punishment- and pain-elicited aggression, the incidence is clearly much higher in males than females, and higher in intact males as compared to castrated males, but these problems do occur in a substantial minority of females. Although intact males still exhibit more

fear-elicited and possessive aggression than castrated males or females, these problems appear to be much less influenced by sex and reproductive status.

Table II presents a matrix depicting the associations among the most frequently occurring aggressive behavior problems. Included in the matrix are 2 of the most common non-aggressive behavior problems: fears or phobias (of thunder or other loud noise, people, etc.) and separation-anxiety (most commonly displayed by elimination, vocalization or destruction when left alone by the owner). These have been included because a surprising number of aggressive dogs also exhibited these fear and anxiety-related problems. Table II shows the number and proportion of cases occurring for each pair of problem types. For example, of the 73 cases of dominance aggression, 10 (14%) included dominance signs only, 54 (74%) exhibited dominance and possessive signs, 16 (22%) dominance and protective signs, etc.

Several of the associations are noteworthy. First, dominance and possessive aggression are frequently associated. Second, fear-elicited aggression and intra-specific aggression frequently occur alone. Third, many of the aggressive problems are associated with non-aggressive problems involving fear and anxiety. It should be noted that the association between punishment-elicited and dominance aggression is probably under-represented in these data. Most dogs exhibiting dominance aggression escalate their aggression when punished or threatened with punishment, particularly by the owner. Most owners quickly realize this and avoid punishment techniques.

III. Breed incidence

Table III lists the number of pure-breed dogs observed and the number exhibiting each of the types of aggressive-behavior problems. Breeds are listed and grouped according to the American Kennel Club (1980). It is apparent that each of the aggressive-behavior problems occurs in a wide range of specific breeds and breed groups. The total number of dogs observed is quite small in view of the large number of pure and mixed-breed combinations which exist, thus great caution is required in interpreting any breed \times problem interactions. A conservative interpretation is to tentatively highlight only the obvious disparities in breed \times problem incidence. Table III suggests some trends.

Dominance aggression seems more likely in English Springer Spaniels and occurs frequently in the Doberman Pinscher, Toy Poodle, and Lhasa Apso breeds. Dominance aggression occurs with about equal frequency in the different breed groups, except for hounds, where it occurs infrequently. Possessive aggression seems to occur in Cocker Spaniels more frequently than other breeds. Protective aggression appears more likely among working dogs and particularly among German Shepherds. Fear-elicited aggression seems much more likely to occur in German Shepherds than in other breeds, and occurs commonly in Cocker Spaniels and Miniature Poodles also. The frequency of occurrence of the other aggressive problem types is too low for meaningful breed interactions to be observed.

TABLE II

Associations (number and proportion) among behavior problems. Included are the 4 most common aggressive-behavior problems and the 2 most common non-aggressive problems¹

N	D	Po	Pr	F	PuE	PnE	IS	Pho	SepAnx
73	Dominance	10(0.14)	16(0.22)	10(0.14)	7(0.10)	3(0.04)	6(0.08)	18(0.25)	10(0.14)
65	Possessive	20(0.31)	17(0.26)	17(0.26)	11(0.17)	3(0.05)	7(0.11)	16(0.25)	26(0.40)
63	Protective		23(0.37)	3(0.05)	2(0.03)	0(0.00)	4(0.06)	13(0.21)	13(0.21)
86	Fear			48(0.56)	1(0.01)	2(0.02)	3(0.03)	25(0.29)	16(0.19)
46	Intra-specific				2(0.09)	0(0.00)	15(0.33)	5(0.11)	4(0.09)

¹ D = dominance; Po = possessive; Pr = protective; F = fear; PuE = punishment-elicited; PnE = pain-elicited; IS = intra-specific; Pho = phobia; SepAnx = separation anxiety.

TABLE III (continued)

<i>N</i>		D	Po	Pr	F	PuE	PnE	Pred	♂	♀	Both	FR
Toys												
4	Maltese	2		3	1		1			1		
7	Toy Poodle	4			1	1	2			2		
5	Shih Tzu	2	2		2		1			1		
4	Yorkshire Terrier	1	2								2	1
1	Silky Terrier		1									
Non-sporting dogs												
3	Bichon Frise		1		2		1					
2	Boston Terrier			1					1			
1	Bulldog	1										
2	Dalmatian	1										1
1	Keeshond	1										
11	Lhasa Apso	6	3	1					1	2		
2	Poodle		2	1								
1	Tibetan Terrier				1							
6	Miniature Poodle	2	1		5		1					

¹ One dog may be represented in more than one type of aggression behavior problem.

² D = dominance; Po = possessive; Pr = protective; F = fear; PuE = punishment-elicited; PnE = pain-elicited; Pred = predatory; ♂ = inter-male; ♀ = inter-female; Both = intra-specific aggression to males and females; FR = fear-related intra-specific aggression.

The large number of mixed-breed combinations have all been combined into one category (mixed breed). Table IV compares pure breeds and mixed breeds with respect to the total number and percentage of aggressive-behavior problem types. Binomial tests indicated that the only individual problem type which significantly differed between pure and mixed breeds was dominance aggression ($z = 2.95$, $P(\text{one-tailed}) = 0.0016$), with dominance aggression occurring more in pure than in mixed breeds. The difference for inter-male aggression approached significance ($z = 1.64$, $P(\text{one-tailed}) = 0.0505$), with inter-male aggression occurring more in mixed breeds than in pure breeds.

TABLE IV

Total frequency and percentage of aggressive-behavior problems in pure-breed ($N = 168$) and mixed-breed ($N = 88$) dogs¹

	Problems											
	D	Po	Pr	F	PuE	PnE	Pred	♂	♀	Both	FR	
Pure breed ($N = 242$)	60	36	40	54	15	7	3	9	9	5	4	
Mixed breed ($N = 131$)	13	29	23	32	12	2	1	11	5	2	1	
Pure breed (%)	25	15	17	22	06	03	01	04	04	02	02	
Mixed breed (%)	10	22	18	24	09	02	01	08	04	02	01	

¹ Types of aggression are labelled as in Table III.

DISCUSSION

The general types of aggressive-behavior problems which occur in pet dogs have been presented. The data indicate differences in the incidence of some types of aggression as a function of sex, and suggest such differences as a function of reproductive status and breed. These findings will be discussed with respect to the variables influencing each type of aggression, the relation between aggression and other behavioral systems, and the classification system itself.

Variables influencing aggression in dogs

It is clear from the present data that more aggression occurs in male than in female dogs. Overall, about 2/3 of the instances of aggression occurred in males. This is in contrast to the virtual equality in the sex incidence among the cases of non-aggressive behavior problems.

A higher incidence of aggression in males is common in many species (Johnson, 1972; Leshner, 1978), including dogs (Scott and Fuller, 1964), and can be a function of several factors including genes, gonadal and extra-gonadal hormones, neural organization, body size and weight. Generally, the types of aggression which are the most sexually dimorphic occur in the context of reproductive behavior. Thus, inter-male aggression in many species is correlated with seasonal changes in androgens, is first exhibited when androgen levels rise during puberty, and is correlated with adult baseline levels of androgens. Dominance-related aggression is also correlated with adult baseline levels of androgens (Leshner, 1978). Other types of aggression, such as fear-related aggression and predation, should be less influenced by androgens, since these behaviors serve functions of equal importance to males and females.

The present data further suggest that gonadal hormones influence aggressive-behavior problems in dogs. More aggression cases involved intact than castrated males, and more involved spayed than intact females. These results are difficult to interpret, however, since the ratios of intact to castrated males and intact to spayed females in the catchment population is not known. The only estimate available is the ratio among the observed non-aggression cases. The slightly lower proportion of intact males and intact females among non-aggression cases is not significantly different statistically from the ratio among aggression cases. However, both inter-male and dominance aggression, which show the greatest difference between intact and castrated males, are also the behavior problems for which castration is likely to be an effective part of the treatment (Hopkins et al., 1976; Voith, 1979).

The breed \times problem type interactions are equally difficult to interpret because the proportion of various pure breeds and the proportion of pure to mixed breeds in the catchment population is not known. These proportions change over time, and may also vary locally. It is certainly true that different breeds of dogs have a long history of selection for different types of behavior,

and there is abundant evidence for genetic differences in a variety of behavioral traits in dogs (Scott and Fuller, 1964). However, any one breed of dog is behaviorally quite variable, and descriptions of typical breed tendencies or dispositions are, at best, generalizations. Thus, these breed \times problem interactions are merely presented; they cannot be accurately interpreted, much less used predictively, without similar data from many other practitioners in other localities. Some pure breeds are not even represented in the present data, and many breeds are represented by only one or a few individuals. Probably, many thousands of cases from various locations would be required before any accurate statements about breed differences and aggression problems could be formulated.

The significantly lower incidence of dominance aggression in mixed breeds as compared to pure breeds is interesting. A similar finding, based on several hundred aggression cases, is reported by Voith (1981). A genetic component to dominance aggression is suggested, and it appears that dominance aggression may be a recessive trait. This might be expected in a species, such as the wolf, which lives in small, highly social groups in which a high frequency of dominance-related behavior would lead to social conflict (Lockwood, 1976).

It also is possible (perhaps probable) that humans have inadvertently selected for dominance aggression among some pure-breed dogs. A high proportion of the mating within any one breed is accomplished by the few males who are consistent "winners" in the show ring. For many breeds, the show standards require the dog to readily display dominant postures (e.g. upright body posture, ears and tail erect, weight forward, etc.). Thus, the readiness to display or learning to display such postures could increase rather quickly over generations.

Aggression and other behavioral systems

One might ask why a person would keep as a companion animal a dog which growls and bites. In fact, all of the aggressive dogs observed were aggressive only under certain specific stimulus conditions, and were friendly, playful and affectionate under most other stimulus conditions. Some of the most aggressive dogs were also the most friendly and affectionate. The stimulus-specificity of these aggression problems is, of course, to be predicted based on a general scientific understanding of animal behavior, but is confusing to the average pet owner.

This general confusion about how animal behavior works is further complicated by the rapidity with which the dog switches from non-aggressive to aggressive behavior, and back again. The most dramatic instances of rapid switching between behavioral systems occurs in dominance aggression. The very social behaviors of the owner which elicit play, for instance, at one time and circumstance, elicit growling and biting at another, perhaps immediately followed by further play behavior. Furthermore, mixing of behavioral

systems can occur when aggressive and non-aggressive behaviors are displayed simultaneously. For instance, dogs often growl, lunge and bite with the tail wagging. This intergrading of aggression with submissive, fear, attachment and friendly behavior occurred in most cases.

The co-existence of aggressive behavior problems with fear and anxiety-related behavior problems is also common. The stereotype of the aggressive dog as a “dominant, vicious, fearless, unsocialized” animal is not correct. Many companion dogs appear to balance several competing behavior systems. For the dog living in the complex human environment, at one time dominant aggression (for instance) is elicited; at another time, anxiety about the absence of the owner is elicited; and at yet another time, fear of loud noises or another type of aggression is elicited. The manner in which these competing systems are “time-shared”, and integrated physiologically, is fertile ground for future research.

The classification of aggression in dogs

The classification system proposed in this paper differs somewhat from classifications proposed by Moyer (1968) for aggression in general and Voith (1979, 1980) for dogs. The terms “territorial”, “irritable”, “maternal”, “predatory” and “learned” or “instrumental” aggression, used in these and other classification systems, requires some comment.

For dogs kept as companion animals, the term “protective” aggression seems more descriptive of the actual stimulus-response relations that occur than the term “territorial” aggression. Pet dogs do, at times, aggressively protect their “territory”, whether that be the home, yard or living area, but dogs often also aggressively protect the owner, children, or other animals, regardless of whether or not they are in their “territory”. The behaviors the dog displays and the eliciting stimuli may be similar or even identical regardless of whether protective aggression occurs on or off the dog’s property. The term “territorial” aggression is applicable to species in which the actual securing and holding of territory has adaptive advantage. In the domestic dog, the function of this behavior has apparently generalized or been selected to include protection of significant persons in the dog’s social unit as well as places in the environment.

The term “irritable” aggression indicates that conditions of frustration, conflict, discomfort or pain all tend to lower the threshold for aggression. Some of the cases described in the present paper did include apparent irritability on the part of the dog at certain times, but the predominant eliciting stimuli for aggression invariably allowed the behavior to be classified as pain-elicited aggression, or sometimes dominance, possessive, intra-specific or punishment-elicited aggression.

“Maternal” aggression refers to aggressive behavior in female dogs when nursing or caring for pups, or during a false pregnancy when the female may display maternal behavior to pup surrogates such as toys or other objects

(Voith, 1980). Several such cases were discussed with clients over the telephone. Since the problem is self-limiting in the sense that weaning or termination of false pregnancy leads to a cessation of the problem, few data were collected on these problems. Follow-up information suggests that avoiding interaction with the female during this time, and subsequent spaying, are usually easy and effective means of solving the problem.

The term "predatory aggression" presents some problems. Predatory behavior is an appetitive component of the feeding behavior system. In general, it does not naturally fit as a component of the aggressive-behavior system, despite the occurrence of lunging and biting behavior. However, some dogs exhibit predatory, or at least predatory-like, behavior to humans, and then display (usually) inhibited nipping or biting. They fail (usually) to exhibit any signs of killing or feeding behavior. For these cases, it might be argued that the term "predatory aggression" is useful in that preliminary signs of predation are exhibited, followed by inhibited aggressive behavior (nips, bites). The owner (or the person bitten), at least, considers it aggression.

Of course, one might as well argue that the behavior sequence is simply predation which has been stimulated initially by, for instance, rapid movement, and then subsequently inhibited by the discrimination of the "prey" as human — a stimulus to whom play and affection are directed at other times. It is perhaps significant that social threat signals, particularly growling, were not observed in these cases and that the occurrence of predatory aggression did not seem related to hunger.

In all of the cases observed, the only "real" predation was directed towards small animals and most of these cases involved killing and/or capturing of at least some prey. Consumption of the prey rarely, if ever, occurred. Instances of predatory behavior of dogs directed towards humans involving capture, killing and feeding are apparently quite rare. Borchelt et al. (1983) describe several cases of groups of dogs attacking and severely injuring or killing humans. Despite these cases involving groups (packs?) of dogs and consumption of flesh, it is not clear that predation motivated by hunger was a major causative factor. Few instances of this type of behavior problem have been observed, and additional observations are needed to understand the distinction between predation and predatory aggression of dogs to humans.

The terms "learned" or "instrumental" aggression do not logically fit into a functional classification system, since learning is a process which influences any of the classes of aggressive behavior. These terms also have the unfortunate connotation of suggesting that other forms of aggression do not involve learning. Based on the histories of these several hundred dog aggression cases, it is apparent that aggression cannot be neatly divided into those instances which are learned and those which are not. In *all* of the cases observed, aggression developed over time. A complex of genes, hormones, early and later experiences, stimulus and response contingencies, and the entire range of other variables known to influence the development of behavior, all interact to lead to more or less aggressive behavior in an individual dog.

Furthermore, in all of the cases, aggression was stimulus-specific. That is, none of the dogs were randomly or unpredictably aggressive. Each only exhibited aggression under certain conditions, and most of these conditions could be reproduced and modulated in the home environment. For each of the proposed classes of aggression, the dog could potentially learn the instrumental or operant contingencies associated with its aggression. For instance, some problems escalated when the dog learned, over succeeding trials, that aggression led to people moving or staying away from it. Many dogs quickly learned to anticipate eliciting stimuli, and aggression often readily generalized to other related stimuli.

An additional reason for avoiding use of terms such as “learned” aggression is that well-understood learning processes were effective techniques for reducing the vast majority of individual problems involving each of the classes of aggression. One or more techniques, such as habituation, desensitization, punishment (rarely) and counter-conditioning, were particularly successful. Note that co-existence of play, affectionate and attachment behavior with aggressive behavior (discussed above) provides a rich supply of stimuli (other than the obvious food and water) which are inhibitory or antagonistic to aggression and can be used in a counter-conditioning program. Sometimes it was necessary to combine these techniques with castration or synthetic progestin therapy for the more hormone-related problems (dominance and intra-specific aggression).

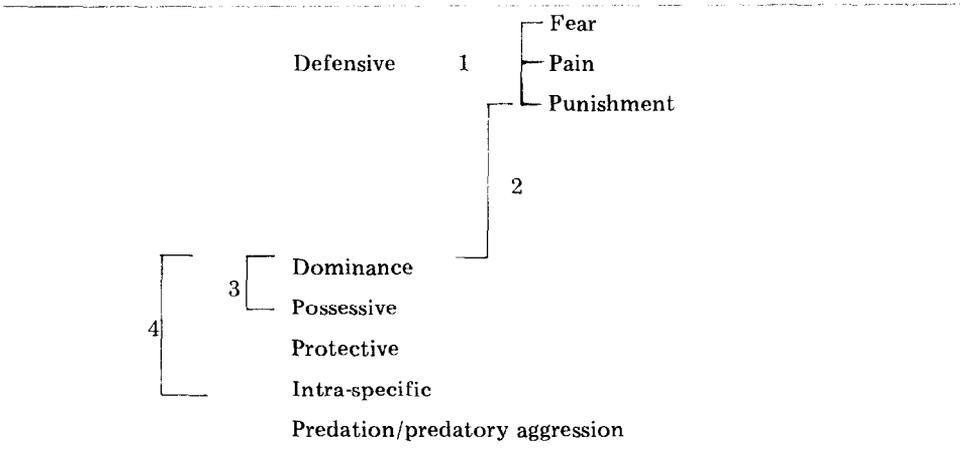
It is proposed that the types of aggressive-behavior problems described in the present paper represent the naturally-occurring aggressive behaviors which develop in dogs living with humans. These behavior problems parallel to a great extent the species-typical sub-systems of aggression exhibited by wolves (Mech, 1970; Fox, 1971), at least with respect to the sequences of behavior and general contexts in which they occur. The eliciting stimuli, of course, differ markedly.

Table V depicts how these problem types might be grouped, and shows 4 links or connections among and between these problem types. The first link clusters fear-elicited, pain-elicited and punishment-elicited aggression into a general category called “defensive aggression”. Each of these 3 behavior problems involves the dog defending itself from some threat or from pain. For each of these problem types, the dog is likely to display defensive or submissive signals prior to, or during, the display of aggression.

The second link indicates that punishment-elicited aggression and dominance aggression are probably more closely related than is indicated by the data from this paper (Table II). Social threats by the owner (or anyone else), which are interpreted by the dog as punishment for aggression (and sometimes even non-aggressive misbehavior), usually elicit escalated aggression rather than submission from the dominant aggressive dog. Fortunately, few owners of dominant dogs used punishment techniques frequently. Since punishment was not likely to be part of a treatment program, not all owners were asked whether they had used punishment, and the dog’s response to punishment or social threat was not often directly assessed.

TABLE V

A classification scheme for aggression problems in the domestic dog, and 4 links among the problems (see text)



Third, dominance and possessive aggression are, in many cases, closely linked. Generally, dominance involves control of resources or access to resources (Alcock, 1979). Lockwood (1979) factor analyzed numerous behavioral variables in wolves and found a high loading of “food competition” with other factors interpreted as “dominance”. Many dominant aggressive dogs observed in the present study became aggressive when they were disturbed when resting in a certain area, eating, or guarding objects. On the other hand, many dogs exhibited possessive aggression without other signs of dominance or indications of defending any resource other than food or perhaps a few toys or objects, but even some “submissive” wolves will, in some circumstances, aggressively defend a choice piece of food or bone from a more “dominant” wolf.

The fourth link indicates the clear effect of sex and hormones on dominance and intra-specific aggression. Dominance and inter-male aggression are the 2 problems most likely to occur in males, and particularly intact males. They are also the 2 problems most likely to respond to castration and synthetic progestin therapy.

It is clear from the present data that aggression in the dog is not a unitary phenomenon. There are several types, or sub-systems, of aggression. These sub-systems are differentiated by the behavioral components involved in the aggressive sequence, the stimuli which elicit them, and the extent to which they are influenced by sex and reproductive hormones. Genetic effects would also be expected. It is hoped that the present classification scheme will facilitate future research on the controlling factors underlying these problems, their treatment, and their prevention.

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