

Paper

Inter-dog aggression in a UK owner survey: prevalence, co-occurrence in different contexts and risk factors

R. A. Casey, B. Loftus, C. Bolster, G. J. Richards, E. J. Blackwell

Aggression between dogs is common and can result in injury. The aims of this study were to estimate prevalence, evaluate co-occurrence with human-directed aggression, and investigate potential risk factors, using a cross-sectional convenience sample of dog owners. Aggression (barking, lunging, growling or biting) towards unfamiliar dogs was reported to currently occur, by 22 per cent of owners, and towards other dogs in the household, by 8 per cent. A low level of concordance between dog and human-directed aggression suggested most dogs were not showing aggression in multiple contexts. Aggression towards other dogs in the household was associated with increasing dog age, use of positive punishment/negative reinforcement training techniques, and attending ring-craft classes. Aggression towards other dogs on walks was associated with location of questionnaire distribution, owner age, age of dog, origin of dog, dog breed type, use of positive punishment/negative reinforcement training techniques and attending obedience classes for more than four weeks. In both, the amount of variance explained by models was low (<15 per cent), suggesting that unmeasured factors mostly accounted for differences between groups. These results suggest general characteristics of dogs and owners which contribute to intraspecific aggression, but also highlight that these are relatively minor predictors.

Introduction

Aggression directed towards other dogs is a commonly reported problem, making up 35 per cent of aggression cases presenting to a referral centre in Spain (Fatjo and others 2007), and 7 per cent of cases where owners sought help from a behavioural service in Denmark (Lund and others 1996). Dog-to-dog bites can cause serious injury and infection (Mouro and others 2010), and can have an important impact on the welfare of canine victims (Roll and Unshelm 1997) including assistance dogs (Brooks and others 2010). Few studies have evaluated the risks for intraspecific canine aggression, with existing studies largely based on case series without comparison populations (eg, Wrubel and others 2011).

The aims of this study were to use a convenience sample of UK dog owners to gather information on (1) the proportion of owners reporting aggression towards other dogs when out for walks, and towards other dogs within the household, both currently and in the past; (2) comorbidities between conspecific aggressive behaviour in different contexts, and with human-directed aggression, and (3) risk factors for intraspecific aggressive behaviour using multivariable anal-

yses. Risk factors for human-directed aggression in this population are reported elsewhere.

Materials and methods Questionnaire and subjects

The questionnaire contained four sections: (1) information about owners: age, sex, geographical location, experience of owning and training dogs; (2) information about dogs: sex, neuter status, age, breed, origin; (3) information about training classes attended, age of dog when attended and length of attendance; (4) whether owners had used any of 22 different training approaches or devices and (5) the current and previous occurrence of undesirable behaviours, including aggression towards other dogs in the household, and unfamiliar dogs when out. Aggression was defined here as barking, lunging, growling or biting.

A convenience sample of dog owners was recruited between May 2007 and August 2009, at different geographical locations around the UK, and at types of events and places where dog owners would be likely to frequent, such as dog shows, countryside events and veterinary practices (Table 1). Questionnaires were distributed with a reply paid envelope to maximise returns. Owners of multiple dogs completed a single questionnaire, regarding their youngest dog.

Statistical analysis

The age of dogs in months was log₁₀ transformed. Other data were categorical. Breeds were combined into UK Kennel Club categories (Table 1) for regression models. The percentage of owners reporting each type of aggression currently (at the time of questionnaire completion), in the past only, both in the past and current at the time of questionnaire completion, and ever occurred, were calculated (Table 2). The extent of comorbidity between aggression towards other dogs in the household and when outside of the household (eg, on walks)

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TABLE 1: Characteristics of the population

Characteristic	Categories	Number	Percentage
Location of questionnaire distribution	Veterinary practices	836	22
	Dog shows/dog-related events	1940	50
	Agricultural/horse events	246	6
	Directly to dog walkers	539	14
	Pet or other shops	239	6
	Other/unknown	97	2
Owner sex	Female	3334	86
	Male	540	14
Owner age	<25 years	312	8
	25-40 years	844	22
	41-60 years	1868	48
	>60 years	851	22
Owner location in UK	Scotland/Wales	68	2
	NE England	95	2
	NW England	152	4
	E Midlands	369	10
	W Midlands	196	5
	E England	327	8
	SE England	121	3
	SW England	1396	36
	Unknown	659	17
	Owner experience	Professional dog trainer	123
Experienced owner and trainer		1414	36
Experienced owner/new at training		1656	43
Origin of dog	New or inexperienced dog owner	688	18
	Breeder	2189	56
	Rescue centre	765	17
	Friend/relative	144	4
	Other (incl. pet shops)	384	10
Dog sex	Home bred	386	10
	Males	188	48
Dog neuter status	Females	1993	51
	Neutered	1995	51
Dog grouping by UK Kennel Club categories	Entire	1738	45
	Toys	185	5
	Terriers	438	11
	Utility	205	5
	Gundogs	1176	30
	Working	253	7
	Pastoral	725	19
	Crossbreeds	679	17
Training class attended	Overall attendance at training classes	2746	71
	Puppy socialisation classes	1294	33
	Obedience classes	1616	42
	Agility training classes	729	19
	Flyball classes	97	3
	Gundog training classes	167	4
	Ring-craft classes	669	17

was evaluated using κ measure of agreement. This was also used to compare co-occurrence with aggression towards people in different contexts, to evaluate the extent to which aggression towards other dogs and people occurred concurrently within dogs.

TABLE 2: Number and proportion of owners reporting aggression towards other dogs within the household, and when out for walks, in the past and at the time of questionnaire completion

Behaviour reported	Reported occurrence of behaviour	Number	Percentage of sample
Aggression towards other dogs out on walks	Occurred currently at time of questionnaire completion	586	15
	Occurred in past but not currently	285	7.3
	Occurred in past and still occurs at time of questionnaire completion	432	11.1
	Reported to have ever occurred	871	22.4
Aggression towards other dogs in the household	Occurred currently at time of questionnaire completion	184	4.7
	Occurred in past but not currently	142	3.6
	Occurred in past and still occurs at time of questionnaire completion	129	3.3
	Reported to have ever occurred	326	8.4

Attendance at training classes was reduced to a 0/1 score. To exclude those only attending classes transiently, a positive score only included cases where owners reported attending classes for at least four weeks. For puppy classes, positive attendance was scored where owners reported going to classes for at least two weeks when their dog was <12 weeks of age, to only include those attending within the socialisation period (Serpell and Jagoe 1995). Training methods were reduced to two categories (Table 3): those using positive reinforcement or negative punishment only, and those where any methods involving positive punishment and negative reinforcement were used (terms as defined in Blackwell and others 2012). Potential risk factors for each type of conspecific aggression were screened using univariable binary logistic regression. Dependent variables for each were whether or not dogs had ever shown aggression, calculated by combining 'present in the past', and 'present currently' variables, as reported by owners. Location for questionnaire distribution was included to check for sub-population biases. Variables $P < 0.2$ were included in multivariable logistic regression models, built through a backward stepwise approach. Hosmer-Lemeshow goodness-of-fit χ^2 statistic was generated, and residuals examined to identify cases which poorly fitted the model.

Results

Description of the population

Three thousand eight hundred and ninety-seven of 14,566 distributed questionnaires were returned complete. Distribution of questionnaires and characteristics of the population are shown in Table 1. Dog ages ranged from 6 to 204 months (mean 48).

Prevalence of, and relationships between, different types of aggression

Numbers and percentages of owners reporting each type of aggression are shown in Table 2. Comparisons of different presentations of aggression revealed κ (kappa) measures of agreement to be <0.4 in all cases (Table 4), where values >0.7 are considered to represent good agreement (Peat 2001). As behaviours in different contexts did not co-occur, the two types of intraspecific aggression were maintained as separate dependent variables in further analyses.

Risk factors for aggression to dogs within the household

The final model significantly distinguished between dogs showing intraspecific aggression in the household and controls ($\chi^2=73.535$, $df=10$, $P < 0.001$), but explained only between 1.9 per cent (Cox and Snell R^2) and 4.3 per cent (Nagelkerke R^2) of the variance. Variables included in the final model were breed type, age of dog (log10), attendance at ring-craft classes, and category of training methods used (Table 5).

TABLE 3: Categorisation of training approaches, methods or devices into categories of positive reinforcement/negative punishment and positive punishment/negative reinforcement

Category	Training methods included
Positive reinforcement or negative punishment only (owners reported only using one of these techniques and none of those listed in the category below)	Food treats Clicker training Verbal praise Withholding treats Shutting away Stroking/petting Ignoring Play
Positive punishment or negative reinforcement (owners reporting using one or more of these techniques)	Bark-activated citronella collar Verbal punishment (shouting) Pet corrector Electric fence Physical punishment (smacking) Electric collar (remote activated) Choke chain Jerking back on lead Bark-activated electronic collar Water pistol Husher Non-verbal distractor (eg, can of stones) Prong collar Citronella collar (remote activated)

TABLE 4: Relative comorbidity of aggression occurring in different contexts in the population

		A				
		Aggression towards family members	Aggression around food bowl	Aggression towards unfamiliar people out of the house	Aggression towards unfamiliar people entering house	Aggression towards other dogs in the house
B	Aggression around food bowl	20% A; 7% B; K=0.088 P<0.001				
	Aggression towards unfamiliar people out of the house	20% A; 9% B; K=0.107 P<0.001	13% A; 16% B; K=0.109 P<0.001			
	Aggression towards unfamiliar people entering house	32% A; 10% B; K=0.133 P<0.001	15% A; 13% B; K=0.102 P<0.001	49% A; 34% B; K=0.374 P<0.001		
	Aggression towards other dogs in the house	15% A; 5% B; K=0.052 P<0.001	18% A; 16% B; K=0.134 P<0.001	17% A; 12% B; K=0.104 P<0.001	15% A; 16% B; K=0.113 P<0.001	
	Aggression towards other dogs out walking	41% A; 4% B; K=0.048 P<0.001	24% A; 7% B; K=0.041 P=0.001	61% A; 14% B; K=0.180 P<0.001	45% A; 15% B; K=0.158 P<0.001	41% A; 13% B; K=0.135 P<0.001

Percentages indicate the proportion of dogs from each category which show both behaviours, defined as A or B for columns and rows respectively. K is the Kappa measure of agreement throughout.

TABLE 5: Variables remaining in final multivariable logistic regression model for aggression towards other dogs within the household

Variable	Categories	Wald statistic	P value	Odds ratio (ExpB)	95% CI for ExpB	
					Lower	Upper
Age of dog (log10)		8.197	0.004	1.553	1.149	2.098
Training category	Any use of positive punishment/negative reinforcement as compared with reference category of only positive reinforcement/negative punishment	19.640	<0.001	2.501	1.667	3.751
Ring-craft classes	Attending ring-craft classes for at least 4 weeks compared with reference of not attending	12.415	<0.001	1.689	1.262	2.260
Breed type	Reference category: crossbreeds	31.005	<0.001			
	Toy	3.242	0.072	0.493	0.228	1.065
	Terriers	1.964	0.161	1.346	0.888	2.038
	Utility	2.864	0.091	1.550	0.933	2.576
	Hounds	1.267	0.260	0.694	0.367	1.311
	Gundogs	3.448	0.063	0.700	0.481	1.020
	Working	0.676	0.411	0.789	0.449	1.387
	Pastoral	3.360	0.067	1.411	0.976	2.039

Variables included in the multivariable logistic regression model were: dog breed type; owner age category; owner experience with dogs; dog sex; origin of dog; dog age (log10); attendance at agility classes; attendance at ring-craft classes; category of training methods used

Risk factors for aggression towards unfamiliar dogs when outside of the household

The final model significantly distinguished between cases and controls ($\chi^2=382.399$, $df=22$, $P<0.001$), explained between 9.7 per cent (Cox and Snell R^2) and 14.8 per cent (Nagelkerke R^2) of the variance, and included the location of question distribution, age of dog (log10), breed type of dog, owner age category, origin of dog and attendance at obedience classes (Table 6).

Discussion

Proportion of population showing aggressive behaviour to other dogs

There is little previous evidence with which to compare prevalence data reported here: other surveys have used factors derived from relative scales, such as the C-BARQ (Duffy and others 2008, Hsu and Sun 2010) rather than presence/absence. Proportions of dogs showing aggression is unsurprisingly lower than in clinical populations without unaffected controls (eg, Fatjo and others 2007). At least numerically, aggression directed towards other dogs outside the household appears to be a particularly serious problem, with over a fifth of contributing owners reporting that this behaviour had occurred at some time in their dog.

Caution should be exercised in extrapolating these data to the general dog population, however, as this opportunistic sample is not necessarily representative. Questionnaires were distributed at a range of different locations. Approximately half were distributed at dog shows or related events: this possibly increased the relative proportion of pedigree animals, people who have bred their own dogs, and 'enthusiast' dog owners in the sample. The location of questionnaire distribution was a significant factor in the final model differentiating dogs reported by owners as showing aggression directed towards other dogs outside the household and those which did not. This is perhaps expected, as owners of aggressive dogs are less likely to attend dog-related events. This bias is likely to have reduced the overall prevalence for this type of aggression. In addition, some caution is required because of possible inaccuracies in owner report of aggressive behaviour. Although aggression was defined as objectively as possible by describing behavioural signs seen during aggressive encounters (eg, growling, lunging or biting), it is possible that in some cases these behaviours were shown due to other motivations, such as lunging associated with frustrated play, and be misinterpreted by owners.

For aggression towards other dogs in the household, 44 per cent of owners reporting the problem suggested that occurrence was in the past but not current. The equivalent proportion for aggression

TABLE 6: Variables remaining in final multivariable logistic regression model for owner-reported aggression towards other dogs encountered when out of the household

Variable	Categories	Wald statistic	P value	Odds ratio (ExpB)	95% CI for ExpB	
					Lower	Upper
Location type for questionnaire distribution	Reference category: veterinary practices	15.690	0.008			
	Dog events	9.199	0.002	0.729	0.595	0.894
	Agricultural/horse events	1.383	0.240	0.803	0.558	1.157
	Dog walkers	6.753	0.009	0.686	0.516	0.911
	Commercial (eg, pet shops)	0.001	0.991	0.998	0.702	1.419
	Other	1.515	0.218	1.821	0.701	4.727
Breed type	Reference category: crossbreeds	81.670	<0.001			
	Toy	0.002	0.964	1.011	0.641	1.592
	Terriers	22.762	<0.001	2.091	1.544	2.831
	Utility	0.389	0.533	1.144	0.750	1.743
	Hounds	0.337	0.562	0.880	0.573	1.354
	Gundogs	7.731	0.005	0.672	0.508	0.889
	Working	3.759	0.053	1.461	0.996	2.142
	Pastoral	9.082	0.003	1.519	1.157	1.994
	Increasing age	111.069	<0.001	3.427	2.726	4.310
Age of dog (log10)	Reference category: breeder	34.227	<0.001			
	Rescue centre	31.242	<0.001	1.925	1.530	2.422
	Bred by owner	0.487	0.485	0.891	0.643	1.233
	From friend/relative	1.155	0.283	1.256	0.829	1.903
	Other (incl. pet shop)	4.526	0.033	1.354	1.024	1.790
	Origin of dog	Reference category: Under 25	17.067	0.001		
25-40 years		3.205	0.073	0.741	0.534	1.029
41-60 years		0.907	0.341	0.864	0.639	1.168
Over 60 years		10.592	0.001	0.572	0.408	0.801
Attending obedience classes	Attending class compared with reference of not	22.010	<0.001	1.495	1.264	1.768
	Category of training method used	29.857	<0.001	1.969	1.544	2.510

Variables included in the multivariable logistic regression model were: location type for questionnaire distribution; owner experience with dogs; dog breed type; owner age category; dog sex; dog neuter status; dog sex*neuter status (interaction between dog sex and neuter status); dog age (log10); origin of dog; attending puppy classes; attending obedience classes; attending agility classes; attending gundog classes; attending ring-craft classes, and category of training method used

towards other dogs out on walks was 33 per cent. This may suggest that in at least a proportion of cases, aggression either resolves spontaneously, or the behaviour is successfully treated. However, it is also possible that owners do not report aggression as 'current' where they have developed ways in which to avoid aggressive incidents. For example, those with dogs showing aggression towards other dogs on walks may avoid contact with other dogs or keep their animal leashed. Longitudinal research into factors influencing the development and amelioration of such behaviours would be needed to better understand this aspect.

Co-occurrence of behaviours

Dogs in this study did not tend to show aggression in multiple contexts. This is consistent with dogs developing behaviours through learning in specific contexts, rather than aggression being an overall characteristic of individuals (Bradshaw and others 2009). The underestimation of associative learning abilities, and resulting misconception that dogs are either 'perfectly safe' or 'vicious' is common (Bradshaw and Casey 2007). Public education programmes should, therefore, highlight the chance that apparently safe dogs can show aggression in specific circumstances. (De Keuster and others 2005, 2006).

Owner age and sex effects in intraspecific aggression

For this population, no effect of owner sex was found with respect to aggression towards other dogs either in the household or out on walks. This is in contrast with Roll and Unshelm (1997), where owners of dogs attacking others were more likely to be male than owners of victim dogs. However, regional subpopulation effects are likely to influence findings in Roll and Unshelm (1997). Owner age category was found to differ between dogs aggressive towards others on walks and those which were not. Owners over 60 years of age were less likely to have dogs showing this behaviour than owners in the under 25 year age category. There are several reasons which might explain this finding. For example, older owners may be less active and exercise their dogs less, reducing the chance of encounters with other dogs. In addition, other people may walk their dogs, in which case owners

would not observe aggressive responses. Older dog owners may have more time to dedicate to their dogs, for example, spend more time on training, provide them with more exercise and socialisation with dogs, or seek out places for exercise where contact with other dogs is less likely. There are also potentially generational differences in attitudes towards dogs, or tolerance of different behaviours.

Dog sex and neuter status effects in intraspecific aggression

No effects of dog sex or neuter status were identified as risk factors for conspecific aggression. In a case series, Wrubel and others (2011) found fights more likely to occur between same-sex pairs within households, particularly females. Female English cocker spaniels have been found to be more likely to show aggression to other dogs in the household (Podberscek and Serpell 1996). Aggression between bitches in a household, especially where they are entire, is suggested by clinical behaviourists to be particularly serious (De Keuster and Jung 2009). Differences may be related to outcome measures: increased risk in females reported elsewhere may be indicative of increased severity of aggression where it occurs, rather than risk of any aggression occurring. Also, no data was available here on the characteristics of the other dog(s) in the household. For aggression to unfamiliar dogs, Schönig and Bradshaw (2005) suggested that males show an increased aggression risk, although none was found here. Further investigation into the relationship between sex, neuter status and aggressive behaviour is needed to reduce clinical confusion about the relative value of neutering in the prevention and treatment of aggressive behaviour.

Dog age effects in intraspecific aggression

Risk of aggression towards other dogs, both within and outside the household, increased with age. Since aggression is postulated to arise in animals on encountering situations of perceived threat (Bradshaw and others 2009, De Keuster and Jung 2009), it is likely that these findings are indicative of the cumulative chance of encountering threats, and hence, developing aggression over time (Haug 2008). In

addition, association of social contact with pain may be a factor in older dogs with osteoarthritis or other painful conditions.

Dog breed effects in intraspecific aggression

Breed type was retained in the final models for both types of intraspecific aggression. Although breed type, overall, was retained in the final model for aggression towards other dogs in the household, no specific breed category had a significantly increased or decreased risk as compared with the reference category of crossbreeds, although there were trends for toy breeds and Gundogs to have a reduced risk. For aggression towards dogs outside of the household, terriers were approximately 2.8 times more likely, and pastoral breeds were approximately twice as likely, to show this behaviour as compared with crossbreeds. Dogs in the Gundog category were about 1.5 times less likely to show aggression in this context. There was also a trend for dogs in the working group to have increased risk. Increased occurrence in the Jack Russell terrier is supported by findings of Duffy and others (2008), but other breed types identified here are not analysed independently elsewhere (eg, Hsu and Sun 2010).

Attendance at puppy socialisation and training classes

Attendance at puppy socialisation classes had no relationship with the occurrence of aggression towards unfamiliar dogs, which is surprising given the putative importance of early social experience on later behaviour (Serpell and Jagoe 1995). This is in contrast with Blackwell and others (2008), although Seksel and others (1999) also found no effect of additional interaction during puppy socialisation on later sociability ratings in relatively small groups of puppies. One aim of classes is to encourage social interaction between puppies during their sensitive period for learning, enabling the development of appropriate social signalling (Seksel 2008) particularly between individuals with different morphological characteristics (Kerswell and others 2010). The success of classes is likely to relate to variability in specific learning for individual puppies, which is influenced by how sessions are managed. Poorly run classes, or failure of owners to continue enabling interactions in the juvenile and adolescent period, may be important in this exposure not having the expected impact on later behaviour.

Attendance at obedience classes was significantly associated with 1.8 times increased risk of aggression to unfamiliar dogs. However, this relationship is not necessarily causal, and may be partly explained by owners seeking training assistance with aggressive dogs. Elsewhere, lack of obedience training has been associated with aggression (Schöning and Bradshaw 2005) and other undesired behaviours (Bennett and Rohlf 2007), although this link was not found in Blackwell and others (2008). Increased obedience might be expected to aid owners in avoiding situations in which dogs show aggression, and may influence the overall dog-owner relationship. However, close proximity to other dogs where there is anxiety about social contact may also increase the risk of aggressive behaviour. These findings suggest the importance of appropriate management of classes and recognition of where group classes may be counterproductive for individual animals that are poorly socialised towards other dogs. The type of training methods used in classes may also be important, as discussed further below.

Attendance at ring-craft classes significantly increased the risk of aggression between dogs in the household by 3.8 times. These classes are designed to introduce puppies destined for the show ring to the elements of showing practice, including tolerance of other dogs, hence, this association seems counterintuitive. However, showing owners are likely to have multiple dogs in the household, unmeasured here, and it is likely to be this which underlies this statistical association.

Training approach used

Each owner was asked to indicate all the different training techniques and approaches used on their dogs for any reason. Since almost all owners used one or more methods categorised as positive reinforcement/negative punishment (Table 3), training methods were compared by whether they also used one or more methods categorised as positive punishment/negative reinforcement. Training method remained a significant factor in both multivariable models. For aggression between dogs in the household, aggression was 3.8 times more

likely where owners used positive punishment/negative reinforcement. For aggression towards dogs outside the household, the behaviour was 2.5 times more likely where owners used these methods. These findings are consistent with those found in other studies, where use of positive punishment-based techniques is associated with the occurrence of undesired behaviour (Hiby and others 2004, Blackwell and others 2008, Herron and others 2009). However, since these associations are correlations, it is impossible to make causal interpretations. It may be that use of such techniques increases the risk of aggressive behaviour in dogs, but it is also possible that the occurrence of aggressive behaviour results in owners resorting to positive punishment/negative reinforcement-based training methods.

Origin of dog

Originating from a rescue centre was associated with 2.4 times increased risk of aggression towards dogs outside the household, as compared with originating from a breeder. Similarly, dogs were 1.8 times more likely to show this behaviour if they originally came from some 'other' source, including pet shops and newspaper advertisements. Dogs are commonly relinquished to rescue centres because of undesired behaviours (Salman and others 1998), and this is likely to explain the relationship between rescue centres and this behaviour. Individual rescue centres vary in approach, but the major UK charities actively work to rehabilitate dogs relinquished due to undesired behaviours. However, intraspecific aggression can be challenging to resolve in a kennel environment where dogs are housed in close proximity. This may explain the increased risk for intraspecific aggression identified here, especially as no effect on origin from rescue centres was identified for aggression towards unfamiliar people, separately analysed (Casey and others, unpublished data).

Since the 'other' category includes a number of sources for dogs, it is difficult to identify why this category is associated with increased risk of aggression towards other dogs, except that puppies from pet shops, purchased through advertisements, or via other third parties, may have had suboptimal early environments, limited opportunity for appropriate socialisation with other dogs, and/or are likely to be passed on to owners with limited advice or information.

Proportion of total variance explained by models

A low proportion of variance in each model was explained by the factors measured, particularly with respect to aggression between dogs in the household. Hence, although the factors discussed significantly vary between aggressive and non-aggressive dogs, there must be a number of other factors associated with differences between groups, which have not been measured here. This may include medical factors (Fatjo and Bowen 2009), and specific learning experiences (Bradshaw and others 2009). Because of the multiple factors involved in the development of aggression, it is suggested that aggressive potential is evaluated at the individual level (Collier 2006, Luescher and Reisner 2008, De Keuster and Jung 2009). This study tends to confirm that multiple factors are involved in aggression, and while it is important to recognise where general factors, such as breed influence risk, the relative influence of these characteristics on the occurrence of aggression in an individual dog appears to be relatively small.

Conclusions

In this owner survey, based on a convenience sample, aggression between dogs appears to be worryingly common, with over a fifth of dogs reported by owners as showing aggression towards other dogs on walks. Dogs appear to not show aggression in multiple contexts, whether this is directed towards other dogs or people. This suggests that dogs are likely to learn to show aggression in particular contexts rather than aggression being an overall characteristic of individuals. Significant risk factors for intraspecific aggression within the household included age and breed type of dogs, attendance at ring-craft classes, and the type of training methods used by owners. For aggression to other dogs on walks, the risk factors were location of questionnaire distribution, dog breed type and age, origin of dog, attending obedience classes and types of training methods used by owners. However, in both cases, the factors identified explained only a small proportion

of the variance between aggressive and non-aggressive dogs, suggesting that the general characteristics measured here, such as breed, have a relatively small overall influence on the development of dog-directed aggressive behaviour.

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