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Characteristics and risk factors of dog aggression in the Slovak Republic

R.E. Matos, T. Jakuba, I. Mino, M. Fejsakova, A. Demeova, J. Kottferova

University of Veterinary Medicine and Pharmacy in Kosice, Slovak Republic

ABSTRACT: Canine aggression is a widespread problem which receives a lot of attention from the media. It has important consequences in terms of public health and animal welfare. To address this issue it is necessary to first determine its epidemiological characteristics in the target population. This study was aimed at exploring the characteristics and determining the risk factors for dog aggression in the Slovak Republic and, in particular, for aggression directed at humans. For this purpose, we used a questionnaire directed to dog owners which included information about dog and owner characteristics, housing, training and fear behaviour. From the 177 analysed questionnaires, 67% portrayed dogs with some type of aggressive behaviour. Half of the animals showed some degree of owner-directed aggression and almost 40% were aggressive towards unfamiliar people. The approach of an unfamiliar male was the situation that stimulated most dogs to behave aggressively (33.3%) and a small percentage (2.3%) of the animals always showed aggression when approached by an unfamiliar child. Multivariate logistic regression models found that "owner's age" (OR, 0.96; 95% CI, 0.93 - 0.99) and "neuter status" (OR, 0.36; 95% CI, 0.13–0.98) were significantly associated ($P < 0.05$) with the exhibiting of aggressive behaviour in different contexts. "Dog's sex" (OR, 2.16; 95% CI, 1.09–4.27) and "type of training" (OR, 2.32; 95% CI, 1.19–4.80) were significantly associated ($P < 0.05$) with the exhibiting of aggressive behaviour towards familiar people. Younger owners were more likely to have aggressive dogs and neutered dogs were less likely to be aggressive in different contexts. Male dogs and dogs with informal training were more likely to be aggressive towards familiar people. Manifestations of fear were significantly associated with the expression of aggressive behaviour in all models. This study provides the first preliminary results on the characteristics and potential risk factors for human-directed aggression in Slovakia. The analysis of these data may help in determining which preventive measures should be given priority in this country.

Keywords: aggression; behaviour; risk factors; Slovakia

Dog aggression is a normal behaviour which serves an important communicative function in these animals (Bollen and Horowitz 2008); however, its expression is undesirable and extremely common (O'Sullivan et al. 2008). It represents a serious problem, not only in terms of public health but also due to its consequences in terms of animal welfare (Horisberger et al. 2004; Duffy et al. 2008) with many animals being relinquished, abandoned, (Orihel et al. 2005; Liinamo et al. 2007) and even euthanised in some cases (Radosta-Huntley et al. 2007; Rosado et al. 2009).

Aggression is the product of environment (owner's characteristics, living and management conditions, training, etc.) biology (sex, age, breed, etc.) and learning experiences (Bollen and Horowitz 2008; O'Sullivan et al. 2008); thus, its expression can vary greatly among individuals (Bollen and Horowitz 2008).

In Slovakia, to our knowledge, there is only a small amount of scientific literature reporting epidemiological data of dog aggression. Nevertheless, incidents involving human-directed aggression are not uncommon and, thus, there is a need to explore

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the main factors associated with aggressive canine behaviour in this country.

The goal of the present study was to perform a preliminary exploration on the characteristics of different types of aggressive behaviour in dogs using a validated owner questionnaire. We hypothesised that the dog's size, training history and living conditions would significantly affect the exhibiting of aggressive behaviour. In particular, we expected smaller and non-trained dogs to be more aggressive towards their owners and dogs from rural areas and those living outdoors to be more aggressive towards strangers.

MATERIAL AND METHODS

A self-administered (paper-pencil) (Chromy 2008) questionnaire was distributed by means of a snowball sampling method. The questionnaire was distributed by volunteers in three different types of environments: dog shows, parks and a University Department of Veterinary Medicine. We tried to avoid common issues in the design of problem behaviour questionnaires, e.g. pretesting, confirmation of reliability and validity of a questionnaire, by creating our questionnaire in accordance with sound questionnaire designing principles (Grooves 1987; Jenkins and Dillman 1997). Its graphic form was developed using CorelDraw 12 software according to the recommendations of Dillman (2007). Its objective was to identify behavioural problems in dogs (separation-related problems, aggressive and fear responses, obedience and compulsive behaviour). Twenty five participants of different ages and educational backgrounds were involved in the identification of potentially problematic elements (e.g. infrequent or ambiguous words or terms, difficulties in reading, etc.) of the questionnaire which was carried out using a debriefing method. Received data was carefully evaluated and the questionnaire was adjusted accordingly (Hess and Singer 1995). The reliability and validity of the questionnaire was then evaluated using Cronbach's alpha, test-retest reliability and content validity (Litwin 1995; Rubio et al. 2003; Rubio 2005). Data were collected from 30 participants placed in the same room without any time restrictions or mutual communication. The statistical software SPSS 12 was used for calculating Cronbach's alpha. Cronbach's alpha coefficient for aggression towards familiar people was 0.810 and for aggression towards unfamiliar people the value was 0.860, indicating good internal consistency. The same process was repeated one month later under the same conditions with a lower number of participants (73.3%). Test-retest reliability revealed no statistically significant deviations in the answers. Five experts (two cynologists and three veterinarians), who had been working with dogs for the past 7–20 years, evaluated the content validity of every question. This procedure and the Content Validity Ratio (CVR) were conducted according to Lawshe (1975). The CVR value of every question was one which constitutes an adequate value of CVR. Implementation of the above-mentioned procedures resulted in the validated version of the questionnaire used in this study. Despite the fact that aggressive behaviour was one of the core topics of the questionnaire, participants were also asked about other potentially problematic behaviours like excessive vocalisation, destructive behaviour and inappropriate elimination.

The questionnaire contained sixty-three questions divided into seven parts. The first and second parts covered demographic data and general information related to the household, owner and their dog. The third part dealt with the dog's daily routine. Feeding behaviour and habits were questioned in the fourth part. Participants provided information about their dog's behaviour while outdoors in the fifth part. The sixth part focused on obedience and training. The behaviour of the dog during miscellaneous situations: play, grooming, medicine application and presence of self-mutilation behaviour were surveyed in the last part of the questionnaire. Acknowledgements and instructions for the respondents were also included in the last part. The participants were given open, closed and combined questions as well as a five-point unipolar scale (Krosnick and Fabrigar 1997) for behavioural variables. Each level on this scale was classified numerically and verbally (Krosnick and Berent 1993) with 0/never representing absence of certain behaviour, through an increasing score of 1/seldom up to 4/always, representing an increase in the frequency of occurrence of the behaviour. A coding key for the statistical analysis was used to assign scores to the answers as follows: 0/never = 1 and 4/always = 5. Aggressive behaviour was defined as growling, lunging, snapping and biting.

All participants had permanent residence in the Slovak Republic and were the owners of the dogs

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described in the questionnaires. Owners were asked to complete the questionnaire considering the first dog that they had acquired in case they owned two or more dogs.

Statistical analysis was performed using SPSS statistical analysis software. Multivariate logistic regression models were used to determine significant risk factors for canine aggression.

RESULTS

The research was carried out in the period of 2008–2013 and included evaluation of 217 questionnaires. Of the total number of collected questionnaires (n = 217) only 177 owners responded to all answers related to aggressive and fear-related behaviours. These 177 questionnaires were used for our subsequent analysis.

One hundred and forty one respondents were female (79.7%) and more than half lived in the city (61.6%). The owner's ages ranged from 12 to 75 years old with 47.2% being between 21 and 30. More than two thirds of the owners had owned dogs in the past and a vast majority (88.6%) had given some level of training to their dog.

Most dogs were over 18 months of age (84.5%), with a ratio of 1 : 1 male : female of which 8.5% of males and 20.0% females were neutered. Ninety seven dogs lived in a house with a yard and more than half (63.6%) were kept inside the house/apartment. More than two thirds (69.4%) of the dogs were small or medium size (30–60 cm) and one hundred and forty individuals were pure breed. Ten of the animals had been owned by more than two owners. Table 1 summarises the demographic characteristics of the population and their living conditions.

Human directed aggression: Familiarity with the victim

More than 60% (n = 106) of the owners stated that their dog was never aggressive towards unfamiliar people in any of the situations presented while 50% (n = 88) reported the same in relation to aggression towards familiar people. Dogs reported to be aggressive towards familiar people did not have individual mean scores of more than 3.5 whereas aggression towards familiar people exhibited individual mean scores of up to 4.5. From the total number of dogs that showed some degree of aggression towards unfamiliar people (n = 71), 11.3% did so very frequently (individual mean scores > 3.5) (Figure 1).

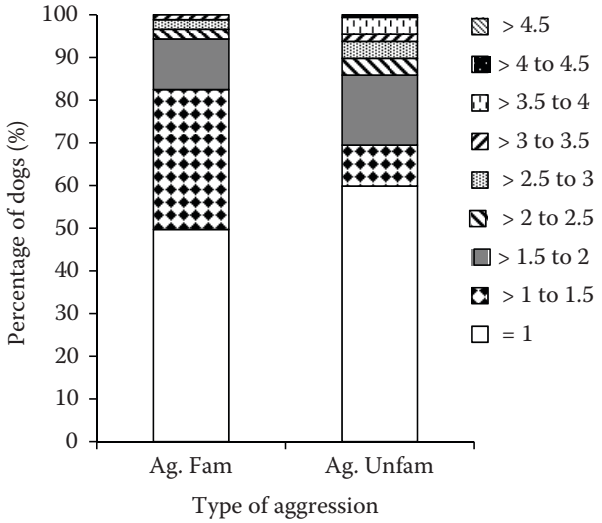

Figure 1. Individual mean dog scores for familiar (Ag. Fam) and unfamiliar (Ag. Unfam) dog aggression: 1 = never, 2 = seldom, 3 = sometimes, 4 = usually and 5 = always

Aggression in specific contexts

More than 80% of the dogs never showed any signs of aggression towards a familiar person in the following contexts: when disturbed while resting; when a toy was taken away; when bathed, groomed or given medicine, when physically punished, when disturbed while eating (Table 2).

The approach of an unfamiliar male was the situation that stimulated most dogs to behave aggressively (33.3%) while physical punishment was reported as the situation which resulted in least aggressive signs. A small percentage (2.3%) of the animals always showed aggression when approached by an unfamiliar child. The same percentage (2.3%) was also found for the situation in which a household member tried to take away a bone or a treat while the dog was eating (Table 2).

Association between fear and manifestations of aggression

Table 3 shows results from multivariate logistic regression models between manifestation of fear

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Table 1. Descriptive statistics of the selected questionnaires

Characteristic	Categories	*n* (%)	Response (%)
Dog's sex	male	88 (50.0)	99.4
	female	88 (50.0)	
Dog's neuter status	intact male	75 (91.5)	94.4
	neutered male	7 (8.5)	
	intact female	68 (80.0)	
	spayed female	17 (20.0)	
Dog's age (months)	mean ± SD	58.54 ± 41.61	98.3
	puppy (≤ 6 months)	8 (4.6)	
	adolescent (7–18 months)	19 (10.9)	
	adult (19–72 months)	95 (54.6)	
	old (> 72 months)	52 (29.9)	
Dog's breed	pure breed	140 (79.5)	99.4
	mixed breed	36 (20.5)	
Dog's height	mini (< 30 cm)	31 (18.6)	94.4
	small (30–45 cm)	60 (35.9)	
	medium (46–60cm)	56 (33.5)	
	large other (> 60cm)	20 (12.0)	
Number of previous owners	1	37 (23.6)	88.7
	2	110 (70.1)	
	3	9 (5.7)	
	4	1 (0.6)	
Owner's sex	male	36 (20.3)	100.0
	female	141 (79.7)	
Owner's age (years)	mean ± SD	26.96 ± 10.51	99.4
	< 20	53 (30.1)	
	21–30	83 (47.2)	
	31–40	22 (12.5)	
	41–50	8 (4.5)	
	51–60	9 (5.1)	
	61–70	0	
	> 70	1 (0.6)	
Owner's experience	has owned dog(s) previously	124 (70.5)	99.4
	has never owned dog(s)	52 (29.5)	
	has only 1 dog	64 (36.2)	100.0
	has 2 or more dogs	113 (63.8)	
Area of residence	city	109 (61.6)	100.0
	rural	68 (38.4)	
Housing type	apartment	80 (45.2)	100.0
	house with yard	97 (54.8)	
	house without yard	0	
Dog's living conditions	kept inside	112 (63.6)	99.4
	kept outside	64 (36.4)	
	wire pen	12 (19.7)	
	chain	3 (4.9)	
	free in the yard	46 (75.4)	
Number of people in the household	mean ± SD	3.76 ± 1.391	
Training	no	20 (11.4)	99.4
	yes	156 (88.6)	
	formal	6 (3.8)	
	informal	108 (69.2)	
	combined	42 (26.9)	

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Table 2. Frequency of aggressive behaviour in context-specific situations

Context	Results (n = 177)
Resting or sleeping	never: 86.4%, seldom: 7.9%, sometimes: 4.5%, usually: 0.6%, always: 0.6%
Eating	never: 83.6%, seldom: 10.2%, sometimes: 4.0%, usually: 1.1%, always: 1.1%
Chewing on a treat	never: 70.1%, seldom: 18.1%, sometimes: 6.2%, usually: 3.4%, always: 2.3%
Playing with a toy	never: 80.2%, seldom: 12.4%, sometimes: 5.1%, usually: 2.3%, always: 0%
Bathing/grooming or giving a medicine	never: 87.6%, seldom: 6.8%, sometimes: 4.5%, usually: 1.7%, always: 0%
Physical punishment	never: 80.8%, seldom: 13.0%, sometimes: 4.5%, usually: 1.7%, always: 0%
Unfamiliar male	never: 66.7%, seldom: 19.2%, sometimes: 7.3%, usually: 6.8%, always: 0%
Unfamiliar female	never: 72.3%, seldom: 18.1%, sometimes: 4.5%, usually: 4.5%, always: 0%
Unfamiliar child	never: 74.6%, seldom: 13.6%, sometimes: 5.6%, usually: 4.0%, always: 2.3%

and manifestation of aggressive behaviour towards people (independently of familiarity), crude in Model 1 and adjusted for information about the owner (sex, age, owner's previous experience) in Model 2, information about the dog (age, height, sex, neuter status) in Model 3, housing (living in, staying in, dog inside) in Model 4 and training (training, type of training) in Model 5.

In all models, manifestation of fear was significantly associated with manifestation of aggression and this association was changed only slightly with adjustment for additional variables. Fear behaviour increased the probability of exhibiting aggressive behaviour towards humans.

From the other variables, only the owner's age and the dog's neuter status were significantly associated with aggressive behaviour towards humans with younger owners being more likely to have aggressive dogs and neutered dogs being less likely to manifest aggressive behaviour.

Table 4 shows results from multivariate logistic regression models between manifestation of fear and manifestation of aggression towards familiar people, crude in Model 1 and adjusted for information about owner (sex, age, owner's previous experience) in Model 2, information about the dog (age, height, sex, neuter status) in Model 3, housing (living in, staying in, dog inside) in Model 4 and training (training, type of training) in Model 5.

In all models, manifestation of fear was significantly associated with manifestation of aggression towards familiar people and this association was changed only slightly with adjustment for addition variables. Manifestation of fear increased the probability of aggression towards familiar people.

From other variables, only the sex of the dog and the type of training was significantly associated with aggression manifestations with male dogs and dogs that received informal training being more likely to exhibit aggressive behaviour towards familiar people.

Table 5 shows results from multivariate logistic regression models between manifestation of fear and manifestation of aggression towards unfamiliar people, crude in Model 1 and adjusted for information about the owner (sex, age, owner's previous experience) in Model 2, information about the dog (age, height, sex, neuter status) in Model 3, housing (living in, staying in, dog inside) in Model 4 and training (training, type of training) in Model 5.

In all models, manifestation of fear was significantly associated with manifestation of aggression towards unfamiliar people and this association was changed only slightly with adjustment for additional variables. Manifestation of fear increased the probability of aggression towards unfamiliar people. No other variables showed significant associations.

DISCUSSION

Assessing canine aggression can be done using different sources of information: information gathered from general veterinary practices, information gathered from referral practices or behavioural specialists, questionnaires directed to dog owners and, finally, reports of dog bites (Horisberger et al. 2004; Fatjo et al. 2007). In Slovakia we do not have any referral behavioural practice or recognised behavioural specialists; therefore, in this study we opted to design a survey directed to dog owners. This type of survey offers some advantages in relation to surveys to veterinary practitioners since owners

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Table 3. Logistic regression models between fear and aggression adjusted for characteristics of owner, dog, housing conditions and training

		N (%) Mean (SD)	Model 1 OR 95%CI	Model 2 OR 95%CI	Model 3 OR 95%CI	Model 4 OR 95%CI	Model 5 OR 95%CI
Fear	no	146 (82.5%)	Ref	Ref	Ref	Ref	Ref
	yes	31 (17.5%)	**5.81 (1.69–20.00)****	**6.50 (1.82–23.21)****	**5.23 (1.39–19.71)***	**6.21 (1.78–21.74)****	**6.52 (1.44–29.52)***
Owner's age		26.96 (10.51)		0.96 (0.93–0.99)*			
Owner's sex	female	141 (79.7%)		Ref			
	male	36 (20.3%)		1.16 (0.52–2.59)			
Previous dog	no	52 (29.5%)		Ref			
	yes	124 (70.5%)		0.79 (0.38–1.66)			
Dog's age (months)		58.54 (41.61)			1.01 (0.99–1.02)		
Dog's height (cm)		43.67 (14.32)			1.00 (0.97–1.02)		
Dog's sex	female	88 (50.0%)			Ref		
	male	88 (50.0%)			1.84 (0.89–3.78)		
Neuter status	no	143 (85.6%)			**Ref**		
	yes	24 (14.4%)			**0.36 (0.13–0.98)***		
Living in	village	68 (38.4%)				Ref	
	town	109 (61.6%)				0.50 (0.20–1.22)	
Staying in	house with a yard	97 (54.8%)				Ref	
	apartment	80 (45.2%)				0.82 (0.29–2.30)	
Dog inside	no	64 (36.4%)				Ref	
	yes	112 (63.6%)				1.61 (0.58–4.43)	
Training	no	20 (11.4%)					Ref
	yes	156 (88.6%)					0.54 (0.06–5.19)
Type of training	combined	42 (26.9%)					Ref
	informal	108 (69.2%)					0.45 (0.24–8.82)
	formal	6 (3.8%)					1.26 (0.60–2.65)

*statistically significant at the 0.05 level

**statistically significant at the 0.01 level

Table 4. Logistic regression models between fear and aggression towards familiar people adjusted for characteristics of owner, dog, housing conditions and training

		Model 1 OR 95%CI	Model 2 OR 95%CI	Model 3 OR 95%CI	Model 4 OR 95%CI	Model 5 OR 95%CI
Fear	no	Ref	Ref	Ref	Ref	Ref
	yes	**2.88 (1.24–6.68)****	**2.87 (1.22–6.77)***	**2.95 (1.07–8.09)***	**2.97 (1.24–6.68)****	**2.62 (1.00–7.03)***
Owner's age			0.99 (0.96–1.02)			
Owner's sex	female		Ref			
	male		1.06 (0.50–2.26)			
Previous dog	no		Ref			
	yes		0.76 (0.39–1.49)			
Dog's age (months)				1.00 (0.99–1.01)		
Dog's height (cm)				0.99 (0.96–1.01)		
Dog's sex	female			Ref		
	male			**2.16 (1.09–4.27)***		
Neuter status	no			Ref		
	yes			0.55 (0.20–1.50)		
Living in	village				Ref	
	town				0.62 (0.27–1.43)	
Staying in	house with a yard				Ref	
	apartment				1.14 (0.45–2.87)	
Dog inside	no				Ref	
	yes				1.20 (0.49–2.93)	
Training	no					Ref
	yes					1.03 (0.21–5.13)
Type of training	combined					**Ref**
	informal					**2.32 (1.19–4.80)**
	formal					0.38 (0.04–3.60)

*statistically significant at the 0.05 level

**statistically significant at the 0.01 level

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Table 5. Logistic regression models between fear and aggression towards unfamiliar people adjusted for characteristics of owner, dog, housing conditions and training

		Model 1 OR 95%CI	Model 2 OR 95%CI	Model 3 OR 95%CI	Model 4 OR 95%CI	Model 5 OR 95%CI
Fear	no	Ref	Ref	Ref	Ref	Ref
	yes	**2.86 (1.29–6.36)****	**3.00 (1.31–6.90)****	**2.46 (1.00–6.17)***	**3.03 (1.34–6.86)****	**3.37 (1.33–8.58)****
Owner's age			0.97 (0.94–1.00)			
Owner's sex	female		Ref			
	male		1.06 (0.48–2.35)			
Previous dog	no		Ref			
	yes		0.81 (0.41–1.61)			
Dog's age (months)				1.00 (0.99–1.01)		
Dog's height (cm)				1.01 (0.99–1.03)		
Dog's sex	female			Ref		
	male			0.84 (0.43–1.65)		
Neuter status	no			Ref		
	yes			0.81 (0.30–2.19)		
Living in	village				Ref	
	town				0.71 (0.30–1.64)	
Staying in	house with a yard				Ref	
	apartment				1.13 (0.44–2.90)	
Dog inside	no				Ref	
	yes				0.94 (0.38–4.43)	
Training	no					Ref
	yes					2.00 (0.40–10.09)
Type of training	combined					Ref
	informal					1.34 (0.63–2.85)
	formal					4.70 (0.76–28.96)

*statistically significant at the 0.05 level

**statistically significant at the 0.01 level

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spend the most time with their dogs and do so in several contexts; thus, they might be more aware of their animal's typical behaviour (Hsu and Sun 2010). On the other side, owners that are willing to answer a questionnaire about their dog's behaviour might be the ones that are more dedicated to their pets which might have an effect on the perception and understanding of dog behaviour and thus might not be representative of the overall population.

Sampling method

Reaching a varied group of owners and using an easy-to-implement and time-effective method were the decisive factors leading us to choose the snowball approach as our sampling method. While this method is prone to selection bias and known for not yielding a random sample, we have partially addressed this issue by including participants from different environments in the initial group. Several studies looking at dog aggression have relied on samples collected from veterinary practices. Despite constituting a more accurate method of sample collection it still presents some problems which we wanted to avoid. Firstly, it will only include owners of dogs that use, or have access to, veterinary services and secondly, aggressive dogs might be taken to the veterinarian less often than non-aggressive dogs (Guy et al. 2001a). Nevertheless, the present results are limited, in that the respondents were not randomly selected.

Questionnaire response rates

The results obtained in our study are based on fully completed questionnaires which may not reflect the country's dog population. Owners who chose not to complete our survey might be less willing to donate time to their pets, translating into poorer training and socialising or less knowledge about dog behaviour, which in turn might result in dogs more prone to develop behavioural problems, such as aggression (Bennett and Rohlf 2007).

Demographic characteristics of the sample

There was a total of 36 (20.5%) mixed breed dogs and 140 (79.5%) pure breed dogs. Some owners might think their dog is pure breed solely based on the fact that the animal resembles a pure breed. This, in addition to the high number of backyard breeders in Slovakia, leads us to believe that the number of pure breed dogs in our sample is probably overestimated. The ratio of neutering according to sex was one male to 2.4 females. This proportion reflects the present trend in the country for neutering mostly the female dogs.

From the 177 respondents almost half were aged between 21 and 30 years old and more than 75% were under 30. This might reflect a stronger interest towards dogs in the younger population and therefore may have biased our results. This could also be a direct consequence of our sampling method. Although we tried to avoid age biases by including people from several age groups in the initial contact group it is possible that the younger respondents were more active and/or successful at recruiting other participants.

Aggression directed towards familiar people vs. aggression directed towards unfamiliar people

There are many ways to classify canine aggression. Some authors categorise the behaviour based on the target, others according to the motivation or trigger (Luescher and Reisner 2008). Another form of classification divides aggression into only two types: offensive and defensive (with a fear component) (Luescher and Reisner 2008). In this study we focused on the target of the aggressive behaviour (humans) and their familiarity to the dog.

Several authors (Borchelt 1983; Bamberger and Houpt 2006; Fatjo et al. 2007) have found human-directed aggression to be the most frequent complaint of dog owners.

In the present study, aggression towards unfamiliar people was present in a smaller number of dogs (n = 71) but occurred at a greater frequency (Table 1) when compared with aggression towards familiar people. Other authors have found conflicting results on the incidence of these two types of human-directed aggression. In 2006, Fatjo et al., conducted a study based on a survey of veterinary practitioners which found aggression directed towards non-familiar people to be the most frequent. One year later the same author (Fatjo et al. 2007) published another study which analysed more than

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1000 aggression cases from a referral practice finding that aggression towards familiar people was the most reported primary complaint, in 39% of the cases, while aggression towards unfamiliar people occupied the third place (in almost 22% of the cases) on the list of owner's complaints. In 2013, Casey et al. (2014) conducted a study with 3897 dogs in which it was found that 7% exhibited some degree of aggression towards unfamiliar people whereas only 3% did so towards familiar people. On the other hand, studies focused on dog bite occurrence found that the dog is known to the victim in most situations (De Keuster et al. 2006) and is usually part of the victim's family (Rosado et al. 2009).

We did not question people about their dogs' past history or if they took any particular measures to avoid situations in which their dog was likely to be aggressive. It is possible that dogs showing severe aggression or frequently showing some degree of aggressive behaviour would be relinquished or even euthanised. The euthanising of dogs for reasons of aggression is not uncommon in Slovak Republic. It is also possible that people with dogs exhibiting some sort of aggression towards unfamiliar people could have reduced the chances of meeting unfamiliar people by, for example, reducing the number of walks. Thus, people might have reported certain situations as never occurring because they changed their routine to avoid facing situations which could constitute a problem.

Association between aggression and other factors

Dog characteristics. Several studies have reported conflicting results for the effect that neutering has on the dog's behaviour and, in particular, aggression. Effects of gonadectomy on aggressive behaviour are more evident in males and in cases of inter-dog and territorial aggression but less clear in females and in other types of aggression (Haug 2008). In this study we found that dogs that had been neutered were less likely to manifest aggressive behaviour towards humans, while male dogs were more likely to show aggression towards familiar people. In contrast to our results, a study sampling more than 1000 English Springer Spaniels found that intact dogs (males and females) were less prone to owner-directed biting than their neutered counterparts (Reisner et al. 2005). Other authors (Bennett and Rohlf 2007; Blackwell et al. 2008; Bollen and Horowitz 2008) did not find an association between neutered status and aggressive behaviour.

When considering only the sex of the animal Guy et al. (2001b) found that females were almost three times more likely than males to have bitten someone in the household.

Similarly to other studies (Podberscek and Serpell 1997; Fatjo et al. 2007) our results suggest the lack of an association between the age of the dog and aggressive behaviour.

Most studies, however, have observed a tendency for older dogs to be more aggressive. In a study conducted by Bennett and Rohlf (2007) the authors found that the age of the dog was positively associated with "unfriendliness/aggressiveness" whereas Hsu and Sun (2010) found that dogs older than 10 years were more likely to show aggression towards their owners; however, no association was found between age and aggression towards unfamiliar people. In a National survey analysing more than 1000 English Springer Spaniels Reisner et al. (2005) found that dogs which were four years or older were more likely to be aggressive towards their owner.

Due to the low response rate it was not possible to group dogs according to their breed; hence, we have grouped them in four categories according to their size.

Some studies (Guy et al. 2001a; Bennett and Rohlf 2007; Duffy et al. 2008; Arhant et al. 2010; Paranhos et al. 2013) have found a greater tendency of aggression towards humans in small-to-medium sized breeds. Aggressive behaviour in large or giant breeds will usually result in more severe injuries and as a result will be taken more seriously which sometimes results in death for the animal (Kobelt et al. 2003). Consequently, people might better tolerate aggression in smaller dogs and thus the selection pressure towards them might have been weaker (Duffy et al. 2008). It has been shown that the size of the dog impacts the way it interacts with its owner (Kobelt et al. 2003; Baranyiova et al. 2009). Larger dogs are more likely to be trained and this training is more likely to be done by professionals (Kobelt et al. 2003; Baranyiova et al. 2009). Owners of small dogs engage less frequently in training activities (Baranyiova et al. 2009) and, moreover, are less consistent overall (Arhant et al. 2010). In addition, small dogs have been reported to be stubborn (Baranyiova et al. 2009), more diso-

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bedient and excitable when compared with large breeds (Bennett and Rohlf 2007; Arhant et al. 2010). Again, this might be because the consequences of having a small disobedient dog are not perceived as being as significant as in the case of large breeds.

Owner characteristics. In our study we did not find a significant association between the owner's sex and the reported presence and/or frequency of aggression. These findings are in accordance with Bennett and Rohlf (2007); nonetheless, other studies have found conflicting results. McGreevy and Masters (2008) found that a greater number of females in the household was positively associated with fear-related aggression.

Interestingly Casey et al. (2014) found that female owners were 1.6 times less likely to report aggression towards unfamiliar people than males, whereas Hsu and Sun (2010) gave greater scores to their dogs on owner-directed aggression questions.

Younger owners were more likely to have dogs which manifested aggressive behaviour. This could be due to differences in lifestyle: the majority of older owners probably have a steadier life, with unchanging routines and seldom face new situations. Additionally, it has been shown (Roll and Unshelm 1997) that the animal plays different roles according to the owner's age: owners under 30 usually regard their dog as a family member whereas older dog owners see them as a child. In contrast, other authors (Bennett and Rohlf 2007) did not find any relationship between this variable and aggressiveness.

It has been shown that owner's experience has an important effect on dog behaviour (Jagoe and Serpell 1996; Kobelt et al. 2003; Bennett and Rohlf 2007). For aggressive behaviour, in particular, several authors (Jagoe and Serpell 1996; Luescher and Reisner 2008) have found a negative association between its expression and the owner's experience. However in this study we could not find any correlation between these two factors.

Housing. In Slovakia it is still common to keep dogs outside, free in the garden, chained or in a kennel. More than 1/3 of the dogs in our sample were kept outside and these dogs probably do not have as many interactions with their owners as dogs which live inside. It is also possible that many of these dogs live exclusively in the garden/kennel and are never taken on walks. This has several implications: most experiences with unfamiliar people are when they enter the dog's territory; usually, the animals live in extremely under-stimulated environments and lack sufficient physical activity. It is likely that these conditions will finally promote frustration (Haug 2008).

Respondents were also asked if they lived in an urban or rural area. We had hypothesised that dogs living in rural areas would be more aggressive because owners might be more tolerant (Hsu and Sun 2010), less involved in dog-owner interactions like training, or both. However, we did not find significant differences in aggressive behaviour between these two types of living communities. In 2005, Baranyiova et al. conducted a study looking at the influence of urbanisation on the behaviour of dogs which included the exhibition of aggressive behaviour in 11 different situations. Dogs from urban areas were found to growl more at family members than dogs from rural areas. No other significant differences were found in terms of aggressive behaviour.

Training. The influence of training on dog behaviour has been studied by several authors (Clark and Boyer 1993; Jagoe and Serpell 1996; Kobelt et al. 2003; Bennett and Rohlf 2007; Blackwell et al. 2008). Many have found a negative relationship between training and the occurrence of behavioural problems in dogs (Clark and Boyer 1993; Jagoe and Serpell 1996; Bennett and Rohlf 2007). Obeying commands has also been found to be correlated with a lower incidence of behavioural problems (Kobelt et al. 2003) and dogs which are aggressive to their owners have been shown to react more slowly to commands (Podberscek and Serpell 1997).

Some studies have focused on finding links between the type of training used, (whether it is formal, informal or combined and the use of aversive techniques) and the presence of unwanted behaviour (Bennett and Rohlf 2007; Blackwell et al. 2008; Arhant et al. 2010). Bennett and Rohlf (2007) found that owner training engagement was strongly negatively correlated with "unfriendly/aggressive" behaviour towards both familiar and unfamiliar people. The use of punishment has been shown to be associated with aggressive behaviour and in particular the frequency of its use has been associated with increased exhibition of aggressiveness (Blackwell et al. 2008; Arhant et al. 2010). However, Blackwell et al. (2008) found that the use of a combination of aversive techniques and positive reinforcement would yield the highest mean aggression scores possibly due to the inconsistency of the method.

doi: 10.17221/8418-VETMED

Similarly to our results, Blackwell et al. (2008) also found an increased likelihood to show aggressive behaviour in dogs that had received informal training by their owners.

Although we did not question owners about their dog's socialising we strongly believe that this is an important factor to consider in this country. On one hand, socialisation classes and puppy schools are extremely rare in Slovak Republic and on the other hand, many dogs live all their lives in the garden or in a house with access to a garden and have very limited exposure to new situations, people and animals. It has been shown that improper socialising is one of the main causes for aggression in dogs (Appleby et al.2002; Blackwell et al. 2008; Haug 2008) and that the frequency of several social activities like taking the dog for a walk and allowing the dog to have contact with other people and animals is negatively associated with aggressive behaviour (Arhant et al. 2010).

Fear behaviour. Not surprisingly, manifestations of fear increased the probability of aggressive behaviour in dogs. Many authors have established an important link between aggression and fear. Fear and aggression are motivational states elicited by the same stimuli (Archer 1979). When a stimulus elicits an aggressive response this can either be defensive or offensive depending on the motivational state (McFarland 1981; King et al. 2003). Despite their differences, defensive aggression occurs concurrently with escape, avoidance or fear (McGlone 1986) it is believed that defensive aggression is often mistaken as offensive aggression and thus underdiagnosed (Galac and Knol 1997). Borchelt (1983) conducted a study looking at 245 cases of aggression in dogs and found fear-elicited aggression to be the most common type, being present in almost one quarter of the dogs. When looking specifically at human-directed aggression, fear has also been described as the most common reason for aggression both directed to familiar (Bamberger and Houpt 2006) and unfamiliar people (Fatjo et al. 2007; Haug 2008).

CONCLUSION

We have conducted a first exploratory study looking at canine aggression in the Slovak Republic and, in particular, the characteristics and risk factors surrounding human-directed aggression. This is a first step to a very necessary wider study that needs to be developed in this country. Although several other studies looking at human-directed aggression have already been developed, their findings might not be generally applicable to the Slovak situation. By better understanding which factors contribute to the exhibiting of aggressive behaviour we can adjust and improve preventive measures.

In this preliminary study several variables concerning the dog and its owner, housing conditions, training and the presence of fear behaviour were found to be significantly associated with the exhibiting of canine aggressive behaviour, in particular, the owner's age, the dog's sex and neuter status and the type of training. Fear was found to be consistently positively associated with aggressive behaviour in several contexts.

While the results cannot be generalised to the entire population we believe they provide a very useful snapshot of the main characteristics of canine aggression in Slovakia.

REFERENCES

Appleby DL, Bradshaw JWS, Casey RA (2002): Relationship between aggressive and avoidance behaviour by dogs and their experience in the first six months of life. Veterinary Record 150, 434–438.

Archer J (1979): Behavioural aspects of fear. In: Sluckin W (ed.): Fear in Animals and Man. Van Nostrand Reinhold Company, New York. 56–85.

Arhant C, Bubna-Littitz H, Bartels A, Futschik A, Troxler J (2010): Behaviour of smaller and larger dogs: effects of training methods, inconsistency of owner behaviour and level of engagement in activities with the dog. Applied Animal Behaviour Science 123, 131–142.

Bamberger M, Houpt KA (2006): Signalment factors, comorbidity, and trends in behaviour diagnoses in dogs: 1,644 cases (1991–2001). Journal of the American Veterinary Medical Association 229, 1591–1601.

Baranyiova E, Holub A, Tyrlik M, Janackova B, Ernstova M (2005): The influence of urbanization on the behaviour of dogs in the Czech Republic. Acta Veterinaria Brno 74, 401–409.

Baranyiova E, Holub A, Tyrlik M (2009): Body size and behaviour traits of dogs in Czech Households. Acta Veterinaria Brno 78, 107–114.

Bennett PC, Rohlf VI (2007). Owner-companion dog interactions: Relationships between demographic variables, potentially problematic behaviours, training engagement

doi: 10.17221/8418-VETMED

and shared activities. Applied Animal Behaviour Science 102, 65–84.

Blackwell EJ, Twells C, Seawright A, Casey RA (2008): The relationship between training methods and the occurrence of behaviour problems, as reported by owners, in a population of domestic dogs. Journal of Veterinary Behaviour: Clinical Applications and Research 3, 207–217.

Bollen KS, Horowitz J (2008): Behavioural evaluation and demographic information in the assessment of aggressiveness in shelter dogs. Applied Animal Behaviour Science 112, 120–135.

Borchelt PL (1983): Aggressive behaviour of dogs kept as companion animals: Classification and influence of sex, reproductive status and breed. Applied Animal Ethology 10, 45–61.

Casey RA, Loftus B, Bolster C, Richards GJ, Blackwell EJ (2014): Human directed aggression in domestic dogs (Canis familiaris): Occurrence in different contexts and risk factors. Applied Animal Behaviour Science 152, 52–63.

Chromy J (2008): Snowball sampling. In: Lavrakas PJ (ed.): Encyclopedia of Survey Research Methods. Sage Publications, Thousand Oaks, CA. 824–825.

Clark GI, Boyer WN (1993): The effects of dog obedience training and behavioural counselling upon the human-canine relationship. Applied Animal Behaviour Science 37, 147–159.

De Keuster T, Lamoureux J, Kahn A (2006): Epidemiology of dog bites: A Belgian experience of canine behaviour and public health concerns. Veterinary Journal 172, 482–487.

Dillman DA (ed.) (2007): Mail and Internet Surveys: The Tailored Design Method. 2nd ed. John Wiley and Sons, New York. xviii–523 pp.

Duffy DL, Hsu Y, Serpell JA (2008): Breed differences in canine aggression. Applied Animal Behaviour Science 114, 441–460.

Fatjo J, Ruiz-de-la-Torre JL, Manteca X (2006): The epidemiology of behavioural problems in dogs and cats: A survey of veterinary practitioners. Animal Welfare 15, 179–185.

Fatjo J, Amat M, Mariotti VM, de la Torre JLR, Manteca X (2007): Analysis of 1040 cases of canine aggression in a referral practice in Spain. Journal of Veterinary Behaviour: Clinical Applications and Research 2, 158–165.

Galac S, Knol BW (1997): Fear-motivated aggression in dogs: patient characteristics, diagnosis and therapy. Animal Welfare 6, 9–15.

Grooves RM (1987): Research on survey data quality. Public Opinion Quarterly 51, S156–S172.

Guy NC, Luescher UA, Dohoo SE, Spangler E, Miller JB, Dohoo IR, Bate LA (2001a): Demographic and aggressive characteristics of dogs in a general veterinary caseload. Applied Animal Behaviour Science 74, 15–28.

Guy NC, Luescher UA, Dohoo SE, Spangler E, Miller JB, Dohoo IR, Bate LA (2001b): Risk factors for dog bites to owners in a general veterinary caseload. Applied Animal Behaviour Science 74, 29–42.

Haug LI (2008): Canine aggression toward unfamiliar people and dogs. Veterinary Clinics of North America: Small Animal Practice 38, 1023–1041.

Hess J, Singer E (1995): The role of respondent debriefing questions in questionnaire development.In: Proceedings of the Section on Survey Research Methods, American Statistical Association, Washington DC. 1075–1080.

Horisberger U, Stark KDC, Rufenacht J, Pillonel C, Steiger A (2004): The epidemiology of dog bite injuries in Switzerland – characteristics of victims, biting dogs and circumstances. Anthrozoos: A Multidisciplinary Journal of the Interactions of People and Animals 17, 320–339.

Hsu Y, Sun L (2010): Factors associated with aggressive responses in pet dogs. Applied Animal Behaviour Science 123, 108–123.

Jagoe A, Serpell J (1996): Owner characteristics and interactions and the prevalence of canine behaviour problems. Applied Animal Behaviour Science 47, 31–42.

Jenkins CR, Dillman DA (1997): Towards a theory of self-administered questionnaire design. In: Lyberg L, Biemer P, Collins M, de Leeuw E, Dippo C, Schwarz N, Trewin D (eds.): Survey Measurement and Process Quality. 1st ed. John Wiley and Sons, New York. 165–196.

King T, Hemsworth PH, Coleman GJ (2003). Fear of novel and startling stimuli in domestic dogs. Applied Animal Behaviour Science 82, 45–64.

Kobelt AJ, Hemsworth PH, Barnett JL, Coleman GJ (2003): A survey of dog ownership in suburban Australia – conditions and behaviour problems. Applied Animal Behaviour Science 82, 137–148.

Krosnick JA, Berent MK (1993): Comparisons of party identification and policy preferences: The impact of survey question format. American Journal of Political Science 37, 941–964.

Krosnick JA, Fabrigar LR (1997): Designing rating scales for effective measurement in surveys. In: Lyberg L, Biemer P, Collins M, de Leeuw E, Dippo C, Schwarz N, Troxler J (eds.): Survey Measurement and Process Quality. 1st ed. John Wiley and Sons, New York. 141–164.

Lawshe CH (1975): A quantitative approach to content validity. Personnel Psycology 28, 653–575.

Liinamo AE, van den Berg L, Leegwater PAJ, Schilder MBH, van Arendonk JAM, van Oost BA (2007): Genetic variation in aggression-related traits in Golden Retriever dogs. Applied Animal Behaviour Science 104, 95–106.

doi: 10.17221/8418-VETMED

Litwin MS (ed.) (1995): How to Measure Survey Reliability and Validity. 1st ed. SAGE Publications. 96 pp.

Luescher AU, Reisner IR (2008): Canine aggression toward familiar people: A new look at an old problem. Veterinary Clinics of North America: Small Animal Practice 38, 1107–1130.

McFarland D (ed.) (1981): The Oxford Companion to Animal Behaviour. 1st ed. Oxford University Press. 670 pp.

McGlone JJ (1986): Agonistic behaviour in food animals: review of research and techniques. Journal of Animal Science 62, 1130–1139.

McGreevy PD, Masters AM (2008): Risk factors for separation-related distress and feed-related aggression in dogs: Additional findings from a survey of Australian dog owners. Applied Animal Behaviour Science 109, 320–328.

O'Sullivan EN, Jones BR, O'Sullivan K, Hanlon AJ (2008): The management and behavioural history of 100 dogs reported for biting a person. Applied Animal Behaviour Science 114, 149–158.

Orihel JS, Ledger RA, Fraser D (2005): A survey of the management of inter-dog aggression by animal shelters in Canada. Anthrozoos: A Multidisciplinary Journal of the Interactions of People and Animals 18, 273–287.

Paranhos NT, Silva EA, Bernardi F, Mendes MCNC, Junqueira DMAG, Souza IOM, Albuquerque JOM, Alves JCM, Machado MNP (2013): Study of aggression by dogs, according to the kind of interaction between dog and victim and motivating circumstances in the accidents, Municipality of Sao Paulo, 2008 to 2009 (in Portuguese). Arquivo Brasileiro de Medicina Veterinaria e Zootecnia 65, 1033–1040.

Podberscek AL, Serpell JA (1997): Environmental influences on the expression of aggressive behaviour in English Cocker Spaniels. Applied Animal Behaviour Science 52, 215–227.

Radosta-Huntley L, Shofer F, Reisner I (2007): Comparison of 42 cases of canine fear-related aggression with structured clinician initiated follow-up and 25 cases with unstructured client initiated follow-up. Applied Animal Behaviour Science 105, 330–341.

Reisner I, Houpt KA, Shofer FS (2005): National survey of owner-directed aggression in English Springer Spaniels. Journal of the American Veterinary Medical Association 227, 1594–1603.

Roll A, Unshelm J (1997): Aggressive conflicts amongst dogs and factors affecting them. Applied Animal Behaviour Science 52, 229–242.

Rosado B, Garcia-Belenguer S, Leon M, Palacio J (2009): A comprehensive study of dog bites in Spain, 1995–2004. The Veterinary Journal 179, 383–391.

Rubio DM (2005): Content validity. In: Kempf-Leonard K. (ed.): Encyclopedia of Social Measurement. 1st ed. Elsevier. 495–498.

Rubio DM, Berg-Weger M, Tebb SS, Lee ES, Rauch S (2003): Objectifying content validity: Conducting a content validity study in social work research. Social Work Research 27, 94–104.

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Corresponding Author:

Raquel Estevao de Matos, University of Veterinary Medicine and Pharmacy in Kosice, Department of Environment, Veterinary Legislation and Economy, Komenskeho 73, 041 81 Kosice, Slovak Republic
E-mail: raqmatos@yahoo.com