



Human directed aggression in Brazilian domestic cats: owner reported prevalence, contexts and risk factors

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Aggression by cats towards humans is a serious behavioural, welfare and public health problem, although owners may believe it is an inevitable part of cat ownership. There has been little scientific investigation of the risk factors associated with this problem. One hundred and seven owners in the Sao Paulo region of Brazil, took part in a survey aimed at investigating the perceived prevalence of the problem, defining the most common contexts of human directed aggression and identifying associated potential risk factors. Human directed aggression occurred in 49.5% of cats and was most commonly associated with situations involving petting and play, followed by protection of a resource, when startled, when observing an unfamiliar animal and least commonly when unfamiliar people were present. Pedigree status, neuter status, a history of early trauma, sensitivity to being stroked, the absence of other cats in the home, relationship with other animals, level of background activity at home, access to the outside and tendency to be alone (meaning tendency to staying far from the family members) were all associated with an increased risk in one or more context. However, sex, age, age when acquired, source of pet, attachment to a specific household member, type of domestic accommodation, relationship with another cat if present and contact with other animals did not appear to increase the risk. The results suggest sensitivity to being stroked and background levels of stress in the home are the most pervasive risk factors, and future research should aim to investigate these factors further. These data are of relevance when advising owners about the risk and development of this problem.

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Recent pet population statistics show an increase in the number of cat households in different countries.^{1–3} Although most cat owners believe their cats get on well with people, human directed aggression is a common problem.^{4–6} Scientific reports suggest that aggression towards either people or among cats accounts for between 12 and 47% of the total behavioural problems reported by owners,^{7–11} although the concept of aggression in cats is often not well defined, for example, some authors (eg, Overall¹²) consider urine spraying to be a passive form of aggression and the finding that the response to certain treatments for urine spraying is affected by overt physical aggression,¹³ may support this idea. However, in common parlance aggression is often taken to include elements of threat and acts resulting in harm. In a survey of 887 owners at veterinary hospitals in the United States, Borchelt and Voith¹⁴

suggested that cats are more likely to direct aggressive behaviours towards another cat than towards humans. However, one recent study⁷ has found that when access to the primary target is denied, the owner is most commonly the target for redirected aggression. Indeed, according to the owners interviewed by Borchelt and Voith,¹⁴ their cats periodically displayed aggressive behaviours to them, such as growling and hissing or even swatting and biting. Human directed aggression is probably under-reported because many people still see cats as 'autonomous creatures that cannot truly be owned or controlled',¹⁵ thus aggression may be expected and accepted as part of having a cat.

Human directed aggression is a very serious concern as it not only has direct implications for the welfare of the cat, being a response to aversion; but also might affect the pet-owner relationship and lead to relinquishment^{16,17} or euthanasia of the cat. There are also public health concerns given the risk of zoonoses.¹⁸ Despite this there are still few scientific reports

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concerning feline aggression, especially compared to canine aggression, and so relatively little is known of the problem.

Developmental factors, appear to play an important role in the prevention of human directed aggression in cats, with lack of early socialisation – in particular gentle handling,^{3,19,20} mother's absence during socialisation (Rodel 1986 cited by Turner³) and paternal temperament – specifically if he is unfriendly towards people,^{20,21} have all been reported to increase the risk of aggressive behaviours towards people. However, aggression does not occur in isolation, but as a result of interaction and remarkably little is known about these proximate factors controlling aggression.

Palacio et al,⁶ in a review of data from Public Health Centres in the Valencian region of Spain, report that aggression is more common in the summer, on Sundays, towards females and children under the age of 15. This may perhaps suggest that time at home with the cat is a major risk factor, especially as most incidences related to cats owned by the victim's family and described as provoked. However, biting is only one expression of aggression, and many situations will be preceded by aggressive displays (even if these are not recognised by a human victim).

Relationships between people and cats vary enormously between societies, therefore, studies exploring all forms of aggression and from a range of cultures are necessary in order to identify generic risk factors and inform the development of scientifically based prevention programmes. The aims of the current study were to record the reported prevalence of human directed aggression in a population of owned Brazilian cats, identify potential risk factors associated with human directed aggression and define the most common contexts of aggression.

Materials and methods

The survey was carried out in Brazil with data collected from April to August 2000 at the University of Sao Paulo. Respondents were cat owners drawn from clients at the University's Veterinary Hospital, students and staff of the University's Veterinary and Psychology Faculties and other available sources. They were asked to complete a questionnaire, either taking it home, having read through the questionnaire in the presence of the first author (contact details were provided in case further assistance was required later on), or by completing it in her presence, with assistance provided upon request as necessary.

The questionnaire focused on human directed aggression as perceived by the owner and was composed of 36 mainly open questions grouped into two sections. In the first section demographic information was gathered, describing the individual cat, its history and management. This included the cat's breed, sex and neuter status, age, age when acquired, source of the cat, housing type, level of access to the outside,

degree of social contact with people in the family, perceived response to being stroked, attachment to specific individuals, presence of other cats in the home (ie, does your cat live with other cats?), contact with other animals (ie, living with or occasionally meeting other animals either outside or through visitors to the home) and the recognised occurrence of traumatic experiences in early life such as being chased or being pulled around by children, falling out of a window or being involved in a road accident.

In the second section, the aim was to obtain descriptive data relating to the context of perceived aggressive encounters, rather than interpretations by the owner of the cat's motivation. The occurrence of aggression was determined in the following contexts: when petted or put on to the lap, when playing, when startled, when observing an unfamiliar animal, when in the presence of unfamiliar people and when protecting food or territory.

The data were analysed using Minitab 13.1. Descriptive statistics relating to demographic data were determined first and then χ^2 tests of association were used to examine relationships between demographic variables and the occurrence of aggression generally followed by each of the contexts described above.

Results

A total of 107 owners of apparently aggressive and non-aggressive cats answered the questionnaire, and although not all respondents completed every element of the survey, data were used from incomplete questionnaires where the data were still applicable. The sex ratio of cats within the sample was approximately equal and there were both neutered and intact animals (Table 1). The following pedigrees were represented in the purebred cats: Siamese, Persian, Angora and Birman. Cats were aged from 3 to 168 months (median = 36.00). Two thirds of the cats lived in apartments and less than half of them had access to the outside (Table 1). Most of the owners classified their environment as calm as opposed to frenetic (Table 1).

Considering the reported social behaviour of cats towards people in the family, 84/104 (81%) of the cats were reported to prefer to be close to their owners while 20 (19%) kept themselves remote. Eighty-three out of 95 (87%) cats reportedly liked to be stroked and 66/95 (69%) were reportedly attached to someone in particular. Three quarters of the cats (79/105) lived with at least one other cat and a slight majority (59/106, 56%) had contact with animals of other species. About three quarters of owners considered that their cat got on well with these other animals (60/77, 78% of relationships with other cats and 43/57, 75% of relationships with other animal species).

Table 2 summarises the findings in relation to the known early life of the cats. Most of the cats were reportedly acquired as kittens (less than 6 months old) being acquired from the streets, another home

Table 1. Descriptive characteristics of the cats and their environment (n = number of respondents)

Characteristics of cats (n)	n (%)	Characteristics of cat environment (n)	n (%)
Gender (107)		Accommodation (105)	
Female	58 (54)	Apartment	69 (66)
Male	49 (46)	House	36 (34)
Neuter status (104)		Access to outside (103)	
Neutered	58 (56)	Yes	40 (39)
(females 35, males 23)		No	63 (61)
Intact	46 (44)		
(females 23, males 23)			
Breed (105)		Ambience (99)	
Purebreed	42 (40)	Frenetic	20 (20)
Mixed-breed	63 (60)	Calm	79 (80)

(breeders included), pet shop or veterinary clinic. The majority of the cats did not have any known trauma reported early in life.

Approximately half (53/107, 49.5%) of the owners reported aggression towards people in at least 1/6 provided contexts: when petted or put onto a lap, when playing, when startled, when observing an unfamiliar animal, when in the presence of unfamiliar people and when protecting food or territory. When the reported occurrence of aggression was assessed against the demographic factors, mixed-breeds, an early traumatic episode and access to outside were all associated with a higher than expected occurrence of human directed aggression in general ($\chi^2 = 5.340$, 1df, $P = 0.021$; $\chi^2 = 4.127$, 1df, $P = 0.042$; $\chi^2 = 9.003$, 1df, $P = 0.003$, respectively). As expected, cats that were reported to dislike being stroked were more likely to show aggression in general ($\chi^2 = 3.885$, 1df, $P = 0.049$) as well as cats that appeared to get on badly with other animals with whom they had contact ($\chi^2 = 4.985$, 1df, $P = 0.026$). However, age, sex, neuter

status, living accommodation, ambience of human environment (as appreciated by the human), age when acquired, source of pet, attachment to someone in particular, living with other cats, relationship with other cats, contact with other animal species and social contact with people in the family were not significantly associated with aggression towards people in general (rather than any of the specifically identified contexts).

Aggression when petted or put on the lap was the most commonly reported context, followed by occurring when playing, when protecting food or territory, when startled, when observing an unfamiliar animal and when in the presence of unfamiliar people (Fig 1). The apparent risk of aggression in different specific contexts was associated with different demographic variables as shown in Table 3.

Discussion

This survey is based on owner opinion from a specific area and so inevitably may be subject to reporting bias or limited in the application of its findings. Owners may vary in their interpretation of aggression but it is useful nonetheless to examine people's perceptions when investigating problem behaviours as it is the personal perceptual element which defines the concept of a 'problem'. The use of a survey such as this for the initial scientific investigation of a behaviour problem such as feline aggression is useful as it provides a starting point for future studies, highlighting factors worthy of future investigation in other populations.¹⁰

In this particular study, perceived aggressivity in a variety of different contexts was investigated, and so it is possible to initially explore questions relating to correlates of aggressivity in general (which might relate to factors affecting irritability and frustration) as well as aggressive responses in different contexts which will have more specific motivational influences. Commonality between different contexts, may be coincidental, but also raise the need to investigate possible causal associations.

Table 2. Descriptive characteristics of cats' early life (n = number of respondents)

Characteristics of their early life (n)	n (%)
Age acquired (103)	
Less than 6 months old	79 (77)
More than 6 months old	12 (11.5)
Born in the home	12 (11.5)
Source of cat (101)	
Abandoned in the streets	40 (39.5)
Another home	34 (33.5)
Pet shop or veterinary clinic	15 (15)
Born in the home	12 (12)
History of early trauma (79)	
Yes	24 (30)
No	55 (70)

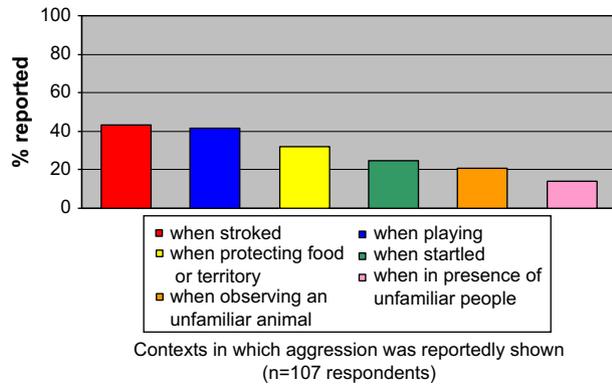


Fig 1. Reported incidence of human directed aggression in different contexts.

Cats are also of great significance within Brazilian society. Recent national estimates of the pet population in Brazil suggest that there are 12 million cats in the country²² and around 230 000 in the city of Sao Paulo alone where this survey was undertaken.²³ It is estimated that within this city around 70% of cats reported as semi-domiciled (partly owned), 20% fully owned and 10% totally feral.²³ This survey relates only to animals that were fully owned, and so the relevance of these results may be limited as they pertain to general public health.

Overall, human directed aggression at 49.5% was much higher than previously reported. For example, Bradshaw et al²⁴ in a slightly smaller survey of UK owners reported a prevalence of 13%. It may be that there is a real difference in the two populations,

but it might also be that the method used to probe aggression in the current survey, (defining specific contexts in which a cat might be aggressive, but not limiting it to specific behaviours) provided more accurate data on the level of the potential problem. The idea that aggression may be closer to that reported in this study is supported by the comment in the report of Bradshaw et al,²⁴ that 'Almost half the cats were reported to be fearful of unfamiliar people', and aggression is frequently used by cats to express their fear of others, especially when escape is not an option.

Although there was a greater risk of aggression associated with mixed-breed animals, there was not a large range of pure breeds of cats in our sample, with only Siamese, Persian, Angora and Birman represented. It is not possible to say if this reflects an over representation of these breeds given the small sample size involved. Nonetheless this finding is consistent with the results of a more extensive survey of British cat owners carried out by the Feline Advisory Bureau¹ which found that mixed-breed cats were not only more likely to be aggressive, but also interpreted as being more nervous, aloof, bad tempered, less confident, less bold, less interactive and less active.

Our results identified the potential significance of an early traumatic experience in life on future aggressivity in general and this deserves further investigation. It is interesting to note that an association with early trauma was also seen specifically in relation to protectiveness and these findings would be consistent with early trauma having a more general effect on emotional stability affecting future relationships, as has been found in other species.²⁵ In the current study

Table 3. Variables associated with aggression in specific contexts

Context	Variables	Statistical results (χ^2 test, 1 df)
When petted	Mixed-breed	8.060, $P = 0.005$
	Get on badly with other animals	4.236, $P = 0.040$
	Dislike being stroked	20.366, $P < 0.001$
	Live in a frenetic environment	10.069, $P = 0.002$
When playing	Mixed-breed	7.232, $P = 0.007$
	Get on badly with other animals	6.614, $P = 0.010$
	Dislike being stroked	9.636, $P = 0.002$
	Live in a frenetic environment	8.486, $P = 0.004$
When startled	Live without another cat (s)	9.515, $P = 0.002$
	Mixed-breed	3.746, $P = 0.053$
	Neutered	10.759, $P = 0.001$
	Get on badly with other animals	6.416, $P = 0.011$
When observing an unfamiliar animal	Dislike being stroked	6.349, $P = 0.012$
	Stay isolated	6.933, $P = 0.008$
	Live in a frenetic environment	9.054, $P = 0.003$
	Dislike being stroked	4.895, $P = 0.027$
When in presence of unfamiliar people	Live in a frenetic environment	9.659, $P = 0.002$
	Early trauma	4.051, $P = 0.044$
Protective		

early traumatic experience was defined by reference to examples, such as being chased, having their hair or tail pulled by children, falling out of a window and being in a motor vehicle accident. It might be argued that this is quite an imprecise way of defining trauma, but the use of examples, may help to reduce owner subjectivity and act as a non-judgemental prompt to encourage an honest response.

Access to the outside was associated with an increased risk of the occurrence of human directed aggression. This result is in accordance with other studies, which have found access to the outside to be associated with both the more general occurrence of aggressive behaviours, including intercat aggression¹⁰ as well as behavioural problems.²⁶ This is in contrast with the results from the Feline Advisory Bureau.¹ Levine et al¹⁰ suggest that a cat that goes outside may come back home aroused and then redirect aggression towards others. Alternatively, it might be that owners of aggressive cats tend to allow them outside in order to alleviate the problem, as correlative surveys such as this cannot distinguish cause and effect. Further specific questioning to investigate these factors is necessary but were beyond the scope of this preliminary study. The nature of the relationship is however, very important, as it is often a source of debate amongst those concerned about cat welfare and access to outside is commonly recommended to avoid a cat getting bored or prevent predatory behaviour directed to owners.²⁷ There was no evidence of any association between aggression towards people and a poor relationship with other cats, suggesting that these two problems are independent as noted by Liddell et al.²⁸ However, our results do suggest that there was an association between poor relationships with other species, and aggression towards people. This might indicate that cats do not view owners as social conspecifics but rather as some sort of alternative social associate. The sociality of cats is an issue of some debate with some emphasising their solitary nature, others a hierarchical interpretation of the outcomes of interactions over limited resources and others the co-operative nature of female nursing groups.²⁹ Regardless of their intraspecific organisation, there is evidence to suggest that cats do develop some form of affectionate attachment bond to their owners³⁰ which affects their behaviour; it is worth noting that nearly 70% of owners reported that their cat appeared attached to a particular individual. Clearly the nature of the cat-owner relationship is an important area for future research as an inappropriate relationship may result in owner directed aggression at one extreme or separation related problems at the other.³¹

A frenetic environment may result in a cat who is often in a high state of arousal, and so it is not surprising that this factor was associated with an increase in most, but not all, the specific contexts of aggression. The lack of association with aggression when startled is consistent with the idea that aggression at this time is a function of temperament and the specific

stimulus, rather than current mood. As such it would be expected for there to be an association with early experience more than current background stress. The lack of effect of background environment on protectiveness suggests that this too may be more trait- and specific context based, and is discussed further below.

Another factor which might affect arousal is neutering. Although some report an improvement in behaviour, such as reduced aggression towards veterinarians³² and elimination of fighting and spraying in males³³ as a result of neutering, there is growing evidence that it may increase sensitivity to aversion or reactivity.^{32,34} Spain et al³² reported that early gonadectomy was associated with shyness around strangers in both sexes and increased hiding by male cats. It is, therefore, interesting to note that neutering was associated with an increased risk of aggression when startled in this study, but not any other context.

It is also worth noting the factors, with which no association was found, in either aggression in general, or in any specific context. These include: the source of the cat, its gender, accommodation and age. It may be that the sample size of this study was too small to identify an effect, or that there are genuine differences between different countries, as associations with some of the factors have been found in some other studies. The Feline Advisory Bureau¹ reports that cats coming from a pet shop were more likely to show aggression when compared to cats from breeders, and that rescue cats were more likely to be nervous when compared with cats from breeders. However, in relation to gender, both Levine et al¹⁰ and Barry et al,³⁵ have also failed to find a gender effect on feline aggression towards other cats. Although Hart and Cooper³³ report that male cats tend to fight more than female cats, the difference was not statistically significant. However, Lindell et al²⁸ report that male cats are more likely to be presented for treatment of intercat aggression. The general evidence, therefore, seems to suggest that there is little sexual dimorphism in aggressivity in cats, unlike in other species.^{36,37}

Although some authors have claimed that cats living in apartments are at a high risk of showing aggressive behaviour,³⁸ there is little empirical evidence to support this claim. Neither Levine et al¹⁰ nor Barry et al³⁵ have found any relationship between size of accommodation and intercat aggression, and it would seem, on the basis of the current results, that the same relationship applies to aggression with people.

In terms of aggression in specific contexts, aggression when petted or put onto a lap was the most common context, being reported by 21.5% of the owners. This result is in accordance with the findings of Blackshaw.³⁹ It has been suggested that cats may respond to being petted as if they were experiencing social grooming from another cat.^{29,40} If so, aggression might be a consequence of owners petting them in areas that are not typically groomed or petting them for prolonged periods, with the consequence that the

interaction is no longer pleasurable.⁴⁰ However, it has also been suggested that petting induced aggression occurs as a result of an instinctive response as the cat suddenly awakens to its surrounding after being temporarily induced into a trance-like state by the pleasure of the interaction.⁴¹ This dichotomy of mechanisms illustrates the reason why it is important to describe behavioural problems in terms of their context, rather than inferred motivation, in the absence of good evidence to support the suggested underlying mechanism.

Aggression when playing was the second most common context, being reported by 20.6% of the owners. This reinforces the finding of Chapman and Voith⁴² in their review of cases. Previously, Borchelt and Voith¹⁴ have suggested that aggressive play towards people is likely to occur in a household in which there was only one cat or in which other cats are old and not playful, if the cat is left alone for much of the day or if the cat is younger than 2 years of age. Our finding that aggression when playing was associated with living without other cats, reinforces the idea that cats that live with other cats have the opportunity to play with each other instead of involving the owners and this decreases the chances of aggression being displayed towards the owners. In addition, a cat that plays with other cats probably learns greater control and inhibition of its behaviour in these contexts and so does not play as roughly when people are involved. It is for these reasons that some recommend introducing another cat, when there are problems with owner directed aggression during play.^{27,40}

Aggression when protecting food or territory was reported by 15.9% of owners, and is probably influenced greatly by temperament and early experience. Resources for a cat are generally abundant in its habitual environments and readily consumed or used, so the idea that cats are naturally territorial has been challenged.²⁹ Barry et al³⁵ also found that cats did not protect food, at least not against other cats with whom they live. It is, therefore, not surprising that the only factor found to be associated with protectiveness in this study was one associated with early development or early trauma, especially given the effect of early experience on later cognitive bias and affective state.^{25,43} Early trauma, might therefore result in the presence of familiar humans being perceived as aversive when there is emotional instability or when there are no clear signs to the contrary. As a result, changes in temperament associated with gregariousness and an increase in protectiveness of resources might be expected.

Aggression when startled was reported by 12.1% of the owners, aggression when observing an unfamiliar animal by 10.3% and aggression when in presence of unfamiliar people by 8.4%. Most of the significant associations with these particular contexts have already been discussed, but it is perhaps surprising, that there was no significant association between aggression occurring in the presence of unfamiliar people and cats

that prefer to be alone. However, because there was an association with being stroked, and this would suggest that it may be physical contact that these cats find aversive, rather than people per se (ie, the problem is not due to a lack of socialisation to people, but rather a lack of habituation to being handled). Both touch and novelty can provoke aggression in a range of species,⁴⁴ and these two factors come together when an unfamiliar person tries to pick up a cat.

Conclusion

In the surveyed population, feline aggression towards people appears to be more common than is generally recognised. The results suggest the need to carefully distinguish between lack of socialisation (acceptance of others within one's social group and the development of meaningful social relationships as a result) and lack of habituation (development of appropriate responses to non-harmful physical stimuli) as risk factors as it seems that those relating to sensitivity to touch and relationship with other animals rather than response to humans per se have a greater effect on the risk of aggression. The sex, age, accommodation, source and relationship with other cats, do not appear to be significant predictors of the occurrence of human directed aggression, although access to the outdoors may increase the risk in general. This information has important implications when offering preventive and interventional behavioural advice.

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