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Human directed aggression in domestic dogs (*Canis familiaris*): Occurrence in different contexts and risk factors

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ABSTRACT

The consequence for dogs of showing aggression towards people is often euthanasia or relinquishment. Aggression is also a sign of compromised welfare in dogs, and a public health issue for people. The aims of this study were to estimate the numbers of dogs showing aggression to people in three contexts (unfamiliar people on entering, or outside the house, and family members); identify whether these co-occur, and investigate risk factors for aggression in each context using multivariable analyses. In this cross-sectional convenience sample of UK dog owners, aggression (defined as barking, lunging, growling or biting) towards unfamiliar people was more common than towards family members. Most dogs did not show aggression in multiple contexts, suggesting that this behaviour may be a learnt response to situations rather than a general characteristic of individuals. Older owners were less likely to report family directed aggression or aggression to unfamiliar people entering the house than younger ones. Female owners were also less likely to report aggression to visitors. Increasing dog age was associated with increased risk of aggression to unfamiliar people both entering and outside the house. Female neutered dogs had a reduced risk of aggression in all three contexts. Dogs in the Utility and Hounds groups as defined by the UK Kennel Club had an increased risk of aggression to family members compared to cross-breeds, although post hoc analyses identified no specific increased individual breed risks. Gundogs has a reduced risk of aggression to unfamiliar people both entering and outside of the house. Where owners acquired their dog was a risk factor for aggression to household members. Attendance at puppy classes reduced risk of aggression to unfamiliar people both in and out of the house; attending ring-craft classes were associated with reduced risk when outside the house. The use of positive punishment or negative reinforcement based training methods was associated with increased chance of aggression to family and unfamiliar people outside the house. Importantly, for all types of aggression, the variables measured explained a relatively small amount of the variance (<10%) between aggressive and non-aggressive animals, suggesting a much greater importance of factors specific to the experience of individual dogs in the development of aggression. These data suggest that although general characteristics of dogs and owners may be a factor at population level, it would be inappropriate to make assumptions about an individual animal's risk of aggression to people based on characteristics such as breed.

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1. Introduction

Aggression directed towards people is the most common 'behaviour problem' referred to specialist clinics (Blackshaw, 1991; Bamberger and Houpt, 2006), and a common cause for relinquishment of owned dogs (Salman et al., 1998). The physical (Calkins et al., 2001), psychological (Peters et al., 2004) and financial consequences of bite injuries (Weiss et al., 1998) make human directed aggression an important public health concern. Gilchrist et al. (2008) have estimated 15.8 bites per 1000 people in USA, and a rate of 8.3 per 1000 has been cited in the Netherlands (Cornelissen and Hopster, 2010). Despite human directed aggression being a serious public health issue, there has been limited systematic research into potential risk factors. Existing studies provide useful insights but many have utilised populations with inherent biases, do not have controls for comparison, or have used multiple univariable analyses with associated risk of Type 1 errors. Previous studies have investigated four population types: hospital recorded bite victims (e.g. De Keuster et al., 2006; Morgan and Palmer, 2007); clinical populations from specialist behaviour clinics (e.g. Bamberger and Houpt, 2006; Fatjo et al., 2007) or general veterinary practices (e.g. Guy et al., 2001a,b,c); temperament screening for particular populations or breeds of dogs (e.g. Ott et al., 2008; Borg et al., 2010), and surveys of dog owners (e.g. O'Sullivan et al., 2008; Hsu and Sun, 2010). Inherent biases are associated with the first three populations, and the latter may be biased depending on recruitment. For example, large breed dogs are more likely to cause injuries to children requiring hospital treatment (Overall and Love, 2001), and incidences with owned dogs have been reported to be less likely to be associated with injuries requiring medical attention than those occurring in public places (Cornelissen and Hopster, 2010). Clinical populations are likely to involve a sub-set of owners willing to invest in treatment, may be biased towards larger breed dogs where aggression is less easy to tolerate, and towards family rather than stranger directed aggression (Bamberger and Houpt, 2006). Temperament testing studies generally utilise specific populations with putatively increased risk, such as rescue centres (Bollen and Horowitz, 2008), military dogs (Haverbeke et al., 2009) or associated with legislation (Schalke et al., 2008), and hence may also not necessarily be representative of the general population. Although owner surveys may overall seem a less biased population, biases can also occur due to different methods of recruitment (Asher et al., 2011). The aim of this study was to estimate the extent to which dogs show aggression to people in three different contexts (towards members of the household, unfamiliar people entering the house, and unfamiliar people when dogs are outside of the house, e.g. on walks); identify whether these co-occur, and investigate dog and owner related risk factors in each independently occurring context using multivariable analyses, using a population of UK dog owners recruited through veterinary practices, dog events and at popular dog walking locations.

2. Materials and methods

2.1. Questionnaires and subjects

A questionnaire was developed and piloted to test for question ambiguity with 15 dog owners. The questionnaire contained four sections: (i) information about owners: age, gender, geographical location, experience of owning and training dogs; (ii) information about dogs: gender, neuter status, age, breed, origin; (iii) information about training classes attended, age of dog when attended, and length of attendance, and (iv) the current and previous occurrence of undesirable behaviours, including aggression towards family members, unfamiliar people entering the house and when outside, withdrawal and hiding from family members or unfamiliar people. Aggression was defined as barking, lunging, growling or biting. Since this questionnaire asked about the occurrence of multiple behaviours, such as aggression towards other dogs (Casey et al., 2013), occurrence of human directed aggression noise was examined with a yes/no question for each context in which an aggressive response may occur. For example, owners were asked "Does your dog bark, lunge, growl or bite at unfamiliar people when out of the house?" Owners were also asked to report other behavioural responses potentially indicative of fear in these contexts, e.g. "Does your dog hide or run away from family members?" For each question, owners were asked to report whether the behaviour currently occurred, whether it had occurred in the past but not currently, and if it had ever occurred whether they considered it to be a problem.

A convenience sample of dog owners was recruited between May 2007 and August 2009, from a range of 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 by the research team to dog owners with a reply paid envelope to maximise returns. Owners of multiple dogs were asked to complete only a single questionnaire, regarding their youngest dog.

2.2. Statistical analysis

The age of dogs in months was $\log_{10}$ transformed. Other data were categorical. Breeds were combined into UK Kennel Club categories (Table 1) for regression models, but also into commonly occurring breeds and related groups of less common breeds for further interpretation. The percentage of owners reporting each type of aggression currently (i.e. at the time of questionnaire completion), in the past but not currently, and ever, were calculated (Table 2). The extent of co-morbidity between the occurrence of aggression in different contexts was evaluated using a Kappa measure of agreement.

Attendance at training classes was reduced to a 0/1 score. This was developed by including all cases attending classes for at least 4 weeks to exclude those attending classes only transiently. The exception was puppy classes, where attendance was scored where owners attended for at least 2 weeks when their dog was <12 weeks of age