



## Research

# Canine aggression toward family members in Spain: Clinical presentations and related factors



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## ABSTRACT

Canine aggression toward family members represents a potential hazard for the owner's health and can severely compromise the welfare of the affected dogs. The aim of this retrospective study was to investigate the main features of canine aggression toward family members using cases from a referral practice. The cases were examined with respect to behavioral and environmental factors that may be related to this problem. Forty-three cases of canine aggression toward family members seen at the Animal Behavior Clinic (Barcelona School of Veterinary Medicine) were analyzed and compared with 50 canine cases with no such history. A logistic regression model was applied to identify environmental and behavioral factors that may be related to aggression toward family members. Dogs adopted before 7 weeks of age and those receiving treats from the table were more likely to present aggression toward family members. Dogs presenting an underlying painful condition were also more likely to be aggressive toward family members. According to the owner's description, most of the dogs showed an ambivalent posture during the aggressive events. These findings provide an insight into some of the factors related to canine aggression toward family members and may help to develop more effective preventive and treatment strategies. Even if causative links cannot be made, our findings certainly provide direction for further investigation.

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## Introduction

Canine aggression is the most common complaint in veterinary behavior referral practice (Bamberger and Houpt, 2006; Borchelt, 1983; Fatjó et al., 2006; Fatjó et al., 2007). The family members are the most common targets of the aggression (Fatjó et al., 2007). Statistical studies of dog bites to humans indicate that in most cases people are victims of their own dog or of a dog they know (Guy et al., 2001a; Rosado et al., 2009; Wright, 1990). Canine aggression can also severely compromise the welfare of the dog, itself, as most cases of aggression result from a negative emotional state and are often related to a stress response (Kurk et al., 2004). Furthermore, dogs presenting aggression are at a higher risk of being abandoned (Salman et al., 1998, 2000) or even euthanized because of the aggression (Overall, 2013).

Aggression can be influenced by genetics and environmental factors. Evidence of genetic effects on aggressive behavior has suggested that there may be breed effects (Amat et al., 2009; Duffy et al., 2008; Hart and Hart, 1985; Liinamo et al., 2007; Pérez-Guisado et al., 2006; Scott and Fuller, 1965). However, many studies have shown a large individual variation in behavior within breeds (Hart and Hart, 1985; Scott and Fuller, 1965; Wilsson and Sundgren, 1998) which indicates that preventive programs should be based on individuals rather than breed, itself.

Environmental and management factors have also been found to influence aggressive behavior (Arhant et al., 2010; Bennet and Rohlf, 2007; Casey et al., 2014; Guy et al. 2001b; Hiby et al., 2004; Jagoe and Serpell, 1996; O'Sullivan et al., 2008; Podberseck and Serpell, 1997; Schoning and Bradshaw, 2005; Tami et al., 2008; Voith et al., 1992); however, there is considerable variation in the results of different studies. Such variation may be related to the differences between the populations studied, the different methods used for evaluating the behavior, and the terminology used by the different authors. For instance, in a study performed in 100 dogs reported for biting a person, O'Sullivan et al. (2008) found a significant association between feeding the dog from the table during

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the 2 months before the bite incident and a history of biting a person. Jagoe and Serpell (1996), on the other hand, used a retrospective data from 737 dogs recruited from 4 different sources, and found that dogs allowed to sleep in the owner's bedroom had a higher prevalence of what they called competitive aggression (aggression toward people when attention is paid to others and to other dogs in the household) than dogs which slept elsewhere. Having slept on someone's bed in the first 2 months of ownership was found to be a risk factor for biting owners in a study performed by a telephone interview to the owners of 227 biting and 126 nonbiting dogs (Guy et al., 2001b). In contrast, Voith et al. (1992) analyzed 711 questionnaires that were available for the owners in the waiting room of a veterinary hospital and failed to find a relationship between sleeping in the owner's bed and other so-called anthropomorphic activities and the prevalence of behavior problems in general, including aggression.

Additional factors have been found to have an influence on the presentation of aggressive behavior. For instance, Podberseck and Serpell (1997) compared 2 groups of English Cocker Spaniel with different levels of aggression and found that dogs in the "high-aggression group" were given less time for exercise. Jagoe and Serpell (1996) found a lower prevalence of dominance aggression and possessive aggression in dogs chosen primarily for exercise. Using a questionnaire directed to dog's owners, Casey et al. (2014) found that the origin of the dog was a risk factor for aggression to household members. They also observed a relationship between the owner's age and family directed aggression and aggression toward unfamiliar people. The size of the dog was also found to be related to aggression. Thus, smaller dogs were found to have a higher risk of biting the owners in the study of Guy et al. (2001b), and in a study comparing the owner's behavior of smaller and larger dogs, smaller dogs were seen as more aggressive than larger ones (Arhant et al., 2010).

Finally, the influence of training was evaluated in various studies. Jagoe and Serpell (1996) found that obedience training was related to a reduced incidence of competitive aggression. Lack of obedience training was also associated with aggression (Schöning and Bradshaw, 2005) and other undesirable behaviors (Bennett and Rohlf, 2007). The use of punishment has been found to be associated with increased aggression (Arhant et al., 2010, Casey et al., 2014; Herron et al., 2009; Tami et al., 2008) and other behavioral problems (Hiby et al., 2004). Yet, as for earlier cited studies, the methodology of these studies differed a lot, so the results may not be applicable to all populations, and comparisons are difficult.

The effect of sex hormones was also considered a factor related to aggressive behavior in dogs. Some studies have found that males are overrepresented in the population of aggressive dogs (Amat et al., 2009; Borchelt, 1983; Fatjó et al., 2007; Reisner et al., 2005). Testosterone seems to act as a behavior modulator that allows the dog to react more quickly and intensely and for a prolonged period of time (Overall, 2013), and this may explain why male dogs are overrepresented in some studies of aggression. The influence of testosterone seems to be especially important in aggression to other dogs as castration decrease the aggression in 60% of cases (Hopkins et al., 1976). In females, on the other hand, spaying can increase the signs of impulse-control aggression in bitches that were already showing signs of aggression as puppies (O'Farrell and Peachey, 1990).

The description and evaluation of the behavior of the dog during the aggressive episodes can be important to understand the problem and implement successful and safe treatment. The influence of anxiety and conflicting motivations in aggressive problems has been recognized in the last few years (Leuscher and Reisner, 2008; Reisner, 2003). The term impulse-control aggression (Landsberg

and Denenberg, 2015; Overall, 2013) has been used to describe most cases of canine aggression toward family members. Impulse-control aggression can be defined as an abnormal, inappropriate, out-of-context aggression consistently exhibited by dogs toward people under any circumstance involving passive or active control of the dog's behavior or the dog's access to the behavior (Overall, 2013). This kind of aggression can be related to fearful or defensive behaviors, resource guarding, redirected behavior, or situations of conflict (Landsberg and Denenberg, 2015).

The aim of this retrospective study was to further investigate the main features of cases of canine aggression toward family members in a referral practice in Spain, and to identify behavioral and environmental factors that may be related to this problem. The information available in the literature about canine aggression toward family members varies substantially and so our findings may not be applicable to all populations. There is a need for more information, and more standardized information collection, so that factors related to canine aggression toward family members can be identified and understood.

## Materials and methods

### Sample

The 93 dogs that participated in this study were evaluated by 2 veterinarians specialized in behavioral medicine from 2011 through 2013 at the behavioral service of the Veterinary Hospital of the Autonomous University of Barcelona, Spain. A behavioral clinical diagnosis made for, and a physical and neurologic examination performed for all dogs. Information was collected from the medical records of these cases, and the independent variables considered are summarized in Table.

Aggression can be defined as an appropriate or inappropriate threat or challenge that is ultimately resolved by combat or deference (Overall, 2013). It can include behaviors such as barking, snarling or lip lifting, growling, snapping, or biting. Based on the target of the aggression, the cases in this study were categorized into 2 groups "aggressive toward family members" (AGR;  $n = 43$ ) and "non aggressive toward family members" (non-AGR;  $n = 50$ ). Dogs were classified as aggressive when they showed any sign of aggression toward the owners. The selection of the cases was random.

The control group (non-AGR) was composed of dogs that, according to the evaluation made by the clinicians, had behavioral problems other than aggression toward owners. The fact that these dogs were also seen and evaluated at the behavioral service allowed us to compare one part of the population seeking help from the clinic to another with different diagnoses and ensure that they were in different behavioral groups by diagnosis. It is often seen that many owners of aggressive dogs do not consider them as such; especially when the signs of aggression are subtle (Beaver, 2009). The behavioral problems of non-AGR dogs were aggression toward dogs ( $n = 15$ ), fear-related problems ( $n = 13$ ), aggression toward unknown people ( $n = 8$ ), separation anxiety ( $n = 7$ ), house soiling ( $n = 7$ ), destructive behavior ( $n = 5$ ), lack of obedience ( $n = 4$ ), cognitive dysfunction syndrome ( $n = 2$ ), excessive vocalization ( $n = 2$ ), coprophagia ( $n = 1$ ), and attention-seeking behavior ( $n = 1$ ). Aggressive dogs were grouped according to the target (familiar people, unknown people, or other dogs) independently of the behavioral diagnosis. The fact that the control dogs also have behavioral problems may affect the interpretation of the results.

To evaluate the aggressive behavior, the context in which aggression occurs and the postures of the dogs in the AGR group were taken into account. Such information was obtained from the owner's descriptions of the aggressive events ( $n = 43$ ) and in some

**Table**  
Characteristics of the AGR and control dogs

Variables	AGR group, N (%)	Non-AGR group, N (%)
Characteristics of the dog		
Sex		
Male	31 (72.1)	27 (54)
Female	12 (27.9)	23 (46)
Neutering status		
Neutered	15 (34.9)	15 (30)
Intact	28 (65.1)	35 (70)
Weight		
Less than 10 kg	13 (31.7)	13 (27.7)
More than 10 kg	28 (68.3)	34 (72.3)
Age of acquisition		
Birth to 7 weeks of age	<b>10 (23.2)<sup>a</sup></b>	<b>2 (4.34)<sup>a</sup></b>
Seven weeks to 12 weeks of age	22 (51.1) <sup>b</sup>	18 (39.13) <sup>b</sup>
Twelve weeks onward	9 (20.9) <sup>b</sup>	26 (56.52) <sup>b</sup>
Origin		
Breeder	12 (27.9)	14 (28)
Particular	12 (27.9)	14 (28)
Shelter	2 (4.7)	8 (16)
Pet shop	7 (16.3)	2 (4)
Street	7 (16.3)	5 (10)
Unknown	3 (7)	7 (14)
Presence of a painful condition		
Yes	<b>6 (16.2)<sup>a</sup></b>	<b>1 (2)<sup>a</sup></b>
No	31 (83.8) <sup>b</sup>	49 (98) <sup>b</sup>
Environment and management		
Access to a garden		
Yes	16 (37.2)	14 (28)
No	27 (62.8)	36 (72)
Frequency of walks		
Null	5 (11.6)	4 (8)
One to 3 times a day	32 (74.4)	33 (66)
More than 3 times per day	5 (11.6)	8 (16)
Total amount of time in walks		
Less than 1 hour a day	14 (32.6)	10 (20)
One to 2 hours a day	21 (48.8)	27 (54)
More than 2 hours a day	6 (14)	9 (18)
Feeding regime		
<i>Ad libitum</i>	18 (43.9)	13 (26.7)
Restricted	23 (56.1)	33 (71.7)
Does the dog receive treats when the owners are eating?		
Yes	<b>24 (60)<sup>a</sup></b>	<b>18 (43.9)<sup>a</sup></b>
No	16 (40) <sup>b</sup>	13 (28.3) <sup>b</sup>
The dog is allowed to get on the sofa		
Yes	15 (41.7)	21 (58.3)
No	21 (46.7)	24 (53.3)
The dog is allowed to sleep in owner's bed		
Yes	14 (35)	26 (65)
No	10 (23.3)	33 (76.7)
Training methods		
Positive reinforcement only	2 (5.4)	10 (20.8)
Positive reinforcement and consistent punishment	16 (43.2)	23 (47.9)
Positive reinforcement and inconsistent punishment	19 (51.4)	15 (31.2)
Other behavioral problems		
Aggression toward unfamiliar people		
Yes	21 (48.8)	12 (24)
No	22 (51.2)	38 (76)
Aggression toward other dogs		
Yes	22 (52.4)	20 (47.6)
No	20 (40.8)	29 (59.2)
Nonsocial fears or phobias		
Yes	16 (39)	19 (38)
No	25 (61)	31 (62)

AGR, aggressive toward family members.

<sup>a,b</sup>  $P \leq 0.01$ .

Numbers in bold with different superscripts were significantly different (within columns).

cases also from video recordings ( $n = 7$ ) and was included in the medical record of each patient. The final decision on which category to place the information was made by one of the authors of the present study.

We considered the circumstances in which aggression occurred (contexts): (1) aggression occurred in competitive contexts, for example, dispute with the person over the dog's resource such as food, toys, or place to sleep and (2) aggression occurred in defensive contexts, the dogs reacted with aggression when was pushed to accept or do something, or in response to punishment. We also analyzed the postures adopted by the dogs during the aggressive episodes: offensive (raised tail, pricked up ears, eyes fixed to the objective, and straight forelegs during the attacks), defensive (tail between legs, fallen ears, averted sight, and folded forelegs), and ambivalent (mixture of offensive and defensive elements). We also took into account if there was a reduction in, or complete lack of warning signals previous to an attack.

### Statistical analysis

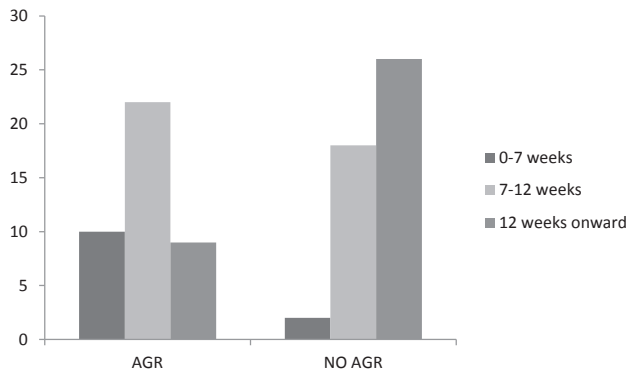
A logistic regression model was applied to detect possible correlated associations. Variables were taken forward for multi-variable analysis when significant at  $P < 0.2$ . Stepwise backward selection was performed to identify the variables that had a significant association ( $P < 0.05$ ) with the outcome measure. The possible relationship between the variables was analyzed by means of a chi square test when the variability of the data did not allow a correct modeling. A  $P$  value of 0.05 was considered significant for all analyses. The data were analyzed using the statistical package SAS (SAS.9.3.Institute Inc., Cary, NC).

### Results

The average age at the time of consultation was  $3.29 \pm 0.39$  (mean  $\pm$  standard error) years for AGR dogs and  $3.46 \pm 0.49$  years for non-AGR dogs. No significant differences were found between the 2 groups. Among dogs of the AGR group ( $n = 43$ ), 12 (27.9%) were females (66.6% of which were intact) and 31 (72.1%) were males (64.5% of which were intact). In the non-AGR group ( $n = 50$ ), 23 (46%) were females (65.12% of which were intact) and 27 (54%) were males (25.9% of which were intact). Sex ( $P = 0.1$ ) and castration ( $P = 0.7$ ) did not have a significant effect on dog aggression toward family members. Twenty-eight (68.3%) of the AGR dogs and 34 (72.3%) of the non-AGR dogs weighed more than 10 kg. The size of the dog was not found to have a significant effect of dog aggression toward family members ( $P = 0.8$ ).

The prevalence of dog aggression toward family members is summarized according to the set of selected variables in Table. According to the age of adoption, the dogs were included in one of the following categories: dogs adopted from birth to 7 weeks of age, adopted from 7 to 12 weeks of age, and adopted from 12 weeks of age onward. Dogs adopted from birth to 7 weeks of age were more likely to be aggressive toward household members (odds ratio [OR] = 7.08; confidence interval [CI] = 1.58–40.32;  $P = 0.01$ ; Figure).

When comparing the independent variables, a relationship between the age of adoption and the training methods used by the owners was found ( $\chi^2 = 9.22$ ,  $P = 0.05$ ). Dogs adopted at 12 weeks of age or more were more likely to be trained using positive reinforcement only. Positive reinforcement can be defined as an increase in the frequency of a behavior when a positive reinforcer (a reward) is presented (Bowen and Heath, 2005). The kinds of



**Figure.** Age of adoption. Dogs showing aggression toward family members were more likely to be adopted between birth and 7 weeks of age. AGR, aggressive toward family members.

rewards used by the owners of this study were verbal praise, food treats, and petting.

Dogs having an underlying painful condition were more likely to present aggression toward family members (OR = 20.99; CI = 2.58–461.25;  $P = 0.01$ ). In addition, aggressive dogs suffering from a painful condition were more likely to be reported by the owners as not giving warning signs before the attacks ( $P = 0.04$ ). Finally, dogs receiving treats from the table were also more likely (OR = 5.86; CI = 1.83–20.75;  $P = 0.003$ ) to be aggressive toward owners. No significant differences were found between the other variables related to the management and environment and the aggressive behavior toward owners. Other behavioral problems (aggression toward unknown people, aggression to other dogs, and nonsocial fears or phobias) were also found not to be related to this problem.

According to the owner's description, 18 (42%) dogs were aggressive in competitive contexts, 7 (16.2%) presented aggression in defensive contexts and 18 (42%) were aggression in both contexts. Of the dogs that were aggressive in competitive contexts, 26 (72.2%) adopted ambivalent postures during the aggressive episodes, 2 (5.5%) offensive postures, and 7 (19.4%) defensive ones. Eight (32%) dogs that were aggressive in defensive contexts adopted a defensive posture while 17 (68%) adopted an ambivalent posture. In 11 (25.6%) cases (6 aggressive in competitive and defensive contexts, 2 in competitive contexts only, and 3 in defensive contexts only), the owners were sometimes unable to detect warning signals before the attack, whereas in 2 (4.6%) cases (1 aggressive in competitive and defensive contexts and 1 in competitive context only), the owners were always unable to detect warning signals of pending aggression.

## Discussion

Dogs adopted from birth to 7 weeks of age were more likely to be aggressive toward their owners than dogs adopted after that age. In many species, including the dog, it has been observed that early weaning can have detrimental effects on the behavior of the offspring (Appleby et al., 2002; Kikusui et al., 2004; Pierantoni et al., 2011). Separation from the mother at 6 weeks of age have found to induce a profound stress response in the puppies (Elliot and Scott, 1961) and have a negative effect on the physical condition, health, and weight of the puppies (Slabbert and Rasa, 1993). In natural conditions, puppies remain with the mother until 10 weeks of age (Scott and Fuller, 1965). The interactions between the mother and offspring are likely to have permanent effects on the behavior of the puppies (Wilsson, 1984). Puppies remaining with the mother until 10 weeks of age were found to be less stressed by isolation than

puppies separated at 6 weeks of age (Fält and Wilsson, 1979). It was also observed that adult dogs which had been separated from their mothers at 30–40 days of age are more predisposed to show undesirable behaviors (some of them related to fear and anxiety) than those that had been taken from the litter at 8 weeks of age (Pierantoni et al., 2011). Our finding reinforces the general recommendation that puppies should remain with the mother at least until 8 weeks of age (Overall, 2013).

Dogs adopted after 12 weeks of age were less likely to be trained using positive punishment (verbal and physical correction) and were more likely to be trained using only positive reinforcement (verbal praise, food treats, or petting). The use of positive punishment (Arhant et al., 2010; Blackwell et al., 2008; Casey et al., 2014; Tami et al., 2008) and negative reinforcement (Casey et al., 2014) were found to be associated with aggressive behavior, whereas the use of positive reinforcement (verbal and food rewards, petting, play, clicker training) alone was associated with the lowest mean score for aggression (Blackwell et al., 2008). The different techniques of positive punishment described in the different studies were verbal punishment (Arhant et al., 2010; Blackwell et al., 2008; Casey et al., 2014; Tami et al., 2008), physical punishment (Arhant et al., 2010; Blackwell et al., 2008; Casey et al., 2014; Tami et al., 2008), jerking the leash (Arhant et al., 2010; Casey et al., 2014), remote activated electric and citronella collars, electric fences (Casey et al., 2014), nonverbal distractors (Blackwell et al., 2008). The types of negative reinforcement used in the study of Casey et al. (2014) were bark-activated electronic or citronella collars, choke chains, and electric fences. The relationship between the use of positive punishment and aggressive behavior observed in these studies may explain, at least in part, the fact that in our study dogs adopted after 12 weeks (which were more likely to be trained only with positive reinforcement) were less aggressive than dogs adopted from birth to 7 weeks of age.

Dogs receiving treats from the table were more likely to present aggression toward family members. In the study by Voith et al. (1992), it was observed that well-trained dogs were less likely to be fed between their regular meals. Obedience training has been found to be associated with a lower prevalence of aggression toward owners (Jagoe and Serpell, 1996). Obedience training, without using aversive techniques, can help to create a controllable and predictable environment and may be particularly beneficial to anxious dogs (Leuscher and Reisner, 2008). Most canine aggression problems appear to be anxiety-related disorders (Overall, 2013) and clear signs and expectations may help to decrease anxiety. Giving treats from the table may be a way of interacting in an inconsistent and unexpected manner with the dog, so they may be more prone to show anxiety and aggression. In fact, lack of consistency in interactions has been found to be associated with aggressive behavior in another study (Arhant et al., 2010).

According to our results, dogs having a painful condition were more likely to be aggressive toward family members. These dogs were also found to be more likely to be reported to not give warning signs. Pain has been associated to aggressive behavior in dogs (Beaver, 2009; Camps et al., 2012) and is likely to represent a defensive reaction to avoid physical contact that may cause further injury. Anticipation of pain as a result of a previous experience may also provoke the same reaction (Mertens, 2002). Moreover, the stress response elicited by a chronic painful condition can lead to changes in the central nervous system, such as reduction of serotonin activity (Mellor et al., 2000). Studies in rodents showed that individuals suffering from pain are also more likely to have reduced the level of exercise which can also lead to a reduction in brain serotonin levels (Chaouloff, 1997).

One of the aims of this study was to evaluate the behavior of the dogs during the aggressive events. It should be taken into account

that the evaluation of the aggressive events was only descriptive. We considered 2 contexts in which aggression occurred and the postures adopted by the dogs during the aggressive events. Most of the dogs reacted in a context of competition for a resource, but they also presented aggression as a defensive reaction. Moreover, many dogs were aggressive in more than one context. Regarding the postures adopted by the dogs, most of them showed ambivalent signals; this may indicate uncertainty about the social environment and the interactions with the owners. Ambivalent signals have been described as a mixture of body signals arising from internal conflict (Beaver, 2009) that may indicate some degree of stress and uncertainty (Leuscher and Reisner, 2008). Stress and uncertainty are likely to be the consequence of inconsistency of the interactions between the owners and the dogs but also by the application of inappropriate training methods such as punishment. The results presented here support the influence of anxiety and conflicting motivations in most cases of canine aggression toward family members.

Guy et al. (2001b) found that biting dogs with a history of dominant or possessive aggression were more likely to be fearful to a variety of stimuli. In their study on English Cocker Spaniels, Podberseck and Serpell (1997) also observed that dogs presenting higher levels of aggressive behavior were more likely to react to loud or high-pitched noises than less aggressive dogs. We did not find any relationship between nonsocial fears or phobias and aggression toward owners. Caution should be taken when comparing the results of those studies with our own since they included dogs that have already bitten (Guy et al., 2001b) and with higher level of aggression (Podberseck and Serpell, 1997) while we included all aggressive dogs toward family members, independently of the diagnosis and the level of aggression.

It was observed that sex did not have a significant effect on dog aggression toward family members. This finding is not surprising since there is no real data on the effect of testosterone on specific kinds of aggression. Moreover, in the present study, there were also aggressive dogs in the control group. In general, testosterone can act as a behavior modulator that allows the dog to react more quickly and intensely and for a prolonged period of time (Overall, 2013) and this may explain, at least in part, why, in some studies (Amat et al., 2009; Borchelt, 1983; Fatjó et al., 2007; Reisner et al., 2005), males are overrepresented.

This is a small retrospective study and has some limitations. For instance, in this study, we were not able to ascertain causal relationships between behavioral and environmental factors and aggression toward owners. However, the findings of this study suggest further investigation into factors that may be causal. A more control study should be a further step to understand which the causal factors are. In addition, to evaluate the behavior of the dogs during the aggressive events, we used the owner's descriptions of the cases, even when the owners may have difficulty to identify properly the signals adopted by the dogs showing aggression. To reduce bias due to owner interpretations, questions were formulated in a straightforward way and included explanations to owners and pictures of dogs displaying different postures. Owner surveys are commonly used method of investigation in studies on dog behavior despite this limitation (Podberseck and Serpell, 1997; Voith et al., 1992).

## Conclusions

The results of this study provide an insight into some factors related to canine aggression toward family members in a referral practice in Spain. In this population, dogs adopted from birth to 7 weeks of age, receiving treats from the table and having a painful condition were found to be more likely to be aggressive toward

owners. In addition, the description of the postures adopted by the dogs during aggressive events supports the hypothesis that many cases of aggression toward family members are linked to anxiety. These findings provide an interesting insight into some of the factors related to canine aggression toward family members and may help to develop more effective preventive and treatment strategies. Even if causal links cannot be made, our findings certainly provide direction for further investigation.

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## Conflict of interest

The authors declare no conflict of interest.

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