

A descriptive study of 215 dogs diagnosed with separation anxiety



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ABSTRACT

Clinical records of dogs visiting a behavioral clinic were used to study the behavior and background of dogs with separation anxiety (SA). 215 dogs (with SA) were included in the study, representing 22.6% of the patients seen during the 40 months the study covered ($n = 952$). Male dogs comprised 60% ($n = 129$) of the patients, and females 40% ($n = 86$). Neutered dogs were more common in the clinical material compared to reference populations. More male dogs diagnosed with SA were neutered compared to female dogs with SA (28% $n = 37$ vs. 8% $n = 7$). Forty dogs (18.5%) were diagnosed with SA only, while 179 (82.8%) of the patients had other behavioral problems in addition to SA. The most common co-morbid diagnosis was noise sensitivities (43.7% $n = 94$). Owners of the dogs presented for clinical evaluation most commonly reported vocalization, destruction and excessive motor activity (as signs of SA). Some breeds seem to have a higher incidence of separation anxiety than other breeds. The majority of the owners were families consisting of two adults or adults with children and most of the owners obtained their dog from a breeder as a puppy. Twenty-eight (14%) of the owners were women living alone and three (1.5%) being a man living alone.

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1. Introduction

Behavioral problems are common in pet dogs (Gonzalez Martinez et al., 2011). Incidence of problems varies significantly between different populations/studies. A retrospective study of 1644 behavior cases in dogs showed that the most common problems were those involving aggression followed by anxiety-related conditions not involving aggression. Of the latter separation anxiety was the most common diagnosis (Bamberger and Houpt, 2006). Owners are most likely to notice and report behaviors that they do not like in their dog, without regard for

whether these behaviors are abnormal or a problem for the dog (Overall, 2013a), this may also reflect why aggression is the most common behavior problem reported. A high proportion of Danish dog owners stated that their dog had one or more behavior problems (29% of 4359 dogs) (Rugbjerg et al., 2003). Salman et al. (2000) reported that at least one behavioral reason was recorded for 40% of the dogs and behavioral reasons accounted for 27% of single-reason canine relinquishments in the study including a total of 2230 dogs from 12 shelters and four regions in the United States (Salman et al., 2000). High prevalence rates of behavioral problems in both American and European dog populations (Bamberger and Houpt, 2006; Rugbjerg et al., 2003) are reflected in the number of dogs being relinquished to animal shelters due to behavioral problems (Salman et al., 2000) and dogs brought to animal clinics for

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euthanasia (Haupt et al., 1996; Miller et al., 1996). Several reports show that the most common reason for euthanasia and relinquishment is the dog's behavior (Gonzalez Martinez et al., 2011; Miller et al., 1996; Mondelli et al., 2004). One third of the dogs that are adopted from shelters are returned because of the dog's behavior (Shore, 2005). A Danish study found that behavioral problems was the third most common reason for euthanasia, only preceded by old age and cancer.

The high prevalence of behavior problems including anxiety and the negative influence on animal welfare supports that increased efforts should be invested to understand the background for these behaviors. Responses to fear and stress are the root of a wide range of behavioral problems in domestic dogs, canine separation anxiety being one of them.

Dogs with separation anxiety show distressed responses to being left alone or being separated from the owner (Overall et al., 2001). When dogs experience separation anxiety they may engage in a range of different behaviors; vocalization, destruction, elimination of urine or stools, anorexia, drooling, attempts to escape and (behavioral) depression (Horwitz, 2009). Vocalization, elimination and destruction are the most commonly reported behaviors (Overall et al., 2001; Sherman and Mills, 2008). As the signs are non-specific it is important to explore other anxiety-related behavioral problems in order to make the correct diagnosis. Separation anxiety can occur alone or together with other anxiety disorders. One study showed that the probability that a dog with separation anxiety also had sound sensitivities was 63% and vice versa that the probability that a dog with sound sensitivities had separation anxiety was 88% (Overall et al., 2001).

The causes of separation anxiety are multi-factorial (environmental and genetic) and the underlying motivations, proposed in the literature are fear, anxiety, over-attachment/hyper-attachment or lack of appropriate stimulation (Horwitz, 2009). Hyper-attachment includes following the owner from room to room, including wanting to follow the owner to the bathroom, wanting to sleep next to its owner and the dog being distressed when separated from the owner (Appleby and Pluijmakers, 2004). The importance of hyper-attachment is debated in the literature, and some findings suggest that separation anxiety may be due to a different attachment style between dogs with and without separation anxiety (Parthasarathy and Crowell-Davis, 2006). A study (from Australia) suggest that separation-related distress may not be purely attachment-based (McGreevy and Masters, 2008). Separation anxiety could also be caused by a more general state of anxiety, which is suppressed when the dog is in contact with the owner (Bradshaw et al., 2002). Another study clearly found factors associated with hyper-attachment to the owner to be significantly associated with separation anxiety (Flannigan and Dodman, 2001). Different findings (contradictory results) regarding the sex of dogs with separation anxiety have been reported, (McGreevy and Masters, 2008; Takeuchi et al., 2000) found that male dogs outnumbered female dogs and that male dogs had higher probability of elevated levels of separation-related distress.

(McGreevy and Masters, 2008) also found that intact dogs showed a higher probability of high separation-related distress scores than neutered dogs, this is in contrast to the study by (Flannigan and Dodman, 2001) which found that sexually intact dogs were more than three times less likely to have separation anxiety as neutered dogs.

Several factors that could play a role in developing canine separation anxiety include periods of kennel housing, shelter housing, a history of long periods of being left alone, long periods with the owner without being left alone, the family moves to a new house/apartment and loss of another pet in the family (Sherman and Mills, 2008). A recent study showed that dogs obtained from pet stores were 30% to 60% more likely to have separation-related problems than dogs obtained from noncommercial breeders (McMillan et al., 2013). Dogs may also have a genetic predisposition to develop anxiety (Serpell, 1995).

The objective of this study is to describe characteristics of a group of dogs diagnosed with separation anxiety in order to better understand the potential genetic and environmental effects important for the etiology of anxiety.

2. Materials and methods

2.1. Dogs surveyed

The study was based on clinical records (retrospectively) from a behavior clinic in Norway. All the dogs that visited the clinic and were diagnosed with separation anxiety ($n=215$, 22.9% of the total number of patients) from April 2007 to August 2010 were included in the study. Most of the dogs in this study were obtained from a breeder as a puppy (which is the most common way to obtain a pure-bred dog in Norway) while 43 dogs (21.3%) had previous owner(s) before the current owner. The neutered dogs with SA included in this study were already neutered when the owners contacted the behavior clinic.

2.2. Classification of behavior

The study is based on clinical observation of the dog from the behavior clinic, owner interviews and questionnaires. One ethologist (GL) with a master in companion animal behavior counselling made all the diagnoses during clinical consultation and was based on discussions with the owner and review of a questionnaire that was filled in before consultation. The diagnosis was made on the basis of a behavioral history and the exclusion of diagnostic differentials; and the conditions for a diagnosis of separation anxiety in this study was that the dog showed behavioral signs of distress in the absence of the owner or when the dog could not gain access to the owner when they are at home. Inclusion criteria were that the dogs showed consistent signs of destruction, vocalization and/or elimination when the owner was absent. The dogs included also showed anxiety/distress at the time of the owner's departure and/or exaggerated greeting behavior and showed signs of strong attachment to one or more family members.

The questionnaire includes basic questions about the dog and its background and sections with more detailed questions about behavior in different situations. The

Table 1

Top 10 breeds diagnosed with separation anxiety at the behavior clinic compared to top 10 breeds of the overall population from the behavior clinic, the most popular breeds registered at the Norwegian Kennel Club (NKC) and the rank of breeds visiting a larger small animal clinic.

Behavior clinic (SA)	Behavior clinic (all patients)	NKC 2005–2010	Small animal clinic
Mixed breed	Mixed breed	German shepherd	Mixed breed
Cocker spaniel	German shepherd	Norwegian elkhound	Labrador retriever
Gordon setter	Cocker spaniel	Golden retriever	German shepherd
Schnauzer	Jack Russell terrier	Cavalier king charles spaniel	English setter
Dachshund, long-haired	Border collie	Border collie	Rottweiler
Jack Russell terrier	Golden retriever	English setter	Boxer
Dachshund, short-haired	Rottweiler	Gordon setter	Jack Russell terrier
German shepherd	English springer spaniel	Labrador retriever	Standard poodle
Tibetan spaniel	Flat-coated retriever	Tibetan spaniel	Flat-coated retriever
Rhodesian ridgeback	Dachshund, long-haired	Irish setter	Cavalier king charles spaniel

sections included: (i) Information about the owners: gender, geographical location and number of family members living with the dog; (ii) general information about the dog: age, gender, neuter status, breed; (iii) general information about the daily life including: where the dog was obtained, daily activity and feeding, rewards, training, punishment; (iv) occurrence of behaviors in different situations: when the dog is alone, behavior toward people, behavior toward other dogs, behavior in situations with loud noises and a specific section about elimination.

2.3. Descriptive analysis

This study focused on the section of the questionnaire related to the “home-alone” situation. Breed, sex and neuter status were included to be able to study potential breed differences, sex-distribution and frequency of neutering. The breed distribution in patients were compared to three reference populations; all patients from the behavior clinic in the 40 months the study covered, the national register of the Norwegian Kennel Club and data from one large small animal clinic in the region to study breed risk of specific behaviors. The results of the dogs with SA regarding sex and neuter status are compared to the overall population from the behavior clinic during the same time period and general health surveys of 7 dog breeds ($n = 2120$). (The descriptive results are presented as frequency tables/figures and odds ratios.)

3. Results

3.1. Breed distribution

Mixed breed dogs were the most frequently $n = 28$ (13%) recorded group with separation anxiety; the rest comprised 93 different dog breeds. The other frequently recorded breeds are found in Table 1.

Table 1 gives an overview of the breeds that are most frequently diagnosed with separation anxiety in the behavior clinic as well as the overall breed distribution of all patients from the behavior clinic. For comparison the top ten breeds from NKC and a small animal clinic were added. Cocker spaniel is the breed that is most frequently diagnosed with separation anxiety in the behavior clinic, even though the breed represents only 1.8% of the dogs recorded in NKC and is not found in the top 10 of breeds registered at the NKC in the years 2005–2010. Another example is in the group

of Schnauzer (pooled), which represents 2.8% of the total patients at the behavior clinic, but only 0.3% of the total dog population (NKC). Separation anxiety is also frequently recorded in Dachshunds. Some breeds seem to be overrepresented at the behavior clinic, compared to the number in the total dog population in Norway (NKC).

3.2. Sex/neutering

In our study 20% (Table 2) of the dogs were neutered which is about twice the frequency compared to dogs in general health surveys in 7 breeds (Table 2). The dogs with separation anxiety also showed a higher frequency of neutering compared to all the dogs from the behavior clinic where only 80 (8.4%) were neutered (Table 2) (reasons for neutering, see Fig. 1 and Section 3.3). Of the SA-dogs, seven (8%) of the females and 37 (28%) of the male dogs were neutered, while in the 7 reference breeds, 81 (9%) male dogs and 122 (10%) female dogs were neutered. The odds ratio of neutering for males compared to females is 4.65 ($p < 0.0002$) in SA dogs, while in the overall behavior clinic population the odds ratio of being a male dog and neutered is 2.94 times higher than female dogs ($p = 0.0004$). For comparison in the 7 reference breeds the frequency of neutering was lower in males (OR 0.90).

Of the SA-dogs 60% were male dogs, while in the 7 reference breeds the frequency of males were 42%. 603 (63.3%) of all the dogs from the behavior clinic were males and 349 (36.7%) females, of these 66 (11%) of the males were neutered versus 14 (4%) of the females (Table 2). This indicates there is a higher frequency of male dogs with separation anxiety compared to females in this study

Table 2

Sex distribution, number of intact and neutered dogs.

Sex	Neutered; n (%)	Intact; n (%)	Total (%)
Dogs with separation anxiety			
Male	37 (29)	92 (71)	129 (60)
Female	7 (8)	81 (92)	86 (40)
Total	44 (20)	171 (80)	215
All patients from the behavior clinic			
Male	66 (11)	537 (89)	603 (63)
Female	14 (4)	335 (96)	349 (37)
Total	80 (8.4)	872 (91.6)	952
7 dog breeds from general health surveys			
Male	81 (9)	815 (91)	896 (42)
Female	122 (10)	1101 (90)	1223 (58)
Total	203 (9.5)	1916 (90.5)	2119

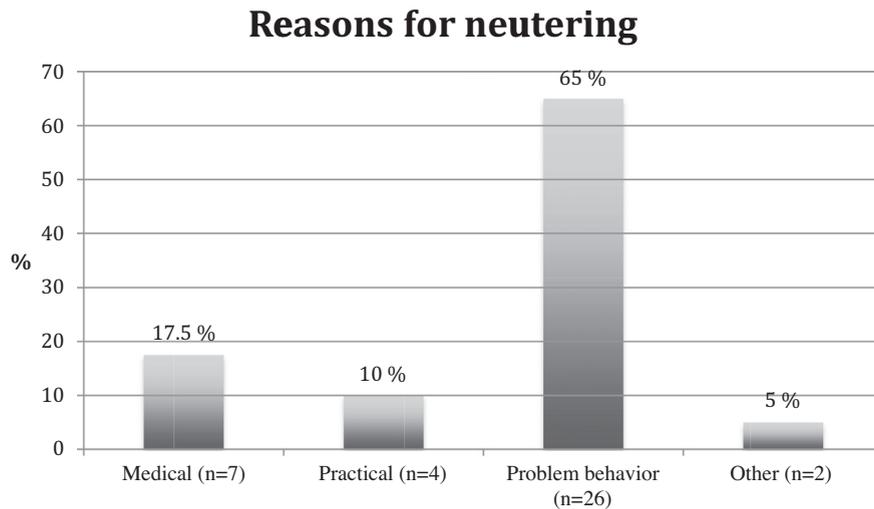


Fig. 1. Reasons given by owners for neutering their dog (in percent), total $n = 39$.

($p < 0.01$). The sex fraction in dog litters should be close to 0.5 and there is no local data that support a skewed sex-distribution with a higher proportion of males in dog populations. Data from local general health surveys have a higher frequency of responders of female dogs as shown in Table 2. Mean age of the dogs when they were neutered was 2.1 years ($n = 35$) and mean age when the dogs were taken for consultation at the behavior clinic for the first time was 2.7 years

3.3. Reasons for neutering

The major reason (65%) for neutering of the 44 dogs with SA was according to the owner behavior problems, other reasons are shown in Fig. 1. The specific behavior reason for neutering (specified in 28 dogs) was sexual behavior (e.g. mounting, reduce high activity of male dogs when close to female dogs in heat) ($n = 8$, 15.3%), marking/house soiling ($n = 2$, 3.8%), aggression ($n = 5$, 9.4%), hyperactivity/wanted a calmer dog ($n = 11$, 20.8%) and separation anxiety/general anxiety ($n = 2$, 3.8%). Most of the owners reported that there had been no change in behavior ($n = 15$, 28.3%) after neutering the dog, 11.3% ($n = 6$) reported that the neutering had a desired effect on the behavior and 15.1% ($n = 8$) said that the behavior in question became worse after neutering.

3.4. Owner information/risk factors

The recording of environmental factors was limited in this study, but we looked closer into some records of the family situation to the dogs (Fig. 2). The majority of the dogs lived in a family consisting of two adults or adults with children (71%). Women living alone represented 14% versus men living alone 1.5%. This might indicate that there could be a difference in risk of separation anxiety depending on the gender/family situation of owners. In the general population in Norway between 2005 and 2011 the percentage of men and females living alone is relatively equal, 9% men and 8.7% women.

3.5. Behavior of the dogs with separation anxiety

Fig. 3 shows the distribution of some of the reported behaviors of the dogs in this study that are associated with separation anxiety. The most common complaint of the owner is vocalization followed by destruction and stress/excessive activity.

3.6. Other behavior problems

Of the 215 dogs with separation anxiety included in this study, 18.1% ($n = 39$) had no other reported behavioral problem. The rest of the dogs (81.9%, $n = 175$) had one or more additional behavioral problems. Ninety-four (43.7%) of the dogs were diagnosed with fear of noises in addition to the separation anxiety. Aggression in different forms was the second largest group of observed behaviors of the SA-dogs in this study. Seventy (32.6%) were classified with fear-related aggression, 4.2% ($n = 9$) showed aggression related to aversive painful interactions, 5.1% ($n = 11$) displayed territorial aggression and 2.3% ($n = 5$) showed aggression related to resources (e.g. food, bones and toys). Additional behavior problems were compulsive behaviors, (4.2%, $n = 9$), and coprophagia (2.3%, $n = 5$). As some of the dogs had multiple problems the numbers will not add up to 215.

3.7. Sleeping habits

The questionnaire includes questions about how the dog acts around the owner when at home and where the dog sleeps during daytime and at night. Over half of the dogs (51.3%, $n = 103$) sleep in the bed with the owner during the night. Results from the general health surveys show that 15.8% ($n = 336$) of the dogs regularly ("always" or "very often") sleep in the owner's bed while 40.4% ($n = 857$) never sleeps in the bed with the owner.

The family situation (dogs with separation anxiety)

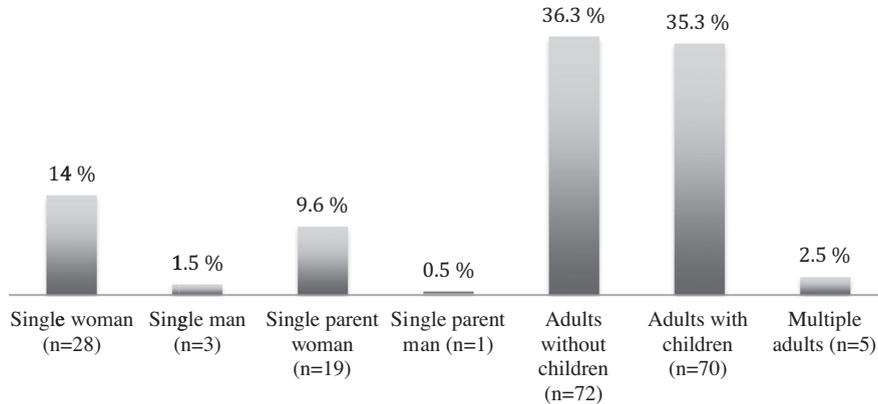


Fig. 2. The family situation of the dog with separation anxiety, total $n = 198$.

3.8. Behavior when the owner leaves and returns

When the owner prepares to leave the house the majority of the SA dogs show signs of anxiety and distress ($n = 126$, 75%). Twenty dogs (11.8%) showed no specific behavior when the owner departs. A small number ($n = 4$, 2.4%) showed signs of owner-directed aggression when the owner is about to leave. When the owner returns 91.5% ($n = 140$) of the dogs diagnosed with separation anxiety shows an excessive greeting ritual like jumping and vocalization.

3.9. Where the dogs are when the owner is away

The majority of the dogs have access to only parts of the house when the owners are away ($n = 67$, 37.2%), while

31.1% ($n = 56$) is in a cage or constrained in a small area in other ways. Some dogs (25.6%, $n = 46$) have access to the entire house. Only 3.9% ($n = 7$) are never left home alone. The rest of the dogs ($n = 4$, 2.2%) are outside when left home alone.

4. Discussion

The study describes some of the main characteristics of dogs diagnosed with separation anxiety at a behavior clinic in Norway. The number of living dogs for each breed in the population is unknown and in population studies in dogs it is therefore a challenge to get good estimates of the reference population. To get an expression of the relative number of each breed we have used nationwide registration data from the Norwegian kennel club and a large small

Distribution of behaviors in the SA-dogs

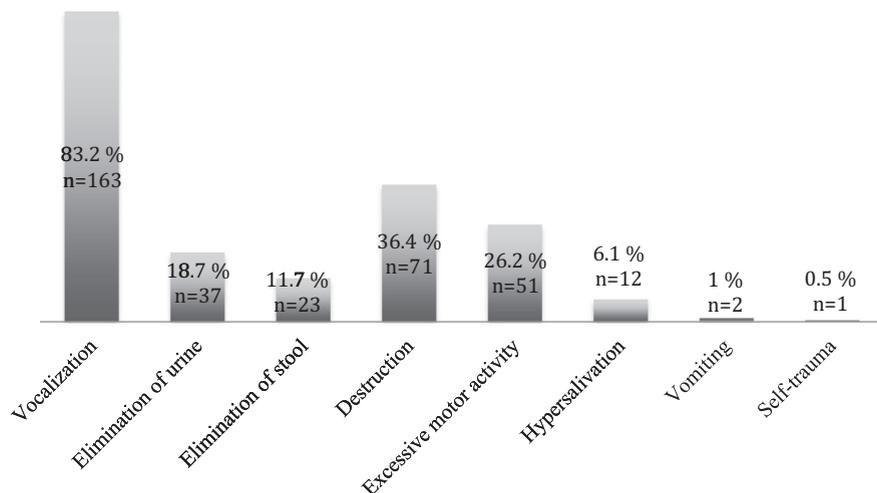


Fig. 3. Distribution of behaviors (expressed) in dogs diagnosed with separation anxiety, total $n = 198$.

animal clinic in the region. The comparison of the rank of the various breeds with the rank of the breeds from the behavioral clinic gave an indication of relative breed prevalence of separation anxiety.

It seems that some breeds are more likely to be diagnosed with separation anxiety than others. This difference in breed prevalence may indicate an accumulation of risk-genes/alleles in some breeds. Even though the 215 dogs represent many breeds, many of the top 10 SA-breeds represented at the behavior clinic have a much lower rank in the number of registered puppies at the NKC (i.e. not of the most popular breeds at the time of the study). We believe that the information from the number of registered dogs combined with data from larger small animal clinics gives a relatively good impression of the breed distribution. Three of the breeds with highest frequency of SA; Cocker spaniel, Schnauzer (group) and Dachshund are not recorded among the top 10 breeds neither in the NKC nor in the small animal clinic. (Flannigan and Dodman, 2001) found in their study that the subsequent order of breed incidence in the separation anxiety group was Golden Retrievers, English Springer Spaniels and English Cocker Spaniels; purebred dogs were predominant in both affected and control group, but overall more mixed-breed dogs had separation anxiety than did purebred dogs, although the difference was not significant. Even if the numbers from the veterinary clinic might be influenced by differences in breed disease frequencies, all records are included; e.g. routine health care visits and vaccinations, and should be less influenced by breed. There could also be a bias if the owners of certain breeds are more likely to take their dog to a behavior consultant, but we have no data to support this. This difference in breed frequency of SA could indicate that some breeds are genetically predisposed to this behavior problem, but this needs to be investigated further.

The sex distribution is somewhat skewed in this study, almost 60% of SA dogs are males and 40% females, which is similar to findings from other studies on SA. Overall et al. (Overall et al., 2001) reported 57% males and 43% females in their study of frequency of nonspecific clinical signs in dogs with separation anxiety, thunderstorm phobia and noise phobia. This is also in accordance to an Australian study where they found that male dogs had a higher probability of exhibiting elevated separation-related distress scores than females (McGreevy and Masters, 2008). The sex distribution from the general health surveys in 7 dog breeds shows a higher frequency of females (58% females and 42% males). Since there is no data to support that there are more males in the general dog population we believe that our data support an increased risk of SA in males (a skewed distribution of 60% males in a population of 215 dogs is significant at $p < 0.05$). This is in contrast to a previous study where they found that sex of the dog was not associated with separation anxiety (Flannigan and Dodman, 2001). Our results also show a higher frequency of neutered dogs with SA (20%) compared to the general population (10%) and to all the patients from the behavior clinic (8.4%). If we expect that the frequency of neutering due to disease is equal we would expect that the difference in neutering associated with behavior problems would be bigger. 29% of the males with separation anxiety are neutered versus

only 8% of the females; the male/female neutering odds is 4.65 ($p < 0.01$) in dogs with separation anxiety. A neuter frequency due to “general preference” in the general dog population in Norway is relatively low (prohibited), and dogs are first and foremost neutered due to specific health and behavior reasons. This represents a situation different from that in some other countries where neutering often is done routinely at a young age. Again we might expect that more females than males are neutered to disease-related problems (pseudo-pregnancy, ovarian hysterectomy), supporting that more males may have been neutered in an attempt to improve behavior. Compared to the numbers from the health surveys there was about the same percentage of neutering in both females and males (9.9% and 9% respectively). The majority of the owners in this study (65%) give that the reason for neutering was due to the behavior of the dog and only 11.3% said that the neutering had a desired effect on the behavior. Behavior problems are one of the primary reasons for owners to request neutering of male dogs even if there is no support of an effect of neutering on behavior problems. Previous studies have showed that only sexually dimorphic behaviors like urine-marking, mounting and roaming are usually reduced by neutering (Maarschalkerweerd et al., 1997; Neilson et al., 1997). To neuter dogs with behavior problems that are not related to sexual behavior (like fearfulness or anxiety) would therefore not be expected to give a positive outcome.

Vocalization was the most common behavior reported by the owners of the dogs diagnosed with SA. Destruction and excessive motor activity was the second and third most common. This is similar to results found in previous studies (Overall et al., 2001; Flannigan and Dodman, 2001; Palestirini et al., 2010). Bradshaw et al. (2002) also found in their cross-sectional study that barking was the most common symptom, followed by destructive behavior and howling. As all these symptoms are non-specific it is important to consider other etiological factors. Other reasons for vocalization includes stimuli coming from outside the house, territorial displays and fears, but in the inclusion criteria we have used excessive vocalization which is much stronger/more frequent than when the owner is at home/within sight of the dog. Other reasons for destruction could be over-activity, playful behavior, territorial behavior, fearful stimuli and noise sensitivities. Excessive activity could also be a product of playful behavior, reaction to arousing stimuli and over-activity, but again according to our inclusion criteria these behaviors have been much worse when the owner is not at home.

Excessive motor activity can be difficult to perceive when the owner is absent. Videotapes will be helpful to verify the diagnosis, but were unfortunately not available for the dogs in this retrospective study. Separation-related behaviors could be the consequence of different underlying states (discomfort, fear or anxiety), direct observation with videotapes would help to differentiate between these states and treatment would be more targeted (Palestrini et al., 2010). Videotapes of the dogs when left alone can also be of great value during behavioral therapy to assess the efficacy of the therapy program (Blackwell et al., 2006). However, most owners are able to detect extensive changes in behavior when they are about to leave, with

increased activity and barking; and combined with other behaviors mentioned in the inclusion criteria, we believe that the dogs would correctly be classified with separation anxiety. Motor activity can also be present when the owner is virtually absent from the dog, meaning that the owner is unavailable to the dog being in another room with a closed door, in this case it is easier for the owner to observe the activity of the dog. The motor activity may also be evident prior to the owner's departure. Since the dogs in this study were not video taped when home alone the results about excessive motor activity must be interpreted with care. Even if obvious symptoms such as destruction and elimination of urine/stool are easily recognized there is a risk that the frequency of separation anxiety is underestimated. In milder cases with no destruction, or in cases where excessive vocalization is not heard (no neighbor complains) the separation anxiety may remain unobserved.

The majority of the dogs (43.7%, $n = 94$) included in this study were also diagnosed with noise sensitivities. Even though the etiology for the development of separation anxiety for the most part remains elusive there is evidence that if dogs react to or are fearful of noises in a repeatable manner, they may have increased incidence of separation anxiety and/or other anxiety-related conditions (Overall, 2013b). Similar results were found in a study including 141 dogs diagnosed with separation anxiety and/or noise phobia, the probability that the dog had storm phobia given that he had separation anxiety was 61% (Overall et al., 2001). (Flannigan and Dodman, 2001) also found that almost half of the dogs with separation anxiety were fearful of noises, whereas less than third of the control group had a similar fear. This indicates that different forms of anxiety may have a partial overlapping etiology and that some dogs may be at risk for several types of anxiety.

Most of the SA dogs in this study live in a home with multiple owners (two or more adults with or without children), however a rather large part of the dogs live in a household with only one adult (13% single women and 1.4% single men). This is in accordance to a study by (Flannigan and Dodman, 2001) which found that dogs from a home with a single adult human were about 2.5 times as likely to have separation anxiety as dogs from homes with multiple persons. McGreevy and Masters (2008) found a significant relationship between an increased number of adult female humans in the household and elevated levels of separation-related distress. We show that the majority of the single owners were women living alone. An explanation for this could be that female owners establish a different relationship to dogs compared to men or that women have a lower threshold to seek help. This study is not conclusive about gender of the owner being associated with separation anxiety and this needs to be investigated further.

The importance of hyper-attachment is debated in the literature, and some findings suggest that separation anxiety may be due to a different attachment style between dogs with and without separation anxiety (Parthasarathy and Crowell-Davis, 2006). And dogs included in this study also showed a strong attachment to one or more family members. Even so our data is not conclusive on hyper-attachment. We do however observe that there is a skewed distribution of some owner groups and a high percentage

of dogs that are sleeping in the bed of the owner. If this is a random effect, a functional association or an expression of extended caretaking of problem-dogs is unknown.

5. Conclusion

This study supports previous findings of characteristics of dogs diagnosed with separation anxiety. In summary more males than females are diagnosed with SA and there is a tendency that more males were neutered because of behavior problems. There seem to be a breed-specific tendency indicating an accumulation of risk-genes/alleles in some breeds, but further efforts including genetic studies should be performed to establish a certain connection between specific breeds and a separation anxiety diagnosis.

Conflict of interest statement

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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