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PREDICTORS OF SEPARATION ANXIETY IN DOGS

An Undergraduate Honors Thesis Submitted in
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University of Nebraska-Lincoln

by

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Abstract

Understanding the potential causes and risk factors associated with separation anxiety in dogs is necessary to provide insight for possible prevention measures and to maintain the health and well-being of the animals affected by this condition. While a considerable amount of research has been done on this subject, it is still unclear what specific characteristics of dogs and their owners relate to the occurrence of separation anxiety and related behaviors. This study aimed to reexamine several dog and owner characteristics that have previously been evaluated in relation to the incidence of separation anxiety, as well as investigate how the frequency that dogs are left alone and the amount of time the owner spends with their dog, connects to the occurrence of separation-related behaviors. It was predicted that dogs who were acquired through adoption, fed table scraps, have one primary caregiver, and spend less time alone and more time with their owner, would display greater rates of separation-related behaviors. Other variables analyzed in relation to the occurrence of separation-related behaviors included the dogs' sex, age, and weight, as well as the owners' perception of whether their dog has separation anxiety. To assess these predictions, binary logistic analyses were conducted using 111 dog owners' responses to a survey administered to owners whose dogs participated in a behavioral study for the University of Nebraska-Lincoln Canine Cognition Laboratory. The results of these analyses did not reveal significant relationships between the occurrence of separation-related behaviors and the variables of interest, with the exception of the owners' assessment of their dogs' separation anxiety. It was found that owners who reported their dog as having separation anxiety also tended to report that their dog displayed separation-related behaviors ($p=.042$). Because this study did not result in conclusive findings, future research should continue to work on understanding the connections between separation anxiety and specific dog and owner traits.

Keywords: Dog, owner, separation anxiety, separation-related behaviors

Appreciation

I would like to sincerely thank Dr. Stevens for his mentorship over the past three years, his guidance throughout my writing process, and for allowing me the opportunity to gain invaluable research experience through working in the Canine Cognition Laboratory. I also want to extend gratitude to the other members of the Canine Cognition Lab with whom I have enjoyed working and have had the pleasure to know these last few years. Lastly, I would like to thank my amazing parents for supporting me along my collegiate journey. I would not have been able to do this without their continual support.

Predictors of Separation Anxiety in Dogs

Introduction

Imagine you have just come home from a long day at work only to find that your dog has torn your couch cushions to pieces while you were away, leaving bits of stuffing littered across the floor. Your dog may be looking at you sheepishly, lightly thumping their tail on the floor while you try to contain your frustration. We have all seen videos of dogs and owners in similar situations to this scenario, but it becomes much less amusing when it is your own dog and furniture. These incidents can be extremely costly and are often not isolated occurrences. If you have gone through similar experiences in your own home or if your dog has tendencies to engage in destructive behaviors in your absence, your dog may have separation anxiety (Bamberger & Houpt, 2006).

The development of separation anxiety in dogs has an evolutionary basis. Archeological evidence suggests that dogs were one of the first animal species to be domesticated (Clutton-Brock, 1995), and have since developed into the companion animals we have today. Because dogs have evolved so closely alongside humans, aiding early civilizations with hunting and herding, a unique relationship has developed between our species (Nagasawa, Mogi, & Kikusui, 2009). This relationship between dogs and people has led to the selection of dogs that have social-cognitive abilities which allow them to communicate with humans in novel ways (Hare, Brown, Williamson, & Tomasello, 2002). In fact, dogs have been shown to discriminate human communicative behaviors such as gaze and point cues far better than other social species like chimpanzees (Hare & Tomasello, 2005). Historically, dogs were bred to aid humans in hunting, livestock guarding, and herding (Coppinger & Schneider, 1995). In modern times, some breeds are still utilized as working dogs, but a large majority of dogs serve solely as household pets. The shift from using dogs primarily for work to owning them as pets, as well as the inherent social nature of dogs, has led them to become “socially dependent” on people (Topál, Miklósi, & Csányi, 1997). This social dependence may be the basis of the development of separation anxiety in dogs. The relationship between separation anxiety and social dependence has been documented in human infants as described by Bowlby (1960). Bowlby

PREDICTORS OF SEPARATION ANXIETY IN DOGS

hypothesized that the behaviors associated with infant separation anxiety (i.e., crying, following, clinging), facilitates the infant's return to close proximity of their attachment figure (Bowlby, 1960). This same principle can be used to describe the foundation of canine separation anxiety. Dogs' tendencies to display separation-related behaviors likely stem from their efforts to re-establish closeness to their version of an attachment figure, which is their owner.

Separation anxiety is defined as the distress experienced when an individual is away from or separated from their preferred companion or group (Schwartz, 2003). In dogs, separation anxiety is the term used to describe animals that exhibit stress or problematic behaviors when they are separated from their owner (Flannigan & Dodman, 2001). Signs that a dog may be experiencing separation anxiety include inappropriate eliminations in the home, excessive drooling, vocalizations such as howling, barking, and whining, escape attempts that may result in self-harm, pacing, and other repetitive or destructive actions (Sherman, 2008). Separation anxiety is recognized as one of the most common behavioral problems seen in dogs, making up about 20% to 40% of the diagnoses in dogs referred to animal behavioral clinics in North America (Voith & Borchelt, 1996).

In the current climate with the COVID-19 pandemic, many dog owners are spending much more time with their pets. Changes in owner routines are already a known predictor of separation anxiety in dogs (Askew, 1996), so when the time comes to head back to work in-person and dogs are left alone, the rates of separation anxiety will likely increase. Additionally, because so many people were isolated at home during the course of the pandemic, rates of pet adoptions from shelters have noticeably risen (Parry, 2020). The dogs adopted during the COVID-19 crisis are unlikely to have been left alone for many extended periods of time, due to the enforcement of stay-at-home orders put in place to mitigate the spread of the virus. Blackwell et al. (2013) considers anxiety to be an adaptive response to avoid seemingly threatening or aversive stimuli, and Ognata (2016) describes separation anxiety as being an adaptive response to social isolation. Because the exhibition of separation anxiety is deemed to be an adaptive response, Ognata presumes that dogs should eventually be able to cope with being left alone if they experience this situation

PREDICTORS OF SEPARATION ANXIETY IN DOGS

often enough. Since dogs adopted during the pandemic likely spend most of their time with their owners, they may have a reduced capacity to cope with social isolation, and would therefore be more likely to display separation anxiety and associated behaviors when they are left alone.

A preliminary study from the Veterinary Naturals blog published in October of 2020 reported that 53% of dog owners already believe that their dog has separation anxiety. The high frequency of separation anxiety is troubling because the behaviors associated with separation anxiety can often be destructive. These destructive behaviors can result in relinquishment of dogs to shelters if the behaviors are not resolved (Flannigan & Dodman, 2001). A recent study estimated that about 5.5 million dogs entered animal shelters across the United States in 2015 (Woodruff & Smith, 2020). Of the dogs entering shelters due to being relinquished by their owners, approximately 40% were said to have displayed some sort of behavioral issue that contributed to the owner's decision to surrender the animal (Scarlet, 2008). Only 48% of dogs entering animal shelters in 2015 were adopted into new families. Of the remaining 52% of dogs in shelters, 18% were returned to their owners, 14% were transferred to other shelters, and 14% were euthanized (Woodruff & Smith, 2020). As separation anxiety may influence dog owners' decisions to relinquish their pets to animal shelters, it is important to understand the potential causes and predictors of separation anxiety in this species.

Several factors have been identified that may influence separation anxiety in dogs, including overattachment to the owner, traumatic experiences while the dog is alone, and changes in family or home situations (Askew, 1996). Studies have also found that separation-related behaviors are more likely to arise in dogs that are of mixed breeds, are from shelters, have only one owner, and show excessive greeting and following of their owner (McGrave, 1991; Voith, 1994; Flannigan & Dodman, 2001). In addition, Jagoe and Serpell (1996) found that separation-related defecation and urination occurs more often in dogs that are owned by people who have previously owned dogs, and in dogs that are allowed to sleep in the same room as their owner. Significant associations have not been found for factors such as dog sex, neuter status, or spoiling activities like feeding the dog at the dinner table (McGrave, 1991; McBride, et al., 1995).

PREDICTORS OF SEPARATION ANXIETY IN DOGS

While these studies provide insight into several possible risk factors and predictors of separation anxiety in dogs, there is not consistent agreement across all factors due to differences in sampling methods, definitions of relevant terminology, and interpretations of diagnoses (Ogata, 2016). The previous studies in which significant predictors of separation anxiety were discovered, utilized different data collection methods such as owner questionnaires, clinical records, and mail in surveys. Furthermore, these studies do not agree upon a specific definition to refer to dogs' hyper-attachment to their owners, which is a phrase commonly used to describe dogs with separation anxiety (Ognata, 2016). Because of these inconsistencies in methodology and terminology, it is difficult to compare these past findings, so it remains unclear what factors contribute to increased rates of separation anxiety and related behaviors. To our knowledge prior studies have not examined the specific amount of time the dog is left alone or the amount of time the dog spends with their owner, and how this relates to the occurrence of separation-related behaviors. The aim of this study was to reexamine some of the dog and owner characteristics that have previously been studied in relation to separation anxiety, as well as to investigate the relationship between the frequency the dog is left alone and the amount of time the owner spends with their dog, and how these factors may contribute to the incidence of separation-related behaviors.

Specifically, this analysis investigated occurrences of owner-reported separation-related behaviors associated with factors such as how the dog was acquired, whether the dog is fed table scraps, how many people are responsible for the dog, how many times the dog is alone per week, how many hours the owner spends with the dog on weekdays, the owners' assessment of whether their dog has separation anxiety, and the age, weight, and sex of the dog. In accordance with findings from McGrave (1991), it was predicted that dogs acquired through adoption rather than a breeder would have higher rates of separation-related behaviors because these dogs may have experienced abandonment or relinquishment by previous owners. Dogs that are fed table scraps were also hypothesized to have higher rates of separation-related behaviors because this spoiling behavior could lead the dog to form an unhealthy attachment to their owner. Findings from Kienzle, Bergler, and Mandernach (1998) support this prediction because dogs who were fed table

PREDICTORS OF SEPARATION ANXIETY IN DOGS

scraps were found to be in their owners' presence more often when the owner was preparing or eating meals, which could suggest that feeding the dog table scraps leads to higher attachment to the owner. In addition, it was predicted that dogs with one primary caregiver would show higher rates of separation-related behaviors due to their dependence on one person for all their needs. This prediction is supported by findings from Flannigan and Dodman (2001), who found that dogs with a single owner were 2.5 times more likely to have been diagnosed with separation anxiety than dogs from multiple owner homes. Lastly, it was predicted that dogs who are left alone less frequently and spend more hours of the day with their owner would show increased rates of separation-related behaviors. Separation anxiety is believed to be an adaptive response to social isolation, so it is thought that dogs will eventually be able to cope with being by themselves if they frequently experience situations in which they are alone (Ogata, 2016). Since dogs that spend less time alone and more time with their owners would have less experience with social isolation, it is reasonable to believe that they would not be able to cope as well with being alone and would display higher rates of separation-related behaviors.

To assess these predictions, this study analyzed dog owners' responses to a series of questions in a survey administered to dog owners whose dogs participated in a behavioral study conducted by the University of Nebraska-Lincoln Canine Cognition Laboratory.

Methods

Participants

The data used for analysis in this study was collected using a Qualtrics survey given to 111 dog owners (79 females, 20 males, 1 non-binary) that allowed their dogs to participate in a study that was conducted by the University of Nebraska-Lincoln Canine Cognition Laboratory from November of 2018 to March of 2020. Dog owners were recruited from the general public of the Lincoln, Nebraska area through advertisement of the Canine Cognition Laboratory at community events and in public spaces. Of the dog owners surveyed, 9 reported that they had never owned a dog previously. While data was collected from

PREDICTORS OF SEPARATION ANXIETY IN DOGS

111 dog owners, many owners did not fully finish the survey because their dogs were unable to complete the behavioral testing. Because of this, the total number of responses to each question varied, but all the data were still used for analysis. Furthermore, modifications were made to the survey after the start of data collection in order to more thoroughly assess separation anxiety. Due to this modification, there are also discrepancies in the total number of responses for the questions specifically related to separation anxiety.

Procedure

The dog owners were asked to fill out the survey questions to the best of their knowledge while their dog was being run through the behavioral test conducted by research assistants from the Canine Cognition Laboratory. All surveys were completed using a wireless tablet and on average, the survey took about 30 minutes to complete. Participation in the study was completely voluntary, and the dog owners did not receive any compensation.

Measures

The final version of the survey consisted of 44 questions that asked about dog and owner demographics, information about dog/owner separation, as well as the dogs' general behaviors, training, feeding, and exercise habits. In addition, the survey included six published scales (see Appendix A for a complete list of questions and scales). Of the total questions, eight were selected to conduct the analyses for this study. The variables used for analysis of the dogs' demographic information were age (range 0.5 to 16 years), sex (52 female, 59 male), acquisition (54 adopted, 46 bred), and weight (range 6 to 135 lbs.), which was obtained from the Canine Cognition Laboratory database. The variables of feeding the dog table scraps (39 never, 71 yes), hours spent with the dog on weekdays (22 all day, 16 1-5 hours, 36 5-10 hours, 30 10-15 hours), number of times the dog is left alone per week (17 every day, 7 1-2 times, 28 3-6 times, 14 rarely, 1 never), owner perception of separation anxiety (7 yes, 60 no), and dog responsibility (39 shared, 60 primary) were also used in the analysis. The Hiby et al. (2004) Dog Obedience and Problematic Behavior scale was the only scale used in this analysis. Specifically, this scale was used to identify separation-related

PREDICTORS OF SEPARATION ANXIETY IN DOGS

behavioral problems in the dogs through the owners' indication of whether their dog had never, previously, or currently displayed separation-related behaviors.

Ethics

All procedures and surveys were conducted in an ethical manner and in full compliance with the University of Nebraska-Lincoln Internal Review Board (protocol # 17922) and the Institutional Animal Care and Use Committee (protocol # 1703). All participants offered their consent to participate and acknowledged that non-identifying data could be published.

Data Analysis

The statistical analysis software SPSS (Grad Pack v27) for Windows was used to run binary logistic regression analyses with all variables of interest. To do this, the variables were recoded into numerical values. Zeroes and ones were used for the binary variables of sex (male=0, female=1), dog acquisition (0=adopted, 1=bred), dog responsibility (0=shared, 1=primary), feeding the dog table scraps (0=never, 1=yes), and owner perception of separation anxiety (0=no, 1=yes). The owners' perception of whether their dog had separation anxiety differed from the response variable of separation-related behaviors in that the owners' perception was asked as a yes or no question (see Appendix A), and the response variable asked about whether the dog had previously or presently displayed separation-related behaviors. For the remaining categorical variables, the values zero through four were used to recode the survey responses. The number of times the dog was alone per week was recoded as (0=everyday, 1= 1-2 times, 2= 3-6 times, 3=rarely, 4=never) and the number of hours spent with the dog on weekdays was recoded as (0=all day, 1= 1-5 hours, 2= 5-10 hours, 3= 10-15 hours).

Response Variable

We were interested in characteristics of dogs and their owners as predictors of separation-anxiety. Separation-anxiety was measured as whether the dog was reported to display separation-related behaviors. Separation-related behaviors can consist of continuous whining, barking, or howling, chewing of objects,

PREDICTORS OF SEPARATION ANXIETY IN DOGS

scratching doors and walls, and urinating or defecating in the home while the owner is away (Hiby et al., 2004). Separation-related behaviors, as reported by the dog owners, were coded as ‘never’ being zero (N=57) and ‘currently’ or ‘in the past’ being one (N=50).

Results

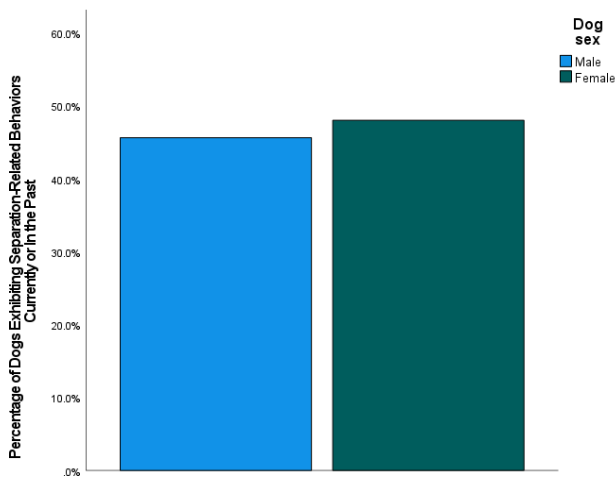


Figure 1. Percentage of dogs exhibiting separation-related behaviors for each sex. The blue bar represents male dogs, and the green bar represents females.

Table 2 summarizes the univariate statistics of the sample data for the variables of dog age and weight. The relationships between dog age and weight and the occurrence of separation-related behaviors are visualized in Fig. 2 and Fig. 3, respectively. The results of the logistic analysis revealed that there is not a significant relationship between the dogs' age ($B=-.036$, $S.E.=.064$, $p=.573$) or weight ($B=-.012$, $S.E.=.009$, $p=.184$), and whether they display separation-related behaviors.

The sample data for the dogs' sex is summarized in Table 1 and the percentage of dogs exhibiting separation-related behaviors for each category is represented by Fig. 1. The results of the logistic analysis revealed that there is not a significant relationship between these variables ($B=.096$, $S.E.=.388$, $p=.805$). The sex of the dog is not significantly related to whether the dog displays separation-related behaviors.

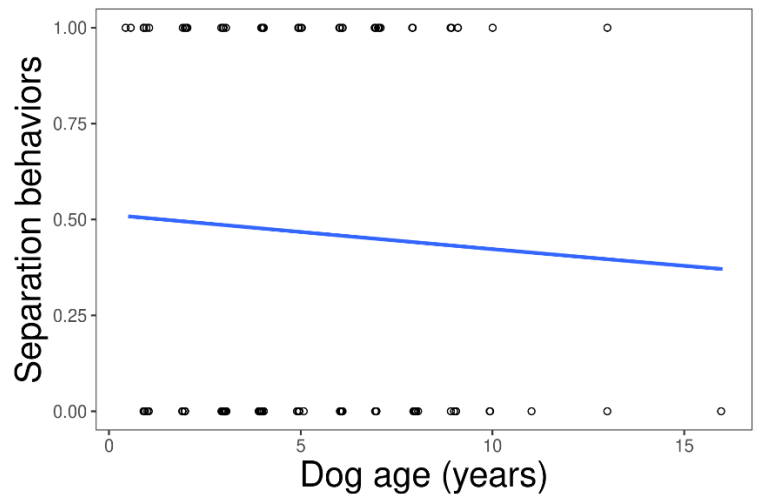


Figure 2. Relationship between separation-related behaviors ('never' coded as 0, 'currently or in the past' coded as 1) and the dogs' age.

PREDICTORS OF SEPARATION ANXIETY IN DOGS

Table 1. Summary of separation-related behaviors and categorical variables

Variables		Separation-Related Behaviors		
		Never (coded as 0)	Currently or in the past (coded as 1)	Total
Dog Responsibility	Primary	34	26	60
	Shared	20	19	39
	Total	54	45	99
Dog Fed Table Scraps	Never	22	16	38
	Yes	35	34	69
	Total	57	50	107
Dog Acquisition	Bred	25	20	45
	Adopted	25	27	52
	Total	50	47	97
Dog Sex	Male	31	26	57
	Female	26	24	50
	Total	57	50	107
Frequency Dog Alone Per Week	Everyday	10	7	17
	1-2 times	3	4	7
	3-6 times	14	14	28
	Rarely	11	3	14
	Never	0	1	1
	Total	38	29	67
Time with Dog Weekday	All day	14	8	22
	1-5 hours	6	10	16
	5-10 hours	23	13	36
	10-15 hours	14	16	30
	Total	57	47	104
Owner Perception of Anxiety	Yes	1	6	7
	No	37	23	60
	Total	38	29	67

PREDICTORS OF SEPARATION ANXIETY IN DOGS

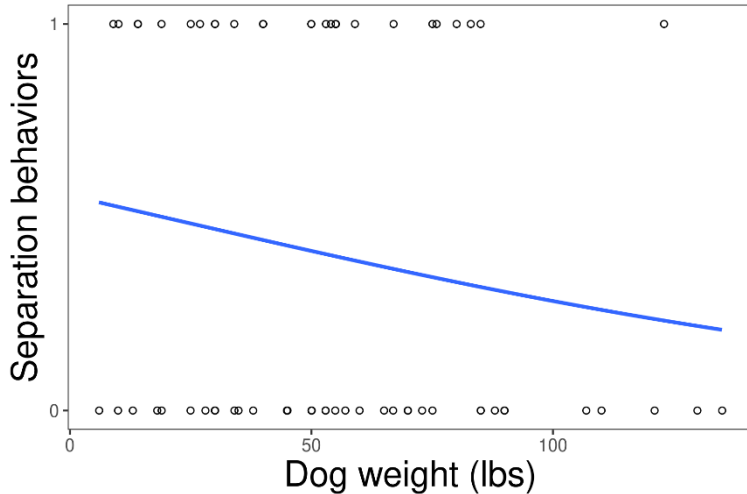


Figure 3. Relationship between separation-related behaviors ('never' coded as 0, 'currently or in the past' coded as 1) and the dogs' weight.

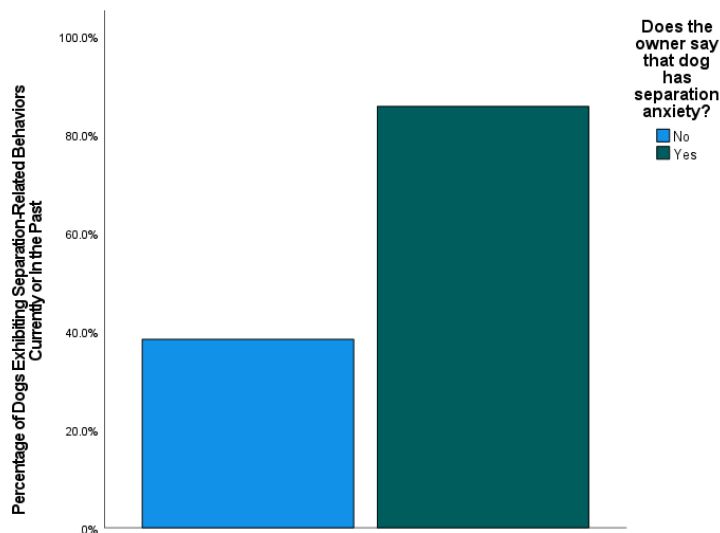


Figure 4. Percentage of dogs exhibiting separation-related behaviors for owners that think their dog has separation anxiety and owners that do not feel their dog has separation anxiety. The blue bar represents dogs whose owners do not think they have separation anxiety, and the green bar represents dogs whose owners do think they have separation anxiety.

Table 2. Univariate Statistics for Dog Age and Weight

	Mean	Range	Std	n
Age (years)	5.24	15.5	3.214	111
Weight (pounds)	54.73	129	30.859	67

A summary of the sample data totals for the owners' perception of whether their dog has separation anxiety are found in Table 1 and the percentage of dogs showing separation-related behaviors for each category is represented by Fig. 4. The results of the logistic analysis revealed that there is a significant relationship between the owners' perception of their dogs' separation anxiety and the owners' tendency to report that their dog displays separation-related behaviors ($B=2.267$, $S.E.=1.112$, $p=.042$). Owners who report their dog as having separation anxiety also tend to report that their dog displays separation-related behaviors. However, the number of owners that reported their dog as showing separation-related behaviors but did not report that their dog has separation anxiety discloses an interesting disparity.

PREDICTORS OF SEPARATION ANXIETY IN DOGS

The sample data totals for owners that feed their dog table scraps and owners that do not feed their dog table scraps are found in Table 1 and the percentage of dogs displaying separation-related behaviors for each category is represented by Fig. 5. Results of the logistic regression analysis show that the relationship between these variables is not significant ($B=.289$, $S.E.=.407$, $p=.477$). Feeding a dog table scraps does not relate to whether the dog exhibits separation-related behaviors. These results do not support the research hypothesis that dogs who are fed table scraps tend to display greater rates of separation-related behaviors.

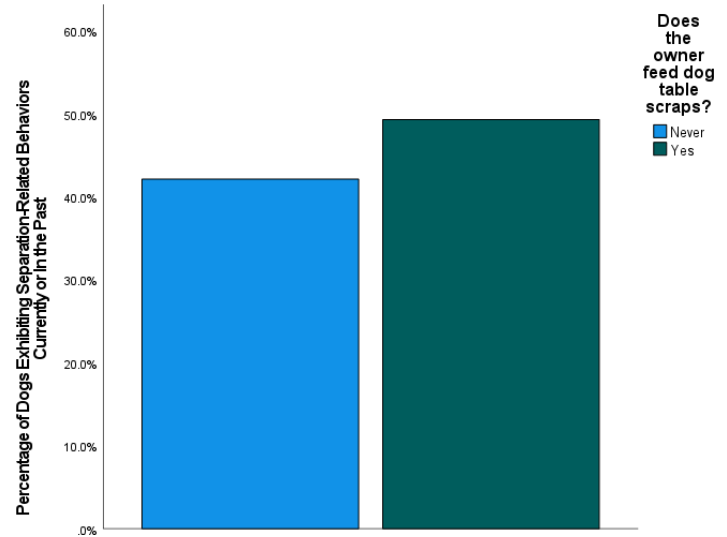


Figure 5. Percentage of dogs exhibiting separation-related behaviors for dogs with owners that do and do not feed their dog table scraps. The blue bar represents dogs with owners that do not feed them table scraps and the green bar represents dogs with owners that do feed

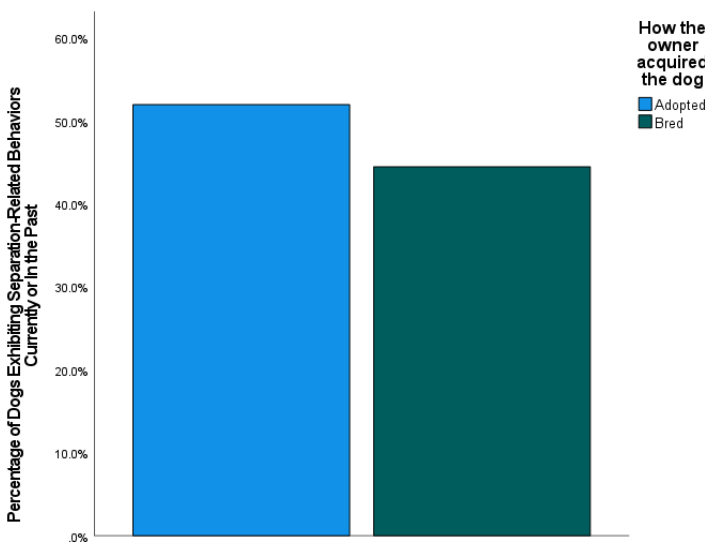


Figure 6. Percentage of dogs exhibiting separation-related behaviors that were adopted versus bred. The blue bar represents dogs that were adopted, and the green bar represents dogs that were bred.

The sample data totals for dogs that were adopted versus bred are found in Table 1 and the percentage of dogs displaying separation-related behaviors for each category is represented by Fig. 6. The results of the logistic analysis revealed that there is not a significant relationship between these variables ($B=-.300$, $S.E.=.409$, $p=.463$). Whether the dog was adopted or purchased from a breeder does not relate to the dog exhibiting separation-related behaviors. These results do not support the research hypothesis that dogs who are adopted tend to display higher rates of separation-related behaviors than dogs that are bred.

PREDICTORS OF SEPARATION ANXIETY IN DOGS

The sample data totals for dogs with one primary caregiver and dogs with multiple caregivers are summarized in Table 1 and the percentage of dogs displaying separation-related behaviors for each category is represented by Fig. 7. The results of the logistic analysis revealed that there is not a significant relationship between these variables ($B=.217$, $S.E.=.413$, $p=.599$). Whether the dog is cared for by one or multiple people does not relate to the dog exhibiting separation-related behaviors. These results do not support the research hypothesis that dogs with one primary caregiver tend to display greater rates of separation-related behaviors.

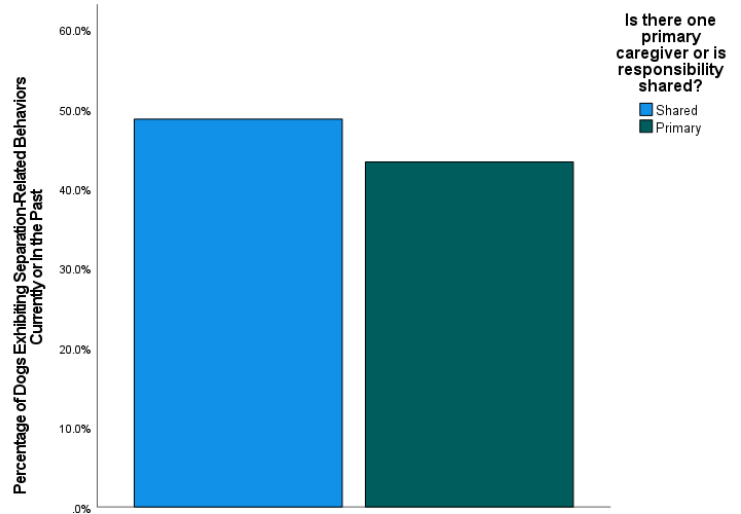


Figure 7. Percentage of dogs exhibiting separation-related behaviors in households with one primary caregiver and households with multiple caregivers. The blue bar represents dogs from single caregiver homes and the green bar represents dogs from homes with multiple caregivers.

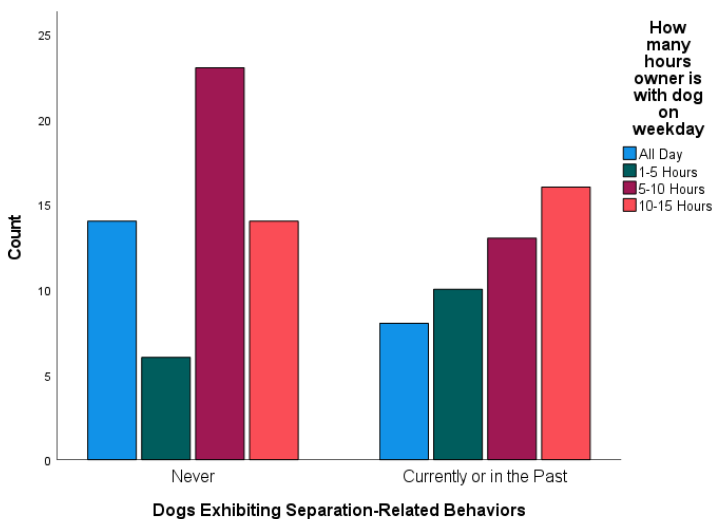


Figure 8. Number of dogs exhibiting separation-related behaviors and the number of hours the owner is with the dog during weekdays. The blue bar represents dogs with owners who spend all day with their dog, the green bar represents dogs with owners who spend 1-5 hours with their dog, the magenta bar represents dogs with owners that spend 5-10 hours with their dog, and the coral bar represents dogs with owners that spend 10-15 hours of the day with their dog.

The sample data totals for the number of hours the owner spends with the dog on a weekday are found in Table 1 and the number of dogs displaying separation-related behaviors for each category is represented by Fig. 8. The results of the logistic analysis revealed that there is not a significant relationship between these variables ($B=.115$, $S.E.=.181$, $p=.524$). The number of hours the owner spends with the dog on weekdays does not relate to whether the dog shows separation-related behaviors. These results do not support the research hypothesis that dogs who are with their owners for more hours of the day tend to display higher rates of separation-related behaviors.

PREDICTORS OF SEPARATION ANXIETY IN DOGS

The sample data totals for the frequency the dog is left alone are found in Table 1 and the number of dogs displaying separation-related behaviors for each category is represented by Fig. 9. The results of the logistic analysis revealed that there is not a significant relationship between these variables ($B=-.106$, $S.E.=.221$, $p=.631$). The number of times the dog is left alone throughout the week does not relate to whether the dog exhibits separation-related behaviors. These results do not support the research hypothesis that dogs who are left alone more often display lower rates of separation-related behaviors. However, there is an interesting difference in the rarely category. Owners that rarely leave their dog alone tend to report that their dogs have never displayed separation-related behaviors.

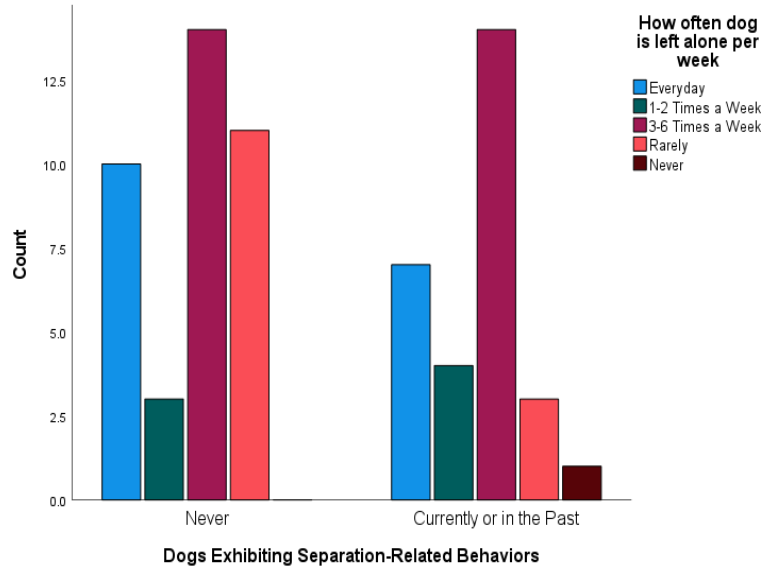


Figure 9. Number of dogs exhibiting separation-related behaviors and the frequency the dog is left alone per week. The blue bar represents dogs that are left alone every day, the green bar represents dogs that are left alone 1-2 times per week, the magenta bar represents dogs that are left alone 3-6 times per week, the coral bar represents dogs that are rarely left alone, and the brown bar represents dogs that are never left alone.

Discussion

Overall, the findings of this study did not provide significant results for dog and owner characteristics that predict whether the dog is more likely to exhibit separation-related behaviors, with the exception of the owners' assessment of whether their dog has separation anxiety. Owners who reported that their dog had separation anxiety also reported that their dog displayed separation-related behaviors.

PREDICTORS OF SEPARATION ANXIETY IN DOGS

This significant result is in alignment with previous findings from van Rooy et al., (2018) who discovered that most owners were aware of the separation-related behaviors their dogs displayed when they were left alone. This finding suggests that many owners are in tune with whether their dog exhibits separation-related behaviors in their absence. As many of these behaviors are quite evident (i.e., destruction of objects, soiling, vocalizations), it is not surprising that many owners are aware of their occurrence. Therefore, in the context of this study, it makes sense that owners who report their dogs as having separation anxiety would also report that their dog displays separation-related behaviors. However, it is notable that approximately forty percent of dog owners who stated their dog has shown separation-related behaviors did not report that their dog had separation anxiety. This is likely the result of owners not making the connection between these behaviors and separation anxiety. Due to this disparity, future research surrounding owner perception of separation anxiety should aim to clarify that dogs displaying separation-related behaviors such as inappropriate eliminations, excessive drooling, vocalizations, and destructive actions most likely have some form of separation anxiety (Bamberger & Houpt, 2006). In addition, the disparity between the owners' reports of separation anxiety and separation-related behaviors partly contributed to the decision to measure separation-related behaviors as the response variable rather than the owners' assessment of separation anxiety. It is also important to note that the owners' perception of whether their dog has separation anxiety was one of the questions added to the survey after data collection had already begun, which resulted in only about sixty percent of the respondents providing an answer to this question. If a greater proportion of the sample had been able to give a response to this question, it is possible that the percentage of owners who reported separation-related behaviors, but said that their dog did not have separation anxiety would be lower, although this is unlikely to have greatly affected the outcomes of this study.

It is also important to consider that many of the owners did not fully finish the survey because their dogs were unable to complete the behavioral test being administered. Although some dogs did not complete the task due to various issues such as low food motivation, or fear of the testing space, a large majority of

PREDICTORS OF SEPARATION ANXIETY IN DOGS

them failed because they exhibited separation anxiety while being away from their owner for the test. The most common signifiers of separation anxiety that were seen during the behavioral test included whining, pacing, salivation, pawing and standing at the door, and the inability to focus on the task being presented to them. Approximately 56% of the dogs (63 out of 111) that were brought in for testing were unable to complete the task because of these reasons. While the present analysis indicates that dog owners seem to have a general awareness of their dog's separation anxiety, it was surprising that most of the owners whose dogs failed the task answered, 'no' when verbally asked by the research assistants if their dog had separation anxiety before testing began. Contrary to what the owners may believe, this anecdotal evidence suggests that it is not always clear whether an owner knows their dog experiences separation anxiety. Maybe this is because not all signs of separation anxiety in dogs are known by lay members of population. The less well-known signs of separation anxiety, like those displayed by the dogs brought in for testing, may be even harder for owners to recognize as separation-related behaviors. Because of this, future research should explore dog owners' abilities to identify and distinguish the signs and behaviors associated with separation anxiety. While it would have been interesting to compare the dogs' exhibition of separation anxiety during the behavioral test to the owners' reports of whether their dog has separation anxiety, this comparison was unable to be made. This was due to variations in record keeping of the individual dogs who displayed separation anxiety when they were being assessed during the behavioral task. These inconsistencies made it difficult to match the dogs' data to the owners' survey responses. An intriguing direction of future studies could attempt to measure a physical display of separation anxiety, and evaluate owners' proficiency in predicting whether their dog shows signs of separation-related behaviors, and indicate specific behaviors they think their dog may demonstrate.

The other variables examined in this analysis for the dogs' sex, weight, age, and acquisition as well as the questionnaire responses for feeding the dog table scraps, number of caregivers, frequency the dog is left alone, and the amount of time the owner spends with their dog did not result in significant findings. These results replicate some of findings the from McGrave (1991) with respect to the dogs' sex and age as

PREDICTORS OF SEPARATION ANXIETY IN DOGS

they were not found to relate to whether the dog displays separation-related behaviors. While some past, more expansive studies have shown higher incidents of separation anxiety in large and medium-sized breeds such as golden retrievers, English springer spaniels, and English cocker spaniels (Flannigan & Dodman, 2001), this analysis did not reveal any relationship between separation-related behaviors and weight of the dog. This suggests that the large and medium-sized breeds in this study did not show any higher rates of separation-related behaviors than their small breed counterparts.

The data collected for analysis in this study did not replicate the McGrave (1991) finding that dogs adopted from shelters display higher rates of separation anxiety. In this data sample, dogs that were adopted and dogs that were bred were about equally represented with 45 bred dogs and 52 adopted dogs. Because these categories were evenly represented, it is possible that the sample size of this study was simply not large enough to reveal any significant relationship between separation-related behaviors and how the owner acquired their dog. Logically, it would make sense that dogs adopted from shelters might show increased rates of separation anxiety because they may have previously been abandoned by an owner, but this analysis was not able to confirm this relationship. One possible explanation as to why this relationship was not represented in this population, could be because the adopted dogs in this data sample had been acquired several years prior to taking part in this study. The average age of dogs who were adopted was 5.76 years, while the average age of dogs at the time they were adopted by their owner was 1.56 years. Given the difference in the dogs' ages from when they were adopted to when they took part in this study, it is possible that they no longer had any recollection of an owner previously deserting them, and therefore might be less likely to show separation-related behaviors in situations when their current owner is absent. Researchers do not agree upon whether non-human animals possess long-term, episodic memory (Pongrácz, Benedek, Enz, & Miklósi, 2012), so it is entirely possible that the adopted dogs from this study simply do not remember their past experience with abandonment.

Additionally, this study did not replicate the Flannigan and Dodman (2001) finding that dogs with one primary caregiver are more likely to exhibit separation-related behaviors. In this analysis, no

PREDICTORS OF SEPARATION ANXIETY IN DOGS

relationship was found to suggest that dogs cared for by one person have more incidents of separation-related behaviors than dogs that have more than one caregiver. In this sample, dogs with one primary caregiver were more represented than those with multiple caregivers (60% one primary caregiver, 40% shared responsibility), which makes it more surprising that the analysis was not able to show a relationship between this variable and separation-related behaviors. The Flannigan and Dodman (2001) study that was able to confirm a relationship between the number of caregivers and separation anxiety had a sample size that was twice as large as what was able to be collected for this study, which could be one reason why a significant relationship was not found between these variables. Another possible explanation is that dogs with only one caregiver experience being left alone more often since it is probable that they have a single owner. If this is the case, it is conceivable that dogs with one primary caregiver are better able to cope with being left alone, so they display lower rates of separation-related behaviors (Ognata, 2016).

In accordance with findings from both McGrave (1991) and Flannigan and Dodman (2001), no association was found between feeding the dog table scraps and the dogs' tendency to exhibit separation-related behaviors. This measure was used as an indicator of the owners' tendencies to partake in spoiling behaviors, as this could potentially create a less healthy dog-owner relationship. Because the Flannigan and Dodman study analyzed a large sample size and did not demonstrate a relationship between these variables, the limited sample size of the present study is likely not the reason for this null finding. Although McGrave (1991) observed that dogs with separation anxiety tend to display a hyper-attachment to their owners, Simpson (2000) indicated that this is not a necessary component of the disorder, because over-attachment can exist both in dogs with separation anxiety and in those without. As such, it is possible that spoiling activities such as feeding the dog table scraps do not actually contribute to the dog becoming hyper-attached to their owner, and therefore does not lead to higher incidence of separation-related behaviors (Flannigan & Dodman, 2001). The opposite could also be true. Spoiling behaviors could, in fact, lead dogs to become over-attached to their owner, but according to Simpson (2000) this over-attachment should not influence whether the dog exhibits separation-related behaviors. Therefore, it is difficult to deduce whether the dogs

PREDICTORS OF SEPARATION ANXIETY IN DOGS

in this study displayed hyper-attachment to their owners. Future studies could try and address the question of whether spoiling behaviors lead dogs to become over-attached to their owners more precisely through use of the Monash Dog Owner Relationship Scale (Dwyer et al., 2006), and an attachment paradigm such as the one modified from Ainsworth's Strange Situation Test used by Parthasarathy and Crowell-Davis (2006). Refer to Appendix A for a full list of questions included in the Monash Dog Owner Relationship Scale.

Lastly, relationships were not found between the number of hours the owner spends with their dog on weekdays or the frequency the dog is left alone per week in relation to the occurrence of separation-related behaviors. While it would make sense that dogs who are left alone more frequently and spend fewer hours with their owner would display lower rates of separation-related behaviors due to an increased ability to cope with social isolation (Ognata, 2016), this relationship was not demonstrated in the present study. However, a follow-up exploratory analysis of the frequency the dog is left alone revealed an interesting pattern within the 'rarely' category. Owners who reported rarely leaving their dog alone were about 3.5 times more likely to report that their dog had never exhibited separation-related behaviors. Perhaps this is because owners who very rarely leave their dog alone do not know whether their dog displays separation-related behaviors, as the dog is seldom in a situation which would allow them to experience separation anxiety.

Taken all together, the results of this study reveal that the dog and owner characteristics of being adopted and being the primary caregiver to the dog, both of which have previously been linked to separation anxiety, are not readily replicated in other populations. In addition, the present analysis supports past findings that found no relationship exists between the dogs' sex, age, or whether the dog is fed table scraps, and the occurrence of separation-related behaviors. Due to the lack of consistent results from studies that investigate potential predictors of separation anxiety, it is hard to say with certainty what dog and owner characteristics can predict the incidence of separation-related behaviors in dogs. Future research should examine these relationships more closely, while ensuring that the methodology and definitions used to

PREDICTORS OF SEPARATION ANXIETY IN DOGS

describe relevant terminology are consistent, in order to more effectively assess potential causes and risk factors associated with separation anxiety in dogs.

Conclusion

The present study addressed the need to investigate the etiology of separation anxiety in dogs. The results of this analysis revealed that dog owners are more likely to consider their dog to have separation anxiety when their dog also displays separation-related behaviors, but no conclusions were able to be drawn about specific dog and owner characteristics that are associated with separation-related behaviors in regards to the dogs' sex, weight, age, and acquisition as well as the owner questionnaire responses for feeding the dog table scraps, number of caregivers, frequency the dog is left alone, and the amount of time the owner spends with the dog. A number of potential explanations for the null results of this study were explored, but ultimately due to the inconclusiveness of these results, future research should continue to develop an understanding of the connection between specific dog and owner traits, and the occurrence of separation anxiety. Future investigations of this subject will be critical in the discovery of viable prevention measures that could aid in reducing the total number of dogs that struggle with separation anxiety. In turn, the discovery of these prevention methods should also cut down on the number of dogs who end up in animal shelters each year as a consequence of recurring behavioral problems.

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PREDICTORS OF SEPARATION ANXIETY IN DOGS

Appendix A

List of Survey Questions and Scales

Note: Bolded questions are indicative of those used for analysis and the question marked with asterisks indicates the response variable

Dog Demographics

- **How old is your dog?**
- How old was the dog when you acquired him/her?
- What breed is your dog?
- **What is your dog's sex? [Male, Female]**
- Is your dog neutered or spayed? [Yes, No]
- **How did you acquire your dog? [Purchased from breeder, Bred yourself, Adopted, Other]**
- How long have you had your dog?
- Was your dog a rescue/shelter dog? [Yes, No]
- Has your dog had previous owners? [Yes, No, I don't know]
- Has your dog suffered any past abuse? [Yes, No, I don't know]

Dog Training

- On a scale of 1 to 10, with 10 being the best, how well trained do you think your dog is?
- As a puppy, did your dog go to socialization classes? [Yes, No, I don't know]
- Do you train your dog at home? [Yes, No]
- Which of the following commands does your dog know? [Sit, Stay, Lie Down, Turn Around, Roll Over, Stand, Speak, Fetch, Come (Recall), None]

Exercise Habits

- How often do you exercise your dog? Can include walk, training session, dog school, etc. [Three or more times a day, Twice a day, Once a day, A few times a week, Once a week, Once a month]
- Is your dog ever allowed to go off leash when exercising? [Three or more times a day, Once or twice a day, A few times a week, Once a week, A few times a month, Very rarely, Never]

Feeding Habits

- How many times a day do you feed your dog? [Less than once a day, Once a day, Twice a day, All day (free choice)]
- Do you feed your dog dry dog food, wet dog food, or a mix? [Dry dog food, Wet dog food, Mix]
- **Do you feed your dog table scraps? [Never, A few times a month, A few times a week, Every day]**
- Which of the following foods do you feed your dog? [Cooked meat, Fish, Vegetables, Fruit, Pasta, Rice, Bread, Cake/pastry, None of the above]
- Do you feed your dog directly from the table? [Yes, No]
- Do you feed your dog snacks or treats? [Every day, A few times a week, A few times a month, Never]
- How would you best describe your dog's weight now? [Far too thin, A bit thin, Just right, A bit overweight, Very overweight]

Dog/Owner Separation

- **On a typical weekday, how many hours is someone at home with the dog? [1-5 hours, 5-10 hours, 10-15 hours, All day]**
- On a typical weekend, how many hours is someone at home with the dog? [1-5 hours, 5-10 hours, 10-15 hours, All day]
- On a typical weekday, how much time does someone spend interacting with the dog (walking, playing, training, etc.)? [Most of the day, A moderate amount, A little, None at all]

PREDICTORS OF SEPARATION ANXIETY IN DOGS

- On a typical weekend, how much time does someone spend interacting with the dog (walking, playing, training, etc.)? [Most of the day, A moderate amount, A little, None at all]
- **How often is your dog alone (no humans)? [Every day, 3-6 Times a week, 1-2 Times a week, Rarely, Never]**
- When your dog is alone, for how much time? [8+ hours per day, 4-8 hours per day, 1-4 hours per day, less than an hour per day, only for minutes at a time]
- Where do you leave your dog alone? [In the home, In the backyard, At a kennel, Other--familiar place, Other--strange place]
- Is there another cat or dog at home when the dog is alone? [Yes-both, Yes-a dog, Yes-a cat, Neither]
- **Does your dog have separation anxiety or any problems when you leave them alone? [Yes, No]**
- If they do have anxiety, how do they show it? [Continuous whining, barking, or howling, Chewing of objects, scratching of the door/wall, or other destructive behavior, Urinating/defecating, Other]
- Answer the following about your feelings on a scale from 1=I am completely calm to 5=I am very nervous.
 - How do you feel if you have to leave your dog at home?
 - How do you feel if you have to leave your dog in a familiar place, but not at home?
 - How do you feel if you have to leave your dog in a strange place?
- Answer the following regarding your thoughts about your dog's feelings on a scale from 1=They are completely calm to 5=They are very nervous.
 - How do you think your dog feels if you leave them alone at home?
 - How do you think your dog feels if you leave them in a familiar place?
 - How do you think your dog feels if you leave them in a strange place?
- Answer the following about your dog on a scale from 1=No joy to 5=intense joy.
 - How much joy do you think your dog feels when you meet again after some minutes of separation?
 - How much joy do you think your dog feels when you meet again after some hours of separation?

Owner Demographics

- Owner gender [Male, Female, Other]
- Marital status [Single, Married, Separated/divorced, Widowed]
- Do you have children in the family? [Yes, No]
- Do you have children younger than 6 years old in the family? [Yes, No]
- Do you have other dogs? [Yes, No]
- Are you a first time dog owner? [Yes, No]
- **What level of responsibility for the dog do you have? [Primary, Shared, Other]**
- What is your annual household income? [Less than \$25,000, \$25,000- \$49,999, \$50,000-\$74,999, \$75,000- \$99,999, More than \$100,000, I would rather not say]

Scales

Dog Characteristics (Rogerson, 1989)

Indicate your perception of your dog as a family pet. Only choose one answer for each pair of words and do so quickly, without stopping to analyze your answers. The first response that comes to mind is the best. [Answers indicated on a 1-4 scale where answers 1 and 2 refer to the first adjective of the

PREDICTORS OF SEPARATION ANXIETY IN DOGS

pair of words and answers 3 and 4 refer to the second adjective of the pair with 1 & 3=VERY descriptive of the dog and 2 & 4=FAIRLY descriptive of the dog]

- touch insensitive/touch sensitive
- bold/hesitant
- demanding/giving
- voice insensitive/voice sensitive
- independent/dependent
- leads/follows
- spontaneous/disciplined
- excitable/calm
- dominant/submissive
- controlling/uncontrollable
- steadfast/shaky
- overwhelming/laid back
- relaxed/tense
- confronting/avoiding
- driving/costing
- willful/compliant
- competitive/uncompetitive
- assertive/passive
- frustrating/satisfying
- quiet/noisy
- annoying/likable
- mild/intense
- people friendly/ not people friendly
- outgoing/clingy
- self-assured/anxious
- cheerful/sad
- threatening/comforting
- playful/boring

Dog Behavior (Bennett & Rolf, 2007)

How frequently does your dog engage in the following behaviors? [Scored on a 1-7 scale where 1=never, 4=sometimes, and 7=Always]

Disobedience Subscale

- My dog does what he/she is told
- My dog will stay when asked
- My dog has good manners
- My dog will sit on command
- My dog will come when called
- My dog soils in the house

Aggressive Subscale

- My dog is friendly to strangers
- My dog is friendly to other dogs
- My dog is aggressive to people he/she knows
- My dog is aggressive to strangers
- My dog is aggressive to other dogs
- My dog is friendly to people he/she knows

Nervous Subscale

- My dog is nervous
- My dog startles easily
- My dog is timid in new situations
- My dog is confident in unfamiliar places

Destructive Subscale

- My dog digs holes inappropriately
- My dog chews things he/she shouldn't
- My dog is relaxed most of the time
- My dog doesn't mind being left alone

Excitable Subscale

- My dog pulls on the leash when walking
- My dog jumps up on people
- My dog shows inappropriate sexual behaviors

PREDICTORS OF SEPARATION ANXIETY IN DOGS

- My dog barks excessively

Dog Obedience and Problem Behaviors (Hiby et al., 2004)

Rate your dog's obedience on a scale of 1-5 (5 being the most obedient) for the following:

- Toilet training
- Chewing household objects
- Stealing food or other objects
- Coming when called
- Sitting on commands
- Give up an object on commands
- Walk to heel
- Overall obedience

Indicate whether your dog has shown the following currently, in the past, or never:

- Barking at people
- Aggression towards people
- Barking at dogs
- Nipping at dogs
- Growling at dogs
- Fear in a few situations
- Fear in many situations
- Excitement in a few situations
- Excitement in many situations
- ***Separation-related behaviors***
- Inappropriate mounting
- Repetitive behaviors
- Eating non-foodstuffs

Dog Impulsivity Assessment Scale (Wright et al., 2011)

Indicate whether you agree or disagree to the following statements about your dog: [Strongly agree, Mainly agree, Partly agree/partly disagree, Mainly disagree, Strongly disagree, Don't know/not applicable]

Behavioral Regulation Subscale

- My dog shows extreme physical signs when excited (e.g., drooling, panting, raising hackles, urination, licking lips, widening of eyes)
- When my dog gets very excited it can lead to fixed repetitive behavior (i.e., an action that is repeated in the same way over and over again), such as tail chasing or spinning around in circles
- I would consider my dog to be very impulsive (i.e., has sudden, strong urges to act; acts without forethought; acts without considering effects of actions)
- My dog does not think before it acts (e.g., would steal food without first looking to see if someone is watching)
- My dog can be very persistent (e.g., will continue to do something even if it knows it will get punished or told off)
- My dog is easy to train
- My dog calms down very quickly after being excited
- My dog appears to have a lot of control over how it responds

PREDICTORS OF SEPARATION ANXIETY IN DOGS

- My dog is not very patient (e.g., gets agitated waiting for its food, or waiting to go out for a walk)
- My dog seems to get excited for no reason

Aggression Subscale

- My dog doesn't like to be approached or hugged
- My dog becomes aggressive (e.g., growl, snarl, snap, bite) when excited
- My dog may become aggressive (e.g., growl, snarl, snap, bite) if frustrated with something
- My dog is not keen to go into new situations
- My dog is very interested in new things and new places

Responsiveness Subscale

- My dog appears to be 'sorry' after it has done something wrong
- My dog takes a long time to lose interest in new things
- My dog reacts very quickly
- My dog is easy to train
- My dog is very interested in new things and new places

Monash Dog Owner Relationship Scale (Dwyer et al., 2006)

Indicate how often the following activities occur: [Multiple times a day, Once a day, Two-three times per week, Once per week, Once per month, Once per year, Never]

- How often do you play games with your dog?
- How often do you take your dog to visit people?
- How often do you give your dog food treats?
- How often do you kiss your dog?
- How often do you take your dog in the car?
- How often do you hug your dog?
- How often do you buy your dog presents?
- How often do you have your dog with you while relaxing, i.e., watching TV?
- How often do you groom your dog?

Owner Personality and Optimism (Gosling, Rentfrow, & Swann, 2003)

I see myself as: [Scored on a 1-5 scale where 1=Disagree strongly, 3=Neutral, and 5=Agree Strongly]

- Extroverted, enthusiastic
- Critical, quarrelsome
- Dependable, self-disciplined
- Anxious, easily upset
- Open to new experiences, complex
- Reserved, quiet
- Sympathetic, warm
- Disorganized, careless
- Calm, emotionally stable
- Conventional, uncreative