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Puppy behaviours when left home alone: A pilot study

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Abstract

The aim of this exploratory pilot study was to investigate which behaviours puppies exhibited when left home alone within the initial weeks (0–11 weeks) following adoption, as well as describing variability and temporal distribution of these behaviours. Eighteen puppies (9 aged less and 9 aged more than 90 days) were filmed home alone for 90 min after the owner left. Owners were asked to complete a brief questionnaire including information on the puppy's characteristics and history as well as on the physical and social environment of the dog. Analysis of behaviours on tape showed that puppies did not behave homogeneously but rather separated into three distinct groups. Puppies were clustered based on behaviours such as (1) playing and exploring or (2) exhibiting passive behaviours or (3) presenting lip licking, yawning, scratching, orienting to the environment and vocalising. Passive behaviour increased significantly over time ($p < 0.001$) and was significantly lower during the first 15 min with respect to the other observation periods ($p < 0.05$). Orientation to the environment tended to decrease ($p = 0.08$). Vocalisation ($p < 0.05$) and play behaviour ($p < 0.01$) both decreased significantly over time.

Keywords: Puppy; Dogs; Behaviour; Separation anxiety

1. Introduction

Anxiety-related disorders and separation anxiety are among the most common behavioural problems in domestic dogs (Overall et al., 2001). Separation anxiety is diagnosed in 20–40% of dogs referred to animal behaviour practices in North America (Voith and Borchelt, 1996;

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Simpson, 2000). Problems that occur when the owner is absent represent one of the principal causes for the breakdown of the human–companion animal bond and lead to surrender of numerous dogs to shelters (Van der Borg et al., 1991; Miller et al., 1996). In the broadest definition of separation anxiety, the condition is described as problematic behaviour motivated by anxiety that occurs exclusively in the owner's absence or virtual absence (Borchelt and Voith, 1982; Overall, 1997; Flanningan and Dodman, 2001). The most common complaints are destructive behaviour directed at the home, self inflicted-trauma, inappropriate elimination, and excessive vocalisation (whining, barking, or howling) only in the owner's absence (King et al., 2000; Simpson, 2000).

Most studies to date on early behavioural development in dogs have been based on various laboratory tests (see Scott and Fuller, 1965) and unfortunately very little information is currently available on puppies observed in the human social environment (Lund and Vestergaard, 1998). This information could be quite helpful to gain a more comprehensive understanding of developmental aspects of social behaviour as well as social influences on behavioural phenotype (Lund and Vestergaard, 1998). To our knowledge, no detailed study has been published that included filmed observations of the behaviour of puppies home alone. The aim of this exploratory pilot study was to investigate which behaviours puppies exhibited when left home alone within the initial weeks (0–11 weeks) following adoption, as well as describing variability and temporal distribution of these behaviours.

2. Materials and methods

2.1. Subjects

Eighteen puppies (10 intact males, 1 neutered male and 7 intact females) ranging in ages from 55 to 161 days (mean = 84.2 days; median = 81 days; S.D. = 29.06) were included. All dogs were purebreds. Breeds represented included three Labradors, two Bernese Mountain Dogs, two Border Collies, and one of each of the following breeds: Newfoundland, German Short Hair Pointer, Cocker, Siberian Husky, Schnauzer, Great Pyrenees, Rhodesian Ridgeback, Chihuahua, German Shepherd, Great Dane, and Golden Retriever. Puppies were recruited mostly through direct contact with veterinarians in private practice. A fax advertisement summarised inclusion and exclusion criteria for participating veterinary hospitals.

One puppy was born at the owner's home, one was adopted from another person, one was acquired from the local animal shelter, three were purchased from a pet store, and the remaining dogs were adopted directly from breeders. Age of puppies at adoption ranged from birth to 105 days (mean = 58.9 days) and duration of ownership varied from 2 to 78 days (mean = 24.7 days).

Videotaping sessions were carried out under conditions normally adopted by the owners: 15 puppies were kept in a cage, 1 was allowed to run freely in the apartment, 1 did not have access to bedrooms, and 1 was locked up in the living room.

2.2. Data collection

The owners were asked to fill out a brief questionnaire including information on the puppy's characteristics and history as well as on the physical and social environment of the dog. Questions touched on home environment, management, age (current, age at acquisition and at weaning), sex, reproductive status (entire or neutered/spayed), breed, number of adults and children (children older than 18 years were considered adults) in the household, source of puppy

(breeder, pet store, shelter, rescue, family, friends or stray), number of dogs and cats in the household, access to outdoors, amount of exercise, as well as the dog's daily and weekend routine.

A video camera was installed in the room where the puppy usually stayed during owner absence. If the puppy was allowed free roam, the camera was installed where the dog was believed to spend most of its time. The owners were asked to start the camera immediately prior to their departure from home, without changing their regular daily routine. The dogs were filmed home alone for 90 min.

2.3. Data analysis

2.3.1. Questionnaire

Answers to the questionnaire were scored and absolute and relative frequencies were calculated.

2.3.2. Videotapes

The behaviour of each puppy was video-recorded and the videotape sessions were analysed by two trained observers. Fourteen categories covering all recorded behaviours were established (Table 1). A focal animal continuous recording method (Martin and Bateson, 1993) was used to describe the puppy's activity. Behaviours were recorded in terms of duration of occurrence or frequency. Behaviours recorded as states (exploration, locomotion, passive behaviour, orientation to environment, scratching, oral behaviour, vocalisation, play, grooming, panting) were reported as percentage of total observation time, and events (licking lips, yawning, elimination) were reported in terms of absolute frequency of occurrence.

Inter-observer reliability was assessed by means of independent parallel coding of a random sample of videotaped sessions (10%) using percentage agreement. Percentage agreement was always more than 98%.

2.3.3. Statistical analysis

Categories such as locomotion, oral behaviour, not visible, grooming, panting and elimination, were not considered for statistical analysis either because of total absence of the given behaviour or short duration. A multivariate statistical analysis, principal component analysis (PCA) with varimax rotation, was used for the remaining observed behavioural categories to determine the role of variables and detect common features. Factor scores were calculated for puppies when the component's Eigen value was greater than 1, in order to evaluate the distribution of the subjects according to the considered variables and classed using the categories obtained from the questionnaire. Puppies were assigned equally to two groups (group 1: $<$90 days and group 2: $>$90 days) in order to assess the effect of age on behaviour. In order to describe the temporal distribution of behaviours during subsequent intervals of 15 min for a total length of 90 min (six intervals of 15 min each), a general linear model (GLM) analysis of variance for repeated measures was performed using the age class as a fixed factor and time intervals as repetition.

3. Results

Most subjects (94.4%) lived in a house and 5.6% lived in an apartment. Most puppies (77.8%) lived in households without children whereas some (22.2%) lived with adults, and teenagers or

Table 1
Behavioural categories and their definition

Behavioural category	Definition
Exploration: EX	Motor activity directed toward physical aspects of the environment, including sniffing, and gentle oral examination such as licking
Locomotion: LO	Walking or running around without exploring the environment (pacing)
Passive behaviour: PA	Lying down with the head on ground without any obvious orientation toward the physical or social environment
Oriented to the environment: OE	Sitting, standing or lying down (the head does not rest on the ground) with obvious orientation toward the physical or social environment, including sniffing, close visual inspection, distant visual inspection (vigilance or scanning)
Scratching: SC	All active behaviours resulting in physical contact with the cage/door, including scratching the cage/door with the paws, jumping on the cage, handling with the forelimbs
Oral behaviour: OB	Any vigorous behaviour directed toward the environment/cage using the mouth (including chewing, biting, shaking, pulling with the mouth)
Vocalisation: VO	Barking, whining and howling
Play: PL	Any vigorous or galloping gaited behaviour directed toward a toy; including chewing, biting, shaking from side to side, scratching or batting with the paw, chasing rolling balls and tossing using the mouth Although, the dog may take the objects into it's mouth, destruction is not included in this category
Not visible: NV	Not visible (during these periods, activities like vocalisation, scratching, chewing, were identified and recorded by the sound of the activity)
Grooming: GR	The action of cleaning of the body surface by licking, nibbling, picking, rubbing, scratching, etc. directed towards the animal's body (self-grooming)
Yawning: YA	Yawning
Lip licking: LL	Lip licking
Panting: PT	Panting
Elimination: EL	Urination, defecation

children. Family composition for the puppies varied from single owners (5.6%), to two adults (66.7%), and even several members (27.8%). In 44.4% of cases, the puppy was a single pet. In about half the households (55.5%), another animal was present, a dog in 33.3% of cases. Twelve puppies were single dogs, whereas six were living with at least one other dog in the household. Fifty percent of puppies had limited access to outdoors (fenced yard), 33.3% were taken out on leash and 11.1% were out both on leash and in a fenced yard. Half the dogs (50.0%) were left home alone for a period ranging from 3 to 4 h daily, about a quarter (22.3%) for 1–2 h and one of them was never left home alone. The remainder was left home alone for more than 5 h daily. Most (89%) of the puppies, when left home alone, had toys available. The dog's daily routine was consistent for most dogs (89.9%) and the same routine was maintained during the weekend in half the households. Analysis of puppies' behaviour on tape (Fig. 1) showed that they spent most of their time exhibiting passive behaviour (77.4%) as opposed to being oriented to the environment (12.6%). Some puppies vocalised 6.9% of the time while separated from the owners. The puppies that tended to vocalise, yawn, scratch, lick their lips and orient to the environment were younger than 90 days and recently adopted (<6 days). Play (4.1%), exploratory behaviour (0.5%), grooming behaviour (0.6%), locomotion (0.6%), oral behaviour (0.2%) and scratching (0.9%) were observed for short periods. Fifteen caged puppies showed similar patterns of locomotion and passive behaviours to the three puppies kept uncrated. Average frequencies per hour for yawning and lip licking were 2.0 and 1.3,

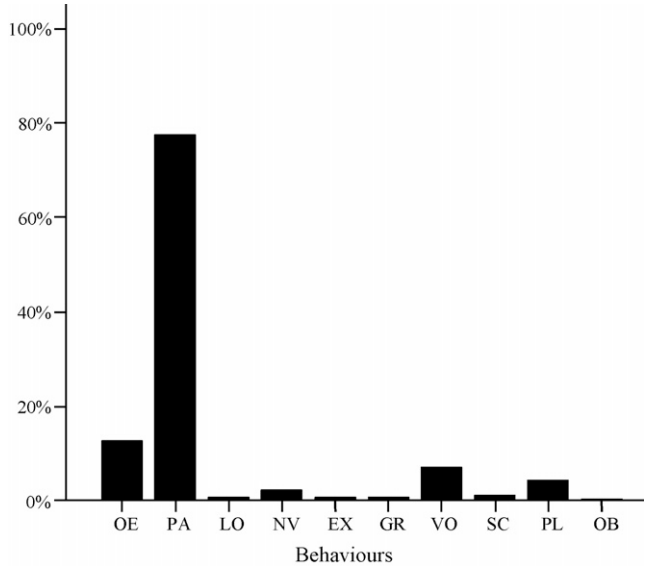

Fig. 1. Percentage duration of behaviours.

respectively. No puppy eliminated during the initial 90 min of separation, and panting behaviour was never observed.

The PCA revealed two underlying components whose Eigen values were greater than 1 (Table 2). The first component (PC 1) showed positive loading for the behaviours oriented to environment, vocalisations, yawning, lip licking and scratching behaviours and negative loading for passive behaviour (Fig. 2). The second component (PC 2) showed positive loading for exploratory and play behaviour. Individual puppies are plotted in Fig. 3. Puppies did not gather homogeneously but rather tended to separate into two groups on PC 1: one group with higher variable values associated with behaviours such as oriented to environment, vocalisations,

Table 2
Principal component analysis (PCA) of quantitative data calculated from correlation matrix

	Eigen value	Explained variance %	Cumulative explained variance %
PC1	3846	48081	48081
PC2	1898	23726	71807

Behaviour	PC1	PC2
Oriented to the environment	**0.906**[a]	0.009
Vocalisation	**0.864**	−0.191
Yawning	**0.822**	−0.031
Passive	**−0.742**	−0.570
Lip licking	**0.728**	−0.045
Scratching	**0.718**	−0.219
Play	−0.080	**0.875**
Exploration	−0.022	**0.848**

[a] The most significant behaviours for each component are bold typed.

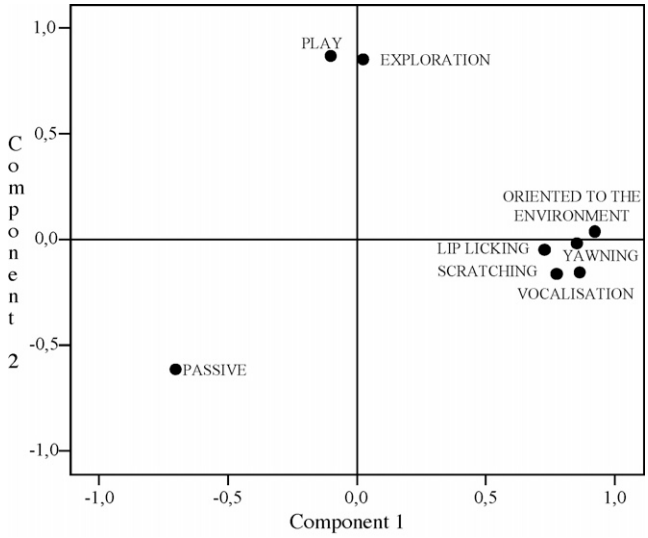

Fig. 2. Projection for the loading of the behavioural variables considered for the first and second principal component.

yawning, lip licking and scratching and the second group identified by higher variable values for passive behaviour. As shown in Fig. 3, female puppies younger than 90 days, left alone between 2 and 4 h daily are clustered indicating that they were more likely to vocalise, orient to the environment, yawn, scratch and lick their lips. On the contrary, male puppies left alone for more

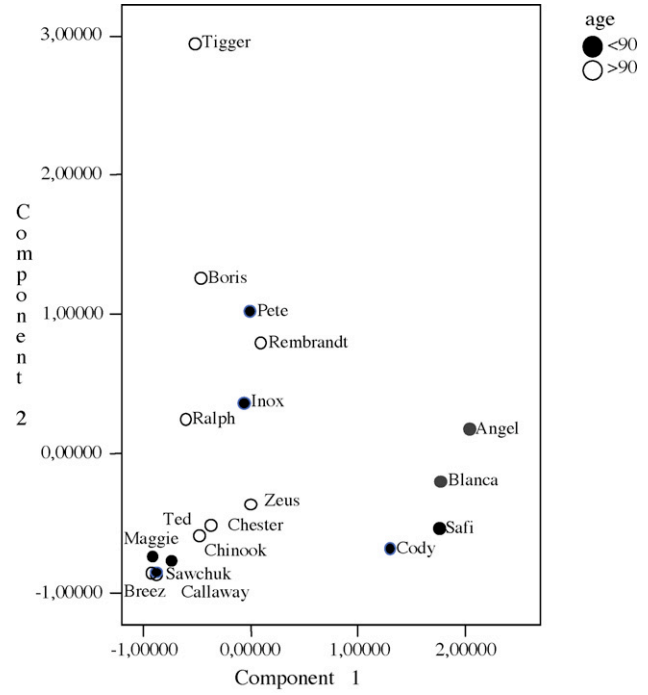

Fig. 3. Plots of puppies in terms of first and second principal components.

than 2–4 h daily appear to be more playful and explorative. Family composition, presence of other dogs in the household, source of acquisition, age of adoption and weaning, presence of toys and routines (weekdays and weekends) did not affect the distribution of the puppies on the first two PCs.

As illustrated in Fig. 4a and b, passive behaviour increased significantly over time ($p < 0.001$) and was significantly lower during the first 15 min with respect to the other observation periods ($p < 0.05$). Age class did not significantly affect duration of this behaviour over time. The behaviour of orientation to the environment tended to decrease ($p = 0.08$) over time. In particular

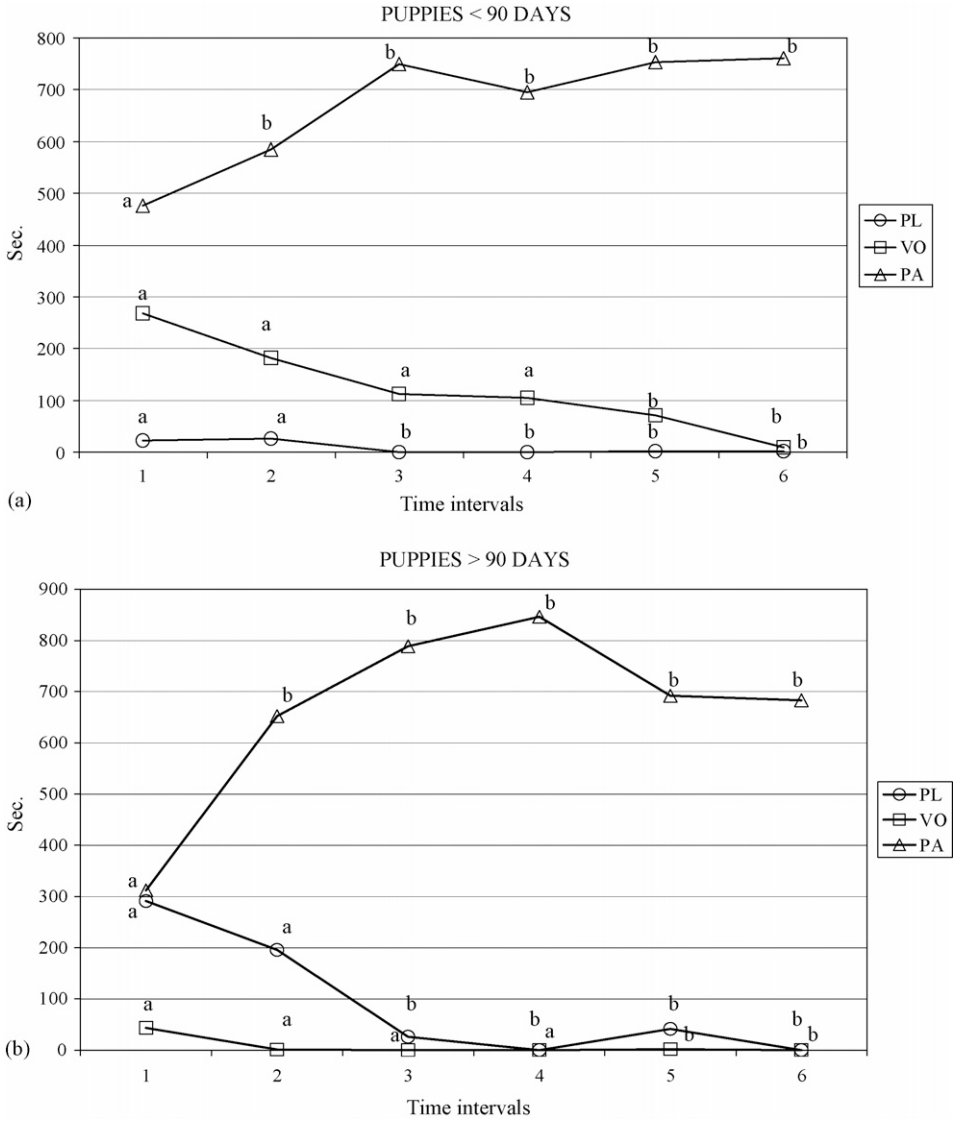

Fig. 4. Mean duration (s) of puppies behaviours during subsequent 15 min intervals of observation. *(a–b) intervals with different letters differ significantly ($p < 0.05$). PL = Play; VO = vocalisation; PA = passive.

the differences were significant when comparing the first period to the second ($p < 0.05$) and third periods ($p < 0.05$). This behaviour also had a tendency ($p = 0.08$) to be affected by age with puppies younger than 90 days tending to orient more. Vocalisation decreased significantly ($p < 0.05$) over time. In particular, puppies vocalised significantly more at the beginning of the observation compared to the end. Vocalisation behaviour had a tendency to be influenced by age of puppy ($p = 0.10$). Puppies younger than 90 days tended to vocalise more than older puppies. The three puppies that vocalised throughout the entire duration of the tape were 61, 56, and 55 days old and had been adopted 5, 4, and 2 days prior to the videotaping. Play behaviour decreased significantly ($p < 0.01$) over time. Puppies played significantly more during observations of the first 15-min period compared to all other periods except when comparing period 1 to period 2. Play behaviour was significantly ($p < 0.01$) affected by age. In fact, puppies older than 90 days played more than younger puppies especially during the first observation periods. Exploration did not vary significantly over time and was unaffected by age. Yawning did not vary significantly over time but was significantly ($p < 0.05$) affected by age. Younger puppies yawned more frequently especially during the initial observation periods. Lip licking did not vary significantly over time and was unaffected by age.

4. Discussion

The aim of this study was to document puppies' behaviours when left home alone because separation-related problems are commonly reported as a reason for consultation in referral behaviour practices. No data are currently available to describe normal behaviours of puppies left alone and little data are available on actual age of onset of separation-related problems. Diagnosis is generally based on indirect evidence such as elimination or destruction during owner absence rather than on tapes of actual behaviours and body language.

This exploratory study documents that puppies do not all behave similarly when left alone. Puppies were clustered based on behaviours such as (1) playing and exploring or (2) exhibiting passive behaviours or (3) presenting lip licking, yawning, scratching, orienting to the environment and vocalising.

The puppies that tended to vocalise, yawn, scratch, lick their lips and orient to the environment were younger than 90 days and recently adopted (<6 days). Many of these behaviours are compatible with signs of anxiety or fear. There is a common stress response resulting from either fear or anxiety (Casey, 2002). The specific appearance of a fearful or anxious animal will vary but body posture tends to lower with fear, anxiety or submission. The animal may yawn or lick its lips repeatedly, may tremble or may exhibit piloerection (Neilson, 2002). Vocalisation can occur as a consequence of fear or anxiety (Landsberg et al., 2003; Overall, 1997). Beerda et al. (1998) found that dogs that were subjected to different types of stressful stimuli performed more body shaking, crouching, oral behaviours (tongue out, tip of tongue briefly extended, snout licking, swallowing, smacking), yawning, restlessness and presented a low posture. Mouth licking, front paw lifting, ears pulled back and lowered standing or sitting postures have also been reported as indications of stress in dogs subjected to harsh training methods (Schwizgebel, 1982). Another study (Hetts et al., 1992) found that dogs housed in the greatest degree of social isolation spent the most time moving, exhibited the greatest number of abnormal movements and vocalised the most. The behaviour of these young recently adopted puppies could be explained by the fact that they were in a new social and physical environment but the tendency to show anxiety-related behaviours applies to all puppies aged less than 90 days, and not just to the recently adopted ones. Age of puppies

affected orientation to the environment, vocalisation, playing behaviour and yawning. Puppies younger than 90 days had the tendency ($p = 0.08$) to orient more to the environment, to vocalise more ($p = 0.1$), and to yawn significantly more ($p < 0.05$) but played significantly less ($p < 0.01$) than puppies older than 90 days. Younger puppies are thus possibly more stressed than older puppies.

Passive behaviour was the main behaviour exhibited by all puppies, although no distinction between sleeping or resting behaviours could be made based solely on the tapes. Puppies left home alone tended to be passive most of their time. As illustrated in Fig. 4, passive behaviours increased over time for both puppies older and younger than 90 days. However, older puppies were less passive initially because they were playing whereas younger puppies were less passive initially because they were oriented to the environment and vocalised more. The increase in passive behaviour for the older group of puppies could be a result of resting behaviour following play whereas the increase in passive behaviour of the younger puppies could be the consequence of exhaustion. Older puppies played and explored more. Passive behaviours and locomotion were not influenced by the fact that puppies were caged.

Some of the puppies in our study vocalised. The three puppies that vocalised throughout the entire duration of the tape were 61, 56, 55 days old and had been adopted 5, 4, and 2 days prior to the videotaping. When young puppies are distressed they usually begin to emit a series of sounds. This kind of behaviour can be classified as et-epimeletic or care soliciting behaviour. Unable to adapt to a situation, the young animal calls for help and attention. In the puppy, the number of vocalisations in a particular period of time provides an objective measure of the emotional state of the animal. For a young animal, being lost from its mother in an unfamiliar environment is one of the most dangerous situations, which can threaten its existence (Elliot and Scott, 1961).

Flanningan and Dodman (2001) found that separation anxiety was not more common in dogs separated from their dam and littermates at an early age. Our study however certainly raises additional questions. First, do all puppies show signs of distress when initially adopted and first separated from owners? If not, are signs of distress in some puppies simply a consequence of young age, recent change in environment or both? Or are the vocal puppies more anxious? If so, could this vocalising behaviour be one of the first signs of future separation-related disorders?

5. Conclusion

These results can serve as preliminary information documenting what behaviours puppies perform when home alone. Ultimately, with additional studies the hope is to gain insight on how these behaviours change over the first few months following adoption. As follow-up, we plan to conduct a longitudinal study to collect data on how behaviours compatible with anxiety evolve over time in puppies left home alone. This information may prove useful for the early diagnosis, treatment or prevention of separation-related disorders.

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