



RESEARCH

Responses of shelter and pet dogs to an unknown human

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Abstract Canine shelters frequently have inadequate living conditions that affect the behavior of dogs. This study compared fear-appeasement and sociability reactions in shelter and pet dogs when they are confronted by an unfamiliar experimenter. Results indicated that shelter dogs used for this study showed more fear-appeasement behavior—tail down, ears down, and crouching—as compared with pet dogs. In addition, shelter dogs quite frequently remained closer to the individual, despite showing signs of fear-appeasement, as compared with pet dogs. Finally, shelter dogs remained near the door of the enclosure less often when compared with pet dogs. This difference might be accounted for by the lack of any attachment bonds among shelter dogs toward their caretakers. These results may be associated to the usual stressful conditions and limited interactions with human beings that may be observed in shelters with scarce resources.

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Introduction

The main purpose of canine shelters is to house animals during a relatively brief period, after which they are adopted into family households or employed as working dogs. However, adoptions are rare in Latin America, which leads to the shelters becoming permanent housing for most dogs. These animals are chronically exposed to several stressors, such as social isolation, initial exposure to a new environment, excessive noise, physical restrictions, and changes in light–darkness cycles (Hennessy et al., 1997; Tuber et al., 1999). They survive under poor living conditions, are exposed to overcrowding, and have scarce contact with human beings (Barrera et al., 2008). In addition,

animals that end up in a shelter usually have already experienced various traumatic situations such as mistreatment or neglect (De Palma et al., 2005).

Consequently, shelters tend to cause some of the behavioral problems reported by adopters (Wells and Hepper, 2000; Diesel et al., 2008). These include fear, hyperactivity, excessive barking (Wells and Hepper, 2000), and aggression (Diesel et al., 2008). Fear and aggression are among the most common behavioral problems that hamper interaction between dogs and human beings, thereby representing a failure in communication between the two species (Serpell and Jagoe, 1995).

Conversely, empirical evidence indicates that dogs develop strong emotional bonds with their owners (Topál et al., 1998; Prato-Previde et al., 2003; Palestini et al., 2005). This causes them to react to separation from their owners similar to the behavior expressed by human infants and chimpanzees when separated from their mothers (Tuber et al., 1996). Interestingly, it has been shown that adult dogs living in shelters can develop attachment bonds relatively

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quickly toward human beings who interact with them (Gácsi et al., 2001).

Exposure to an unknown human being is commonly used in behavioral evaluation of shelter dogs. In some studies, the experimenter shows an indifferent or passive attitude toward the animal while the dog's attempts to approach him/her are measured (Weiss and Greenberg, 1997; Hennessy et al., 2006), whereas in others, the experimenter is proactive, calling to the animal by its name, talking to and petting it (Van der Borg et al., 1991; De Palma et al., 2005; Lucidi et al., 2005). Reactions of the dog toward the initiatives of the experimenter have been previously assessed. However, there are no comparative studies relating the behavior of shelter dogs and that of pet dogs in similar situations.

The aim of the present study was to compare fear-appeasement and sociability behaviors among shelter and pet dogs when faced with an unknown individual acting passively initially, and actively later. Because these groups of dogs differ with respect to their housing conditions, shelter dogs probably show more fear-appeasement responses to human beings as compared with pet dogs. Considering the fact that they experience lower levels of social interaction with human beings as opposed to pet dogs, differences in their sociability reactions to an unfamiliar individual are expected.

Materials and methods

Animals, housing, and husbandry

The subjects were 34 mixed-breed domestic dogs (*Canis familiaris*). Twenty of them (shelter dogs group, SHD) were confined in the Esperanza Animal Shelter, at Crespo, Entre Ríos, Argentina, (7 males and 13 females; mean age = 3.2 years, SEM \pm 0.56). The other 14 subjects (pet dogs group, PD; 4 males and 10 females; mean age = 4.21 years, SEM \pm 0.59) had since puppyhood lived as pets in human households.

Shelter dogs had been neutered and kept alive in 2 \times 4 m² kennels in mixed gender groups of 3 or 4 animals. The shelter had a 20 \times 40 m² recreation area, where the dogs were taken for approximately 15-20 minutes per day. Daily contact with caretakers occurred during feeding, cleaning of the kennels, and walks, resulting in approximately 13 minutes of daily human being contact per animal. All the shelter dogs included in the experiment had lived in the shelter for >2 years; they were healthy and underwent regular health examinations. To select the pet dogs, a criterion was established whereby selection was restricted to those whose owners declared that they lived most of the time inside the house, interacting with the family. In the case of pet dogs, females were neutered, whereas males were left intact.

Experimental setting and apparatus

The test was performed at the location where the dogs lived. In the case of shelter dogs, observations were carried out in a wired enclosure with a concrete floor similar to their kennels. Pet dogs were assessed in a room within the home of their owners. The experimenter was in all cases an unfamiliar woman.

All experimental settings contained a blanket for the dog to lie down and a stuffed toy to play with. Sessions were recorded with a Sony DCR 308 camera (Handycam Sony Model DCR-DVD308, Optical Zoom 25x, China), which was mounted on a tripod, to evaluate inter-observer reliability.

Procedure

The procedure consisted of 2 successive phases of 3 minutes each, with no intervals between them. Each subject was taken by a handler to the experimental area where it was released. During each 3-minute phase, the dog was left alone in the experimental area to explore and familiarize with it.

Phase 1: Passive experimenter (PE)

Immediately after the familiarization phase, the experimenter entered the enclosure and situated herself on the opposite side of the door (regardless of the location of the dog) maintaining a standing position without making any gestures or speaking. The experimenter crouched and interacted with the dog if it approached her, by petting and speaking softly for a period of 3-5 seconds, after which she stopped petting it. In cases when the dog reinitiated physical contact, the experimenter behaved in the same way. The experimenter remained still in cases where the subject did not approach her.

Phase 2: Active experimenter (AE)

Immediately after the first phase, the experimenter called the dog by its name and began to interact with it. The experimenter approached the dog and interacted by speaking to it, inviting it to play with the toy, and petting it. In cases where the dog exhibited either fearful behavior or unwillingness to interact and stayed away from the experimenter, she stopped attempting to approach it.

Behavioral observations

To evaluate the responses of a dog to an unknown human being, 9 behaviors were classified into the following 3 categories: (a) fear-appeasement behavior (tail down, ears down, and crouching), (b) sociability-related behavior (proximity to experimenter, proximity to the door, and initiation of physical contact), and (c) other behavior (exploration, remaining still, and vocalizations) (Table 1). The selection

Table 1 Definition of behaviors

Categories of behavior	Behaviors	Definitions
Fear-appeasement behaviors	Tail down	The tail was stuck to the hind legs, without any movement.
	Ears down	The ears remained back and down.
	Crouching	A pronounced lowering of the top line.
Sociability-related behavior	Proximity to experimenter	The dog was within a distance of half a meter from the experimenter, regardless of body orientation.
	Proximity to the door	The dog was within a distance of half a meter from the door, regardless of body orientation.
Other behaviors	Initiation of physical contact	The dog touched the experimenter with any part of his body.
	Remaining still	The dog stayed motionless without any activity.
	Exploration	Putting the muzzle on the ground, on the wall, individual or objects, also includes sniffing the air, that is, when the dog raises the head, moving the nostrils and breathing the air to perceive odors. An instance was scored starting from when the dog put his muzzle on the surface until he/she raised it again.
	Vocalizations	Included barks, groans, and snorts. When there was at least a 1 second interval between vocalizations a new instance was scored.

of the evaluated behaviors was on the basis of previous descriptions of dog behavior (Topál et al., 1998; Beerda et al., 1999; Hennessy et al., 2001, 2006).

Measurements were scored in both phases—active and passive—with the exception of initiation of physical contact, which was only registered during the PE phase. Every 5 seconds, behaviors were recorded through instantaneous sampling. It was not possible to score all variables because on several occasions the dogs were not visible to the experimenter. A ratio was calculated by dividing the observed frequency in each phase by the total number of times when the dogs were visible to the experimenter.

Behavioral observations were performed by 2 independent observers. One of them was the first author (G.B.) and the other was a veterinary science student. Agreement between the 2 observers was determined on the basis of Cohen's Kappa coefficient, which was reported as >0.90 in all the variables with the exception of crouching behavior ($k = 0.54$) during the passive phase.

Data analysis

For data analysis, nonparametric statistical methods were used. A Mann–Whitney U test was used to assess between-group differences in each phase. Within-groups comparisons between phases were analyzed by Wilcoxon signed-rank test. Significance level of 0.05 (2-tailed) was adopted throughout the analysis.

Results

Fear-appeasement behaviors

The frequency of tail down behavior in both the groups during passive and active phases is shown in Figure 1A.

During the PE ($Z = 2.88$, $P = 0.004$) and the AE ($Z = 3.45$, $P = 0.001$) phases, the SHD group exhibited a significantly higher frequency of tail down behavior as compared with the PD group.

Significant group differences were observed regarding the frequency of ears down behavior (Figure 1B). During the PE ($Z = 3.67$, $P = 0.000$) and the AE ($Z = 2.81$, $P = 0.005$) phases, the SHD group had a higher frequency of ears down behavior as compared with the PD group.

Also, there were significant differences between groups with respect to the frequency of crouching behavior in the PE phase ($Z = 2.21$, $P = 0.027$) but not during the AE phase ($Z = 1.53$, $P > 0.05$).

In summary, SHD dogs showed more fear-appeasement behaviors as compared with the PD group during both phases.

Sociability-related behaviors

Figure 2A shows the frequency of proximity to experimenter behavior in both groups during the passive and active phases. Mann–Whitney U test analysis indicated that the SHD group exhibited a higher frequency of proximity to experimenter behavior as compared with the PD group during the PE phase ($Z = 2.83$, $P = 0.005$) but not during the AE phase ($Z = 2.16$, $P = 0.031$).

Differences were found between the SHD and PD groups with respect to proximity to the door behavior (Figure 2B). During the PE ($Z = 4.29$, $P = 0.000$) and the AE ($Z = 3.90$, $P = 0.000$) phases, the SHD group were found to be less frequently situated near the door as compared with the PD group.

There were no significant differences between the SHD and PD groups with respect to initiation of physical contact behavior ($Z = 1.85$, $P > 0.05$).

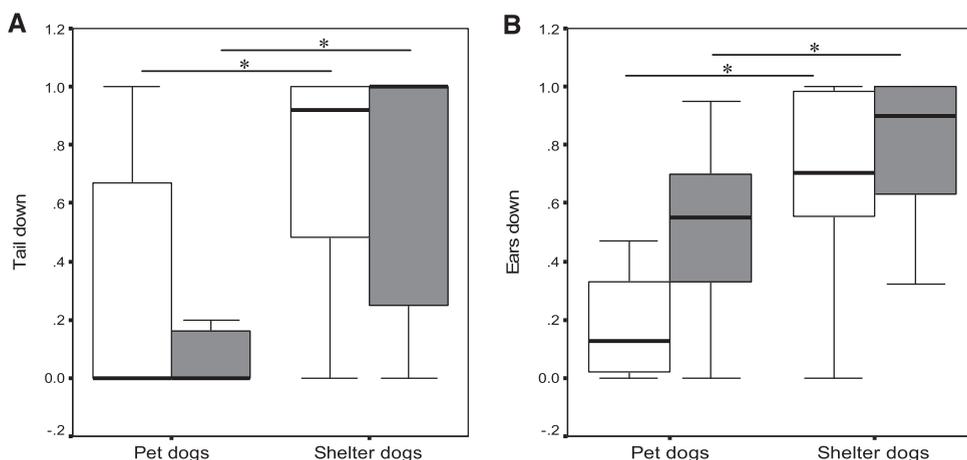


Figure 1 (A) Frequency of tail down behavior, and (B) Frequency of ears down behavior in shelter and pet dogs during passive (white box) and active (gray box) experimenter phases. The box represents the interquartile range, which contains 50% of the values, and the bold lines indicate the median. The error bars extend from the box to the highest and lowest values. * = $P < 0.05$.

In summary, these results showed that the SHD and PD groups differed in their sociability behaviors. SHD more frequently remained near the experimenter, whereas the PD group exhibited more proximity to the door.

Other behaviors

No significant differences among groups were found with respect to the following behaviors: remaining still (PE phase, $Z = 0.35$, $P > 0.05$; AE phase, $Z = 0.98$, $P > 0.05$), exploration (PE phase, $Z = 1.84$, $P > 0.05$; AE phase, $Z = 0.41$, $P > 0.05$), and vocalizations (PE phase, $Z = 0.12$, $P > 0.05$; AE phase, $Z = 0.59$, $P > 0.05$).

Behavioral changes throughout phases

The performance of all the dogs throughout the 2 phases was compared by means of a Wilcoxon signed-rank test. A

significant increase in the frequency of proximity to experimenter ($Z = 3.06$, $P = 0.002$) and ears down ($Z = 3.06$, $P = 0.002$) behaviors and a significant decrease in the frequency of vocalizations ($Z = 2.04$, $P = 0.041$) behavior throughout both the phases were observed. The remaining measures did not significantly change between the 2 phases (proximity to the door: $Z = 2.04$, $P > 0.05$; tail down: $Z = 1.05$, $P > 0.05$; crouching: $Z = 0.66$, $P > 0.05$; exploration: $Z = 0.59$, $P > 0.05$; and remaining still: $Z = 0.81$, $P > 0.05$).

On performing a separate analysis for each group, a significant increase through phases in the frequency of proximity to experimenter ($Z = 3.29$, $P = 0.001$) and ears down ($Z = 2.51$, $P = 0.012$) behaviors was observed in the PD group, whereas the frequency of the vocalizations behavior was found to be not significant ($Z = 1.60$, $P > 0.05$). With respect to the SHD group, there were no significant differences between the 2 phases (proximity to

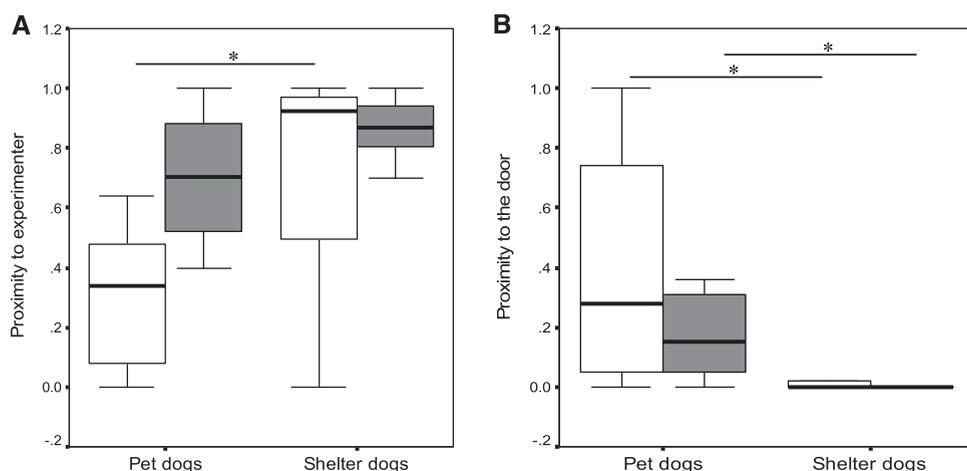


Figure 2 (A) Frequency of proximity to experimenter behavior, and (B) Frequency of proximity to the door behavior in shelter and pet dogs during passive (white box) and active (gray box) experimenter phases. The box represents the interquartile range, which contains 50% of the values, and the bold lines indicate the median. The error bars extend from the box to the highest and lowest values.

experimenter: $Z = 7.45$, $P > 0.05$; ears down: $Z = 1.82$, $P > 0.05$; and vocalizations: $Z = 1.29$, $P > 0.05$).

In summary, all animals modified some of their behaviors (proximity to experimenter, ears down, and vocalizations) throughout both the phases. However, the PD group showed a significant increase in proximity to the experimenter and ears down behaviors.

Discussion

Compared with pet dogs, shelter dogs showed different responses when they were exposed to an unfamiliar individual who at first acted passively, and then later took up an active attitude. Fundamentally, these differences were related to fear-appeasement and sociability behaviors. Fear-appeasement behaviors appeared with a higher frequency in shelter dogs as compared with pet dogs. The presence of these responses could be a result of the stressful conditions imposed on dogs by dog shelters. Numerous studies indicate that shelter dogs and those kept in laboratories under conditions of physical and social isolation can have several behavioral disorders, such as high frequency of self-grooming, circling, low posture, sighing, and coprophagy (Hetts et al., 1992; Hubrecht et al., 1992; Hennessy et al., 1997; Beerda et al., 1999; Hiby et al., 2006). At the physiological level, increase in the levels of cortisol among the shelter dogs was observed (Hennessy et al., 2001; Hiby et al., 2006; Stephen and Ledger, 2006) and these increases were significantly higher than those present in pet dogs (Hennessy et al., 1997). In addition, it might be possible that shelter dogs exhibit fear-appeasement behaviors toward human beings, even before their intake into the shelter. This could be one of the reasons that favors their entry to the shelter (Salman et al., 1998, 2000). However, the 2 factors are not exclusive.

Regarding sociability behavior, results showed that shelter dogs remained near the PE for longer periods as compared with pet dogs. This result could be related to the limited human social interaction offered by the shelter. In addition, these data support the idea that these dogs have a remarkable need for social contact with people (Gácsi et al., 2001). Also, the PD group was characterized by its higher frequency in remaining within proximal distances to the door as compared with shelter dogs. This behavior is usually observed when the dog is left alone or with a stranger in a novel environment and it is considered to be an attachment response (Topál et al., 1998; Gácsi et al., 2001). Conversely, it is quite possible that the differences in sociability behaviors may be related to more frequent interactive situations involving shelter dogs and unknown individuals (e.g., caretakers, visitors) as compared with those involving family dogs. Future studies could measure the level of interactions with strangers in both groups.

Other behaviors like remaining still, exploration, and vocalization showed no differences between the groups. These results suggest that these behaviors are not related to

the presence of an unknown human being, but possibly to responses provoked by the relatively new environment to which they were exposed. In contrast, the absence of differences may be as a result of a floor effect because the percentage of occurrence of these behaviors was $<2\%$.

Finally, when the responses of the dogs were compared through both the phases, the active attitude of the experimenter during the second phase was quite possibly perceived as a potential threat leading to an increase in ears down behavior. Furthermore, this increase has also been observed in response to other threatening stimuli (e.g., King et al., 2003; De Palma et al., 2005). In addition, it may be the case that the active behavior of the experimenter causes an increase in docile behavior, related to fear-appeasement behaviors. Nevertheless, shelter dogs showed a high frequency of proximity to the experimenter and ears down behaviors in comparison with the first phase.

Finally, shelter dogs and pet dogs react differentially to an unknown human being. The most important differences have been observed in fear-appeasement and sociability behaviors.

Conclusions

To the best of our knowledge, this is the first study that compares the fear-appeasement and social behaviors between shelter and pet dogs when they are confronted by an unfamiliar individual. Shelter dogs exhibited more fear-appeasement responses. Quite remarkably, they also remained more frequently near the experimenter as compared with the pet dogs, even though they had no previous bonds with the human agent. These results suggest that shelter conditions and particularly social isolation could influence the relationship between dogs and human beings.

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