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Are animal-assisted activity dogs different from pet dogs? A comparison of their sociocognitive abilities

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ABSTRACT

Animal-assisted activities (AAAs) refer to a variety of interactions between animals and humans, intended to improve people's well-being providing recreational or educational opportunities. Domestic dogs are one of the most commonly used animals for these kinds of interventions, given their trainability and the positive effects of dog-human interactions. Nevertheless, the selection of participating animals is mainly unsystematic, and training is not required for dogs to take part in AAAs. Previous studies suggest that high sociability as well as reduced fear and aggression are desirable traits in AAA dogs. Yet, to our knowledge, there are no previous studies assessing the specific characteristics of dogs participating in AAAs. The aim of this study was to compare the performance of AAA and pet dogs (PDs) that live in the same household but do not participate in AAAs. We assessed 17 dogs (9 participating in AAAs in hospital settings and 8 pets living in the same household—control group) with a test battery comprising 3 behavioral tasks (sociability test, gazing test, and A-not-B task), and owner-rated questionnaires (Dog Impulsivity Assessment Scale [DIAS] and 4 subscales: trainability, fear to strangers, nonsocial fear, and attachment/attention seeking of the Canine Behavioral Assessment and Research Questionnaire [C-BARQ]). Results of the gazing test indicate that, when dogs were not reinforced for looking at the human face, AAA dogs gazed longer at an unknown experimenter than PDs. Therefore, they showed an increased tendency to gaze at humans and persist on this communicative attempt when this response was not successful. Additionally, according to the DIAS score, AAA dogs would be less impulsive than the control group. No significant differences were found on the A-not-B task, the sociability test, or the C-BARQ. In conclusion, since these AAA dogs had not undergone specific training, the effects observed in the present work may be attributed, at least partially, to the learning experiences they had during AAA work. Overall, it would be important to take into account these characteristics for both the selection and training of these animals.

Introduction

Animal assisted interventions (AAIs) entail interactions between animals and humans in a variety of areas such as health, education, or psychosocial rehabilitation, in order to improve people's well-being. Animal assisted activities (AAAs) are a type of AAI that provide motivational, educational, or recreational opportunities, and both professionals and volunteers carry them out. Furthermore, they prioritize spontaneity, are not considered a treatment, and thus do not have specific goals (Kruger & Serpell, 2006).

Bert et al. (2016) pointed out that dogs seem to be the most common animals employed for these interventions. Dogs are optimal candidates for AAI since they are relatively easy to train (Jofre, 2005), have remarkable abilities to respond to human communicative clues (e.g., Miklósi et al., 2003; Hare & Tomasello, 2005), share a close relationship with people (e.g., Bentosela & Mustaca, 2007; Udell et al., 2010), and dog-human interactions

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have numerous advantageous physiological and psychological effects for both species (e.g., Odendaal & Meintjes, 2003; Nagasawa et al., 2009; Cirulli et al., 2011).

Describing the typical behaviors and characterizing the temperamental traits of dogs that participate in AAI could help improve the selection of animals for this role and contribute to our understanding of the mechanisms responsible for their therapeutic effects (Serpell et al., 2017).

However, few studies have focused on the assessment of these aspects. Mongillo et al. (2015), in order to standardize a selection protocol for AAI dogs, carried out 2 tests: behavioral examination and role playing simulating an AAI session. Dogs were evaluated on certain behavioral prerequisites such as controllability, predictability, and reliability of their social behavior, in order to judge whether they were suitable for AAI work. The authors found that the dogs which were deemed suitable according to the examination performed better on the role-playing task, significantly showing less negative interactions, fear, and aggression. In another study (Mongillo et al., 2017), dogs trained for AAIs were found to gaze more frequently and sustain their attention on their owners more than pet dogs (PDs) and agility dogs. This increase in the attentional abilities of AAI dogs toward their owners could be explained by the fact that, when faced with unpredictable situations such as working with unknown people, dogs may rely on the owner/guide for support and clues to adjust their behavior.

Particularly in AAAs, there is much variability regarding the animals used. In most cases, their selection is neither systematic nor do they need thorough training to participate in them (in contrast to Animal Assisted Therapy). These features make AAA animals a group of particular interest, given that otherwise any differences found between pets and working dogs could be attributed to previous selection or specific training.

Therefore, the aim of this study is to compare the performance of AAA dogs and PDs living in the same household but not participating in such tasks. Dogs were tested on several sociocognitive skills relevant for their work. These abilities include sociability, defined as the tendency to approach and interact with people (Svartberg, 2005), and the learning of the communicative response of gazing at the human face to ask for inaccessible food. Additionally, another task measured behavioral inhibition and self-control in a social context, which implies the capability to inhibit preponderant and immediate but counteractive responses in order to get better future consequences (MacLean et al., 2014). Finally, 2 written scales were used to record the owner's evaluation of their social behavior and impulsivity levels. These skills are of great importance for AAI dogs, as they have to interact with unfamiliar people of different age ranges, who have varying degrees of mobility and ability to work in unpredictable settings such as hospitals, schools, or prisons. Furthermore, it is important that dogs working in AAAs have adequate impulse inhibition skills so that they do not hinder medical care in hospital settings or obstruct the normal operations of educational or rehabilitation centers.

In the sociocognitive tasks considered, AAA dogs are expected to perform better than family dogs living with them. We predict AAA dogs to be more sociable and communicative than PDs, as well as less impulsive and fearful, as they are exposed to a greater number and variety of interactions with people and other dogs.

Methodology

Subjects

We assessed 18 domestic dogs (*Canis familiaris*). One dog was excluded from our study due to its excessive fearfulness. The final sample consisted of 17 adult dogs between 1 and 10 years of age (mean age = 5.16, standard deviation: ±2.18), 9 males and 8 females or various breeds and mixes. The AAA group ($N = 9$) was recruited from groups of volunteers working in different units of patients (palliative care, physical rehabilitation, and psychiatry). AAA sessions were carried out weekly and involved interactions with unfamiliar people of different ages. The PD group ($N = 8$) consisted of dogs living in the same household than the dogs in the AAA group but not participating in such work. Due to technical difficulties, one AAA dog did not complete the A-not-B task, and one PD did not complete the gazing test. Thus, data from these dogs in the mentioned tasks were not used in the analysis. All dogs lived (and worked, in the case of AAA dogs) with their owners. Dogs had at least 3 hours of fasting before the test, and water was available ad libitum.

General procedure

The dogs underwent a battery of tests comprising 3 behavioral tasks (sociability test, gazing test, and A-not-B task), and 2 owner-rated questionnaires (Dog Impulsivity Assessment Scale [DIAS], Wright, Mills & Pollux, 2011 and 4 subscales—trainability, fear to strangers, nonsocial fear, and attachment/attention seeking—of the Canine Behavioral Assessment and Research Questionnaire [C-BARQ], Hsu & Serpell, 2003).

All dogs were tested in a quiet room at their home. The experimenters (E's) were 3 females, unknown to the animals. All sessions were videotaped, with a SONY DCR 308 video camera placed on a tripod in a corner of the room for the sociability and A-not-B tests, and handheld by an E for the gazing test.

The food rewards were pieces of cooked liver. The behavioral tests were carried out in 2 sessions, so that the 2 tasks including food (gazing test and A-not-B task) were done separately in order to avoid satiation.

The order of sessions was counterbalanced across subjects: 7 dogs had the sociability and gazing tests on the first session, whereas 8 started with the A-not-B task. The sociability test was always carried out first within a session, to avoid the association between the food and E's. A printed version of the questionnaires was given to the owners during the first visit, and it was collected during the second visit.

Sociability test

Materials. The set up consisted of a chair placed against a wall. Tape marks on the floor 1 m away from it were used to analyze the time the dog spent near the E. Only one E and the dog were present during testing.

Procedure. The procedure was the same as Jakovcevic et al. (2012). The dog was allowed to explore the room for about 5 minutes. The test phase began immediately after. It was divided into 2 phases of 2 minutes: (1) passive phase: E entered the room and sat on the chair pretending to be distracted reading a book. If the dog made physical contact (PC) with her, E petted it only once and then withdrew her hand. During this phase, visual contact was avoided. After 2 minutes, the second phase began: (2) active phase: E stood up, left the book on the chair, made visual contact with the dog, and called it by its name (whether it was near or far). If the dog approached her, E interacted by petting and talking to it. If the dog did not approach, E called it up to 3 times. If the dog approached her and then went away, E also called it up to 3 times. During this second phase, E stayed still in the same place, usually sitting on the floor, to avoid possible fear reactions in the dog.

The following variables were registered continuously both during the active and passive phases: time close (TC): time (s) the dog stayed close to E (<1 m distance) and PC: duration (s) of the PC between the E and dog.

Communicative learning task: Gazing test

Materials. Food rewards were placed in a container located on a high surface, so it was visible to the animals but out of their reach. There were 2 E's present, one standing next to the food container and another recording the situation. This last E was located diagonally behind the E, to be able to film the direction of the dog's head and gaze.

Procedure. The procedure was the same as the one mentioned by Bentosela et al. (2008). It consisted of 4 phases: baseline, acquisition, extinction, and reacquisition, with a 2-minute interval between them. Each trial lasted 2 minutes with an intertrial interval of approximately 2 minutes. After each trial, the E left the training area taking the food container with her.

Before the beginning of the test, the animals received a warm up in order to assess their motivation for food. The E called the dogs by their names and actively sought PC with them. During this interaction, the dogs received 3 pieces of liver, directly from the hand of E.

Baseline. Immediately after warm up, the dogs received 1 baseline trial. The trial started with E standing by the food container, calling the dog by its name and giving it a single piece of food, after which she stood gazing at the dog's face without further movement, trying to maintain eye contact.

Acquisition. Afterward, the dogs received 3 trials of reinforcement of the gazing response toward the E. Acquisition trials began with E standing by the food container, calling the dog's name, and giving it a piece of food. From then on, dogs were reinforced each time they gazed at E's face for at least 1 second.

Extinction. Next came 3 extinction trials, in which the gazing response was not reinforced anymore. This phase was identical to the baseline.

Reacquisition. Finally, the dogs received 1 trial of reacquisition, identical to the acquisition trials. This phase discarded potential satiety or fatigue effects.

Gaze duration (s) was measured as the dependent variable. The cumulative duration of visual contact of the dog toward the E was measured continuously in all trials.

A-not-B task

Materials. Three opaque expanded plastic cups, of 8.5 cm diameter and 10 cm height, were used for this task. The cups were spread with liver to control for odor cues. There were 2 E's present, one doing the demonstration and another handling the dog by the leash (H).

Procedure. The procedure was the same as mentioned by Fagnani et al. (2016). There were 3 opaque-aligned cups (A, M, and B), and a reward was placed in one of the cups located at the far end of the array, whereas the middle cup (M) and the cup at the other end remained empty. The aligned cups were separated 1.20 m from each other and placed at 2.10 m from the starting line where the dog and H were waiting. The procedure comprised the following 3 phases.

Pretraining. The purpose of this phase was to allow the dogs to learn that the cups were baited with food. E held a reward in one hand and brought it close to the dog's nose, so that the animal could see and smell it. Then E approached cup A, showed the reward in her hand to the dog, bent down, placed the reward in cup A, and stood up. After standing still for 2 seconds, E turned her back to the dog and H. Immediately, H dropped the leash to allow the dog to choose one of the cups. It was considered a correct response when the dog touched the baited cup with its snout, in which case, H lifted the cup to allow it to eat the reward and verbally reinforced it by saying "very well." Responses were considered incorrect when the dog selected one of the 2 unbaited cups, in which case, H said "no" and took it back to the starting line. In this case, E removed the reward from the baited cup without the dog seeing her. A response was also computed as incorrect if after 30 seconds, the dog did not choose a cup. This procedure was repeated for the 3 cups A, M, and B, until the dog managed to retrieve the reward correctly from each container as a first choice. Trials were continuous with no intervals. After 1 minute, the next phase started.

Training. The procedure of the training phase was identical to the pretraining, except that E always placed the reward in cup A. The subjects were required to retrieve the reward in 5 trials out of a maximum of 10 to move onto the next phase. Intervals between trials were of 20 seconds.

Test. The procedure was similar to training, except that once the subjects watched E baiting cup A, E removed the bait and, in full view of the subject, took it to the cup located at the other end of the array (cup B). This phase consisted of 15 trials, with 20-second intervals between trials. It was considered a correct response when the dog first chose the cup B. The location of cup A and B (right or left) was counterbalanced across dogs.

Two variables were scored during the test phase: the number of trials before the first correct response and the frequency of errors (i.e., approaching cups A or M, or not choosing any cup).

Canine Behavioral Assessment and Research Questionnaire

We administered a Spanish-translated version of the C-BARQ by Hsu and Serpell (2003). This questionnaire identifies a total of 11 subcategories, 7 of which have been validated as diagnostic categories (stranger-directed aggression; owner-directed aggression; dog-directed aggression/fear; stranger-directed fear; nonsocial fear; separation-related behavior; and attachment/attention seeking) and the remaining 4 refer to specific experiences in the dogs' life (trainability, chasing, excitability, and touch sensitivity).

Of these subcategories, we chose to focus on 4 that were particularly relevant to our study:

Trainability: related to the readiness to obey the owner, follow simple commands, return objects, respond positively to corrections, and ignore distracting stimuli.
Fear to strangers: referred to the dog's reactions when directly approached by an unknown person.
Nonsocial fear: defined as the tendency to react with fear to sudden or loud noises and unfamiliar objects or situations.
Attachment/attention seeking: related to the tendency to keep closeness to the owner and to other members of the family, ask for affection and attention, and become agitated when the owner shows affection to others.

To calculate the score of these 4 subscales, the value of each item was added and the total was divided by the number of answered items of the subscale.

Dog Impulsivity Assessment Scale

We administered a Spanish-translated version of Wright's et al. DIAS (2011). This scale assesses impulsivity in domestic dogs based on the owner's report and yields an overall score and 3 factors: (1) behavioral regulation, (2) aggression and response to novelty, and (3) responsiveness. The DIAS comprises 18 statements answered with a Likert type 5 point scoring scale that have proved to be reliable and valid in the United Kingdom (Wright et al., 2011; Riemer et al., 2014).

The score interpretation presented by the authors is that a higher score in the overall questionnaire score (OQS) represents higher impulsivity. Meanwhile, higher score in factor 1 means lower behavioral regulation (i.e., higher impulsivity and arousal); higher score in factor 2 refers to higher aggression/negative responses to novelty; and higher score in factor 3 implies higher

responsiveness (i.e. quicker responses and easier trainability) (Wright et al., 2011).

The OQS and the 3 factors of the DIAS (Wright et al., 2011) were calculated for each dog, adding the values of each item and dividing the total by the number of items answered.

Data analysis

The performance of each group (AAA and PD) was compared for each test and questionnaire administered.

To compare the performance of both groups of dogs in the sociability test, a repeated-measures analysis of variance was performed for both of the variables registered (TC and PC). The phase (active/passive) and the group (AAA/PD) were introduced as within and between subjects' factors, respectively.

To analyze the data from the gazing test and to facilitate its interpretation, we first calculated the mean time dogs spent gazing at the E in all 3 acquisition and extinction trials. Second, given the relative small sample size and that not all the measures were normally distributed (Shapiro-Wilk test: mean time of gaze duration at the E during extinction phase, PD group: $W = 0.65$, $P < 0.01$; gaze duration during baseline trials, PD groups: $W = 0.65$, $P < 0.01$, all the other measures $P > 0.3$), nonparametric tests were used. We compared the time dogs spent gazing at the E in each phase (baseline, acquisition, extinction, and reacquisition) between groups with Mann-Whitney *U* test. Finally, we compared the time dogs spent gazing at the E in each group in the different phases with Friedman's test, and for pair comparisons, we used Wilcoxon paired test.

For the A-not-B task, the number of trials until the first correct response and the number of errors were compared between groups using an independent samples *t*-test.

Finally, the scores of each group in the questionnaires (C-BARQ and DIAS) were compared utilizing independent samples *t*-tests.

All tests were 2 tailed ($\alpha = 0.05$). The data were analyzed with the statistics program SPSS (version 20). An E blind to the dog's group codified data from sociability and gazing tests. Additionally, one of the authors (C.M.C.) also codified 40% of those results. Interobserver reliability was high (sociability test: $r_s > 0.968$; *P*'s > 0.005; gazing test: $r_s > 0.890$; *P*'s > 0.005). Data from A-not-B task were scored live by 2 of the E's; agreement between them was excellent as the choices were unequivocal.

Results

Sociability test

Regarding the time spent close to the E, the dogs spent significantly more time near the E in the active phase than the passive one ($F(1,16) = 53.86$, $P < 0.001$). We did not find any differences between groups ($F(1,16) = 0.063$, $P = 0.78$) or interactions' effects between phase by group ($F(1,16) = 0.075$, $P = 0.78$). These same results were observed for the time the dogs spent in contact with the E (phase: $F(1,16) = 60,83$, $P < 0.001$; group: $F(1,16) = 0.13$, $P = 0.72$; phase by group interaction: $F(1,16) = 0.003$, $P = 0.95$, see Table 1).

Gazing test

AAA dogs gazed significantly more at the E than PD during the baseline ($U = 12$, $P = 0.02$, $Z = -2.25$), and extinction ($U = 9$, $P = 0.01$, $Z = -2.53$) phases. In addition, the time dogs gazed at the E varied significantly between phases in the AAA group ($X^2_3 = 23.16$, $P < 0.01$, $N = 10$) but not in the PD group ($X^2_3 = 2.31$, $P > 0.51$, $N = 7$). A more detailed analysis showed that dogs in the AAA group gazed significantly more at the E in the baseline phase than in the acquisition ($Z = -2.80$, $P < 0.01$) and reacquisition ($Z = -2.62$, $P = 0.01$) phases. Furthermore, dogs looked longer in the extinction phase than during baseline ($Z = -2.19$, $P = 0.02$), acquisition ($Z = -2.80$, $P < 0.01$), and reacquisition ($Z = -2.80$, $P < 0.01$) phases. No differences were found between acquisition and reacquisition phases ($Z = -0.51$, $P = 0.95$). The other comparisons were nonsignificant, $P > 0.5$ (see Figure 1).

Table 1
Mean and SD of the main measures of the sociability test and A-not-B task

Test	Phase	Measure	Group	
			AAA	PD
Sociability	Passive phase	Time close to the E	25.00 (±35.53)	28.82 (±34.22)
		Time in contact with E	27.90 (±45.34)	19.51 (±31.04)
	Active phase	Time close to the E	93.61 (±32.29)	95.44 (±42.84)
		Time in contact with E	97.34 (±23.94)	93.11 (±42.40)
A-not-B		Trials until correct response	0.38 (±0.74)	0.88 (±1.25)
		Number of errors	2.25 (±3.33)	3.25 (±3.28)

All measures are expressed in seconds, except trials until correct response and number of errors.
AAA, dogs participating in animal assisted activities, PD, pet dogs living in the same household not participating in animal assisted activities; SD, standard deviation.

A-not-B task

There were no significant differences between groups ($t(14) = -0.6$, $P = 0.55$). There were also no significant differences on the number of trials until the first correct response ($t(14) = -0.97$, $P = 0.34$, see Table 1).

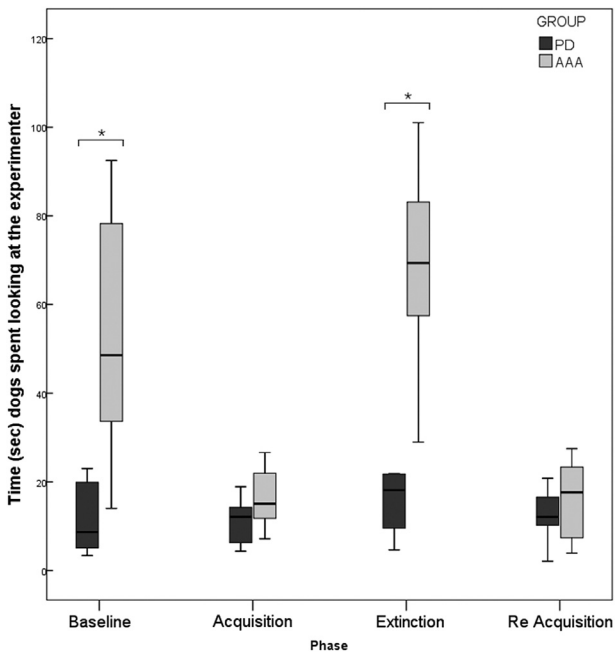

Figure 1. Median and interquartile rank (s) of the time dogs spent looking at the experimenter in each phase during the gazing test. The median of the acquisition and extinction phases was calculated using the mean time dogs spent looking at the experimenter during the 3 acquisition and extinction trials. AAAs, dogs participating in animal-assisted activities; PDs, pet dogs living in the same household not participating in animal-assisted activities.

C-BARQ

There was a tendency for PD to score higher on the fear to strangers subscale than AAA dogs ($t(15) = -2.04$, $P = 0.059$). No other significant differences were found (see Table 2).

DIAS

PDs scored higher than AAA dogs on the OQS ($t(15) = -2.41$, $P = 0.0029$) and on factor 1 (behavioral regulation) ($t(15) = -2.32$, $P = 0.034$). No other significant differences were found (see Table 2).

Discussion

The aim of this study was to assess the performance of AAA dogs in comparison to dogs living in the same household but not doing such work. Differences were found on the gazing test. A number of studies have established that gazing behavior is sensitive to learning processes as it increases with reinforcement and decreases during extinction when it is no longer reinforced with food (Bentosela et al., 2008). In addition, it has been noted that previous training affects gazing length toward a person when a reinforcer is inaccessible. For example, agility dogs gaze longer than search and rescue dogs when confronted with an unsolvable task (Marshall-Pescini et al., 2009), and Schutzhund-trained dogs gaze more toward the owner during a walk than untrained PDs (Bentosela et al. 2008). Furthermore, Barrera et al. (2011) found that shelter dogs, having little interaction with people, gazed less than family dogs during extinction, thus underlining the importance of the animals' previous experience.

Our results show that AAA dogs gazed longer than pets at the face of an unfamiliar person during baseline and extinction phases, when they were not reinforced for looking at the human face. Therefore, they showed an increased tendency to gaze at humans and persist on this communicative attempt even when this response was not successful. This is of particular importance for the work of AAA dogs, since participants often do not respond properly or to any extent to their communication attempts. However, dogs are usually reinforced during the task, both with food given by the handler and by interacting with the people present. According to the aforementioned interpretation, it is possible that AAA dogs have learned to gaze longer at participants during their working sessions.

Mongillo et al. (2017) measured the attention patterns of dogs with different levels of training (untrained pets, AAI dogs, and agility dogs) by assessing their gaze toward the owner. Dogs participating in AAIs monitored more their owner's behavior by showing increased gaze duration at them compared with agility trained dogs and pets. The increase in attention of AAI dogs could be due to their reliance on the owner as a source of support in uncertain situations, such as working with unfamiliar people. It is important to note that, in this study, AAI dogs did not gaze longer toward the stranger than dogs from the other groups. The authors propose that this type of work may not promote a generalized increase of attention toward all people, although this could be expected since they constantly interact with strangers. Those findings are contrary to the conclusions of the present study, where AAA dogs showed an increased gazing response to an unfamiliar person in comparison to PDs.

Several methodological differences could account for this discrepancy in results. First, the presence of the owner in the Mongillo et al. (2017) study could have concentrated the whole of the dog's attention during the task, thus overshadowing any significant differences in the attention patterns toward the stranger. Additionally, gaze persistence during extinction could indicate greater perseverance in a learned behavior or higher trainability in AAA dogs. Given that we found no evidence of the "trainability" C-BARQ subscale between groups, the first explanation seems more likely.

Furthermore, PD had significantly higher scores on the DIAS than AAA dogs, both on the OQS and on factor 1, which is related to behavioral regulation. According to Wright et al. (2011), dogs scoring high in this factor have less control over their responses to stimuli, are more impatient, and have higher levels of activation in general. This could suggest higher impulsivity in PDs than in AAA dogs. Thus, AAA dogs are likely to better regulate their behavior to avoid disrupting the usual activities in their working place.

Despite the results observed on the DIAS score, we found no differences in the dogs' performance in an inhibitory test like the A-not-B task (Amici et al., 2008). Inhibitory control is a complex theoretical construct which comprises diverse abilities, ranging from tolerance to delayed reinforcement (e.g., Leonardi et al., 2012) to restraint of preponderant responses (Amici et al., 2008). Therefore, the discrepancy between the DIAS scores and the A-not-B task performance could be accounted for by the differences in the theoretical construct of impulsivity underlying both tests (e.g. Bray et al., 2014; Brucks et al., 2017). In addition, as the DIAS score is an owner-reported questionnaire, it does not directly measure dogs' impulsivity, but the owners' perception of this trait on their dogs. Thus, one possibility is that dogs that are perceived by the owner as less impulsive are selected to participate in AAAs, while their companions perceived as more impulsive are left aside. This is important because it emphasizes the need to educate owners about selection criteria to choose dogs able to participate in this kind of tasks.

On the other hand, the fact that no differences were found between groups in the A-not-B task is contrary to our predictions, as we expected higher social contact to improve AAA dogs' performance. In particular, previous works remarked the importance of social experiences on this task, as shelter dogs that have little interaction with people had a poorer performance (Fagnani et al., 2016). The lack of differences on this task suggests that the experience acquired during AAA work may not be enough to modulate the inhibition of a highly preponderant behavior such as approaching food.

In addition, we found no differences in the dogs' performance during the sociability test. One possibility is that this task may not be sensitive enough to detect differences between the groups. Another possible explanation is that, since the evaluated AAA dogs had received no specific training, there are fewer differences with PDs than expected.

The main strength of this study lies in the fact that dogs in the pet group live in very similar social conditions to the AAA dogs: they live in the same household and their daily learning

Table 2
Mean and SD of the scores of the C-BARQ and DIAS questionnaires

Questionaire	Measure	Group	
		AAA	PD
C-BARQ	Trainability	2.38 (±0.42)	2.44 (±0.77)
	Dog-directed aggression/fear	1.00 (±0.91)	1.53 (±1.28)
	Stranger-directed fear	0.11 (±0.25)	0.63 (±0.71)
	Nonsocial fear	0.78 (±0.61)	0.5 (±0.45)
	Touch sensitivity	0.56 (±0.41)	0.56 (±0.59)
	Attachment/attention seeking	1.81 (±0.79)	2.15 (±0.97)
DIAS	General score	0.46 (±0.06)	0.56 (±0.11)
	Factor 1	0.37 (±0.09)	0.53 (±0.18)
	Factor 2	0.30 (±0.10)	0.41 (±0.17)
	Factor 3	0.77 (±0.12)	0.74 (±0.12)

C-BARQ, Canine Behavioral Assessment and Research Questionnaire; DIAS, Dog Impulsivity Assessment Scale; AAA, animal-assisted activity; PD, pet dog.

experiences outside the AAA work are alike. As a result, the differences found can possibly be explained, at least partially, by the participation in tasks of assisted intervention.

Nevertheless, as we do not have measures prior to the study, we cannot exclude the possibility that the evaluated AAA dogs had shown these behavioral dispositions prior to participating in AAA activities, hence making the owners assume they were suitable for this type of work. Moreover, these results may not be generalizable to highly selected or trained dogs.

In conclusion, gazing seems to be a fundamental communicative response in AAA dogs, specially its persistence when it is no longer reinforced. This characteristic should be taken into account for both the selection and training of these animals. In addition, there could be differences in the inhibitory control abilities of both groups, as suggested by the higher scores of PDs on the DIAS. This lower impulsivity trait could be extremely valuable for good AAA performance. However, the present data do not allow us to draw final conclusions in this respect and further studies are needed to assess the behavior of AAA dogs and PDs in different contexts requiring inhibitory control.

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Ethical consideration

This study complies with the current Argentinean law of animal protection (Law 14.346) and was developed with the approval of the CICUAL (Institutional Commission for the Care and Use of Laboratory Animals) from the Medical Research Institute IDIM CONICET (Res. Nro. 038-16). All owners expressed their consent for the participation of their dogs in this study.

Authorship statement

The idea for the paper was conceived by Mariana Bentosela and Susana Underwood. The experiments were designed by Mariana Bentosela and Fabricio Carballo. The experiments were performed by Camila María Cavalli, Mariana Bentosela, and Marina Victoria Dzik. The data were analyzed by Camila María Cavalli and Marina Victoria Dzik. The paper was written by Camila María Cavalli, Fabricio Carballo, Susana Underwood, and Mariana Bentosela. All authors revised and approved the paper.

Conflict of interest

The authors declare no conflict of interest.

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