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The help-seeking behaviour of dogs (*Canis familiaris*)

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Sammanfattning/Abstract:

During domestication, the dog(*Canis familiaris*), have become skilful in understanding human communication and also in communicating with humans. The wolf (*Canis lupus*), is not as skilled with this interspecific communication. When dogs are faced with an unsolvable problem, they seek help from human by e.g. gazing at them. This behaviour has been studied and both age and breed group differences have been showed. In this study, we presented dogs with a task that consisted of a solvable and unsolvable problem in order to see if they gazed at their owner and/or an unfamiliar person for help. Although we did not find any difference in breed groups regarding gazing at humans, we did find that adult dogs (dogs older than 2 years) gazed more frequently at their owner and for a longer duration than adolescent dogs (6 months to 2 years). This may be because the adult dogs have more experience of this communication with humans, as they have lived longer with them. These findings empathize the bond between a dog and its owner that seems to grow stronger during the dogs' life.

Nyckelord/Keyword:
Age, Dog, Gaze, Human-directed communication, Problem-Solving

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Innehållsförteckning

1 Abstract

During domestication, the dog (*Canis familiaris)*, have become skilful in understanding human communication and also in communicating with humans. The wolf, *Canis lupus*, is not as skilled with this interspecific communication. When dogs are faced with an unsolvable problem, they seek help from human by e.g. gazing at them. This behaviour has been studied and both age and breed group differences have been showed. In this study, we presented dogs with a task that consisted of a solvable and unsolvable problem in order to see if they gazed at their owner and/or an unfamiliar person for help. Although we did not find any difference in breed groups regarding gazing at humans, we did find that adult dogs (dogs older than 2 years) gazed more frequently at their owner and for a longer duration than adolescent dogs (6 months to 2 years). This may be because the adult dogs have more experience of this communication with humans, as they have lived longer with them. These findings empathize the bond between a dog and its owner that seems to grow stronger during the dogs' life.

2 Introduction

The dog (*Canis familiaris*), is a subspecies of the wolf (*Canis lupus*) and was the first animal that humans domesticated about 11 000 – 16 000 years ago in South East Asia (Freedman et al., 2014). During all of this time, dogs and humans have been living in a close relationship and especially during the latest centuries, humans have selected dogs for desired traits resulting in the variety of breeds we have today.

Through domestication and co-evolution with humans, dogs have developed a special understanding of our communicative cues (Kaminski and Nitzschner, 2013). One theory for this understanding of human cues is that dogs that worked well with humans and showed high sensitivity to human gestures, have been selected for during domestication. However, dogs can also communicate with humans and have been shown to actively seek human attention in a way of trying to communicate with us. They do this by e.g. gazing at the human when faced with an unsolvable problem in a way interpreted as if they ask the human for help (Miklósi et al., 2000; Gaunet, 2010; Horn et al., 2012). Dogs alternate their gaze between the human and the problem, such as inaccessible food or an object, which could be considered as a way of communicating the location of the problem they want the human to help them with (Miklósi et al., 2000; Gaunet, 2010; Horn et al., 2012).

This help-seeking behaviour has previously been studied in various forms and differences have been seen regarding age, where adult dogs have a shorter latency to gaze at humans and gaze for a longer duration compared to 4.5 and 2 month old pups (Passalaqua et al., 2011). Breed difference in help-seeking behaviour has also been showed. Dogs from the Hunting/Herding group have longer gaze duration than the Primitive and Molossoid groups, then presented with an unsolvable problem (Passalaqua et al., 2011). No conclusions have been made regarding potential sex differences (Miklósi et al., 2000; Miklósi et al., 2003; Gaunet, 2010; Passalaqua et al., 2011; Horn et al., 2012; Jakovecevic et al., 2012) and therefore if would be interesting if a difference could be found concerning the help-seeking behaviour in our study.

In another study, a test was preformed there the dogs learned to gaze at the human in order to get a treat that was in sight but not within their reach (Jabovcevic et al., 2010). After the learning phase, dogs were put thought an extinction phase where they did not get the treat by performing the gaze (Jabovcevic et al., 2010). Golden Retrievers gazed longer at the human face than German Shepherds and Poodles in the extinction phase (Jabovcevic et al., 2010).Also dogs with a high score of sociability gazed longer at the human face, compared to dogs that had a low sociability score (Jabovcevic et al., 2010).

In the current study, a problem-solving task was used, but with a method used that was slightly different to what has been used by other . This was due to the fact that most of the previous studies used a design where dogs learn to solve a problem task that was later made impossible to solve (Miklósi et al., 2003; Pescini et al., 2009; Gaunet, 2010; Passalacqua et al., 2011; Marshall- Horn et al., 2012 ;), but here both two steps were incorporated into a single test. This means that the problem given in this study consisted of a solvable task and an unsolvable task. In this way, dogs were trained to learn how to solve the problem by trial and error, and were at the same time exposed to a blocked trial and therefore only needed to be tested once.

By the use of this test, we are aiming at evaluating dogs' social behaviour by looking at their problem solving behaviour as well as their willingness to seek human attention when faced with an unsolvable problem. The value of the human-dog relationship will be demonstrated by investigating how motivated the dogs are to seek help from humans. This understanding may provide more insight into the social behaviour of dogs that can lead to improved welfare of pet dogs.

The aim of the study is to investigate how prone dogs are to look at humans when faced with an unsolvable problem. Differences between gazing towards the dogs' owner and an unfamiliar person will also be evaluated. Additionally, we will investigate whether there are any differences in attention-seeking behaviour observed between dogs of different sex, age and/or breeds. Based on the findings of previous studies, we expect older dogs and dogs from the herding dog group and Flushing Dogs, Retrievers and water dog group to perform this help seeking behaviour e.g. gazing, more than the younger dogs and the other breed groups.

3 Material & methods

3.1 Animals

An invitation to participate in the study was sent out to dog owners. Of those that replied, a schedule was created in order to reduce the possibility of unfamiliar dogs to meet. In total 50 dogs went through the test, but in the end data from 49 dogs were used in data analysis (one experiment was interrupted and the dog got too distracted to carry out the task). Of those, 21 dogs were females and 28 were males. Ages ranged from 10 weeks to 13 years, and dogs were of 28 different breeds that could be divided into the eight breed groups (Table 1).

Table 1. *Showing the breeds of the 49 dogs that were tested in the problem solving test and which behaviours from this test that were analysed. The number dogs tested of each breed is presented as well as the breed groups. Breed groups are obtained from SKK (Svenska Kennel Klubben).*

Breed group	Breed	Tested
Mixed breed	Mixed breed	6
Herding dogs	Pyrenean Sheepdog-long-haired	2
	Pyrenean Sheepdog - smooth faced	1
	Schapendoes	2
	Border Collie	2
	Lancashire Heeler	1
	Shetland Sheepdog	2
	Pumi	1
Schnauzer and Pinscher, Molossoid and mountainhounds sennendogs	Rottweiler	3
	Miniature Schnauzer	1
	Danish-Swedish Farmdog	1
Terriers	Staffordshire Bull terrier	3
	Parson Russell Terrier	1
	Jack Russel	1
Spitz and breed of primitive type	Eurasian	1
	Shiba	1
	Pomeranian	1
	German Spitz/Mittel	1
Flushing Dogs, Retrievers and water dogs	Nova Scotia Duck Tolling Retriever	4
	Labrador Retriever	3
	Flat Coated Retriever	1
	Golden Retriever	2
	Welch Springer Spaniel	2
Companion dogs	Papillon	1
	Pug	1
	Poodle, medium size	2
	Chihuahua, smooth-haired	1
Sighthounds	Italian Greyhound	1
	Total number of dogs	49

3.2 Apparatus

The apparatus consisted of a board (54.8 X 24.8 cm) containing three plates (9.8 X 15.0 cm) with holes in the middle; there a treat was placed during testing (Figure 1). Each plate was covered with a piece of hard plastic in the same size as the plate. On the two outer plates, the plastic covers were movable but the one in the middle was locked in place. The dog was therefore presented with both two solvable and an unsolvable problem at the same time. A plate without plastic which was not attached to the board served as a food-motivation pre-test plate. Before the test, the dog would be given treats, mini Frolic®, from the motivation plate three times in order to make sure that the dog was motivated to eat. Between each individual, the problem-solving board and motivation plate was cleaned in order to prevent any potential contagion of diseases.

3.3 Procedure

The study was conducted at Hunden och Djurens Beteendecenter in Linköping, Sweden. Dogs had access to water *ad. lib.* during their visit. The testing area was enclosed by a wall using compost grid that also kept the dog inside the enclosure during the experiment (Figure 2).

Before the start of the experiment, the owner was informed of the purpose of the experiment and given instructions of what they were supposed to do. They also had to fill in a short questionnaire (Appendix) regarding the dogs' name, age, breed, and sex, questions about the dogs' training, previous experiences with problem-solving, point and play exercises, what type of games they preferred and how prone the owner thought the dog was to ask for help. The dog was allowed to move freely in order to acclimate to the environment. Before the experiment started, the dog, owner and test-leader entered the testing area (Figure 2). The owner was instructed to stand at the mark, as shown in Figure 2 and was given directions to look towards the test apparatus during the entire test and not to interact with the dog.

A motivation-test was first performed, consisting of the test-leader giving the dog three treats, mini Frolic®, placed in the motivation plate (Figure 1). This was done in order to see if the dog was motivated to eat treats and for the dog to associate the plate with a treat. The dog was presented with the problem-solving board, which was placed on two dark carpet pieces. The experiment lasted for a total of three minutes from the point when the problem-solving board was presented to the dog. The test-leader stood opposite the owner and both of them were passive and facing the problem-solving board. If the dog could not solve the solvable tasks in one minute, the test-leader opened them half way and tapped the

problem-solving board to make sure the dogs' attention was drawn to the board.

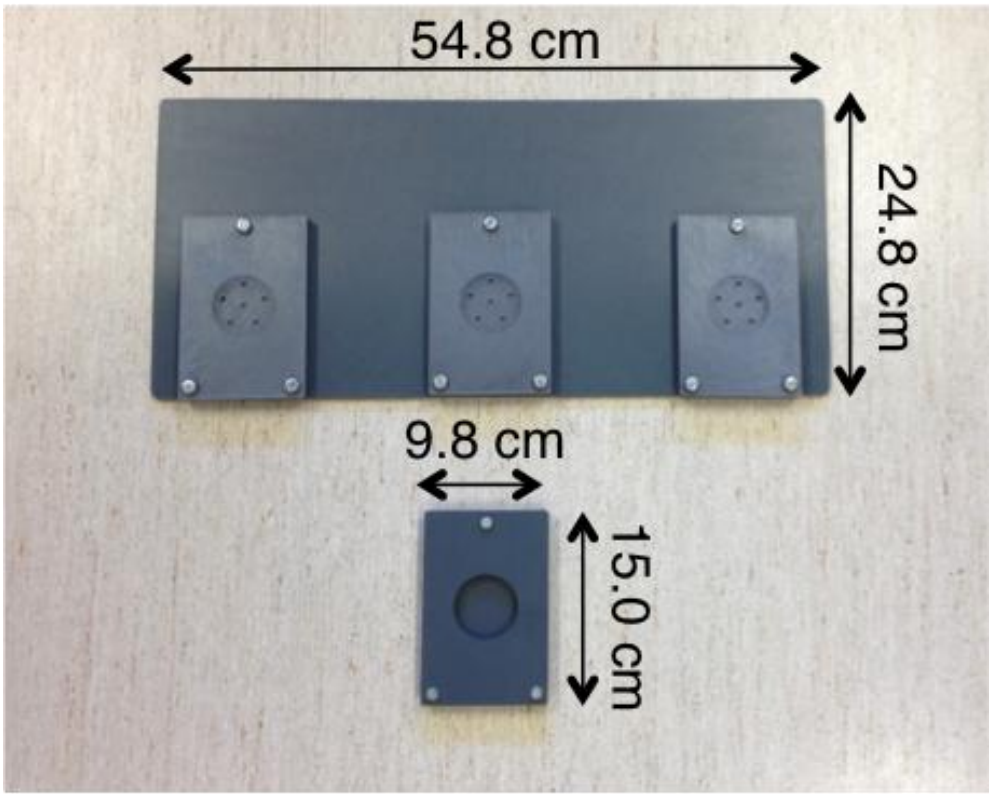

Figure 1. *Test apparatus used for problem -solving task for dogs. Top part was used for problem-solving test lower for motivation test. See main text for further details. The holes measure 0.5 cm diameter.*

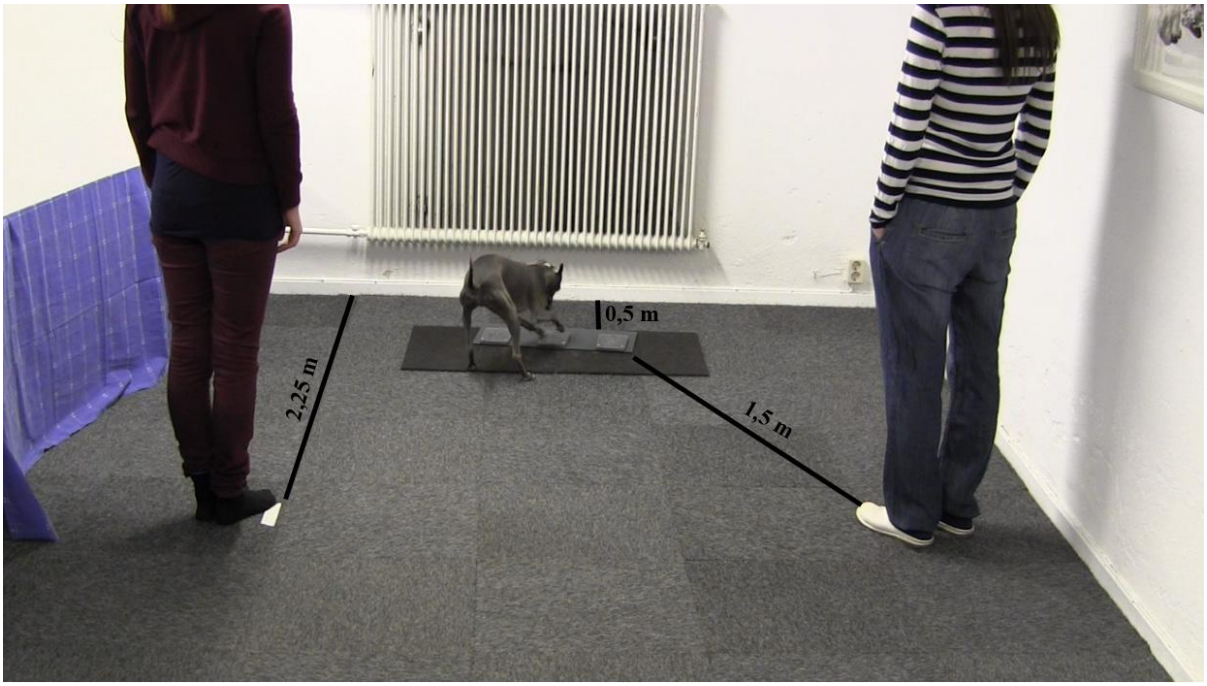

Figure 2..*Test area (2.5 m * 4 m) for motivation test and problem-solving test of dogs. Dogs owner to the right, test-leader to the left. Problem-solving board laying on two dark carpet pieces, in order to clearly be seen as the flooring had a very similar colouring to the problem-solving board.*

3.4 Data collection

The experiment was recorded with a camera (Canon Legria HF M52) in order to capture the behaviours of the dogs for further analyses. Behaviours collected for analyses were; gazing at owner or test-leader, physical contact with owner or test-leader, barking and whining (Table 2). Time to first gaze was measured with a stopwatch to the nearest hundredth of a second and it was noted if the gazing was directed towards the owner or test leader. The number of gazes at each person (owner, or test-leader) was counted and the total duration of the gazes was measured in to the nearest hundredth of a second with a stopwatch. The duration and number of gaze were measured by two people in order to minimize errors which would occur if a gaze was missed or the wrong duration obtained. The number of physical interactions, dogs physically touching person, was counted for each person (owner or test leader). Last, the number of barks and whining was counted during the 180 second long problem-solving test. Physical interaction and vocalisation were measured because these also are forms of communication between dogs and humans, in addition to gazes.

Table 2. *Ethogram of behaviours preformed by dogs towards their owner and a unfamiliar person in a problem-solving task which was noted and analysed.*

Functional Term	Descriptive Term
Gazing	Dog lifts its head towards the persons face, high enough to be able to gaze towards the persons face
Physical Contact	Dog interacts physically with the person and touch them e.g. licking, nosing or jumping on them
Barking	Dogs emits a harsh, abrupt and explosive sound
Whining	Dogs makes a low, nasal complaining sound

3.5 Statistics

Information from the questionnaire used was the dogs' age, sex and breed. The dogs' age in years was used, and also if the dog was a pup (< 6 months), adolescent dog (6 months to 2 years) or adult dog (> 2 years), dividing the dogs into age groups. There was 1 pup, 14 adolescent dogs and 34 adult dogs. Sex was noted as male or female. As we had a wide range of breeds, they were divided into breed groups according to SKK, Svenska Kennel Klubben (Swedish kennel club) (Table 1).

The data was plotted and visually inspected for normality. Nonparametric statistics was used, as the data was not normally distributed. Since there was only one pup participating it was excluded from the age group analysis. Mann-Whitney U-test was used to compare the remaining adolescent and adult dog groups. Mann-Whitney U-test was also used for analyzing sex differences ($N_{females}$=21; N_{males}=28). To investigate effects of age, day and breed-groups, Kruskal-Wallis H-tests were used. All data was examined for correlations using the Spearman's correlation test.

IBM SPSS Statistics 22 was used for the statistical analysis.

4 Results

Two out of 49 dogs did not gaze toward either test-leader or owner during the experiment.

Fourteen of 49 dogs barked in total, and one male barked 116 times, which was an extremely high frequency. No significant effect of sex was found, but there was a tendency of a difference with regards to barking where males barked more than females (median ± SE: Females, 0 ± 0.623; Males,0 ± 4.506 N= 49; U=367.5; P= 0.062).

Dogs of various ages differed somewhat in their gaze durations towards their owners (N= 49; H=19.034; P=0.088), and visual inspection of raw data suggests that dogs of age 11 and 13 had the longer gaze duration (Table 3). Dogs of 0 (10 weeks) and 9 years had a tendency to gaze somewhat less frequently towards the owner, than other dogs did (N= 49; H=19.35; P= 0.081) also suggested by visual inspection of raw data (Table 3).

Table 3. *Median ± SE of the dogs' number of gazes towards the owner and the duration of the gazes towards the owner. * indicates values that tends to differ from the other values.*

Age (Years)	Duration (s) of gazes at owner (median ± SE)	Number of gazes owner (median ± SE)
0	0	0*
1	0.7 ± 4.99	1 ±2.7
2	4.78 ± 1.42	5 ± 0.97
3	7.6 ± 3.90	7.5 ± 1.12
4	11.5 ± 11.68	8 ±3.17
5	18 ± 10.80	11 ± 5.51
6	4.51 ± 4.12	4.5 ±1.25
7	29 ± 9.70	10 ± 4.41
8	3.4 ± 0.60	4 ± 0.0
9	0.15 ± 0.15	0.5 ± 0.50*
10	1 ±11.02	3 ± 5.03
11	42 *	11
13	43.61 ± 25.39 *	12 ± 1.00

Adult dogs gazed more frequently toward the owner (N=49; U= 356; P=0.24) and had a longer gaze duration (N=49; U=361; P=0.021) compared to adolescent dogs (Figure 3). There was a tendency for adult dogs' first gaze to be directed towards the test leader more often than in adolescent dogs (median ± SE: Adults, 1±0.0787; Adolescents, 0±0.137 N=47; U=300; P=0.054) and they also tended to have a higher number of gazes towards the test leader during the test (median ± SE: Adults, 4.5 ±0.654; Adolescents, 2 ± 1.123; N=49; U=342.5; P=0.054).

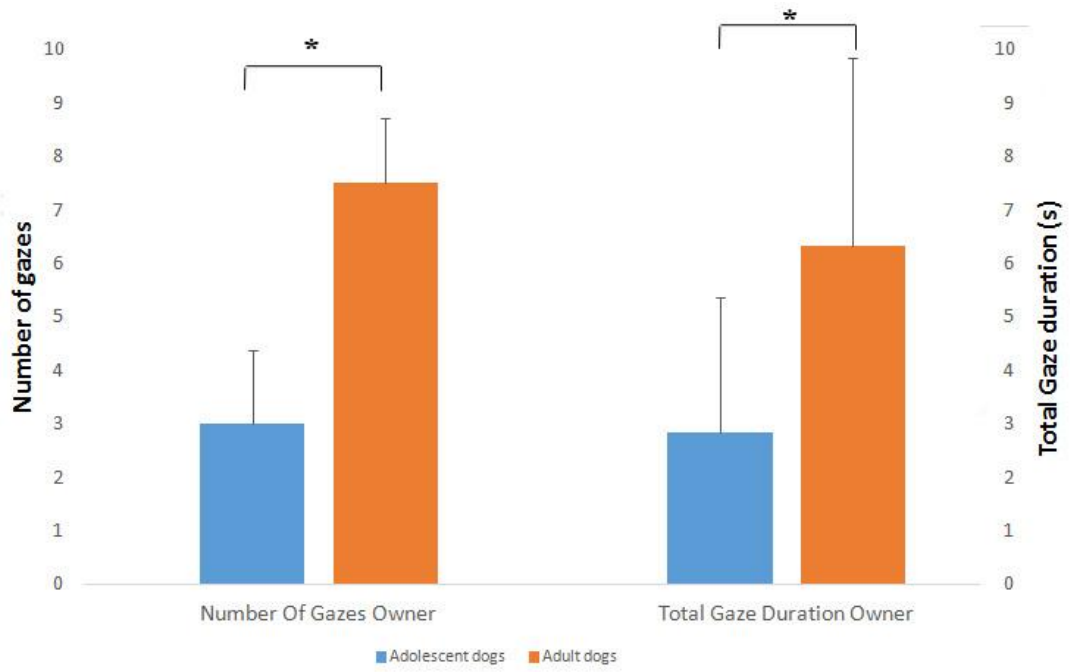

Figure 3. *Median + SE for number of gazes at owner and total gaze duration towards owner (s) for adolescent (6 months to 2 year old) and adult (over 2 years old) dogs in the problem-solving test. * indicate significant difference (p< 0.05).*

There were no differences between the breed groups in regards to gazing (p>0.05 for time to fist gaze, number of gazes at both persons as well as the gaze durations). A difference in the number of barks was found between the breed groups where companion dogs had a higher number of barks than the rest of the breed groups (median ± SE: Companion dogs, 13± 2.429; mixed breeds, 0 ±0.33; Herding dogs, 0 ± 10.46; Schnauzer and Pinscher, Molossoid and Mountainhounds sennendogs, 1.34 ± 0.6; Terriers, 5.81 ± 2.6; Spitz and breed of primitive type, 0 ± 14.0; Flushing dogs, Retrievers and water dogs, 0 ± 0.25; Sighthounds, 0 N=49; H=18.47; P= 0.012). Dogs tested on the last day had a higher number of whining than whinings recorded during the other days (median ± SE: day1, 0 ± 1.12; day 2, 0 ± 3.885; day 3, 0 ± 1.63 day 4, 10 ± 6.415; N= 49; H= 9.973; P=0.019).

There is a positive correlation between total gaze duration towards the test leader and the owner during a test (N=49; R= 0.399; P = 0.005, Figure 4a). There was a positive correlation between the number of gazes towards the test leader and towards the owner (N= 49; R = 0.435; P = 0.002, Figure 4b) as well as between the number of physical contacts a dog made towards the test leader and the owner during a test (N=49; R=0.355; P = 0.013).

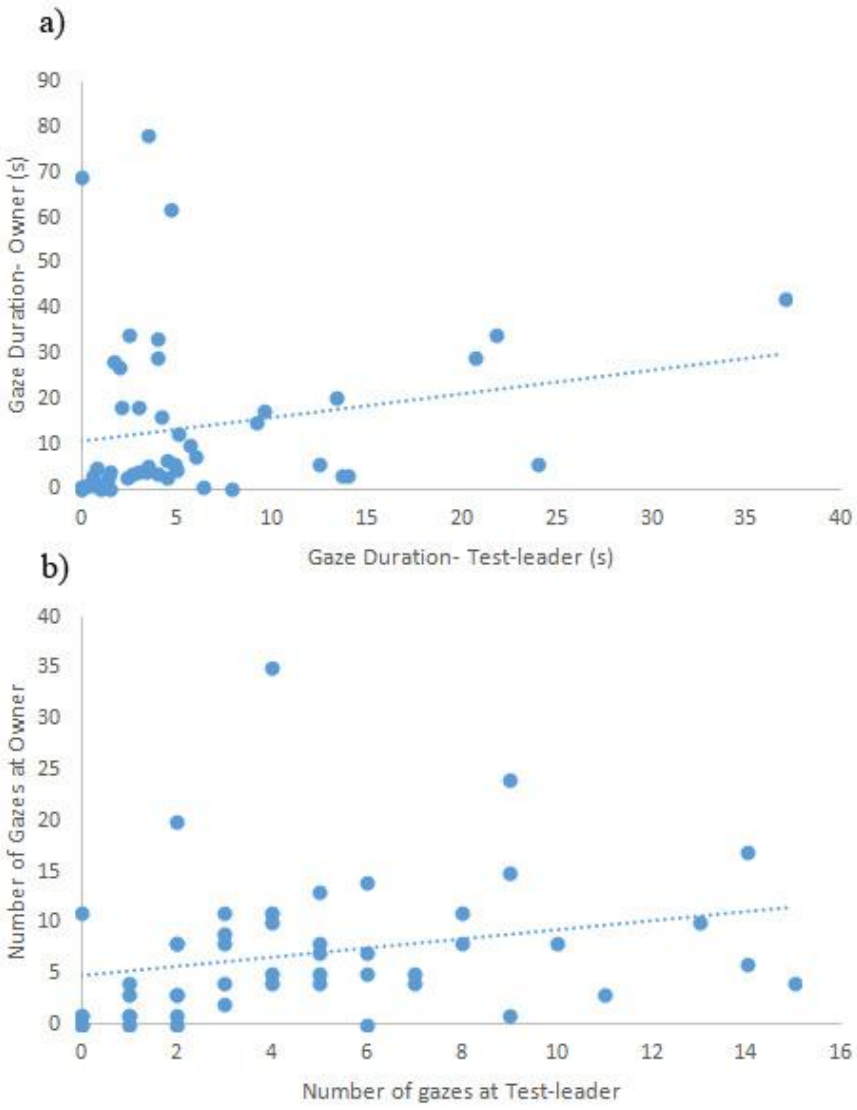

Figure 4. *Relation between a) gaze duration (s) at owner and test-leader and b) number of gazes at owner and test-leader during a problem-solving test of dogs.*

5 Discussion

Our aim of this study was to investigate possible differences in help-seeking behaviour towards humans, of dogs faced with an unsolvable problem. We wanted to see whether dogs would prefer seeking help from their owner or the unknown test leader, and also to investigate the effects of age, sex and breed groups. Our main findings are that adult dogs displayed a higher number of gazes and longer total gaze duration directed at their owner in comparison to adolescent dogs. Additionally, adult dogs tended to direct their first gaze towards the test leader rather than towards their owner.

There was a significant difference in barking where companion dogs barked more than other breed groups and there was also an effect of testing day on the amount of whining the test dogs did. However, one individual displaying excessive barking whilst another dog displaying a lot of whining was likely causing these high numbers of vocalizations. Vocalization of dogs might be more depending on breed and the dogs' personality than on age and sex. By a coincidence most of the whining dogs may have been tested on the same day. Vocalization may then not be related to the help-seeking behavior of the dogs, as barking and whining only differed with regards to one breed group and one testing day.

With regards to age, we predicted a correlation showing that the number and duration of gazes towards humans would increase with dogs' age (Passalacqua et al., 2011). Passalacqu et al. (2011) found that adult dogs gazed longer at humans. We only had one pup, and when removing the data from this dog and separating our subjects only into adolescent and adult dogs, our results were in accordance to Passalacqua et al. (2011) as adult dogs had longer gaze duration towards their owner. Even though their classification of an adult dog was between 1 and 12 years of age instead of ours above two years. Passalacqua et al. (2011) discuss the possibilities of adult dogs gazing longer at humans being due to increased experience of human communication during development. This difference between adult dogs and adolescent dogs seems likely as adult dogs have spent more time with their owners and other humans and have probably communicated with them in their everyday life and during training, and therefore learned the behaviour. It has been shown that dogs trained in agility, a dog sport where direct collaboration between human and dog is important, have longer gaze duration than dogs trained in search and rescue or untrained dogs (Marshall-Pescini et al., 2009). When looking at the separate age differences, there was none regarding gazing. As there was a difference in age groups with dogs older than 2 years gazing more and longer at the persons, a thought could be that the behavior might increase with the dogs' age in years. We did not find this in our study. As we had only 49 dogs and 13 different ages with some with just one dog, further studies on the help-seeking behaviour of dogs with a larger sample of each age would be advised in order to investigate further the possibility of a positive correlation between the behaviour and increasing age. In conclusion, we can say that when combining the adult dogs and adolescent dogs, there are differences in the help-seeking behavior regarding to gazing with adult dogs performing more of it then adolescent dogs. There are no difference regarding the separate ages of the dogs but this could be due to an uneven and small sample.

The number and duration of gazing towards the owner and the test-leader correlated. This indicates that dogs who gazed more times at their owner, also gazed more times at the test-leader. It is interesting though, by looking at the correlations (Figure 4), it shows that dogs that looked less at humans, tends to look more to the owner than the test-leader. This could be because dogs who show less of the behavior seem to direct it at their owner most. Dogs that show more of this behavior tend to not discriminate as much between their owner and an unfamiliar person. One could argue if dogs that gazed more at both the owner and the test-leader are more sociable than those dogs which gazed less at both persons and therefore are more motivated to look at an unfamiliar person (Jakovcevic et al., 2012).

The hypothesis that the Herding breed group as well as Flushing dogs, Retrievers and Water dogs would gaze a higher number of times and with longer duration, compared to the other breed groups tested, was not met. Pasalacqua et al. (2011) also investigated breed differences in their study and found that Hunting /Herding dogs had a longer gaze duration then Primitive and Molossoids. They predicted that they would find that Primitive breeds would gaze less then both of the other groups, because they are an older breed, which would have made sense since dogs have been seen to gaze more towards humans than wolfs during an unsolvable task (Miklósi et al., 2003). Passalacqua et al. (2011) discuss whether selection for cooperation with human in the Hunting/Herding dogs affects help seeking behaviour. One theory for dogs' excellent understanding of human cues was that communication between humans and dogs is a product by selection during domestication (Kaminski and Nitzschner, 2013). Further selection on dogs has continued and this may then be dissimilar in different breed groups, regarding which traits have been favoured by humans. Therefore there could be a difference in the help-seeking behaviour of between breed groups, but this was not seen in our study. We did not get a similar result as Passalacqua et al. (2011) in regards to gazing, as in our study there was only a difference between the breeding groups, there companion dogs barked more than the rest. Wherever Passalacqua et al. (2011) found that Herding dogs had longer gaze duration the other breed groups. As we had fewer dogs in our breed groups, this may have led to us not being able to identify any differences with number of gazes and gaze duration. Further studies regarding breed group with a larger sample size within each group would be advised in order to get a clearer result that could argue if there is a difference between the breeding groups in the help-seeking behaviour.

5.1 Societal & Ethical aspects

This study has provided more insight on the dogs' behaviour and interaction with humans that could benefit welfare of the dog, because it shows that dogs turns to humans when faced with a problem they cannot solve themselves.

Regarding ethical aspects of the study, we studied the dogs' behaviour and the only potential harm to the dogs may have been if they got stressed during the test due to the novel environment. However, we did not see any indications of this. We made sure that no stranger dogs interacted with each other to reduce harm and stress.

5.2 Conclusion

Our main findings are that adult dogs gaze more at humans, especially their owner, compared to adolescent dogs. However, adolescent dogs also gaze at humans in search for help, but not as much as adults. This points towards that the great bond between humans and their dogs seems to grow stronger as they live and interact with each other. The problem-solving behavior is a topic that would benefit from more research regarding the importance of breed and age when it comes to effects on dog-human communication.

6 Acknowledgments

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8 Appendix

Questionnaire

Linköpings universitet

Frågeformulär till hundägaren

ÄGAREN

1) Namn: _____

2) Kontaktinformation (helst e-post): _____

3) Är det okej om vi sparar din kontaktinformation för ev. framtida beteendestudie?
❑ Ja ❑ Nej

HUNDEN

4) Namn (gärna även reg. namn): _____

5) Födelseår: _____

6) Tik / hane / kastrerad: _____

7) Ras: _____

8) Är din hund en ❑ omplaceringshund eller har du ❑ ägt hunden sedan 8 veckor?

9) Har hunden blivit tränad (tex. bruks, lydnad, agility, spår)?
❑ Ja ❑ Nej Om ja, vad för typ av träning: _____

10) Har hunden blivit utsatt för liknande övningar hemma? ❑ Ja ❑ Nej
Om, ja, vilken/vilka övningar? ❑ Problemlösning ❑ Pekövningar ❑ Lekövningar

11) Hur benägen är hunden att be om hjälp? Skala 1–5, där 1 är lite benägen och 5 är mycket benägen. Ringa in siffran som stämmer bäst. 1 2 3 4 5

Härmed godkänner jag att jag och min hund filmas för att materialet senare ska kunna användas i vetenskapligt syfte:

Hundförarens signatur