Problem solving games as a tool to reduce fear of strangers in dogs

Marcella Zilocchi[1,*], Beatrice Carlone[2]

[1] *Dipartimento di Scienze Veterinarie, Università di Pisa - Italy*
[2] *AltreMenti - Italy*

Abstract: Problem solving games are often advised in the behavioral therapy of fearful dogs. There have been few experimental works conducted on animals with respect to the innate reinforcing properties of problem solving or the emotional consequences of responding to challenge.

The aim of the current study was to assess the effectiveness of problem solving games in reducing fear of strangers in dogs.

The sample consisted of 16 animals. Dogs' fear was evaluated through the Fear Behavioral Assessment (FBA) test, a simplified version of the Dog Mentality Assessment (DMA) test, focusing on dog behavior towards people.

The first subtest consisted of a social contact with an unknown person (UP) who approached the handler and then tried to walk the dog. In the second, another UP was hooded and encouraged the dog to play, moving in front of him/her and shaking a rope. In the third a manikin suddenly appeared in the dog's path. In the last subtest a third UP spent 3 minutes talking to the dog handler without interacting with the animal. In each subtest a score varying from 1 (extreme display of fear) to 5 (no fear) was assigned to dogs' behavior by two trained observers.

Dogs resulted fearful were divided into a "problem solving" (PS) (12 dogs: 3 males and 9 females,) and a control group (4 dogs: 2 males and 2 females).

The experimental group underwent problem solving sessions carried out by experimenters (different from UP) in a room, with games in increasing complexity. The number of sessions needed to solve all the games presented in the session were 6.6 ± 2.6. The problem solving sessions and the FBA test were conducted in two different places.

Sixty days after the first test (T_0), all dogs were blindly assessed by repeating the test to evaluate possible behavior changes towards proposed stimuli.

Data was statistically analyzed by using a Wilcoxon signed-rank test ($p=0.05$).

Dogs belonging to the experimental group statistically increased their scores after the problem solving sessions in T_1 ($W=-91.0$, $p<0.022$) but not those of the control group ($W= -1.0$; $p=0.317$).

Moreover, the number of times dogs showed no sign of timorousness (score=5) was statistically higher after the treatment (9 *vs* 0; $\chi^2=6.37$; $p=0.012$).

Results of this study showed that dogs of the PS group, in contrast of those of the control group, obtained statistically higher scores in the FBA test after problem solving sessions, meaning that they appeared less fearful. This result suggests that the improvement of the experimental group could be related to problem solving sessions and they may be effective in reducing fear of strangers in dogs.

Key Words: dog; fear of strangers; problem solving game.

* *Corresponding Author*: zilocchi@vet.unipi.it

Introduction

Fearfulness is considered as a basic personality or temperament trait defining the general susceptibility of an individual to react to a variety of potentially threatening situations (Boissy, 1995), such as the presence or proximity of an object, an individual or a social situation (Sherman & Mills, 2008). Among animals, fear is manifested by physiologic responses, such as tachycardia, hyper salivation or

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faeces and urine elimination, in addition to behavioral responses associated with escape, avoidance or defensiveness (Sherman & Mills, 2008).

Fear is part of normal behavior: it is regarded as a biologically adaptive (evolved) mechanism that contributes to the survival of the individual by controlling its distance to the stimulus (e.g. escape/avoidance, fight/flight, immobility), (Öhman & Mineka, 2001). The determination of whether the fear or fearful response is abnormal or inappropriate must be determined by context (Overall, 2013).

Fear-related behavior emerged as an important aspect of the dogs' personality also from applied point of view as it relates to the welfare of the animals and it could have a strong influence on the owner-dog relationship (Guy et al., 2001; Duffy et al., 2008; Hsuand Sun, 2010).

In particular, fear of strangers in dogs has been found to be a common source of behavioural problems and to be associated with a decreased lifespan (Dreschel, 2010).

The shyness-boldness continuum is a fundamental axis of behavioral variation in humans and psychologists often measure shyness and boldness in children by noting their response to a novel object. Since results of personality studies in animals have revealed suggestions of human personality traits in different species of animals, similar techniques can be applied in the field to nonhuman species (Wilson et al., 1994). A study of Svartberg (2002) on dog personality revealed that "Playfulnees", "Curiosity/Fearlessness", "Chase-Proneness" and "Sociability" traits are all related to one higher-orded factor which was interpreted as a shyness-boldness dimension.

In literature dog personality has been studied through different standardized behavioral tests: one of these tests was the Dog Mentality Assessment (DMA) (Svartberg & Forkman, 2002). The DMA test, can be seen as a personality test for dogs in which the animals are exposed to several different novel situations and their reactions are described according to a standardized score sheet (Svartberg & Forkman, 2002; Svartberg, 2002 and Svartberg et al., 2005) providing consistent (Svartberg et al., 2005) and reliable results (Svartberg, 2005). Considering that the DMA is a validate dog personality test used to measuring: (1) interest in playing with humans; (2) attitude towards strangers – interest in, fear of, and aggression towards; (3) non-social fearfulness, the researchers regarded it suitable for the purpose of this study.

According to Beata and colleagues (2007), the management of anxieties, fears and phobias may require induced behavioral changes and possibly stress reduction training programs to improve dogs' abilities to cope with stressful situations. In veterinary behavioral medicine, a couple of techniques are frequently used in the management of a wide range of behavioral problems and are the most utilized methods in the treatment of fearful responses: systematic desensitization and counter-conditioning (Palestrini, 2009). These techniques are used to change dog's negative perception of the stimulus into a positive one, also providing the dog the possibility to show an alternative and appropriate behaviour which achieves the desired outcome.

In the last years, some behaviorists and dog trainers suggest the use of problem solving as a technique to treat fear in dogs. In humans self-esteem and problem solving ability were related to each other (D'Zurilla et al., 2002) and the self-esteem is the main variable affecting the individual's psychological well-being and social functioning (Salmivalli, 1999). Moreover, when problem-solving confidence was high, negative emotional intensity tended to reduce (Sugiura & Sugiura, 2015). For these reasons, problem solving can be supposed being a good way also for dogs, but, to our knowledge, its effectiveness has not been evaluated yet.

Problem solving can be defined as a subset of instrumental responses that appear when an animal cannot achieve a goal using a direct action (Shimabukuro et al., 2015). Therefore, the subject needs to perform a novel action or an innovative integration of available responses in order to solve the problem (Scheerer, 1963). This ability has been studied in dogs using a wide variety of tasks (e.g., Scott & Fuller, 1965; Frank & Frank, 1985; Miklósi et al., 2003; Osthaus et al., 2005).

The aim of the present study was to evaluate the effect of problem solving sessions on dogs showing fear of strangers by using a shorter and modified version of the DMA test.

Materials and methods

Subjects

Twenty-seven dogs (10 males and 17 females, 49.9 ± 34.8 months) were tested, for fear of strangers, through the Fear Behavioral Assessment (FBA) test, a modified and shortened version of the DMA test (described below in the text). Dogs whose score at this time (T_0) was less than 25 were assessed as fearful of strangers and were recruited for the actual sample of the study. The total ranged from the 8 (extreme display of fear) and 40 (no fear); the cut-off score to include subject in the sample was fixed in 25, i.e. the halfway point between the two extreme.

Only 16 dogs were classified as timorous/fearful. The remaining 11 dogs, with a score higher than 25 in the FBA, were excluded from the present research.

The final sample included 11 females and 5 males, whose mean age was 39.3 ± 30.5 months, belonging to the following breeds: 1 Australian Shepherd, 1 English Setter, 1 Collie tricolor, 1 Golden Retriever, 1 Border Collie, 1 Rottweiler, 1 Yorkshire Terrier, 1 Bolognese, 1 Weimaraner, 1 Bichòn a Poil Frisé, and 6 mixed-breeds.

After the first test, the 16 dogs were divided into two groups: the Problem Solving group (PS), formed by 12 dogs (9 females and 3 males, 32.0 ± 20.3 months old), which participated to problem solving sessions and the control group (CO), formed by 4 dogs (2 females and 2 males, 61.0 ± 48.0 months old), which did not attend such sessions. Because we supposed the dogs take an advantage to solve the problem solving task, we were ethically correct in reducing the number of animals in the control group.

After 60 days (T_1) from T_0, the two groups (PS and CO) were exposed again at the four subtests of the FBA test to assess the possible improvement of dogs' behaviour response to fear-eliciting stimuli.

Behavioral test procedure and rating

For evaluating dog fear, the FBA test, a reduced version, composed by 4 subtests, out of 10, of DMA test (Svartberg & Forkman, 2002) was performed. FBA's 4 subtests were carried out consecutively; the owner handled the dog during the whole test, maintaining a passive posture and behavior towards the animal. The four subtests were modified from the original one, as described below, and have been executed in the following order: Social contact, Play with stranger, Sudden appearance, Passive situation. Tests were carried out in an about 100 m² fenced-in field and lasted around 9 minutes.

Besides the owner and the dog, in the test area an experimenter and 4 unknown persons (UP) to the dogs, were present. The experimenter guided the owner during the whole test, while the UP was hidden in hiding places.

FBA test was video-recorded and dogs' behavior was later analyzed by two trained observers, in order to attribute to each dog a score. The score sheet contained scales for 8 behavioral variables, corresponding to different phases during each subtest. All variables were scored from 1 (extreme display of fear) to 5 (no fear) according to the intensity of the behavior response.

The score of each dog was calculated as the average of the scores attributed to each dog by the two observers for each variable. Total scores ranged from 8 to 40, with a threshold of 25 below which dogs were considered as timorous/fearful. The detailed descriptions of FBA test and behavioral scores are reported in Box 1.

Box 1. FBA test description with relative scores.

FIRST SUBTEST - Social contact with a UP

The owner with the dog on a leash is approached by an UP. The UP greets the owner and shakes his/her hand. After that, the UP takes the leash and tries to take the dog for a short walk (10 meters), without pulling or forcing the dog, while the owner stops. After the walk, the UP returns to the owner with the dog. The scores were attributed to dog response as follows:

Meeting the UP

SCORE 1 = Withdrawing attempting to escape
SCORE 2 = Approaching UP displaying fear
SCORE 3 = Fearful posture and tail between lags
SCORE 4 = Approaching UP displaying curiosity
SCORE 5 = Intense greeting behavior with jumping and whining

Walking with UP

SCORE 1 = Withdrawing and refusing to walk with UP
SCORE 2 = Timorous walking with UP and repeatedly stopping
SCORE 3 = Walking with UP but gazing at owner
SCORE 4 = Walking with UP and looking at owner just once
SCORE 5 = Show high willingness to walk with UP wagging the tail

SECOND SUBTEST - Distance-play

An UP dressed in a cape with hood is hidden at a distance of approximately 10 m away from the owner and the leashed dog. The UP starts to move towards the dog in a crouching manner and tossing a rope in the air. The movement towards the dog and the crouching is repeated twice. Thereafter the UP goes to a hiding place and un-hoods himself. The dog is un-leashed. The UP comes out from the hiding place and starts to invite the dog to play by tossing a rope UP in the air three times. If the dog engages in play, after 10 s the UP let's go of the rope and remains passive during a period of the same length. The scores were attributed to dog response as follows:

The dog looks UP tossing the rope

SCORE 1 = Withdrawing and barking with a very low posture
SCORE 2 = Barking while approaching the UP and Withdrawing at any abrupt movements
SCORE 3 = Not interested in playing and UP
SCORE 4 = Trying to play with UP maximum twice
SCORE 5 = Repeatedly approach the UP

Play invitation

SCORE 1 = Barking, growling and become aggressive
SCORE 2 = Very low posture
SCORE 3 = Approaching UP only if the owner is close
SCORE 4 = Trying to play with UP maximum twice
SCORE 5 = Show high willingness to play with UP wagging his tail

Tug-of-war

SCORE 1 = No attempt to play tug-of-war
SCORE 2= Showing little interest in playing and looking continuously at the UP
SCORE 3 = Showing some interest in playing but without being interactive
SCORE 4 = Showing some interest in playing and being interactive
SCORE 5 = Immediate attempt to play with active pulling even when UP is passive

THIRD SUBTEST - Sudden appearance

The owner and the leashed dog move toward a hiding place. When the dog is 5 m from the hiding place, a human-like dummy (a coat on a crutch) is suddenly pulled UP in front of the dog and a hidden experimenter shacked it. After 15s the owner un-leashes the dog and remains passive for other 15 s, which gives the dog opportunity to freely approach and investigate the dummy. The scores were attributed to dog response as follows:

Human-like dummy suddenly appearance

SCORE 1 = Withdraw, try to run away, significant avoidance behaviour
SCORE 2 = Fearful, standing and/or barking
SCORE 3 = Hesitating for maximum 10 sec but showing curiosity
SCORE 4 = Hesitating for maximum 5 sec and then approaching
SCORE 5 = Immediately attempt to approach the dummy

Approach the dummy (dog unleashed)

SCORE 1 = Withdraw, run away, significant avoidance behavior
SCORE 2 = Fearful, standing and/or barking
SCORE 3 = Hesitating for maximum 10 sec but showing curiosity
SCORE 4 = Hesitating for maximum 5 sec and then approaching
SCORE 5 = Immediately approach the dummy

FOURTH SUBTEST - Passive situation

The dog is leashed but with the possibility to move in the full length of the leash. A UP approaches the owner and starts talking with him ignoring the dog for 3 min. The scores were attributed to dog response as follows:

Passive situation

SCORE 1 = Withdrawing, attempting to go away
SCORE 2 = Standing and attempting to escape
SCORE 3 = Standing and looking at owner and UP
SCORE 4 = Approaching the UP and showing curiosity
SCORE 5 = Immediately approach the UP, seek attention

Problem Solving

Dogs belonging to the PS group participated at problem solving session. The problem solving tasks were conducted in an unfamiliar room at the Dipartimento di Scienze Veterinarie - University of Pisa (Italy) in a period of sixty days between (from T_0 to T_1).

During each session in the room there were: the tested dog, the owner and a female experimenter (always the same). The owner was asked not to say or do anything during the sessions (Topál et al., 1997). The owners should not be allowed to repeat the problem solving tasks by themselves at their house.

Several apparatus (described below) with three different levels of difficulty were used. A dog moved on the subsequent level when he/she had solved all the apparatus belonging to the previous level.

Each subject had to solve all the tasks of the first two levels of difficult and at least one problem solving games of the third levels. Each session lasted 20 minutes at most. The problem solving sessions were conducted once a week.

If the dog lost interest in the apparatus, the experimenter moved it or added more tasty food trying to increase dog's motivation. In case the dog was not interested in the apparatus despite the expedients described above and in order to end successfully the session, an easier apparatus (already solved by the dog) was provided to the dog.

Apparatus

1st LEVEL

A small polystyrene or plastic glass of coffee, placed upside down over few pieces of food, was used as first solvable trial. Later the small glass was changed before with a normal size glass and then with a more stiff and transparent glass high almost 15 cm.

Due to dogs' preference to use paws or muzzle to solve the trial, further apparatuses were proposed in different order. Apparatuses proposed were: 2 wicker baskets (15 cm and 23 cm diameter); a transparent plastic small cup (10 cm diameter), a pyramid formed by jar's tops between which were placed titbits of food.

Fig. 1. Rolled cotton towel inside which food rewards.

2nd LEVEL

Rolled towel

A rolled cotton towel inside which food rewards were placed (Fig. 1).

The cage

A cotton towel was placed on a small wooden board on which a metal cage with two side opened was fixed. At both the opened side of the cage the towel's ends were left outside to let dogs to drag out the towel and eat the titbits of food that was placed on it (Fig. 2).

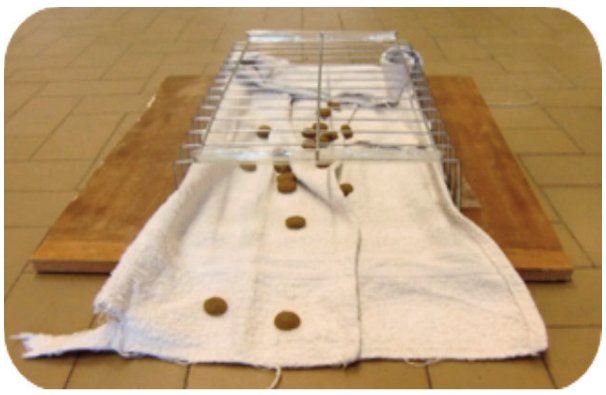

Fig. 2. The cage.

The "roulette"®

This apparatus had several compartments to fill with treats covered with a top disc. When the dog tried to get the treat from a compartment contacting the top disc, it turned and disclosed the following compartment. To get more information look at the Trixie's instruction.

The twister

This apparatus was realised fixing three rotating small wooden boards on a wooden base and, at the ends of each small wooden board, a jar's top were fixed. The small wooden boards were arranged in a parallel manner to hide the titbits of food placed in each jar's top. The dog had to be able to turn the small wooden boards to catch all the treats.

3rd LEVEL

Turn Around ®

This apparatus had a turning element with a lid. Some titbits of food were placed into the turning element and the dog must turn it to get the treats out. In order to reduce the noise a lightweight bottle was used for more timorous and small size dogs. To get more information look at the Trixie's instruction.

Pull out the disk

This apparatus was realised using a plastic tube on which two fissures at different high were produced. In one of this fissure were placed a wooden disk to close the plastic tube. Titbits of food were placed inside the tube and the dog had to be able to pull out the disk form the plastic tube to drop the treat on the floor. In some cases a towel were placed on the floor under the apparatus in order to reduce the fallen disk's noise. While for more timorous dogs a plastic lightweight disk was used.

The strategy game Chess ®

Chess is a board game with cones and small indentations for hiding small treats for dogs to sniff out. To get more information look at the Trixie's instruction.

Data analysis

The total scores obtained by all subjects in the FBA test at t_0 and t_1 were analyzed with a Wilcoxon Signed-rank test (p=0.05).

Results

All dogs of the PS group completed the problem solving protocol but the number of sessions needed varied for each individual dog (Table 1).

Table 2 and 3 showed the scores (mean ± S.D.) obtained by the dogs of the two groups in the FBA test performed at T_0 and T_1.

The scores obtained by the dogs of PS and CO groups in each subtests at time T_0 and T_1 are shown in table 4. The results of PS group were significantly higher in all steps except for the subtest 3 (*Human- like dummy suddenly appearance*). None of the dogs obtained a maximum score (5) at T_0, while at T_1, the dogs of PS group obtained for 9 times the maximum score (0 *vs* 9; χ^2=6.37; p=0.012).

The statistical analysis on the total scores revealed that in PS there was a significant increase (W=-91.0, p<0.022), while in CO such trend was not found (W= -1.0; p=0.317).

Table 1. Number of sessions needed to the dogs of PS group for completing the problem solving protocol.

PS GROUP	Number of sessions needed to complete problem solving protocol
LYON	7
BEA	6
AGATA	5
SISSY	6
TOTO'	7
ELANY	5
DEA	6
FLORA	8
SANGRIA	4
GINESTRA	6
ISOTTA	8
KORA	5
Mean ± S.D.	6.1±1.7

Table 2. Score obtained by the dogs belonging to the PS group in the FBA test at T_0 and T_1.

PS GROUP	SCORE (T_0) (Mean ± D.S.)	SCORE (T_1) (Mean ± D.S.)
LYON	3.06 ± 0.78	3.68 ± 0.59
BEA	1.38 ± 0.44	2.50 ± 1.07
AGATA	1.81 ± 0.84	2.06 ± 0.86
SISSY	2.13 ± 0,52	2.44 ± 0.15
TOTO'	1.56 ± 0.62	2.31 ± 0.09
ELANY	1.88 ± 0.83	3.75 ± 1.16
DEA	2.00 ± 0.92	2.88 ± 1.15
FLORA	2.88 ± 0.99	3.38 ± 0.92
SANGRIA	1.88 ± 0.83	2.75 ± 1.28
GINESTRA	3.00 ± 1.31	3.75 ± 1.06
ISOTTA	2.00 ± 1.07	2.88 ± 1.25
KORA	2.25 ± 0.71	4.63 ± 0.52

Table 3. Score obtained by the dogs belonging to the CO group in the FBA test at T_0 and T_1.

CO GROUP	SCORE (T_0)	SCORE (T_1)
LUCKY	3.13 ± 0.99	3.13 ± 0.99
WILLY	1.50 ± 0.46	1.50 ± 0.56
SOFIA	1.50 ± 0.46	1.50 ± 0.56
NENSIE	1.88 ± 0.95	1.88 ± 0.95

Table 4. Scores obtained by PS and CO groups in FBA test at T_0 and T_1.

		PS GROUP					
	STEP	T_0		T_1			
		MEDIAN	RANGE	MEDIAN	RANGE	W	p
Subtest 1	1	2.5	1-4	4.0	3-5	-21.0	<0.032
	2	1.5	1-4	4.0	1-5	-36.0	<0.024
Subtest 2	1	3.0	1-3	3.0	1-5	-21.0	<0.032
	2	2.0	1-4	3.0	1-5	-25.0	<0.054
	3	1.0	1-3	1.5	1-4	-15.0	<0.054
Subtest 3	1	2.0	1-4	2.5	2-5	-10.0	<0.18
	2	2.0	1-3	3.0	1-5	-57.0	<0.018
Subtest 4	1	2.0	1-3	4.0	2-5	-70.0	<0.02
		CO GROUP					
		T_0		T_1			
		MEDIAN	RANGE	MEDIAN	RANGE	W	p
Subtest 1	1	3.0	1-4	2.5	1-4	1.34	<0.18
	2	2.5	1-4	2.5	1-4	1.34	<0.18
Subtest 2	1	1.25	1-2	1.25	1-2	1.41	<1.16
	2	3.0	2-4	3.0	2-4	0.45	<0.65
	3	2.0	1-4	2.0	1-4	1.41	<1.16
Subtest 3	1	2.0	2-3	2.0	2-3	1.34	<0.18
	2	1.75	2-3	1.75	2-3	1.07	<0.28
Subtest 4	1	3.0	2-3	3.0	2-3	1.34	<0.18

Discussion

The aim of this study was to evaluate the effect of problem solving trials on dogs which showed fear of strangers by using the FBA test, a shorter and modified version of the DMA test.

Manifestation of fear required a careful consideration because it increases the probability of aggression towards unfamiliar people (Matos, 2015). Aggression directed towards people is the most common behavioral problem referred to specialist clinics (Blackshaw, 1991; Bamberger & Houpt, 2006); the most aggressive dogs were mainly elderly and of small size with anxiety and fear (Zilocchi et al., 2015).

In humans, self-confidence is the ability to react to new situations (Fuchs et al., 2005) and is often used as an umbrella term that diffusely refers to such traits as feeling confident, secure, strong, competent, or proud (Thomaes et al., 2011). Similarly, we refer to self-confidence in dogs to describe their assertiveness in various situations, but we didn't refer to specifics researches because there aren't.

In order to increase the dogs' self-confidence in this study, we gave them various problem solving challenges, since the problem solving trials could improve the dogs' self-confidence. Problem solving can be defined as the ability to overcome obstacles by using previous knowledge in new ways and piecing together information to create solutions in novel situations (Coren, 1994).

Opportunities to solve problems make decisions and exercise cognitive skills are important to an animal's subjective experience (Meehan & Mench, 2006).

The results indicate that dogs' behavior towards strangers improves after problem solving trials and the behavioral changes are not due to test repetition or other causes.

Since the problem solving sessions and the FBA test were conducted in two different places, the environmental factors had little influence in the dogs' behavior.

Bekoff & Byers (1992) classified play into three different categories: play as motor training, play as socialization, and play as cognitive or sensor-motor training. In this study, we focus on play as cognitive activation.

A well-known feature of play is that animal will play only when they are relaxed and free from threats, discomfort, hunger, danger and illness (e.g., Bekoff, 1972; Shaller, 1972; Fagen, 1981; Suomi et al., 1981). In this study, we capitalise on the benefits of play to help dogs behave in a more relaxed and calm way.

Topal et al. (1997 and 1998) have investigated the influence of the type of attachment between people and their pet dogs on the dog's behavior, including problem-solving abilities. They found that dogs performed better at solving novel problems in the presence of their owners than in the presence of strangers or when isolated, even when their owners had no actual knowledge of the task that have to be solved (Topal et al., 1998). In fact, dogs explore and play autonomously more often when the attachment figure is present, i.e., humans act as a secure base for dogs (Mariti et al. 2013). In order to increase a sense of security in the dogs in our study, the owner was present throughout the problem solving sessions, but it was important that the owner did not help the dog by indicating the solution. Therefore, owners were instructed not use their gaze, gestures or voice to help the dog solving the problem.

Moreover, Topal and colleagues (1997 and 1998) noted frequent glancing toward the owner as if the dog was monitoring the owner's behavior or even soliciting help with the task. In fact, gaze is one of the most important nonverbal communicative responses in the communication of several species (Emery, 2000). There is evidence showing that, when faced with an unsolvable task involving an inaccessible reward, dogs tend to gaze at the human face to gain access to the reinforcement (Miklósi et al., 2003; Marshall-Pescini et al., 2008, 2009). Dogs have demonstrated remarkable abilities to solve problems using human communicative cues, such as following a pointing gesture to find hidden food (e.g. Miklósi & Soproni, 2006).

Similar observation was also described in problem-solving situations involving a gorilla (Gomez, 1990). Gomez argued that the gorilla applied eye contact to the experimenter to check whether he was also aware of the situation. In a number of cases the gorilla then tried to get help from the experimenter instead of solving the problem alone (Topál et al., 1997).

Results in this study showed that the dogs in the experimental group obtained statistically higher scores in the FBA test after the problem solving sessions, meaning that they appeared less fearful. Dogs belonging to the control group did not show such improvement when re-tested in the FBA test sixty days after the first test, but the lower number of dogs in this group could have influenced the results. This data suggests that the improvement of the experimental group could be related to problem solving sessions that could be effective in reducing fear of strangers in dogs.

Conclusion

In conclusion, this study suggests that dogs, engaged in problem solving activities, appear to be calmer and less fearful towards the strangers, probably because the problem solving sessions might have increase their self-confidence. Therefore, cognitive activation through problem solving could be a possible way of reducing fear of strangers in dogs and, in turn, encouraging them to behave in a more socially apt way.

However, some methodological considerations need to be stressed. Notably, the dogs' welfare needs to be carefully considered: it is important that dogs feel free to engage in the problem solving task without feeling distress and/or frustration.

The frustration may occur because an animal is denied access to something that it wants and so is thwarted in its efforts to obtain that resource (Mills et al., 2013). The presence of their owner is key in order to facilitate this. However, these problem solving tasks help the dogs self-confident and enhance their performance. It is important that the owner does not help the dog throughout the session through verbal or non verbal communication.

In a future research, the control group must be accompanied in the same structure where the problem solving group participated at the problem solving sessions so as to reduce the confounding factors and the groups must have the same sample size. Finally, some circumstances might be more beneficial for the dogs than others. Therefore, further research is needed in order to understand how and when it is appropriate the use of problem solving in the treatment of canine behavioral problems.

References

Bamberger M., Houpt K.A. Signalment factors, comorbidity, and trends in behavior diagnoses in dogs: 1644 cases (1991-2001). J. Am.Vet. Med. Assoc. 2006; 229: 1591-1601.

Beata C., Marion M., Muller G. Effects of alpha-casozepine (Zylkene) versus selegiline hydrochloride (Selgian, Anipryl) on anxiety disorders in dogs. J. Vet. Behav. 2007; 2: 175-183.

Bekoff M. The development of social interaction, play and meta-communication in mammals: An ethological perspective. Q. Rev. Biol. 1972; 47: 412-434.

Bekoff M., Byers J.A. Time, energy and play. Appl. Anim. Behav. Sci. 1992; 44: 981-982.

Blackshaw J.K. An overview of types of aggressive behavior in dogs and methods of treatment. Appl. Anim. Behav. Sci. 1991; 30: 351-361.

Boissy A. Fear and fearfulness in animals. Q. Rev. Biol. 1995; 70: 165-191.

Coren S. The Intelligence of Dogs: Canine Consciousness and Capabilities. 1994. New York: The Free Press.

Dreschel N.A. The effects of fear and anxiety on health and lifespan in pet dogs. Appl. Anim. Behav. Sci. 2010; 125: 157-162.

D'Zurilla T.J., Maydeu-Olivares, A., Gallardo-Pujol D. Predicting social problem solving using personality traits. Personality and Individual Differences. 2011;50: 142-147.

Emery N.J. The eyes have it: the neuroethology, function and evolution of social gaze. Neurosci. Biobehav. Rev. 2000; 24: 581-604.

Fagen R. Animal play behaviour. 1981.London and New York: Oxford Univ. Press.

Frank H., Frank M.G. Comparative manipulation-test performance in ten-week-old wolves (Canis lupus) and Alaskan malamutes (*Canis familiaris*): a Piagetian interpretation. J. Comp. Psychol. 1985; 99: 266-274.

Fuchs T., Gaillard C., Gebhardt-Henrich S., Ruefenacht S., Steige, A. External factors and reproducibility of the behaviour test in German shepherd dogs in Switzerland. Appl. Anim. Behav. Sci. 2005; 94: 287-301.

Gomez J.C. The emergence of intentional communication as a problem-solving strategy in the gorilla. In "Language" and Intelligence in Monkeys and Apes, 333- 356, 1990. eds. S. Taylor-Parker and K.R. Gibson, Cambridge: Cambridge University Press.

Mariti C., Ricci E., Zilocchi M., Gazzano, A. Owners as a secure base for their dogs. Behaviour. 2013; 150: 1275-1294.

Marshall-Pescini S., Passalacqua C., Barnard S., Valsecchi P., Prato Previde E. Agility and search and rescue training differently affects pet dogs' behaviour in socio-cognitive tasks. Behav. Processes. 2009; 81: 416-422.

Marshall-Pescini S., Valsecchi P., Petak I., Accorsi P.A., Prato Previde E. Does training make you smarter? The effects of training on dogs' performance (Canis familiaris) in a problem solving task. Behav. Processes. 2008; 78: 449-454.

Matter H.C., Arbeitsgemeinschaft S. The epidemiology of bite and scratch injuries by vertebrate animals in Switzerland. Eur J Epidemiol. 1998; 14: 483-90.

Meehan C.L., Menc, J.A. The challenge of challenge: Can problem solving opportunities enhance animal welfare? Appl. Anim. Behav. Sci. 2007; 102: 246-261.

Miklósi A., Kubinyi E., Topál J., Gácsi M., Virányi Z., Csányi V. A simple reason for a big difference: wolves do not gaze back at humans but dogs do. Curr. Biol. 2003; 13: 763-767.

Miklósi A., Soproni K. A comparative analysis of animals' understanding of the human pointing gesture. Anim. Cogn. 2006; 9: 81-93.

Mills D., Dube M.B., Zulch H. Stress and Pheromone therapy in small animal clinical behaviour. 2013. John Wiley e Sons, Ltd.

Matos R.E., Jakuba T., Mino I., Fejsakova M., Demeova A., Kottferova J. Characteristics and risk factors of dog aggression in the Slovak Republic. Veterinari Medicina. 2015; 60: 432-445.

Osthaus B., Lea S.E.G., Slater A.M. Dogs (*Canis lupus familiaris*) fail to show understanding of means-end connections in a string-pulling task. Anim.Cogn. 2005; 8: 37-47.

Overall K.L. Manual of Clinical Behavioral Medicine for Dogs and Cats. 2013. Elsevier.

Palestrini C. Situational sensitivities. In: Horwitz, D.F., Mills, D.S. (Ed), BSAVA Manual of Canine and Feline Behavioural Medicine Second edition, British Small Animal Veterinary Association, Quedgeley. 2009. 169-181.

Salmivalli C., Kaukiainen A., Kaistaniemi L., Lagerspetz K.M.J. Self-evaluated self-esteem, peer-evaluated self-esteem, and defensive egotism as predictors of adolescents' participation in bullying situations. Personality and Social Psychology Bulletin. 1999; 25: 1268-1278.

Scheerer, M. Problem solving. Sci. Am. 1963; 208: 118-128.

Shimabukuro C., Putrino N., Helbling J., Tognetti S., Bentosela M. Individual differences in social and non-social behaviors in domestic dogs (Canis familiaris) during the acquisition, extinction and reacquisition of a problem solving task. Behavioural Processes. 2015; 113: 179-186.

Sherman B.L., Mills D.S. Canine Anxieties and Phobias: An Update on Separation Anxiety and Noise Aversions. Vet. Clin. Small Anim. 2008; 38: 1081-1106.

Scott J.P., Fuller, J.L., Genetics and the Social Behavior of the Dog. 1965. The University of Chicago Press, Chicago.

Sugiura Y., Sugiura T. Emotional intensity reduces later generalized anxiety disorder symptoms when fear of anxiety and negative problem-solving appraisal are low. Behaviour Research and Therapy. 2015; 71: 27-33.

Suomi S.J., Kraemer C.M., Baysinger, De Lizio R.D. Inherited and experimental factors associated with individual differences in anxious behavior displayed by rhesus monkey. In anxiety: New research and Changing concept (D.F. Klein and J. Rabkin, eds). Raven press, New York, 1981. 179-200.

Svartberg K., Forkman B. Personality traits in the domestic dog (*Canis familiaris*). Appl. Anim. Behav. Sci. 2002; 79: 133-155.

Svartberg K. Shyness-boldness predicts performance in working dogs. Appl. Anim. Behav. Sci. 2002; 79: 157-174.

Svartberg K. A comparison of behaviour in test and in everyday life: evidence of three consistent boldness-related personality traits in dogs. Appl. Anim. Behav. Sci. 2005; 91: 103-128.

Svartberg K., Tapper I., Temrin H., Radesäter T., Thorman S. Consistency of personality traits in dogs. Anim. Behav. 2005; 69: 283-291.

Thomas O., Lane A., Kingston K. Defining and contextualizing robust sport-confidence. Journal of Applied Sport Psychology. 2011; 23: 189-208.

Topàl J., Miklòsi A., Csànyi V. Dog-human relationship affects problem solving behaviour in the dog. Anthrozoos. 1997; 10: 214-224.

Topal J., Miklosi A., Csanyi V., Doka A. Attachment behaviour in dogs (Canis familiaris): a new application of Ainsworth's (1969) strange situation test. J. Comp. Psychol. 1998; 112: 219-229.

Wilson D.S., Clark A.B., Coleman K., Dearstyne T. Shyness and boldness in humans and other animals. Trends Ecol. Evol. 1994; 9: 442-446.

Zilocchi M., Galligani F., Nava L., Mengoli M. Dog dangerousness test (DDT): preliminary results. Dog Behavior. 2015: 3: 14-22.

I giochi di attivazione mentale come strumento per ridurre la paura di persone estranee nel cane

Marcella Zilocchi[1], Beatrice Carlone[2]

[1] *Dipartimento di Scienze Veterinarie, Università di Pisa - Italia*
[2] *AltreMenti - Italia*

Sintesi

I giochi di attivazione mentale sono spesso consigliati nella terapia comportamentale di cani timorosi per aumentarne la loro sicurezza. In letteratura esistono alcuni studi effettuati sugli animali che dimostrano l'effetto benefico del problem solving.

Lo scopo del presente studio è stato quello di valutare gli eventuali cambiamenti comportamentali in cani timorosi dopo aver partecipato ad alcune sessioni di attivazione mentale.

In totale sono stati coinvolti 17 cani. Tutti i soggetti sono risultati timorosi durante un test comportamentale Fear Behavioral Assessment (FBA), una versione semplificata del Dog Mentality Assessment (DMA), che focalizza la valutazione della paura dei cani verso gli estranei.

Il primo subtest riguarda il contatto sociale con una persona estranea al cane che dapprima si avvicina al conduttore, poi tenta di passeggiare con lui al guinzaglio; il secondo subtest osserva le reazioni del cane davanti ad una persona incappucciata, che si muove e agita una treccia per invitarlo al gioco. Nel terzo subtest appare improvvisamente un manichino lungo il tragitto del soggetto. Nell'ultimo subtest si esamina il comportamento del cane nell'arco di 3 minuti in cui una persona sconosciuta parla con il conduttore senza interagire con lo stesso.

Il punteggio è stato attribuito da 2 valutatori esperti e variava da 1 (estrema manifestazione di timore) a 5 (nessuna manifestazione di timore).

I soggetti risultati timorosi sono stati divisi in: gruppo sperimentale (12 cani: 3 maschi e 9 femmine) e gruppo controllo (4 cani: 2 maschi e 2 femmine). Il gruppo sperimentale ha partecipato a sessioni di attivazione mentale svolte da sperimentatori, con giochi a complessità crescente.

Il numero di sessioni necessarie affinché i cani fossero in grado di risolvere tutti i giochi proposti è stato pari a 6,6 ± 2,6. Le sessioni di attivazione mentale e l'FBA sono stati svolti in due luoghi diversi.

Sessanta giorni dopo il primo test (T_0), i cani appartenenti ai due gruppi sono stati sottoposti nuovamente al test (T_1) per valutare eventuali cambiamenti di comportamento verso gli stimoli proposti.

Per l'elaborazione dei dati è stato utilizzato il test dei segni dei ranghi di Wilcoxon ($p<0,05$).

I cani appartenenti al gruppo sperimentale, dopo le sessioni di attivazione mentale, hanno statisticamente aumentato i punteggi ottenuti in t1 ($W = -91,0$; $p <0,022$), ma ciò non si è verificato nel gruppo di controllo ($W = -1,0$; $p = 0,317$).

Inoltre, il numero di volte che i cani non hanno mostrato alcun segno di timore (punteggio = 5) era statisticamente più alto dopo il trattamento (0 *vs* 9; $\chi^2=6,37$; $p=0,012$).

I risultati di questo studio hanno dimostrato che i cani del gruppo sperimentale, a differenza di quelli del gruppo di controllo, hanno ottenuto dei punteggi statisticamente più alti nel FBA dopo le sessioni di attivazione mentale, il che significa che essi sono risultati meno paurosi.

Questo risultato suggerisce che il miglioramento del gruppo sperimentale potrebbe essere correlato alle sessioni di attivazione mentale e che queste possono essere efficaci nel ridurre la paura degli estranei nei cani.