Dog dangerousness test (DDT): preliminary results

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Abstract: Aggression manifestation in familiar and urban context, where the dog lives, requires careful management as canine aggressions constitute an event which often provokes serious injuries. Our research aim was to develop a test to assess the potential dangerousness of the dog (DDT).

The test was carried out in an open space and it is divided into four phases:

Step 1: Reaction of the dog on the leash towards a stranger.

Step 2: Reaction of the dog when a fake hand is positioned on his head by a stranger.

Step 3: Reaction of the dog to the positioning of the muzzle by the owner.

Step 4: Walking on the leash.

All phases of the test were evaluated separately by two different observers (a veterinarian expert in animal behavior and an expert dog trainer). To evaluate the efficacy of the test, two groups of dogs were selected: the first group was composed of dogs classified by their respective owners as non-aggressive dogs (n. 12 dogs), while the second group was composed of dogs that were potentially dangerous (n. 11 dogs) towards strangers in a public environment.

Statistical analysis performed on the test scores of the dogs in group 1 and 2 showed a significant difference concerning the total score assigned to each subject (U=0.000; p=0.000) and in relation to step 1 (U=36.00; p=0.010), the step 2 (U=0.00; p=0.000) and the step 3 (U=36.00; p=0.010), but not for the step 4 (U=60.00; p=0.269).

Based on the results obtained it was possible to create an evaluation grid where dogs are divided, according to the behavior exhibited in the test, in three categories: Category A: not aggressive dogs; Category B dogs with reduced aggressiveness; Category C: dogs with potentially high aggressiveness.

The test allows users to carry out a rapid screening of animals suspected to be potentially dangerous, to put in place all necessary measures to avoid accidents and then send the dog to a specialist.

Key Words: behavioral test; aggression; dog.

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Introduction

Aggression can be considered to be an adaptive feature because individuals appropriately expressing it earn access to particular resources and have greater success in spreading their genetic make-up. However, its manifestation in familiar and urban context, where the dog lives, requires careful management as canine aggressions constitute an event often provoking serious injuries.

In the context of public health protection, some forms of aggression management (such as aggression towards people, which occurs more frequently in an urban environment), are particularly important. Fear aggression is easily triggered outdoors, especially when the dog is on the leash, and therefore unable to effectively avoid the triggering stimulus (Luescher &, Reisner, 2008). This is because the owner is often unable to understand the dog's calming signals (Gazzano et al., 2014). Protective and irritation aggression are also very frequent (Overall, 2001).

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Canine aggression is relevant for two reasons. Firstly, if directed towards people, it constitutes a public health problem, and if it is associated with a behavior problem, this is one of the main causes for relinquishment or euthanize (Overall, 2001). This is also the most frequent reason why dog owners require a behavioral consultation (Voith, 1981; Wright & Nesselrote, 1987; Landsberg et al., 2013; Berzon et al., 1972). Secondly we must not ignore the psychological injury: the victims of canine aggressions show signs of post-traumatic stress for many months after the accident (Schalamon et al., 2006). Also the origin of people's phobias against dogs and cats, which represent 36% of human phobias, could be related to traumatic events occurred during childhood. (Schalamon et al., 2006; Rentz et al., 2006).

Research shows that dogs are responsible for 60-95% of cases of bites inflicted by animals to people (Berzon et al., 1972; Matter et al., 1998; Quiles et al., 1998; Palacio et al., 2008) and Guy showed that the most aggressive dogs were mainly old, small size dogs with anxiety and fear problems (Guy et al., 2001).

This evidence clearly points to the need to prevent aggressive episodes in the urban context. The aim of this research was to develop a behavioral test to assess the potential danger of a dog towards people (DDT).

Subjects, materials and methods

In order to assess the potential danger of a dog in the urban environment, a test was developed, which recreates the most frequent situations where aggression towards people occurs.

The test was carried out in an open space, and is divided into four phases:

Step 1: Reaction of the dog on the leash towards a stranger

All "dog-owner" couples tested were placed in the same place and position. The owners are instructed to avoid pulling the leash and seeking interaction with the animal, and encouraged to leave him completely free to express his behaviors. The animal is then approached by a person he has never seen before: the person walks in a straight line directly in front of him, stopps at a distance of 1.5 m from the subject and stares at him for 5 seconds.

Step 2: Reaction of the dog when a fake hand is positioned on his head by a stranger

At the end of Step 1, the stranger puts a fake hand on the dog's head, holding it there for 5 seconds.

Step 3: Reaction of the dog to the positioning of the muzzle by the owner

After Step 2, the owner places a basket muzzle on his dog, who must maintain it for 5 seconds. If the first attempt fails, the owner can try again to a maximum of 5 times.

Step 4: Walking with the dog on the leash

The owner walks with the dog on the leash along a pedestrian street for 12 m, in an urban environment.

For each phase of testing, the behavior of the dog is evaluated according to the scheme shown in table 1.

Table 1. Test evaluation sheet.

Step 1: Reaction of the dog on the leash towards a stranger	
The dog is calm	1
The dog avoids the person without threatening	2
The dog has a fearful or threatening behavior (horripilation, stiffening, staring, growling, barking, teeth exposure…)	3
The dog attempts to bite	5
Step 2: Positioning of a fake hand on the dog's head	
The dog is calm	1
The dog has a fearful or threatening behavior (horripilation, stiffening, staring, growling, barking, teeth exposure…)	5
The dog attempts to bite	7
Step 3: Positioning of the muzzle by the owner	
Easy placing without dog's rebellion	1
The dog struggles or freezes	2
Difficult placing (the dog growls, attempts to bite)	3
Step 4: Walking on the leash with the owner in an outdoor environment	
The dog does not pull at the leash and is calm	1
The dog pulls at the leash, is agitated and difficult to control	2
Total	

To evaluate the efficacy of the test, two groups of dogs were selected: the first group was composed of dogs classified by their respective owners as non-aggressive dogs (n. 12 dogs), while the second group was composed of dogs that were potentially dangerous (n. 11 dogs) towards strangers in a public environment.

All dogs were visited by a veterinary behaviorist who confirmed owner's evaluation.

The test was video-recorded and evaluated separately by two different observers (a veterinarian expert in animal behavior and an expert dog trainer). During video analysis, the observers did not know the group to which the dog belonged.

The two sets of coding were compared by using a concordance index (CI = observed number of agreements / total observations).

Table 2. Group 1, dogs with a non aggressive behavior.

Dog	Age (years)	Gender	Breed
1	1,5	Female	Golden Retriever
2	9	Castrated male	Golden Retriever
3	1,5	Female	Golden Retriever
4	9	Male	Sharp-Pei
5	5,5	Castrated female	Mongrel
6	1	Female	Flat Coated Retriever
7	5	Female	Dobermann
8	4	Female	Golden Retriever
9	4	Female	Dogue De Bordeaux
10	2	Female	Dogo
11	7	Female	Golden Retriever
12	7,5	Male	Golden Retriever

Table 3. Group 2, dogs with an aggressive behavior towards strangers in an urban environment.

Dog	Age (years)	Gender	Breed
1	4	Male	Mongrel
2	3	Castrated female	Mongrel
3	4	Male	Mongrel
4	1,5	Female	Mongrel
5	1,5	Female	Mongrel
6	1,5	Male	Mongrel
7	6	Castrated female	Mongrel
8	5	Castrated female	Mongrel
9	3	Male	American Pit Bull
10	3	Castrated male	Mongrel
11	5,5	Male	Mongrel

The data of subjects belonging to the two groups are shown in Tables 2 and 3. Statistical analysis was performed by using the Mann-Whitney test.

Results

The scores of the test for group 1 and 2 and the relative IC between Veterinarian (DVM) and Dog Trainer (DT) are presented in tables 4 and 5.

Because a high correlation between the evaluations performed by the veterinarian and the dog trainer was found, the veterinarian's score set were selected as a base for statistical analysis.

Statistical analysis performed on the test scores of the dogs in group 1 and 2 showed a significant difference concerning the total score assigned to each subject (U=0.000; p=0.000) and in relation to step 1 (U=36.00; p=0.010), the step 2 (U=0.00; p=0.000) and the step 3 (U=36.00; p=0.010), but not for the step 4 (U=60.00; p=0.269).

Table 4. Test scores obtained by the dogs in Group 1 and IC between DVM and DT.

	Test 1		Test 2		Test 3		Test 4		Total score	
Dog	**DT**	**DVM**	**DT**	**DVM**	**DT**	**DVM**	**DT**	**DVM**	**DT**	**DVM**
1	1	1	1	1	1	1	1	1	4	4
2	1	1	1	1	1	1	1	1	4	4
3	1	1	1	1	1	1	1	1	4	4
4	1	1	1	1	1	1	1	1	4	4
5	1	1	1	2	1	2	1	1	4	6
6	1	1	1	1	1	1	1	1	4	4
7	1	1	1	1	1	1	1	1	4	4
8	1	1	1	1	1	1	1	1	4	4
9	1	1	1	1	1	1	1	1	4	4
10	1	1	1	1	1	1	1	1	4	4
11	1	1	1	1	1	1	1	1	4	4
12	1	1	1	1	1	1	1	1	4	4
IC	**100%**		**90,90%**		**90,90%**		**100%**		**90.90%**	

Table 5. Test scores obtained by the dogs in Group 2 and IC between DVM and DT.

	Test 1		Test 2		Test 3		Test 4		Total score	
Dog	**DT**	**DVM**	**DT**	**DVM**	**DT**	**DVM**	**DT**	**DVM**	**DT**	**DVM**
1	2	1	5	5	3	3	1	1	11	10
2	2	2	5	5	1	2	1	1	9	10
3	2	2	5	5	1	1	1	1	9	9
4	1	1	7	7	1	1	1	1	10	10
5	1	1	5	5	1	1	1	1	8	8
6	1	1	7	7	1	1	1	1	10	10
7	3	3	7	5	3	3	1	1	14	12
8	1	1	5	5	2	2	1	1	9	9
9	1	1	7	5	2	2	1	1	11	9
10	3	3	7	7	2	2	2	2	14	14
11	1	1	5	5	1	1	1	1	8	8
IC	**81.80%**		**81.80%**		**90.90%**		**100%**		**63.60%**	

Based on the scores obtained by the dogs in the test, it is possible to create an evaluation grid where dogs are split into three categories; Category A: not aggressive dogs; Category B: dogs with reduced aggressiveness; Category C: dogs with potentially high aggressiveness. For these three different categories, particular prescriptions can be given to the owners (Table 6).

Table 6. Prescription sheet for dogs from the three categories.

Score	Prescriptions
Score until 7	**Category A: not aggressive dog** A normal dog management permits avoiding undesiderable behaviors.
Score between 8 and 11	**Category B: dog with reduced aggressiveness** In some situations, the dog can express a fearful behavior that could evolve into an aggression if not properly controlled. It is advisable to accustom the dog to wearing a muzzle in crowded and noisy places. Where necessary, basic training should be improved.
Score between 12 and 17	**Category C: dog with elevated aggressiveness** The dog is required to be on the leash and to wear a muzzle in and public places, careful control of the interactions with the dog. The dog will be visited by a veterinary behaviorist for the planning of a behavioral modification. Dog interactions (eg. avoid contact with children or people at risk) should be carefully controlled.

The dogs from group 1 were all in category A. Of the dogs from group 2, 9 were in category B and 2 in C.

Discussion

The evaluation of a dog's aggressiveness is always a very sensitive issue, because of the difficulty in finding a reasonably reliable scientific method that can predict the behavior of the animal in particular situations. Behavior complexity makes it difficult to devise a test that is comprehensive and

exhaustive. A significant number of studies has focused on the development of dog behavioral evaluation that can provide the means for preventing aggression, both towards people or other animals.

It is clear that only a clinical consultation performed by a veterinarian behaviorist, can provide reliable evidence for evaluating a behavior and offer useful advices to the owners since puppyhood (Gazzano et al., 2008); however, consultations are costly, time consuming and not always easily achievable when it is necessary to take an immediate decision.

Bearing in mind these difficulties, the aim of the research was to create a test of simple and rapid execution that allows screening dogs with potentially dangerous reactions.

The test was designed with a focus on a particular aspect of dog behavior, namely the aggressiveness of the animal against strangers in an urban environment. The test was designed as a tool to support security in public places, where dogs can display dangerous behavior. Although many aggressions occurs within the house (Landsberg et al., 2013), great attention has always traditionally been given to aggressive behavior in urban environments, as evidenced by the recurrence of ministerial ordinances.

The second step was to realize a reliable test. For this reason, the behavioral assessment in the test was carried out by two people, a Veterinarian behaviorist and a Dog Trainer. The high correlation between the scores of the two experts allows us to hypothesize that test results are not easily subjected to misinterpretation.

The high correlation between the judgments permits us to state that, within specific circumstances, the test can be predictive of the dog behavior. The dogs in group 1 are, indeed, all included in category A, while of the dogs in group 2, 9 are in category B and 2 in category C. The test, allows users to carry out a rapid screening of animals suspected to be potentially dangerous, to put in place all necessary measures to avoid accidents and, subsequently, send the dog to a specialist.

Through steps 1 and 2, the test highlights reactions that are mainly those related to aggression by fear, possessive and irritation.

The frontal and fast paced approach to the dog can trigger a defensive reaction by the animal that can react with both avoidance and aggression. Avoidance behavior may seem harmless, but it should not be underestimated because it shows a state of fear of the animal. It is known as by the avoidance, for a process of instrumentalization, it can easily get to aggressive behavior, which is more profitable for the dog in solving the situation (Dehasse, 2006). The instrumentalization is a psychological process that allows to select behavioral effective responses, prompt and free of emotional involvement, at least in the early stages (Mege, 2006).

Possessive aggression can easily occur inurban environments, where very often strangers try to approach dog owners to greet (Overall, 2001).

As far as aggressiveness of irritation is concerned, this is characterized by a particular reactivity of the animal to certain behaviors of the person, such as the attempt to place a hand on the head.

Steps 3 and 4, on the other hand, test the owner's ability to control the dog: over recent years, numerous ministerial laws have listed the provision under which dogs must wear a muzzle at the request of the competent authority. It is therefore advisable that the dog is accustomed, with gentle methods, to wear a muzzle.

Even though a significant difference between the two groups of dogs was not detected in relation to this aspect, proper conduct on a leash, i.e. the dog walks beside the owner without pulling on the leash, is in itself an important way of exercising control over the animal. Further researches will be necessary to check how long the test results continue to remain valid for. It is clear that behavior is subject to changes, sometimes rapid and often sudden and difficult to explain. This is particularly true for aggressiveness, as this type of behavior can occur suddenly, consequently to the aforementioned phenomenon of instrumentalization and anticipation (i.e. a learning process which allows the animal to react in advance with respect to the appearance of the stimulus that he is familiar with Mege, 2006).

It will also be necessary to verify in practice the incidence of "false negatives", i.e. the number

of those dogs with a previous history of aggression that could escape the categorization given by the test.

Despite these limitations, the test can provide information to screen dogs' behavior, offering more information for the competent authorities to issue appropriate management rules.

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DDT: risultati preliminari di un test per la valutazione della pericolosità del cane

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Sintesi

L'aggressività può essere considerata una caratteristica adattativa poiché gli individui che la manifestano in modo appropriato si guadagnano l'accesso a particolari risorse ed hanno maggiore successo nel diffondere i propri geni. La sua manifestazione nel contesto familiare ed urbano, in cui il cane vive, richiede però un'attenta gestione in quanto le aggressioni canine costituiscono un evento causa di gravi lesioni.

Scopo della presente ricerca è stato quello di mettere a punto un test comportamentale per valutare la potenziale pericolosità del cane nei confronti delle persone.

Il test, effettuato in uno spazio aperto, è suddiviso in 4 fasi:

Fase 1: Reazione del cane, mentre è al guinzaglio, all'avvicinamento di un estraneo
Le coppie "cane-proprietario" erano collocate tutte nel medesimo luogo e posizione. I proprietari erano fermi, senza tendere il guinzaglio né cercare l'interazione con l'animale, ma lasciandolo completamente libero di esprimere i comportamenti. Una persona estranea al cane effettuava l'approccio all'animale, avvicinandosi con una traiettoria diretta e frontale, fermandosi ad una distanza di 1,5 m dal soggetto e fissandolo per circa 5 secondi.

Fase 2: Reazione del cane al posizionamento sulla testa di una mano finta da parte dell'estraneo
Alla fine della primo sub-test l'estraneo posizionava una mano finta sulla testa del cane, mantenendola per 5 secondi.

Fase 3: Reazione del cane al posizionamento della museruola da parte del proprietario
Terminato il secondo sub-test, il proprietario poneva la museruola a canestro al proprio cane, il quale la doveva mantenere per 5 secondi consecutivi. Qualora il primo tentativo fallisse il proprietario poteva riprovare fino ad un massimo di 5 volte.

Fase 4: Passeggiata al guinzaglio
Il proprietario e il cane eseguivano una passeggiata al guinzaglio lungo un tratto di strada, di 12 m.

Per la valutazione dell'efficacia del test sono stati selezionati 2 gruppi di cani, identificati come cani non aggressivi (gruppo 1, n. 12 cani) o, al contrario, potenzialmente pericolosi (gruppo 2, n. 11 cani) dai rispettivi proprietari, esperti in comportamento canino, e confermati da un medico veterinario esperto in comportamento.

Tutte le fasi del test sono state videoriprese e valutate separatamente da due diversi osservatori (un Medico Veterinario esperto in comportamento animale ed un Istruttore Cinofilo di comprovata esperienza e preparazione teorica). Per ogni fase del test il comportamento del cane è stato valutato secondo lo schema riportato in tabella.

Fase 1: Reazione del cane al guinzaglio all'avvicinamento di un estraneo	
Resta tranquillo	1
Si ritrae senza minacciare	2
Comportamento di timore e/o minaccia (orripilazione, irrigidimento, fissità, ringhi, mostra i denti, abbaia…)	3
Tenta di mordere	5
Fase 2: Posizionamento di una mano finta sulla testa del cane	
Il cane è tranquillo	1
Il cane è spaventato e/o minaccia (orripilazione, irrigidimento, fissità, ringhi, mostra i denti, abbaia…)	5
Il cane tenta di mordere	7
Fase 3: Posizionamento della museruola da parte del proprietario	
Posizionamento facile senza che il cane si ribelli.	1
Il cane si divincola o si immobilizza	2
Posizionamento difficile (il cane ringhia, tenta di mordere)	3
Fase 4: Condotta al guinzaglio, da parte del proprietario, in ambiente esterno	
Il cane non tira al guinzaglio ed è tranquillo	1
Il cane tira al guinzaglio, è agitato e poco controllabile	2
Punteggio totale	

I risultati delle valutazioni del medico veterinario e dell'istruttore, sono stati confrontati utilizzando l'Indice di Concordanza (IC = numero di accordi osservati/n° totale di osservazioni).

L'analisi statistica effettuata sui risultati del test dei cani del gruppo 1 e 2 ha mostrato una differenza significativa, riguardante il punteggio totale attribuito ad ogni soggetto (U=0,000; p=0,000) e relativamente al sub-test 1 (U=36,00; p=0,010), il sub-test 2 (U=0,00; p=0,000) e il sub-test 3 (U=36,00; p=0,010), ma non per il sub-test 4 (U=60,00; p=0,269).

La concordanza elevata tra i giudizi dei due esperti permette di ipotizzare che la lettura dei comportamenti oggetto dei test non sia soggetta ad errori di interpretazione.

In base ai risultati ottenuti è stato quindi possibile creare una griglia di valutazione che permette di suddividere i cani, in base al comportamento esibito nel test, in 3 categorie: categoria A cani non aggressivi; categoria B cani ad aggressività ridotta; categoria C: cani ad aggressività potenzialmente elevata. In tabella sono riportate le prescrizioni consigliate per ogni categoria di cani.

Range di punteggio	Prescrizioni
Punteggio totale fino a 7	**Categoria a: cane non aggressivo** La normale gestione del cane permette di prevenire comportamenti indesiderati.
Punteggio totale tra 8 e 11	**Categoria b: cane ad aggressività ridotta** In alcune situazioni il cane può esprimere un comportamento di minaccia che potrebbe evolvere verso una strumentalizzazione qualora non adeguatamente controllato. Si consiglia di abituare il cane ad indossare la museruola senza difficoltà in ambienti affollati e rumorosi. Migliorare, se necessario, l'educazione di base.
Punteggio totale tra 12 e 17	**Categoria c: cane ad aggressività elevata** Obbligo di guinzaglio e museruola in locali e luoghi pubblici, indicazioni precise per il controllo delle interazioni con il cane. Il cane sarà avviato ad una valutazione di un medico veterinario esperto in comportamento animale per la programmazione di un percorso terapeutico. Saranno date indicazioni precise per il controllo delle interazioni con il cane (es. evitare contatto con bambini o persone a rischio).

Tutti i cani del gruppo 1 sono rientrati nella Categoria A mentre tra quelli del gruppo 2, 9 appartengono alla Categoria B e 2 alla Categoria C.

Ulteriori ricerche saranno necessarie per verificare per quanto tempo i risultati del test mantengano la loro validità. È evidente che il comportamento è soggetto a cambiamenti a volte rapidi e spesso improvvisi e di difficile spiegazione. Questo è particolarmente vero per il comportamento aggressivo che può manifestarsi improvvisamente per il già citato fenomeno della strumentalizzazione e dell'anticipazione, processo di apprendimento, quest'ultimo, che permette all'animale di reagire in anticipo rispetto alla comparsa dello stimolo che già conosce.

Sarà inoltre necessario verificare nella pratica l'incidenza dei "falsi negativi", ovvero di quei cani con una storia di aggressività alla spalle e che potrebbero sfuggire alla categorizzazione proposta dal test.

Pur con queste limitazioni il test fornisce indicazioni per effettuare uno screening del comportamento del cane, fornendo alle autorità competenti maggiori informazioni per la promulgazione di regole adeguate di gestione.