



UNIVERSIDADE DE LISBOA
Faculdade de Medicina Veterinária

**ASSESSING DOGS USING A TEMPERAMENT TEST – WILL
TRAINING AFFECT THE OUTCOME? A TEST-RETEST TRIAL
AS A FORENSIC TOOL**

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Acknowledgements

I would like to start off telling you about an incident that happened to me on one of my frequent dog-crowded walks across the Alentejo countryside. It was a lovely afternoon until one of my Pit Bull bitches (who was having a particularly “bitchy” day) had a minor but majorly noisy physical disagreement with one of the dogs belonging to our neighbor, a cattle herder. I went in the *melée* with all the stress of a Pit Bull owner who cannot put one wrong foot on the line, much less have a dog exhibiting anything less than super-social behaviour, and positively fell apart in apologies and high-strung offers of help and veterinary care. Of course the other dog was fine, it was one of those squabbles with a lot of drool and no blood, and the cattle herder, who had not even let go of his staff, drawled in the untranslatable Alentejo accent:

“Oh menina... dêixe lá isso, sã cães” (*Lassie, leave it, they’re dogs...*)

And that is an important lesson to bear in mind... after all theories and studies, behaviour modification protocols and seminars, after all books, exchange of ideas and training tips, dogs are dogs and we also have to accept them as such, and love them as such, and sometimes – many times – we just have to take it easy and relax.

Having said this, my journey across veterinary medicine has been incredibly rewarding, filled with learning and humble pie, while I, a die-hard bookworm and language freak, struggled to come to terms with some much neglected areas of my left-side brain: Logics. Analysis. Mathematics. Scientific rigor. Sequencing facts – oh, it was hard!

I could not have completed this thesis without the help of many people – they say it takes a village to raise a child, well, it definitely took quite a crowd to birth this baby with all that lead up to it!

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My Omi Gisela who sadly did not live to see me become a vet, but who always showed great trust in me, I hope they let her read this, where she is now, she is one of my few role-models. To my Auntie Erika, a force of nature – Du wirst 100!

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To Carlos for being a rock and never letting us down.

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Winston has been with me through it all, and though he is “just” a dog, today a slightly oldish, slightly chubby Pit Bull he has influenced my path in ways I never imagined. I will not dedicate my thesis to you, my shoomi-dawg, as you don't care about papers, but you have my heart and my arm for as long as I can throw Frisbees and you can catch them.

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With love, for animals, but also for people. Always.

Abstract

Temperament Tests can be a forensic tool as they are often used to clarify legal cases in which dogs were allegedly involved in circumstances of aggression towards humans or other dogs. The test used in this study, the standardized temperament test of Lower Saxony, a battery type test of 36 situations scaled from 1-7 aims to identify those dogs that show disturbed or inadequate aggression at the point of the evaluation. To be able to use this test as a forensic decision making tool it is important to understand if aggressive behaviour shown in the test can be altered through training. The records of all Temperament Tests applied at the Hamburg Shelter since 2006 to 2016, a total of 264 were analysed. From these records, the dogs that were subject to two Temperament Tests were chosen: n= 28 dogs. These dogs had been subject to a first Temperament Test at the Shelter, were trained, and then took a re-test. The 36 situations comprising the test were bundled into 5 sub-groups of situations evaluating similar circumstances and the results of the first and the second temperament test were analysed applying a paired Wilcoxon signed rank test with continuity correction. The training the dogs had been subject to in the meantime was taken into consideration. The average values in two of the five bundles were lower in the second temperament test: in the bundle of situations where the dogs had to interact with threatening humans the average value went from 1.64 in the first test to 1.39 in the second test (P=0.03) and in the bundle of situations of dog-dog contact, the average value went from 1.98 in the first test to 1.53 in the second test (P=0.02). These results suggest that training does have an effect on the aggressive behaviour shown in some test situations. 23/28 dogs, 82,1%, passed the second Temperament Test after being trained at the shelter. Practical implications and future applicability of the test are discussed.

Keywords: Temperament Test, Personality, Aggression, Breed Specific Legislation, Training, Behaviour Stability.

Resumo

Testes de Temperamento podem ser uma ferramenta forense uma vez que são frequentemente utilizados para esclarecer casos legais nos quais cães alegadamente estiveram envolvidos em circunstâncias de agressão contra humanos ou outros cães. O teste utilizado neste estudo é o teste de temperamento estandardizado da Baixa Saxónia, na Alemanha. Este teste é constituído por uma bateria de subtestes, 36 situações avaliadas numa escala de 1-6 e pretende identificar aqueles cães que mostrem agressividade perturbada ou inadequada no momento da avaliação. Para poder utilizar este teste como ferramenta para tomar decisões forenses, é importante compreender se o comportamento agressivo mostrado no teste pode ser alterado através de treino. Foram analisados os resultados de todos os Testes de Temperamento aplicados no Abrigo de Hamburgo desde 2006 até 2016, um total de 264. Deste conjunto de dados foram selecionados todos aqueles cães que, por alguma razão, repetiram o Teste de Temperamento: $n=28$. Estes cães foram sujeitos a um primeiro Teste de Temperamento no abrigo, foram treinados e voltaram a ser testados. As 36 situações constituintes do teste foram agrupadas em cinco subgrupos de situações que avaliam circunstâncias similares e os resultados agregados do primeiro e segundo teste foram comparados utilizando um teste de Wilcoxon emparelhado e relacionados com o treino ministrado entretanto. O valor das médias de dois dos cinco subgrupos foram inferiores no segundo teste: no subgrupo de situações em que os cães tinham de interagir com humanos que agiam de forma ameaçadora o valor da média alterou-se de 1.64 no primeiro teste para 1.39 no segundo ($P=0.03$) e no subgrupo de interação cão-cão o valor médio alterou-se de 1.98 no primeiro teste para 1.53 no segundo ($P=0.02$). Estes resultados sugerem que o treino influencia o comportamento agressivo demonstrado em algumas situações do teste. Para além disso, 23/28 cães, 82,4%, passaram no segundo Teste de Temperamento. Foram discutidas implicações práticas e a aplicabilidade futura deste teste.

Palavras-chave: Teste de Temperamento, Personalidade, Agressividade, Potencialmente Perigosos, Treino, Estabilidade Comportamental.

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List of abbreviations and symbols

% - percentage

BSL – Breed-Specific Legislation

DDA – Dangerous Dog Act

DNA – deoxyribonucleic acid

DVM – Doctor Medicinae Veterinariae

e.g. – exempli grati (for example)

ESVCE – European Society of Veterinary Clinical Ethology

GefTVO – Gefahrtier Verordnung

i.e. – id est (that is)

MSS – Magister Scientiae

NHundG – Niedersächsische Gesetz über das Halten von Hunden

Nr – number

PDDBSL – Potential Dangerous Dog Breed-Specific Legislation

P.h.D. – Philosophiae Doctor

PCT – Personal Care Taker

T. (1-10) – Training item

T.T. – Temperament Test

TiHo – Tierärztliche Hochschule Hannover

SAB – Socially Accepted Behaviour

SICAFE – Sistema de Registo de Canídeos e Felinos

Sit – Situations

VDH – Verein für das Deutsche Hundewesen

h - hours

Chapter 1 – Internship Report

1.1. Time and Place

The internship of my Veterinary Medicine degree took place in Hamburg, from January to March 2016, comprising a total of 500 hours. In Hamburg I had the pleasure of working with Doctor Barbara Schöning, DVM, MSc, PhD, board-certified specialist in animal behaviour, animal welfare, behavioural medicine; and Doctor Kerstin Röhrs, DVM, board certified specialist in animal behaviour and behavioural medicine. They both run the behavioural practice and dog training school “Struppi&Co”, a referral practice for behavioural cases, assessments in welfare cases and cases concerning PDDBSL in Germany. Most behavioural cases come to the practice for a first evaluation, and patients are brought in from as far as 300 km away. Alternatively home visits or appointments in the training area can be scheduled to evaluate or help with the outdoor training difficulties. Puppy classes and beginners courses run in different time schedules every day of the week and are also attended by trainee trainers or veterinary students.

Aside from the time spent at the behavioural practice and dog training school, another important place in my traineeship was the humane shelter in Hamburg, the *Hamburger Tierschutzverein von 1841 e.V.*, which is a major institution with more than 4000 members and 80 employees, receiving more than 10.000 animals a year, including numerous wild animals and exotic species. The operating costs of over 5 million euros are entirely financed through charitable donations, membership fees and inheritances.

1.2. Direct Traineeship Supervisor in Hamburg

My direct traineeship supervisor while in Hamburg was Doctor Barbara Schöning, MSc PhD, a dedicated professional *avant-garde* scientist and veterinary neurophysiologist who is renowned throughout the scientific community. Karen Pryor even credits Schöning with being the one who drew her attention to the relationship between clicker training and research on stimuli and the limbic system. Doctor Barbara Schöning has been a member of the presidial board of the Hamburg chamber of veterinarians since 1994, and was its president from 1998-2006. Aside from this, she has been a member of the presidial board of the German chamber of veterinarians from 1999 – 2003. She is a

member of an expert group of the German Society for Animal Behaviour Counselling, and as such has been designing and running a course for veterinarians for further education in behaviour counselling. Since 2001 she is also a member of the examination committee for veterinarians gaining the board qualifications “behaviour counselling”, “animal behaviour” and “animal welfare” in the German states of Lower Saxony, Hesse, Schleswig-Holstein and North-Rhine Westphalia. Doctor Schöning is a member of the scientific advisory board of the *German Kennel Club (VDH, Verein für das Deutsche Hundewesen)*, and together with Doctor Kerstin Röhrs designed a “temperament test for adult service dogs” on behalf of the Austrian society for handicapped people, funded by the Austrian Ministry of Social Affairs, in 2004. Also, she is a board member of the European Society for Clinical Veterinary Ethology (ESVCE) since 2008, and its president since 2010. Doctor Schöning quite often collaborates with governmental services, as an expert witness at court in cases concerning animal behaviour, behaviour problems and animal welfare since 1996. She is also a member of the expert group nominated by the Ministry of Agriculture of Lower Saxony to deal with the “dangerous dog problem”. This group also developed the official Temperament Test which is the subject of this study. Since 2000, Doctor Schöning has been a member of the expert group nominated by the Ministry of Agriculture of Germany to deal with “pain inflicting dog-training devices” and of the group dealing with matters of dog-keeping and expert advising in matter regarding aggressive dogs or PDDBSL. Besides these activities, she has authored numerous books on animal behaviour and training, is a prolific international lecturer and owns two beautifully trained Rhodesian Ridgebacks.

1.3. Activities during the Traineeship

During my traineeship I had the opportunity of getting hands on experience in all sectors of activity of the practice, as well as good insight into how a veterinary practice focused on behavioural medicine works. I accompanied the various behavioural consultations, taking notes and writing reports we later on discussed in group sessions with Doctor Schöning and the other trainees. The consultations had various motives and covered a panoply of behaviour problems such as aggression towards humans and other dogs, excitability, barking, misdirected prey-drive, separation anxiety, fearfulness and phobias, destructive behaviour and house-soiling. Besides the behavioural consultations we had

the opportunity of taking part in the official Temperament Tests for the city of Hamburg, videotaping and serving as an intervening “strange” human whenever such was required in the test situations. I also took part in the organization of the puppy classes and beginners’ courses, with increasing levels of involvement. From week two onwards I was allowed to contribute in helping the owners with their questions about puppy related issues and lead some obedience exercises, always under supervision of one of the veterinarians. Aside from these practical sessions, the trainees also had question time, during which any subjects of training or behavioural medicine on which further clarification was needed, could be discussed, which was very helpful. The other part of my traineeship took place at the humane shelter in Hamburg, the *Hamburger Tierschutzverein von 1841 e.V.*, where aside from focusing on the material related to my study, (namely the information on Temperament Tests performed on dogs since their earliest use in this facility), I integrated a team of trainers and other staff in the daily activities. I also had the opportunity of taking part of the data collection process for a group housing study using an ethogram, which was very elucidative of the ethologic analysis in behavioural studies.

My supervisor in Portugal was Professor Doctor Gonçalo da Graça Pereira DVM, MsC, PhD, Dip ECAWBM (BM), European Veterinary Specialist in Behavioural Medicine (Companion Animals). Professor Gonçalo is a member of the European College of Animal Welfare and Behavioural Medicine, as well as the President of PsiAnimal – Portuguese Association of Behavioural Therapy and Animal Welfare, Vice-President of the European College of Animal Welfare and Behavioural Medicine (ECAWBM) and Vice-President of the European Society of Veterinary Clinical Ethology (ESVCE). He is a prolific trainer and speaker in seminars, conferences and congresses both nationally and internationally, author, co-author and coordinator of several studies in animal behaviour and welfare in Portugal and always has an open ear for the concerns of his students and their academic welfare.

Chapter 2 - Introduction

When looking at the modern use of the word “forensic”, we realize that it relates to, and is used as a synonym of, something related to “legal action” or “related to courts”. In veterinary medicine, forensic information is all information that, being specific to the veterinary field, is deemed useful for cases involving animals in courts of law (Reisman, 2013). This definition is a broad one, and can include various topics: the information described as forensic evidence is not determined by the type of information itself, but by the fact that it serves to explain or clarify circumstances related to the animal in a court of law. Therefore, forensic evidence could be the follow-up charts of weight gain post recovery from a case of alleged neglect and starvation, the analysis of bite wounds and the odontology of the supposed aggressor or a microchip used to establish “ownership” (Reisman, 2013). In this dissertation, we are going to look at Temperament Tests or behaviour assessments of dogs, and how these can be forensic tools: Shelters are frequently faced with situations involving animals that are in one way or another subject to legal actions, be it because they are taken in from situations of hoarding and/or neglect, victims of abusive owners or abusive third parties or because they have been involved in situations of aggression, either toward a human being, or another animal. If legal action is pending, the court may require a behavioural evaluation or a Temperament Test to determine if the dog presents an ongoing threat for society, if and under which conditions it can be re-homed or returned to the owners, or if there seems to be any relation between the behaviour shown in the Temperament Test and that shown, or allegedly shown, in the past (Reid, 2013). In some other cases dogs are taken into custody because they have phenotypical resemblance to banned breeds or breeds subject to Breed-Specific Legislation and the requirements to owning or walking these dogs in public are not met, in which case a lawsuit follows and if the dog is seized and put up for adoption at a latter moment in time, a Temperament Test with the specific purpose of screening for aggression may also be ordered. Applying Temperament Tests to dogs could be one of various possible measures for reducing the numbers of dog-bites. Aside from banning certain breeds, this has been a method applied in many European countries. In the great majority of German states certain breeds are listed and dogs face specific measures (such as being leashed and muzzled while outside) unless they have passed a so-called “Temperament Test for aggression” (Schöning, 2006).

In Portugal, due to the Potential Dangerous Dog Breed-Specific Legislation (PDDBSL), shelters are recurrently faced with the necessity of re-homing dogs belonging to a list of seven breeds established in 2004 (Ministerial Decree nr.422/2004), and also any dog which has been involved or allegedly has been involved in biting incidents. Up to the date, there is no mandatory application of any kind of Temperament Test to these animals, which could be a useful instrument in helping to assess these and other dogs. This fact was painfully brought to conscience of the general public when in 2013 a dog identified as a “pit bull type dog” allegedly killed a toddler, and a protective order was granted, so the euthanasia of the dog could be suspended until the end of the criminal prosecution opened against the parents of the child. There were no established protocols on how to behaviourally assess this dog, or who would have the competences to do so, and an official Temperament Test could have been a valid scientific instrument to cast some more light upon this legal case.

Throughout Germany this kind of test is successfully applied, and the Agricultural Ministry of Lower Saxony clearly states that they must be applied by veterinarians with experience in behavioural therapy or expert knowledge of animal behaviour. This knowledge must be acquired in specific educational programs and training as to assure that the evaluations of the sociability of the dogs is as unambiguous as possible. The author thought it interesting to study how exactly the test is used in a shelter environment and within the scope of the so called “Dangerous Dog Acts”, and, most importantly, what it means for a dog to fail this kind of test.

Does it mean the dog is irrevocably dangerous? Does it mean it should be euthanized? Or can training have such an effect on the dog as to make possible a re-test with a different outcome? This study was outlined to find answers for these questions, as presented and discussed in chapters 6-8.

Chapter 3 – Behaviour and Communication

3.1. A Matter of Individual Fitness

Dogs are endowed with all the natural behaviours of a highly social wolf descendent who solves his problems through displays of more or less ritualized aggression and communicates through body language – in opposition to the simian-descendent human beings who chose vocal communication (Donaldson, 1996; McConnell, 2002) and abstract concepts such as suing someone (Bollen & Horowitz, 2016). This makes communication rather difficult, but if we think about it, humans and dogs do share some important ways of living – they are both highly sociable hunters, with complex communicational systems; they can adapt to the environment and cooperate with other species (Abrantes, 1987). Both dogs and people use acoustic, visual and tactile signals to communicate, and body posture and facial expressions are essential, especially over short distances (Ohl, 1999; Overall, 2013). Over the course of domestication the social behaviour of *Canis familiaris* has been influenced by mankind, and the tendency to interact with humans enhanced, with slight variations across the different breeds (Serpell, 1995). Dogs have developed unparalleled abilities in interpreting and interacting with humans (Hare and Tomasello, 2005). They are quicker in interpreting human visual cues such as pointing gestures than even the much studied great apes (Bräuer et al., 2006) and are sensitive to humans' attention focus (Virányi et al., 2004; Schwab and Huber, 2006). Dogs direct a vast display of communicative behaviours at humans, some of which they do not use amongst themselves (Gácsi et al., 2009), they use social referencing from their owners to interpret stimuli in their environment (Merola et al., 2012), turn to humans to aid them with problems they consider insoluble (Miklósi et al., 2003) and even communicate referentially with them (Miklósi et al., 2000). Of course this communication is not always successful, as our interactions with animals are based on the ability of the animal to translate the signals we are sending into a language or application that is meaningful to them and the animal's response also has to be interpretable for humans. In this process a lot can go wrong and get lost (Overall, 2013) and in the panorama of social closeness in which dogs even assume the role of surrogate children they are often subject to an anthropomorphism which leads to emotionally affected misinterpretations of behaviour (Feddersen-Petersen & Ohl, 1995). But what is, after all, the motivation behind communication and behaviour in general? When talking about dogs, as well as of all other

animals, the term “individual fitness” sums up the three major biological goals, which are 1) Reproduction, 2) Avoidance of harm and 3) Access to resources (Schöning, 2006; Tschanz, 1993). Any living being has the innate impulse of passing on the biggest possible amount of genes into the next generation – not as a way of preserving the species but rather as a way of maintaining its personal genetic information (Dawkins, 1989). The concept of “fitness” refers to this achievement, so the higher the number of offspring (and consequently, of genes) that an animal passes on to the next generation, the higher its fitness (Immelmann, Scherer, Vogel, & Schmoock, 1988; Del Amo, Jones-Baade, & Mahnke, 2001; Miklósi, 2007). To increase its fitness, the animal needs to reproduce, a territory to raise its young, and nutrition (Del Amo et al., 2001). The avoidance of physical harm and the maintenance of enough resources for survival are therefore the two pillars for a successful reproduction and consequently the reason for all action (Tschanz, 1993). Thus, bearing in mind what lies at the origin of behaviour in general, we will now proceed to a short outlay of the canine behavioural repertoire with specific emphasis on aggressive behaviour as part of the agonistic category – as this is the actual point of focus of the Temperament Test when we ask: Does the dog show inadequate aggressive behaviour, or impaired aggressive communication?

3.2. Behaviour Categories

The German ethologist and behaviourist Feddersen-Petersen uses the term “expressive behaviour” (“*Ausdrucksverhalten*”) to define the aggregate of gestures, facial expressions, eye-contact, body postures and vocalizations that the dog uses in a given behavioural context, all of which give us clues about the emotional state, the motivation, and the readiness to engage in behaviour (Feddersen-Petersen & Ohl, 1995; Mittmann, 2002). These behavioural congregates must always be interpreted as a whole, because they incorporate various different signals which according to the context can assume different meanings (Feddersen-Petersen & Ohl, 1995; Immelmann, Pröve, & Sossinka, 1996). For the evaluation of the dog in a Temperament Test it is useful to group behaviours into categories, and for the Temperament Test issued by the Ministry of Agriculture of Lower Saxony the following 6 categories were chosen:

3.2.1. Social Approach

The behaviours grouped together under this title serve the purpose of indicating the individual's own peaceful intentions and to reduce or end agonistic tendencies (Gattermann, 1993). These include all socio-positive (distance reducing) behaviours also called "active submission", such as can be seen from puppies towards adult dogs (e.g. sniffing the fur of the other dog, or licking its face) (Feddersen-Petersen & Ohl, 1995).

3.2.2. Passive Submission

In opposition from active submission in this case the dog showing this behaviour does not approach the partner. It is a reaction to imposing or threatening behaviour and includes head turns (avoiding eye contact) in subdominant posture and rolling onto the back, usually with tucked in tail and spread hind legs (Feddersen-Petersen & Ohl, 1995).

3.2.3. Imposing Behaviour

This is a ritualized behaviour which includes elements from the attacking and fight tendencies, but which lacks the intention for attack seen in threatening displays (Meyer, 1984). Imposing animals make themselves bigger, through piloerection and a prancing gait and such displays as scratching the ground (Immelmann et al., 1996; Röhrs & Schöning, 2013).

3.2.4. Play Behaviour

Behaviour which is not shown in a serious context, it is an opportunity to train muscles, motoric capacities and social roles (Overall, 2013) and it is important for the development of communication and control of aggression (Feddersen-Petersen & Ohl, 1995; Immelmann et al., 1996) and includes such elements as repeated jumps and playbows (Röhrs & Schöning, 2013).

3.2.5. Sexual Behaviour

This behaviour appears related to the heat period of the female dog and the male dog's reaction to it. It includes mounting behaviour and, for the female, the presentation of the vulva, with the tail held sideways (Feddersen-Petersen & Ohl, 1995).

3.2.6. Agonistic

This category includes those behaviours directed at others that disturb or interfere (or are perceived to do so) with those vital requirements such as space, nutrition, reproduction and care for the offspring, etc. (Gattermann, 1993). It is divisible into two sub-categories: Offensive Aggression or attack behaviour, and Defensive Aggression or defense behaviour, including also all elements of flight behaviour (Feddersen-Petersen & Ohl, 1995).

3.3. Aggression as part of Agonistic Behaviour

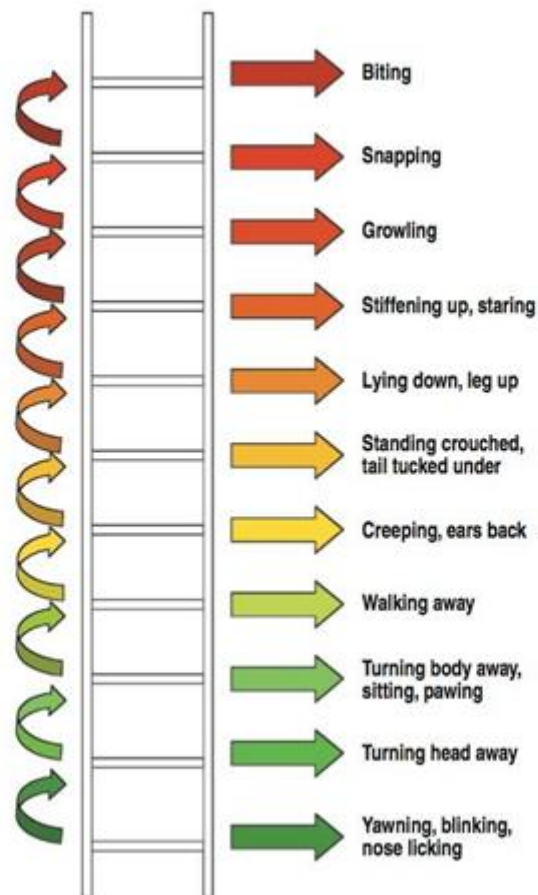
The objective of agonistic behaviour is to increase or maintain the distance between the animal and the (subjectively) threatening element, or to eliminate the threatening element (Del Amo et al., 2001; Mittmann, 2002), which can be achieved through the four “F”s: Fight, Flight, Freeze and Flirt (Röhrs & Schöning, 2013). Fighting serves the purpose of driving away or eliminating the threatening element; Flight is used if the threatening element is near but the animal wants to avoid confrontation; in the situation of Freeze the threatening element is so close that the animal probably does not see a way of avoiding it, thus freezing in the hope of making it through alive; in the case of Flirt the animal tries to defuse the threat through social behaviours or displacement behaviours (Mittmann, 2002).

In the scope of this study, the focus lies on the aggressive behaviour inherent to the Fight option, as this assumes special importance in the Temperament Test. Aggression can be shown intra-species (among members of the same species, such as two dogs) and interspecies (among members of different species, such as between a dog and a person) (Immelmann et al., 1996). Observing the expressive behaviour of a dog allows us to classify the aggressiveness shown as offensive or defensive aggression. Typical behaviours of offensive threatening are creeping up, direct eye contact (staring) and the aggressive stance. Inhibited offensive aggressive behaviour is for example biting over the muzzle. Uninhibited aggressive behaviour includes attacking and biting. Typical defensive threats are air snapping and looking away, inhibited defensive threats are defensive pushing and defensive positioning with curved neck. Uninhibited defensive aggressive behaviour includes defensive biting (Feddersen-Petersen & Ohl, 1995).

3.3.1. The Ladder of Aggression

The following diagram (figure 1) explains the behavioural responses of dogs to threatening environmental stimuli (Sheperd, 2009). The response increases from green to red according to the level of threat perceived by the dog, depending always on the context, and stating that the next step of the ladder is reached if the lower ones including behaviour meant to deescalate the situation and achieve distance from it prove - or have proven in the past - inefficient (Horwitz & Mills, 2009).

Figure 1 – The ladder of aggression: behavioural responses to threatening stimuli (Sheperd, 2009).



3.3.2. Aggression Influencing Factors

According to Jones-Baaden (2001), the aggression influencing factors can be grouped into 4 categories:

- 1 – Predisposition (innate);
- 2 – Experiences during the first weeks of life (socialization) and the daily experiences of latter life (casual experiences and training);
- 3 – Organic reasons (e.g. hormonal status, age, presence of pain or disease);
- 4 - The specific situation in which aggressive behaviour occurs.

Therefore learning – category 2 - has a great effect upon the aggressive behaviour of the dog (Del Amo et al., 2001; Schöning, 2006) and this behaviour has to be understood as an interplay of various external and internal factors related to a situation, and cannot be viewed as a general characteristic of an animal (Feddersen-Petersen, 2000a). Being learning dependent, an animal might exhibit this behavioural response in a certain context and experience success in doing so, therefore very probably resorting to the same behavioural response in future similar situations (Bowen & Heath, 2005; Horwitz & Mills, 2009). This fact must be taken into account in daily interaction with dogs and also while conducting the so called battery tests for temperament testing, as we will see further on.

It is of the utmost importance that we understand aggression as a natural part of dog communication and as an important biologic regulator of social living, for balanced cooperation and competition (Böttjer, 2003), which can never be totally eliminated from the repertoire, and has to be channelled into appropriate forms and subject to coping mechanisms (Schöning, 2006). It is important to recognize the lower levels of discomfort and/or apprehension and act accordingly in order to avoid pushing the dog up on the ladder of aggression (Horwitz & Mills, 2009). Dogs bite for many reasons, therefore we should not assume aggression as an individual personality trait nor use words such as “vicious” or “mean” when describing dogs that have bitten, as those are anthropomorphic and not scientific terms (Schöning, 2000). Aggression is a term that includes a group of behaviours which are not exclusive of this behavioural response, and the response itself occurs during short periods of time in very specific circumstances – it is, therefore not correct to talk about aggressive dogs as such, but of dogs showing aggressive behaviours

in complex and variable emotional conditions (Bowen & Heath, 2005; D. Horwitz & Mills, 2009; Casey, Loftus, Bolster, Richards, & Blackwell, 2014).

3.4. Behaviour Problems

All behaviours that owners find unacceptable assume themselves as behaviour problems, which does not necessarily mean that they are unnatural, but rather that they range from mildly annoying (e.g. digging) to dangerous (e.g. owner directed aggression) (Amat et al., 2009). When the human-dog relationship does not work out as planned, the dog is, quite often, relinquished to a shelter, given away, abandoned or euthanized (Scarlett, Salman, New, & Kass, 2002; Landsberg, Hunthausen, & Ackerman, 2013; Tamimi, Malmasi, Talebi, Tamimi, & Amini, 2013). The most common cause for owner relinquishment are, in fact, behaviour problems and temperament issues (Scarlett et al., 2002; Bollen & Horowitz, 2016). The percentages vary from study to study, but as many as 80 - 90% of the dogs, estimated through owner complaints at the veterinarian, exhibit problems the owners find unacceptable (Vacalopoulos & Anderson, 1993; Tamimi et al., 2013). These behaviours can assume various forms, be it coprophagy, housesoiling, jumping up, inappropriate elimination, predatory behaviours, excessive vocalization or, finally, human or dog directed aggression (Horwitz & Neilson, 2007).

3.4.1. Aggression as a Behaviour Problem

With the increase of this chasm between the former function of dogs in various areas of human life and the present sole purpose of a dog as a companion, the tolerance for formerly thought acceptable behaviour has drastically gone down. Today, behaviours such as territorial aggression, which would have been regarded as normal - and even desirable, in a guard dog - or the intent to chase and herd fast moving targets such as sheep - which would have represented a basic trait of a good working border collie - suddenly assume themselves as “behaviour problems”, unacceptable in family pets and frowned upon by society (Donaldson, 1996). These behaviors, which can assume themselves as problematic or even dangerous in terms of public safety must, of course, be molded or redirected into adequate and safe forms, with the help of qualified

professionals such as dog trainers and/or behaviourist veterinarians (Overall, 2013). In terms of referral to behaviour specialists, aggression towards humans is the most common behaviour problem in dogs, besides being a major cause for relinquishment to shelters (Bamberger & Houpt, 2006) and it is also an important public health concern due to the physical, psychological and financial consequences of bite injuries (Salman et al., 1998; Weiss, Friedman, & Coben, 1998; Peters, Sottiaux, Appelboom, & Kahn, 2004).

3.4.2. Prevention of Behaviour Problems

Considering that behaviour problems are responsible for the major percentage of euthanasias, in fact, more than infectious, metabolic and neoplastic problems combined (Fatjó, Ruiz-de-la-Torre, & Manteca, 2006; Tamimi et al., 2013) veterinarians should most definitely work on the necessity of making them a paramount concern and their prevention the ultimate goal to reduce these euthanasias (Landsberg et al., 2013). Prevention can assume various forms:

a) Reaching the owners, and providing up-to-date, pet-friendly information on how to better understand and communicate with the dog at all levels and improve their physical, mental and emotional well-being, through informative sessions, flyers, lists of informative materials, events in the community or/and pre-adoption counselling services (Marston & Bennett, 2003; Marder & Duxbury, 2008). This must not only involve the veterinarian, but also other members of staff such as nurses or trainers, who explain the basics of learning theories, which behaviours are normal and to be expected according to the dog's age, and how to identify, prevent and/or solve problem behaviours (Landsberg et al., 2013).

b) Socialization/habituation and stimulation: Breeders as well as owners must be aware of the importance of correct and extensive socialization of their puppies, starting as early as 3 weeks and continuing up to 12 weeks with focus on different types of environments, people/well socialized dogs and various pleasant experiences (Landsberg et al., 2013). Attending puppy classes is an important addition to achieve this. Also, promoting a mentally stimulating environment with different objects, toys, activities and interaction in various games for physical and mental stimulation is a factor for reducing later

unwanted behaviours such as excessive vocalization and destructive behaviours (Seksel, Mazurski, & Taylor, 1999; Overall, 2010; Landsberg et al., 2013).

c) The importance of life-long commitment to exercising and mentally stimulating the dog must always be brought to the attention of the owner, as in their absence behaviour problems can develop later in life as well (Seksel et al., 1999; Overall, 2013).

Chapter 4 – Behaviour and Breed

4.1. Breeds & Function *versus* Breed & Looks

Over the course of the centuries, even of the millennia, the importance of breeding dogs lay in their function, and different morphologic traits. Different phenotypes were mainly the reflection of their ability to perform the task they were used for most efficiently, meaning that function was sovereign to form, and reproductive selection was made by choosing those individuals that excelled at what whatever task they were supposed to perform (Seksal et al., 1999; Bradshaw, 2011). This rather reasonable way of selective breeding came to an end around the mid-18th century, when the first dog show took place in England, after which pedigrees were developed and an internationally fixed phenotype became the standard for any individual breed (Seksal et al., 1999; Bradshaw, 2011) . Nowadays, not only has form evolved to be the most important criterion, and the one most breed evaluations are based upon, but the function of the average dog has suffered a dramatic shift, with the use of dogs as companion animals increasing above all other (Svartberg, 2006; King, Marston, & Bennett, 2012). The physical appearance of the dog is very often the criterion of choice, which can lead to increased chances of behaviour problems and mismatches when the new owners fail to inform themselves about the other characteristics of the breed (Marder & Duxbury, 2008). Being companion dogs the most important skill of today's dogs lies in being able to merge into the lifestyle of their owners while satisfying human needs for attention, love, emotional support and companionship, which is a difficult task considering the variety of ways of life chosen by human beings and their variable approach to dogs (Judson, 1995; Gebhardt-henrich, 2002).

4.2. What is a Breed-Specific Legislation?

Pet owners as well as politicians would like to be able to predict the future behaviour of a dog. This would simplify choosing an animal which would most easily fit in with the human family, and, more importantly, allow for the prediction and avoidance of behaviour problems, especially those which pose a threat to humans or other animals, such as aggression (Netto & Planta, 1997; Wilsson & Sundgren, 1997; Diederich & Giffroy, 2006; Stephen & Ledger, 2007). Quite often such predictions are made with basis on supposed breed characteristics. If the law specifically defines a group of breeds and

applies a legislation to this group which is different to that affecting the rest of the dog population, we are facing a so called BSL – a Breed Specific Legislation (Bradley, 2011).

An interesting fact when discussing BSLs is that they greatly vary from country to country, and even from state to state in countries which, like Germany and the USA, have this kind of political division. This fragmentation in terms of Dog Law assumes almost comic proportions when the BSL of adjacent states encompasses different dog breeds. This is the case in Baden-Württemberg and Rheinland-Pfalz, which at one point, close to Mannheim, are connected by a bridge called Konrad-Adenauer-Bridge. When crossing this bridge with a Staffordshire Bullterrier and an English Bullterrier one would have to stop and swap muzzles half-way, because the Stafforshire Bullterrier is listed in Rheinland-Pfalz but the Bullterrier is not (Landtag Rheinland-Pfalz, 2004), while in Baden-Württemberg (LHundG, 2004) it is exactly the opposite.

Analysing the records of the biting statistics from 2011-2015 in Rheinland-Pfalz, which are available on the official website of the Supervision and Service Administration Body of this state, the three breeds listed as irrevocably dangerous in this state are in none of the years coincident with the highest (absolute) numbers of dog bites to either humans or dogs. Unfortunately, there is no available data on the total numbers of dogs belonging to each breed that are registered in this state, but the following table (table 1) summarizes the proportion of the listed breeds in comparison those that featured the highest numbers among the total dog bites, in 2015. The total number of dog bites in the German state of Rheinland-Pfalz, for the year 2015 was of 201 bites to humans, and 325 to other dogs. Of this total of 526 bite occasions, 1 person and 3 dogs were bitten by dogs listed as dangerous dogs, which equals 0.76% of all bites.

Table 1 – Number of dog bites, per year, by breed, in the state of Rheinland-Pfalz, Germany, 2015.

	Breeds
Breeds which bit >10 humans	Doberman, Labrador, Mixed Breed
Breeds which bit >20 humans	German Shepherd
Breeds which bit >10 dogs	Husky, Kangal, Labrador, Rottweiler
Breeds which bit >20 dogs	Mixed Breed
Breeds which bit >60 dogs	German Shepherd

4.3. Are Breed Specific Legislations Based on Scientific Evidence?

For a BSL to be efficient, at least two criteria have to be met:

1. Breeds have to be identifiable, so we can determine that a given individual does or does not belong to a certain breed or breeds, and it has to be possible without the aid of pedigrees and breeding registrations, especially because of the issue of mixed bred dogs (Bradley, 2011);
2. Behaviour must be predictable by breed, this meaning that individuals belonging to a certain breed are more likely to behave in a specific way than those of other breeds throughout the species, because they have been bred selectively for this characteristic (Bradley, 2011).

Data is needed, stating that certain breeds are over-proportionally involved in incidents. The identification of the correct breed for each dog is an important issue as it can severely alter the statistics, and often this identification is made by people without the competence to do so, such as police officers, medical personnel, the victim itself or bystanders/family members (Schöning, 2006). This identification, in the case of dogs without pedigrees, or mixed breed dogs, is mostly assumed with base on the phenotypically most similar breed, but research done as early as 1965 has clearly shown that even when there are only two pure bred parents involved in a mixed breed dog (50%-50%, which is rather uncommon) the offspring of these animals, the so called F1, will look nothing like any of the parents (Scott & Fuller, 1965b). Of course pet owners as well as shelter staff and veterinarians are quite happy to assign a given breed to a mixed breed dog, but various studies have shown that labelling based on morphology is extremely unreliable, by comparing the assigned breeds to the results of DNA testing (Brackman, 2008; Voith, Ingram, Mitsouras, & Irizarry, 2009; Voith et al., 2013). Also, another study on genetics has shown that morphological traits such as coat type and colour, skull shape, etc. are the result of a very small number of “large effect” genes, so as long as the dog has a small proportion of a given breed in it, it will probably strongly resemble this breed, which of course makes assigning a predominant breed to a dog, based on appearance, extremely unreliable (Scott & Fuller, 1965b).

Furthermore, even if it were easy and reliable to attribute breed by morphologic appearance, we must not forget that within adult dogs of the same breed, considerable

variations in aggressive behaviour can be found as the displays of this behaviour are highly dependent not only on genetics, but also on the environment and the very diverse factors affecting learning (Feddersen-Petersen, 2000a). Comparative studies with American Staffordshire Terriers, Bullterriers and dogs of the “Pit Bull” type have shown great differences even among dogs of the same litter, thus proving the importance of the environmental factor in shaping behaviour which makes a general categorization of aggression by breed impossible. The same goes for the extrapolation of “augmented aggressive behaviour” of an individual based on its breed (Feddersen-Petersen, 2000a, 2000b). Mittmann (2002) stated that, after testing 415 dogs subjected to the Dangerous Animals Act of Niedersachsen (the BSL by then still in effect, which divided the dogs affected by it into two categories (“revocably dangerous” and “irrevocably dangerous”) no difference in aggressive behaviour between the tested breeds and the pit bull type could be found, and for 95 % of the 415 dogs there was no indication of a disposition for disturbed or inadequate aggressive behaviour.

In 2008, this study was followed by another one (Ott, Schalke, von Gaertner, & Hackbarth, 2008) which tested a group of 70 golden retrievers, to function as a control group for the study of Mittmann (2002). The conclusion was that a total of 98.57% of the dogs reacted appropriately and that comparing the results of golden retrievers and breeds affected by the legislation, no significant difference was found (Bruns, 2003; Hirschfeld, 2005; Ott et al., 2008). A scientific basis for breed specific lists does not exist. Therefore, legislation in Lower Saxony was changed, and breed lists were withdrawn (Ott et al., 2008). Besides these technical considerations and the scientific evidence, it should be noted that the permanent requirement of being on a short leash and wearing a muzzle, as stated in various BSLs throughout Europe, including Portugal, can lead to changes in the general behaviour of the dog, independent from its breed (Frauke Ohl, 1999). Muzzled and on a leash it is very difficult if not impossible for the dog to exercise sufficiently and to have appropriate social contact, both of these primary natural needs, which besides restlessness and physical imbalance can lead to inadequate aggressive behaviour (Ohl, 1999). Therefore, those measures meant to reduce aggressive behaviour might in fact even increase it (Böttjer, 2003).

4.4. Breed Specific Legislation in Portugal

In Portugal Breed Specific Legislation was enacted with the Decree-Law nr. 312/2003, which established the legal requirements for keeping and reproducing dangerous and potentially dangerous animals as companion animals. Dangerous animals were defined as any animal which fulfills one of the following conditions:

- 1) Having bitten, attacked or offended the physical integrity or health of a person;
- 2) Having severely injured or killed another animal outside of the property of its legal holder;
- 3) Having been declared, voluntarily, by its holder, to the parish council of the area of residence, as having an aggressive character and behaviour;
- 4) Having been considered by the competent authorities as representing a risk for the security of people or animals due to its aggressive behaviour or physiological specificity.

Potentially Dangerous Animals were defined as “Any animal which due to the characteristics of the species, aggressive behaviour, jaw size or strength, can cause lesion or death to people or other animals, namely those breeds included in the ministerial decree as well as the first generation crossed among them or crosses with other breeds, leading to a typology similar to some breeds referred therein”. The breeds mentioned above were then defined in the Ministerial Decree nr.422/2004. They are seven, namely: Fila Brasileiro, Dogo Argentino, Rottweiler, Staffordshire Bullterrier, American Staffordshire Terrier, Tosa Inu and Pit Bull Terrier. This breed list has not, since then, been subjected to any alterations, although the law has been reviewed and changed several times, until its present form, which is Law nr.46/2013. It states, for the dogs of these 7 breeds and their cross breeds, a mandatory identification system, muzzle/leash restrictions at all times when in public, a mandatory civil liability insurance, mandatory spaying or neutering, except for those pure bred dogs registered in a book of origins, and which apply for an official exemption. Furthermore, the owner is required to be of age, to sign a term of responsibility and to have a clean criminal record.

A study by Bettencourt (2013), which analyzed official records of the Portuguese registration data base for cats and dogs, SICAFE (*Sistema de Registo de Canídeos e*

Felinos), and a major Lisbon Hospital reached the conclusion that the number of children victims of dog bites has suffered no significant alterations after the implementation of the PDDABSL by the Decree-Law nr.312/2003. Besides, the same study found that the dogs most commonly responsible for biting incidents in the metropolitan area of Lisbon were dogs of mixed breed, Staffordshire Bullterriers, Dalmatians and Portuguese Podengos, which is not in complete accordance to the breeds listed by the PDDABSL (Bettencourt, 2013).

4.5. Breed Specific Legislation in Lower Saxony and Hamburg

In Lower Saxony, Germany, a Breed Specific Legislation, the Dangerous Dogs Act (DDA) of Lower Saxony, (*Verordnung über das Halten gefährlicher Tiere [Gefahrtier-Verordnung]* – GefTVO) was enacted on July 5th 2000, following a fatal accident involving two American Staffordshire Terriers which attacked and killed a 7-year-old boy in Hamburg, Germany (NMELF, 2000).

Following the idea that certain dog breeds may possess a predisposition for aggressiveness, dog breeds were divided into categories: Dogs belonging to Category 1 - American Pit Bull Terrier, American Staffordshire Terrier, Staffordshire Bullterrier and Bullterrier - had to undergo a Temperament Test to not be euthanized and had to be kept on leash and muzzled in public. Dogs assigned to Category 2 - Dobermans, Rottweilers, Bullmastiff, Dogo Argentino, Dogue de Bordeaux, Fila Brasileiro, Kangal, Caucasian Owtscharka, Mastiff, Mastin Español, Mastino Napoletano, and Tosa Inu - had to attend a temperament test in case the owner wanted to get an exemption from having his dog muzzled and on a leash in public. A specific permit was necessary to own a dangerous dog, which was only to be granted if the dogs capacity for socially acceptable behaviour was proven. The dog's capacity for socially acceptable behaviour had to be verified through a standardized temperament test (*Wesenstest*) (NMELF, 2003).

Several studies were made at the University for Veterinary Medicine of Hannover (TiHo) evaluating dogs belonging to breeds affected by the legislation and to validate the “*Wesenstest*”, as explained in more detail in point 4.3. A scientific basis for breed specific lists was not found in either of the studies. Therefore, legislation in Lower Saxony was changed, and breed lists were withdrawn on July 3rd 2002. A revised DDA, the

Niedersächsische Gesetz über das Halten von Hunden (NHundG) was put through 12th December 2002, and changed twice more in October 2003 and then in July 2011 (NMELV, 2011).

According to the current Lower Saxony Dog Law, dogs are to be kept and led in a way that does not pose any risk for public safety and order. A dog can be classified as individually dangerous when it has either bitten people or other animals; when its predisposition for aggressiveness, eagerness to fight or sharpness exceeds the deemed natural degree; or if it has been trained or bred to possess a predisposition for aggressiveness, eagerness to fight or sharpness which exceeds the deemed natural degree or any other equivalent trait (NMELV, 2011). Measures such as Temperament Testing, the use of a muzzle or permanent use of a leash are only enforced for dangerous dogs according to the DDA. Passing the official Temperament Test (*Wesenstest*) qualifies a dog as being non-dangerous.

Hamburg is the second smallest of the German federal states, also called a city-state, and maintains a Breed Specific Legislation coincident with the one withdrawn in Lower Saxony (HundeGDVO, 2006).

Chapter 5 – Temperament Tests

5.1. Temperament and Behaviour

Both these terms appear closely related in scientific literature, and most of the time the term “behaviour” appears when defining the term “temperament” – yet, they are not synonymous. Behaviour has been defined as the complex of actions and reactions with which an animal interacts with its environment (Gattermann, 1993), consisting of hereditary and genetic components as well as of individually variable, learnt and acquired traits (Meyer, 1984). This definition indicates that behaviour is visible, it is observable. On the other hand, temperament is an attribute (Mittmann, 2002; Diederich & Giffroy, 2006; Schöning, 2006; Rayment, De Groef, Peters, & Marston, 2015). As early as 1972, Seiferle (1972) defined it as an individual’s disposition or nature; the sum of all inborn and acquired traits, aptitudes or predispositions, which have impact on the individual’s actual behaviour, and aggressiveness. Fearfulness or sociability would be elements of the temperament of a dog (Seiferle & Leonhardt, 1984). Another definition, this one borrowed from human psychology, defines temperament as the way in which an individual responds to new and unusual situations (Pervin & John, 1997).

Feddersen-Petersen (1992) refers that “temperament” must be clearly set apart from “behaviour”, being more related to the concept of “personal character” in an individual dog, which we assess based on the behaviour shown to humans or other animals in specific situations. Weidt (1993) also pointed out the importance of environmental factors in the given situation: “*Temperament is the whole sphere of innate and acquired behaviours added to the momentaneous inner condition or state, with which the dog reacts to the environment*”. It therefore includes information such as the tendency of a dog to show submissive or dominant display, the readiness of reactivity and the whole behavioural repertoire, which can be more or less complete or show gaps or exacerbation of specific functional ranges. Characteristics such as stamina, the capacity of learning associatively and through combination are also part of this complex (Feddersen-Petersen, 1992). The development of the temperament is influenced by experiences (or lack thereof) of the dog during the socialization period, with social partners as well as with all other environmental factors (Feddersen-Petersen, 1992; Foyer, Bjällerhag, Wilsson, & Jensen, 2014). If the dog’s temperament is the underlying attribute which influences and defines

behaviour and therefore conclusions about a dog's temperament can be drawn from the observation and analysis of shown behaviour, which is essential to understand why this is the method of evaluation in a temperament test (Feddersen-Petersen, 1992; Mittmann, 2002). One of the subjacent assumptions underlying the idea of a temperament test is that there is a component that is relatively stable and consistent, distinguishing individuals from one another, which has been called "personality" (Gosling & John, 1999), "character" (Gebhardt-henrich, 2002) or "emotional predispositions" (Sheppard & Mills, 2002). Thus, temperament is defined as those differences in behaviour, between individuals, that are relatively consistently displayed when tested under similar situations (Diederich & Giffroy, 2006), therefore exposing a pattern or a group of behavioural traits which we may assume that the dog will show again if or when subject to similar circumstances in a different moment in time (Taylor & Mills, 2006).

An interesting question is the further exploration of the concept of consistency of behaviour: according to this idea, these differences are considered to be the product of both genetically determined and acquired behavioural traits (Stur, 1987) but the chronological delimitation of acquired behaviour traits does not seem to have a fixed limit, being influenced by experiences and learning throughout the dog's life (Schöning, 2006). Surprisingly little is known about the development and stability of individual behavioural differences in non-human animals and which factors, at which time points, influence them (Stamps & Groothuis, 2010). There is some debate over the number and types of dimensions needed to characterize personality variation in most animal species (Fratkin, Sinn, Patall, & Gosling, 2013). One of the most widely used dog personality measures, the Canine Behavioural Assessment and Research Questionnaire (C-BARQ), proposes eleven different personality dimensions in companion dogs (stranger directed aggression, owner directed aggression, stranger directed fear, non-social fear, dog directed fear or aggression, separation related behaviour, attachment or attention seeking behaviour, trainability, chasing, excitability and pain sensitivity) (Hsu & Serpell, 2003). Jones and Gosling (2005) determined seven broad dimensions (reactivity, fearfulness, activity, sociability, responsiveness to training, submission, aggression).

5.2. Types of Temperament Tests and their Objectives

The idea of using a Temperament Test as a tool that allows for the categorization of dogs as apt or inapt for various roles is an attractive one, as it would facilitate choices at different levels: a) be it the selection for breeding purposes (Wilsson & Sundgren, 1997); b) behavioural development (Seiferle & Leonhardt, 1984); c) prediction of working aptitude (Harvey et al., 2016; Slabbert, 1996); d) adoptability (Ledger & Baxter, 1997; Valsecchi, Barnard, Stefanini, & Normando, 2011) or, as main focus of this study, e) prediction or identification of behaviour problems, especially those involving aggression (Diederich & Giffroy, 2006; Netto & Planta, 1997). For all these reasons, over the last decades, numerous behaviour tests have been developed.

The various types of Temperament Tests (TTs) can be divided in several categories according to their approach (Jones & Gosling, 2005), such as: a) the “rating of the individual dog,” through an owner questionnaire on behaviour (Hsu & Serpell, 2003); b) “expert ratings of breed prototypes,” in which experts are asked to rate different breeds in relation to different traits (Hart & Hart, 1985; Duffy, Hsu, & Serpell, 2008; Asp, Fikse, Nilsson, & Strandberg, 2015); c) “observational test,” in which the dog’s reactions are observed by trainers or shelter staff in a less standardized situation (Murphy, 2016), and d) the so called “battery tests,” in which the dog is subjected to a standardized series of specific stimuli and the reactions are scored according to a predefined grid (Netto & Planta, 1997; Gebhardt-henrich, 2002; Åkerberg et al., 2012). TTs for shelter dogs, serve the purpose of heightening adoptability and matching the dogs more easily to adequate owners by identifying problem behaviours before the adoption (Valsecchi et al., 2011). One such test developed by van der Borg, Netto & Planta (1991) takes around 1,5 h and included 21 situations. According to the authors the results indicate potential aggression, a tendency for separation anxiety and general obedience (van der Borg, Netto, & Planta, 1991).

There are also TTs for dogs that do specialized tasks, such as those used to choose puppies to be trained as guide dogs (Pfaffenberger, Scott, & Fuller, 1976; Paroz, Gebhardt-Henrich, & Steiger, 2008; Harvey et al., 2016). In this case the objective is to identify those dogs most suitable for the task making a more efficient use of the training resources. In the test by Pfaffenberger et al., (1976), puppies were tested around 8-12 weeks in situations likely to be encountered in their life as guide-dogs, and according to the authors

90% of the dogs chosen through this test make capable guide-dogs. Seiferle & Leonhardt (1984) developed a test to be used in dogs between 12-18 months of age which served the purpose of determining if they had the temperament traits according to the breed standard, excluding fearful and insecure individuals from breeding. Of course, when looking for specific traits in different breeds, there are several problems with the interpretation of TT results: not only is it difficult to distinguish between learned and trained effects on behaviour, in the case of seeking and hunting behaviours for example, but this *bias* gets worse when we are looking for traits like “hardness”, “willingness” or “defense drive”. Some of these are not biologic traits, but anthropomorphic ways of interpreting the dog’s behaviour and relating it to what we want from it (Schöning, 2006).

Finally, there are TTs to be applied to puppies in order to improve dog-owner matching such as the “Handling Test” in which the puppies are separated from the mother and then picked up by the tester who according to their behaviour assesses the degree of socialization with people (Scott & Fuller, 1965a). This is a similar procedure to the one in the “Campbell Test”, which tests puppies around 5-7 weeks in an unknown environment to reach conclusions about their excitability, social bonding ability, and future dominant behaviours (Campbell, 1975).

Aggressive behaviour against humans and/or conspecifics is often a source of danger originating from dogs, which governments and legislators try to prevent by banning certain breeds deemed more dangerous than others, or applying different TTs to dogs of all breeds in order to detect individuals with heightened aggressiveness (Schöning, 2006). The temperament test which is the basis of the one analysed for this study was developed to identify dogs with heightened levels of aggression in those breeds listed in the Netherlands as potentially more aggressive, and then eliminate them from breeding programs. It is also a scientifically validated instrument aimed to detect aggressive individuals in general (Netto & Planta, 1997) and is therefore closely associated to so called Breed Specific Legislations in other countries, which intend to categorise on aggression based on breed, or even move towards banning dogs belonging to supposedly dangerous breeds. Such “battery type” tests, are defined as a group of “*standardized experimental situations where stimuli serve to elicit behaviour that is statistically compared with that of other individuals placed in the same situations, in order to classify the subject tested*”. Their specific aim is detecting or confirming aggression and therefore

they are also most frequently used as forensic tools, as the issue of aggression or the absence of it is often highly relevant in cases of lawsuits involving dogs (Serpell & Hsu, 2001; Reid, 2013). To be a valuable and accurate tool to aid decision making, the use of these tests calls for a standardization of testing methods, and compliance with the criteria of Reliability, Validity and Feasibility (Serpell & Hsu, 2001).

5.3. Characteristics of the Test

5.3.1. Standardization

Standardization is important, as the applied protocols must be the same in all tested dogs if we want to extrapolate from them. According to Taylor & Mills (2006), exact procedures for the subtest and the elements within it have to be formalized so they can be consistently repeated by all testers, reducing external variation, including:

- Where the test is going to be performed (unfamiliar location for the dog, indoors/outdoors, home environment, etc.);
- Timing of the test (during the day, before feeding, not when on heat/nursing, etc.);
- Stimuli to be presented (size and type of objects, treats, same sex/age/type of dogs/people to be presented);
- How long/how often the dog is supposed to be exposed to the stimuli;
- When the observation starts and for how long;
- Whether the first, last, or overall reaction is recorded.

5.3.2. Reliability, Validity and Feasibility

The great variety of tests and methods being applied makes interpretation and comparison difficult (Diederich & Giffroy, 2006). Besides a general standardization, several other shortcomings of these tests have been noted (Taylor & Mills, 2006), namely that most

published tests do not fulfil rules for reliability (the degree to which the test scores are free from errors of measurements); validity (the appropriateness, meaningfulness, and usefulness of the specific inferences made from the test results); and feasibility (practicality of the test for use in the field).

5.3.2.1. Reliability

Reliability being the absence of errors of measurement, implies: 1) consistency within the observer, who is the person grading the test; 2) consistency between different observers (absence of viewers bias); 3) within the dog in the case of a test-retest, and, finally, 4) within the components of measures to assess the same behaviour (Taylor & Mills, 2006). A meta-analysis on all known studies of dogs that provide relevant data on personality consistence was performed by Fratkin et al., (2013), showing that this said consistency is higher in older dogs, which can be explained through the fact that the personality being evaluated has already passed the determining phase that is the socialization period and because of the energetic or structural costs of changing personality; when behavioural assessment intervals were shorter, because there is less time for external effects to affect it, and when the measurement tool was exactly the same in both assessments (Fratkin et al., 2013).

Intra-observer reliability is the consistency of the reports of a single observer when describing the behaviour of a dog during the same test. This can be assessed by describing the same behaviour(s) on different occasions, as can be achieved by re-viewing a video recording (Taylor & Mills, 2006).

Inter-observer reliability is related to consistency of reports between observers, during the same test. If two different observers describe or evaluate the same behaviour, the results must be the same, and this is assessed by comparing the reports of observers who have viewed a video recording of the same test (Taylor & Mills, 2006).

5.3.2.2. Validity

Validity is the characteristic of the test that assures us that it is, in fact, appropriate and meaningful and does assess the trait of interest (e.g., aggression, fearfulness) which is difficult because there are many external variables and the behavioural reaction in a given circumstance can never be predicted with complete certainty. (Taylor & Mills, 2006).

If we choose a sub-test such as the sudden opening of an umbrella as a novel and frightening stimulus (testing the reaction of a dog when something frightens it), and in a litter of 6 puppies 1 and 2 do not show signs of fright or being frightened, puppies 3 and 4 get frightened but then investigate, and puppies 5 and 6 get frightened but don't come around to investigate until the end of the test period, the standard interpretation might be that puppies 1 and 2 are very stable, puppies 3 and 4 slightly fright prone and puppies 5 and 6 definitely fright prone. This is a fallacious interpretation, as in reality we learnt nothing about puppies 1 and 2, considering they were not frightened by the stimulus (therefore it was not a novel and frightening stimulus) so the test was not valid, about puppies 3 and 4 we learnt they have an excellent bounce-back and puppies 5 and 6 some reactivity and some lack of bounce-back (Donaldson, 1996).

5.3.2.3. Feasibility

Feasibility relates to the necessity of having a temperament test which is practical enough to be widely used, and therefore it cannot be overly lengthy, unpractical or difficult to assess otherwise it will not be extensively or accurately used in shelters/training centres/breeding facilities (Taylor & Mills, 2006). According to Taylor & Mills (2006), when developing a TT some key considerations for widespread use would be:

- The test has to be short enough to not exceed the capacities of the organization or affect the welfare by stressing the dog for too long;
- The test has to be easy to perform and easy to standardise;
- The test should herald results which are easy to interpret and helpful in decision making;

- The use of the test by testers from different backgrounds may require refinement such as reduction of subtests or/and of the observations, based on reliability concerns;
- If the test is changed by refinement, it should be re-evaluated for content, construct, and predictive validity in its new setting.

5.5. Origin of the Lower Saxony Temperament Test

One of the most cited and validated behaviour test is the extensive battery test described by Netto & Planta (1997) almost twenty years ago. Nevertheless, it is widely considered – even by the authors themselves – a rather “severe” test, including various fear and stress evoking sub-tests such as being cornered and threatened by humans and/or other dogs. The percentages of the results are thought-provoking, as 97% of dogs showed aggression and 67% show biting or attack behaviour on one or more than one occasion, although only 60% of them had ever bitten before taking part in the test (Netto & Planta, 1997). A dog fails this test if it shows aggressive biting behaviour in more than 6 of the 43 subtests, and the test has to be performed in an inside enclosure and takes about 45 minutes for each dog (Netto & Planta, 1997; Planta & de Meester, 2007). Because this was unpractical and too lengthy to be applied to a larger population, a simplified behavioural test was developed, the so-called Socially Acceptable Behaviour (SAB) which aimed to test aggressive (biting) and fear behaviour of the dog. This condensed test includes only 16 subtests, is performed outdoors, and the total time per dog is approximately 15 minutes, therefore making it possible to test a larger population of dogs in a relatively short time (Planta & de Meester, 2007).

Netto & Planta (1997) tested 112 dogs, 75 of which had a previous history of showing aggression. To validate their test the authors compared the dogs’ behaviour in the test with a previously obtained biting history and then they re-tested individual dogs after an appropriate time span. Dogs with a biting history showed a significantly higher level of aggressive behaviour in the test than those without that history. When re-tested, the results of the first and the second test were significantly correspondent in both classes of dogs. Some drawbacks to the test were discussed by the authors: information from owners on the previous history of their dogs might have been wrong; the criteria chosen for a subtest

to be passed with a certain score will influence the results as they might differ from tester to tester; the number of aggression-eliciting subtests is limited.

The validation of the SAB test was based on the behavioural elements “aggressive biting” and “aggressive attacking”, testing about 300 dogs of different breeds with and without a history of biting humans. The authors concluded that this test was a valid instrument for testing aggressive biting against humans, since 82% of the “biting-dogs” showed a positive test result, when the threshold of no biting at all in the tests was used. The correct differentiation into biting and non-biting dogs improved slightly, when biting in one test situation was allowed (Planta & de Meester, 2007).

5.6. The Lower Saxony Temperament Test used in Hamburg

In Spring 2000, the Ministry of Agriculture, Food and Forestry of Lower Saxony named a group of scientists, veterinarians and behaviourists to develop a temperament test for dogs with the aim of excluding aggressive dogs from breeding, detecting those individuals with impaired social competences and impaired aggressive communication intra as well as interspecies (NMELF, 2000; Böttjer, 2003). The test this panel of experts came up with is based on then internationally used validated tests for temperament- and dangerousness assessment (e.g. the test by Netto & Planta (1997)). Later on, this test also became the tool to assess the social and communicational competences (intra and interspecies) of dogs from the breeds affected by the BSL of both Lower Saxony and Hamburg, as has been explained in further detail in 4.5. of this study. Those animals with disturbed or inadequate aggressive behaviour may be euthanized or kept muzzled and leashed in public, and for the dogs listed in Category 2 the test also determines the necessity of permanent use of leash and muzzle (NMELF, 2000, 2003). In the city-state of Hamburg, the Temperament Test (*Wesenstest*) used, as well as the DDA still in force are coincident with those established in Lower Saxony even though this state has revoked its DDA in 2002. The TT of Lower Saxony can be divided into three parts: human-dog contact, dog-dog contact and dog-environment contact.

5.6.1. Anamnesis

Before the test begins, an anamnesis of the dog to be tested is made. This is complemented with a general physical examination of the dog to exclude medical conditions which may influence behaviour). Also, a questionnaire is filled in by the owners (or the person responsible for the dog) including as much detail as possible. This questionnaire is analyzed for correlations with specific events which may help clarify the origin of some behaviours, and comprises information such as if it is the first dog of this owner, where it was obtained (breeder, private litter, shelter, etc.), number of previous owners, living conditions (kennel, home, garden, etc.), presence of other animals, number of walks, circumstances off leash, training details (when, who, where, how long), training methods used (choose from list), has the dog ever bitten (if yes, circumstances, whom), how does the dog react in several circumstances (list of circumstances and options), does the dog run away, does the dog show predatory behavior, which methods for reward/punishment does the owner think adequate (choose from list).

5.6.2. The Frustration and Learning Test

Following physical examination, the TT begins with the Frustration and Learning Test, which besides giving insight on the dog's tolerance to stress and frustration does also screen for the effects of sedatives, which would impair the dog's learning capacities (NMELF, 2000). The frustration test is described in detail in table 2. This test gives insight into which behaviours the dog is most likely to show in a stressful and frustrating situation, besides, in combination, assessing the learning capacity of the dog. In the course of the test frustration is subtly increased and slightly threatening elements are added.

Table 2 - Frustration and Learning Test according to Schöning (2000).

Steps	Description
1	The dog gets 4-5 treats.
2	<p>The fifth or sixth treat is held between the fingers when the dog wants to take it. How does the dog react?</p> <ul style="list-style-type: none"> a. does it try to gnaw the treat out of the fingers (how long, how insistently?); b. does it turn away and do something else; c. does it show avoidance, threatening behaviour, aggression, learnt behaviour or communication (e.g submission)? <p>Attention: safety measures as leash may be necessary.</p>
3	The dog is stared at, over the treat (with due safety measures, depending on previously shown behaviour). To increase the threat, the tester may bend the body slightly towards the dog.
4	<p>Some treats are tossed on the floor. The dog is allowed to eat some treats off the floor and then a treat is tossed between the testing person's feet. When the dog wants to pick up the treat, it is blocked by putting the feet together (carefully, not to hurt the dog) and standing between the treat and the dogs. Trials to avoid the person and get to the treat are also blocked. When the dogs steps back or sits down (behaviour determined by the tester), the tester steps back and allows the dog to get the treat. Behaviours are chosen according to what the dog offers, but should not be changed too often so that the dog can make an association between its behaviour and getting the treat. This should be repeated at least 4-5 times or until the dog shows it made the association between the behaviour and getting the treat.</p>

5	The clicker is introduced as a secondary reinforcer: it is clicked 3-4 times, and if the dog is clearly afraid of the sound, the test cannot be done. If dogs are not afraid: 3-4 times the clicker is clicked and the dog gets a treat in parallel. Then a pen is held in the same hand as the clicker, and is used as a target stick, the final goal being that the dog touches the pen with its nose, upon which it receives a click and a treat. Again after 4-5 repetitions, a learning curve should be seen, i.e. the dog is touching the pen deliberately with its nose.
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As a motivator, food rewards are the easiest to use, but toys or access to the owner may also be used. Dogs which are able to be conditioned to touch the targetstick in this manner, have high stress and frustration tolerance and excellent learning ability. Obvious breaks in behaviour in these tests can be indicative of the use of sedatives.

5.6.3. The Subtests

The test furthermore comprises 36 subtests aiming at assessing the following factors: sociability toward human beings and conspecifics, playfulness, problem solving skills, trainability, possessiveness, and reactivity. It comprises a number of everyday situations alternated with simulations known to easily elicit aggressive behaviour. The test situations are described in table 3.

Table 3 – List of situations of the Lower Saxony Temperament Test for dogs.

The Temperament Test according to the law for keeping dogs in Niedersachsen (NMELF, 2000):	
1	The owner tries to play with the dog by giving appropriate visual signals.
2	A person approaches the dog from the front and stares at it.
3	The dog is tied to a post (e.g., as in front of a shop) and a person runs past him (distance, approx 50 cm).

4	A person wearing a long black coat and a hat walks past the dog; the coat touches the dog.
5	A limping person (with a walking stick or walking aid) walks past the dog and his owner.
6	A person kneels in front of the dog, stretches the hand toward the dog and talks to him (distance, 0.5 m 1 lead).
7	A person is lying on the ground (or is crouching) and gets up abruptly as dog and owner are passing by (distance, 2 m*).
8	A person stumbles, passing the dog at a 1 m distance.
9	A jogger passes the dog from both directions and suddenly runs away from the dog.
10	A person with a blind man's cane is slowly finding his way past the dog (distance, 2 m).
11	A 'drunk person' staggers past the dog (2 m distance).
12	A person talks to the dog.
13	A person shouts angrily at the dog.
14	A person cries (like a child).
15	The dog owner talks in a friendly way to the dog and strokes him, while another person walks past, shouting at the dog and clapping his hands.
16	The dog owner puts his hand on the neck/back of the dog and puts his hand around the dogs' muzzle (while talking to the dog in a friendly way).
17	A person contacts the dog's body while passing by.
18	A person displays play behaviour in front of the dog.
19	Several (4) people approach the dog (not directly, in a casual manner) and stop close by him, coming into body contact with the dog (simulating a situation such as in a lift).
20	A strange person tries to stroke the dog over the back (while talking to him).
21	A group of people come up to the dog, stand near him talking to each other and (if possible) coming occasionally in slight body contact with the dog.
22	A barking dog is standing in front of the dog and his owner (distance approx 2 m).
23	Two strange dogs of different gender and with a different appearance (e.g., size, coat), pass the dog (distance approx. 2 m).
24	Immediately afterwards: the owner stumbles and touches the dog.
25	Confrontation with a dog of the same gender behind a fence.

26	The dog gets isolated from his owner and is tied up at approx. 2 m distance from a fence with a dog of the same gender behind it.
27	Several people stop close to the dog while a noisy machine gets pushed by.
28	Dog and dog owner pass some coloured balloons in a closed space.
29	An umbrella gets opened in close proximity to the dog (in a casual way as if happening on a street, not in a threatening way directed toward the dog).
30	A ball is rolled up to the dog.
31	A pram stroller with baby noise coming from it (tape recorder with crying baby, and a doll) gets pushed past the dog.
32	A bicycle drives past, ringing the bell (2 m distance).
33	A test person approaches the dog, threatening him, shouting at him (with no other aids).
34	A person threatens the dog with a stick (while standing up, not crouching down).
35	A person with a burning lighter approaches the dog. ^a
36	A broom makes noises on the floor.

^aThis situation was eliminated for welfare reasons.

5.6.4. Scaling of the Test

In each one of the 36 Situations of the test, described above (Table 3), the reactions of the dog are quantified according to a 7-point scoring system, following Netto & Planta (1997) and the Temperament Test of Lower Saxony (NMELF, 2000). The system is described in table 4.

Table 4 – The seven point scoring system for the individual situations of the Lower Saxony Temperament Test for dogs (NMELF, 2000).

Scores	Description
1	Behaviour of avoidance/retreat (without aggressive signals)
2	Acoustic and/or visual signals of threat: growling, barking, snarling, teeth-baring, creasing the skin over the muzzle, staring; the rest of the body language remains antagonistic or fearful/unsure. The dog remains stationary or retreats.
3	Snapping, at a distance, with threatening signals or approach with threatening signals.
4	Snapping with incomplete approach.
5	Biting, attempt at biting, attack with head thrust but without bite. Threatening signals present.
6	Same as score 5 but no threatening signals.
7	After escalation, the dog does not calm itself before the timespan of ten minutes.

This numeric system does not serve the purpose of achieving a fixed number of points representing *pass* or *fail* but rather to establish an easy and comprehensible system facilitating individual assessment. Therefore, the aforementioned numbers are reference values always to be seen in the context of the individual description and evaluation of the dog's behaviour. As not necessarily all tests are/can be applied to all dogs, this descriptive evaluation is indispensable.

5.6.5. Passing and Failing

Decisive for the passing or failing of the TT is the behaviour of the dog in the different test situations. The situations are grouped into two types: Threatening/Non-Threatening, which have distinct weights in the decisions of passing or failing. The threatening

situations are Sit2 (staring at the dog), Sit13 (shouting at the dog), Sit33 (threatening without aid) and Sit 34 (threatening with stick), all others are Non-Threatening.

A dog passes the test if he reacts with behaviours scaled from 1 – 4 (inclusively) in non-threatening situations, and with behaviours scaled from 1 – 5 (inclusively) in threatening situations. A dog fails the TT if he reacts with behaviour scaled 5 in non-threatening situations and/or if he reacts with behaviour scaled 6 or 7 in any situation, threatening or non-threatening (Johann, 2004).

At all times, there must be a descriptive evaluation of the dog taking into consideration the relation between dog and owner. If the dog passes the test but the obedience is considered insufficient the final considerations include the advice of training before revoking the mandatory use of the leash. If the dog fails the TT, indications for solving the problem together with a behaviourist and through professional dog-training are added.

Chapter 6 – Training of the Dogs

Although the training of the specific dogs in this retrospective study had already taken place at the moment of the data collection (or was still ongoing in some cases), it is pertinent to describe how the data about the training was collected and how a general training outlay is projected, at the shelter. When a dog enters the shelter, staff stands before the challenging task of analysing the dog and the existence of the problem, even more so if it has already bitten or is suspected of having done so. The first step is always getting as much information as possible from the owners, the authorities involved and any other available sources – but often this information is scarce and biased. The dog gets a veterinary check-up and is assigned to a Personal Care Taker (PCT). It is then kept in a single housing kennel for one to two weeks during which the PCT tries to establish a relationship with the dog and to learn as much as possible about it, including its tolerance levels, and which stimuli or situations might be critical, e.g. learning if it shows signs of distress, fear or aggression when handled, put on leash, approached while eating or holding a toy. The resident dog-trainer then devises a plan for the most effective training and rehabilitation of each dog, including all the information the PCT gathered. For the purpose of the study, both the resident dog-trainer and the PCTs responsible for each individual dog were interviewed and all individual existing records on daily life and training were utilized, in order to determine what kind of training each dog had been subject to during the time elapsed between the first and the second test. The general training items are listed in table 5.

Table 5 – The training types (T1 – T10) applied to the dogs included in this study.

Training Items	Description
T1 Leash and Muzzle training	All dogs at the shelter receive more or less formal leash and muzzle training, as walking on a leash correctly is a necessary skill for daily interactions such as being taken out on walks, being led to the outside pens, and even general adoptability. It is achieved through positive reinforcement of the correct behaviour (loose leash, attention to handler) and negative punishment (denial of access to desired resource in presence of undesirable behaviour such as pulling forward, barking, etc). Quite often this training does not necessarily take place in the controlled environment of a class, but rather during day to day activities and routes. Muzzle training is very useful for dog-dog interactions in all safety, interventions which might lead to some aggressive reaction (veterinary visits), in cases of dogs which are not safe being handled by people, or which are considered by law to be “dangerous breeds”.
T2 Basic Obedience	“Come”, “sit”, “down”, “stay” are the basic obedience commands that are usually taught the dogs at the shelter, during weekly classes with the resident dog trainer as well as during individual training and interaction sessions. Positive reinforcement with food treats are widely used.
T3 Individual situations of the TT	These dogs are mostly resident shelter dogs and as such do not live the life of a family pet, which in the ideal case would be exposed to all these stimuli in a real-life environment, or, if they have been, this socialization was not done adequately. Therefore, they have, in their great majority, social deficits or lack of coping mechanisms different from fearful or aggressive reactions which are undesirable in social interaction with humans and other animals. To achieve habituation and teach coping behaviours those dogs that will undertake the TT or that have already undertaken it and need to be retested are trained how to correctly react in case of fear/insecurity. The alternative behaviour to undesirable behaviour such as threatening and/or attacking is usually eye contact with the handler, which is trained until it is on cue, and then consolidated up to the point where it becomes the coping mechanism of choice for unfamiliar situations. E.g. a desensitization program is followed.

<p>T4 Desensitization to contact with humans</p>	<p>For dogs who have problems regarding their relationship with humans (strangers or humans in general) an individualized desensitization and counterconditioning training is developed to gradually improve their skills when confronted with this stimulus. In the beginning one specific member of shelter staff is attributed to this dog, the personal caretaker or PCT, and work is done to achieve a relationship of trust with this person in the first place, who will do all the relevant interactions, as far as possible, with the dog, to then gradually expand the sphere of trusted people until achieving generalization. Dogs that come to the shelter with a known heightened reactivity to children, or even with a history of child aggression are, as far as possible, subject to a desensitization and counterconditioning training with the aid of real children which participate in the training by being present in different degrees of noise intensity and movement, always behind a safe, solid fence.</p>
<p>T5 Desensitization to contact with other dogs</p>	<p>Dogs that have a specific problem with other dogs (aggression towards small, furry dogs for example) are trained through desensitization and counterconditioning. Allowing at least a few hours a day in a controlled group of dogs is the ultimate goal.</p>
<p>T6 Impulse control and bite inhibition</p>	<p>In day-to-day interaction and play these two fundamental aspects are practiced over and over again, be it through rules such as executing a sit before each desired activity (exiting the kennel, getting a toy, etc) or through games that implicate the giving up of valued resources and gentle interactions with human hands.</p>
<p>T7 Touch on cue</p>	<p>Used in some dogs which were extremely wary of strangers and of being touched, this reward based training puts a formerly uncomfortable or frightening stimulus (touch of a stranger) on cue, in order to give the dog the opportunity to expect it, knowing it will be rewarded for showing the appropriate behaviour (sitting and looking at handler).</p>
<p>T8 Car behaviour</p>	<p>Behaving adequately while riding a car is an important social skill which heightens adoptability and is especially important in the case of those dogs born at the shelter, as is the case with 3 female dogs which failed the first TT due to extreme fearfulness. Shelter staff and voluntary workers tried as much as possible to include these activities in day-to-day life.</p>

T10 Agility and tricks	Always a good way of offering mental stimulation and strengthening the dog-human bond, besides exercising.
T11 Home with caretaker	Some dogs have the opportunity of being taken home by their caretaker on a day to day basis.
T12 Staying outside the kennel	At the Hamburg shelter all dogs get the opportunity of exercising and changing their environment by being placed in one of the outdoor runs/pens.
T12 Group housing	Whenever possible the shelter encourages group housing or at least pair play sessions so dogs can maintain or improve their social skills, even if this means trying multiple constellations or resorting to the use of a well fitted muzzle.
T13 Social contact	Difficult to quantify and affected by being taken home or staying in the office of the shelter, for example. Some busy days shelter staff hardly has time at all, others they do extra hours just for that one long walk. There is a “cuddle-house” for volunteers to use for social interaction with the dogs, but there are no accurate records of time, so the minutes referred to in the table are merely illustrative.

A general outlay of training for a dog might look like the following one (table 6).

Table 6 – General training program for subjectively threatening situations.

Goal	In subjective threatening situations instead of lunging and barking the dog shall spontaneously and without signal turn towards the PCT and hold the focus. In situations with possible hunting objects the dog shall do the same. Emotional stability in such encounters is the ideal scenario.
Strategy	The dog is taught an attention signal to start the shaping and desensitization process in presence of the trigger of unwanted behaviour.

Steps	1	The signal (name of the dog) is presented in a non-distractive environment, and the moment the dog reacts with moving its head towards the PCT it is rewarded. Sessions comprise 4-5 repetitions, around 10 such sessions per training module (with the necessary pauses). When the dog reacts 5/5 successfully over a few sessions, the next step starts.
	2	Changes of environment and distractions are added, but never both as the same time, as to not exceed tolerance levels for stress, frustration and fear.
	3	Desensitization process to the specific stimuli eliciting (or formerly eliciting) unwanted behaviour (humans, children, other dogs, bicycles. Training should lead to the attention signal no longer being necessary, but the dog showing the behaviour spontaneously. In the case of fear eliciting stimuli, the stimulus moving away is a second reward for adequate behaviour.

Chapter 7 - The Effect of Training on the Outcome of the Temperament Test

When using TTs that have two possible outcomes - passing or failing -, of course the question of what this means for the dogs that fail the test rapidly arises: Are those dogs irrevocably dangerous, and should be euthanized? Or can dogs which have bitten and failed a subsequent Temperament Test be rehabilitated through training?

7.1. Objectives of the Study

The objective of this study was to test the hypothesis of training – and, consequently, learning – having an effect on the behaviour of the dog, and if it would affect the outcome of the TT in a test - retest situation. If the dog's behaviour were positively altered through training, this should reflect itself in lower scores in the individual situations of the retest and consequently also in lower average scores in the bundled subtests, besides higher passing quotes.

7.2. Material and Methods

7.2.1. Data Collection

The data for the retrospective study was collected at the shelter *Hamburger Tierschutzverein von 1841 e.V* (Hamburg), during the period between January and March 2016 under supervision of a Behaviourist Veterinarian. The data derived from paper files for individual dogs kept in the shelter, including only those subject to TTs between 2006 and 2015. The data set of each dog comprised the maximum of information about each dog, so in the end after the process of data collection the relevant parameters could be kept, and the ones not available for a sufficient number of dogs, discarded. The dogs had been tested on the premises of the Hamburg shelter. Testing was done according to the lower Saxony test and video records of all tests were made, covering the whole situation, i.e. the test assistant, the owner/handler of the dog, and the display of the dog, for future reference.

7.2.2. The Dogs

The inclusion parameters for dogs in this study were: having been admitted to at least two Temperament Tests, so the retest could be compared to the first results, and having been trained at the Hamburg shelter. The sample achieved through this method was then characterized, the data set of each dog comprising the following points: age when admitted to the shelter, date when first test was conducted, date when second test was conducted, results of those tests, breed, gender, reproductive status, future (adopted/euthanized/still at shelter), reason for admission, health issues and training ministered.

7.2.2.1. Test-to-Test Sequence of the Dogs

Each one of these dogs had been subject to two sets of Temperament Tests, separated by a variable period of training. The tests applied to the dogs were in accordance with the *Wesenstest* of Lower Saxony as described in Chapter 5, including the Anamnesis and Questionnaire according to 5.6.1, followed by the Frustration and Learning Test according to 5.6.2 and the 36 Test Situations according to 5.6.3, these evaluated according to the 7-point scoring system described in 5.6.4. For more information on the nature of the training ministered to the dogs between TTs, please refer to Chapter 6.

7.2.3. Data Handling and Statistics

For a more comprehensive overview of the data of the two sets of Temperament Tests, the data was aggregated in bundles, working with 5 sub-groups (bundles of test situations) instead of the original 36 test situations.

The criterion for bundling the subtests was the nature of the evaluated situation, as there are several sub-tests evaluating basically the same subject through various circumstances, and therefore the five subgroup categories are:

- 1) Dog – Dog situations, which serve to evaluate the reaction, communication and interaction of the dog with members (both genders) of their own species, not only in terms of aggression but also in terms of social competence, of variability of the used

communication, of escalation of behaviour, and coping strategies. The subtests related to this category are the situations number 23-26.

- 2) Dog – Human (Threatening) situations, in which the human assumes behaviours and postures that are known to be interpreted as threatening to the dog, and therefore evoke fight, flight, flirt or freeze responses which can then be evaluated. The subtests in this group are numbers 2, 3, 13, 15, 33 and 34.
- 3) Dog – Human (Friendly/Neutral) situations, in which the human either tries to establish friendly contact with the dog (speaking in a friendly voice, extending hand) or simply behaves neutrally as a non-interested passer-by. These are situations 6, 12, 17, 18, 20 and 30.
- 4) Dog – Human (Strange) situations, in which the human being behaves in an unusual or unexpected manner, making sudden rapid movements or walking abnormally (tripping, stumbling, running), as is the case in sub-tests number 4, 5, 7, 8, 9, 10, 11 and 14.
- 5) All other sub-test that simulate situations that cannot be categorized more specifically, including noisy or moving objects, groups of people/crowds, etc.

Having bundled the 36 subtests into these subgroup, the average score of the dog was determined for each subgroup so that we than could compare the results of the first and the second Temperament Test in the different bundled situations. Lower scores were indicative of more adequate reactions; therefore, the aim of training would always be to lower the obtained scores as much as possible except for the cases in which they were already = 1. Considering the size of the sample and also the type of scores, the data was analysed applying a paired Wilcoxon signed rank test with continuity correction using the free R statistical program (R Core Team, 2013) and considering a cut-off for statistical relevance at P-values of $\leq 0,05$.

7.3. Results

During the period between 2006 and 2015, a total of 264 Temperament Tests were applied to dogs at the Hamburg shelter. At the first trial, 223 dogs passed, 39 dogs failed, and 2 did not complete the test. Of the 39 that failed the first test, 19 were admitted to a second test, which 16 passed. The remaining 3 failed a second time, which led to their euthanasia. Besides these 19 dogs, the study group also included the following: 2 dogs which having passed the first Temperament Test, failed the second one; 7 dogs which having passed the first test were re-tested and also passed a second test. The dogs that were tested a second time, after having passed a 1st TT were animals that were either involved in an incident of aggression, changed owner, or had indications of aggressive behaviour which needed to be clarified. The dogs constituting the study-group are those 28 which, for whatever reasons, during this period from 2006 up to the present year were submitted to a retest or, in 2 cases, even a third test, as shall be discussed further on.

Of the 28 dogs included in the study, 9 were admitted to the shelter after they were seized because they belonged to one of the breeds listed under the BSL still in force in Hamburg and their owners did not, in some form, comply with the legal requirements to own a dog belonging to this breed. Eleven dogs were admitted because of some form of aggression, either towards humans or towards other dogs, including 2 which had not bitten but shown threatening behaviour. Three dogs were born at the shelter, three were rescued and another 2 were submitted by the owners for personal reasons other than aggressive behaviour (table 7).

Table 7 – Reasons the dogs were admitted to the shelter.

Reasons for being at the shelter	
Breed	32% (9)
Bit person	21% (6)
Bit dog	11% (3)
Found/abandoned	11% (3)
Born at the shelter	11% (3)
Aggressive against owner	7% (2)
Relinquishment for reasons other than aggression	7% (2)

The breed distribution was of 20 dogs belonging to “Pit bull type breeds”, 2 American Bulldogs, 3 Shepherd Crosses and 1 of each Dobermann, Rhodesian Ridgeback, Rottweiler (table 8).

Table 8 – Breeds of the dogs included in the study.

Breeds	
XPit Bull/Amstaff	71% (20)
XAmBulldog	7% (2)
XGerman Shepherd	7% (2)
Dobermann	4% (1)
Rhodesian Ridgeback	4% (1)
Rottweiler	4% (1)
XDutch Shepherd	4% (1)

Of the 28 dogs (table 9) 15 were male, of which 14 were neutered, and 13 females, of which 11 were spayed and 2 intact. The ages at admission was organized in ranged groups: born at the shelter or <1 year (7 dogs), between 1 and 3 years (15 dogs) and between 4 and 8 years (6 dogs).

After the 2 (or in two cases 3) TT, 15 dogs were adopted, 5 were sent to other shelters, 3 remain at the shelter and 5 were euthanized for behavioural reasons.

Table 9 - Timespans between TTs for each of the 28 dogs of the study.

Number of the dog	1st TT – Months after admission	2nd TT – Months after 1st TT	3rd TT – Months after 2nd TT
1	7	16	---
2	<1	9	---
3	5	25	---
4	7	11	---
5	1	6	---
6	<1	9	---
7	3	7	---
8	3	8	---
9	3	7	---
10	2	9	---
11	8	12	---
12	8	12	---
13	8	12	---
14	20	12	---
15	4	12	---

16	3	31	---
17	2	3	---
18	1	16	---
19	4	18	---
20	10	7	---
21	10	53	---
22	9	7	---
23	5	25	---
24	2	6	---
25	4	7	---
26	1	7	22
27	4	40	29
28	1	6	---

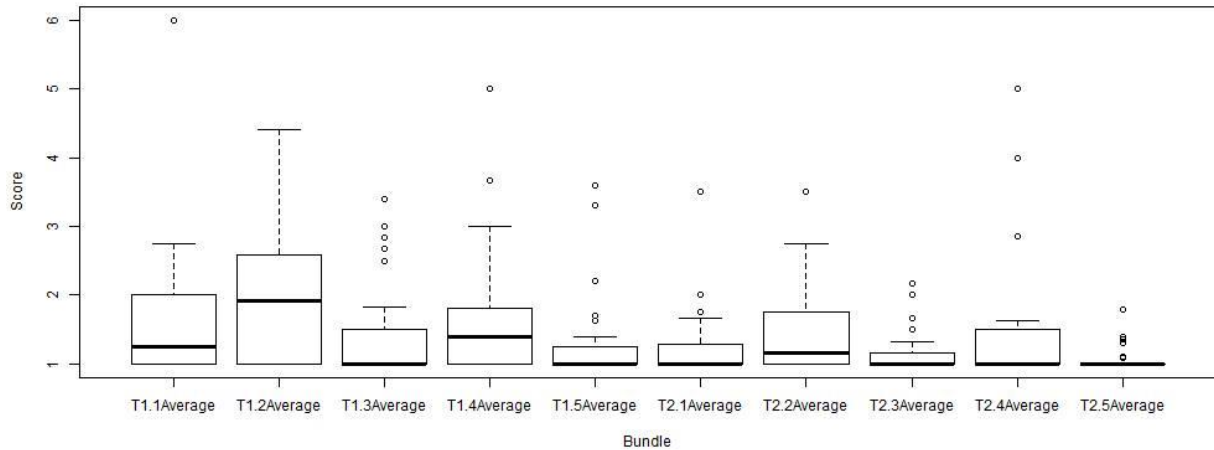
The timespan between admission and the 1st TT varied between <1 month and 20 months. Between the 1st TT and the 2nd it varies between 3 and 53 months. In the two cases that were tested thrice it was 22 and 29 months between the 2nd and the 3rd TT. The average number of months between the 1st and the 2nd test was 14 months, and the mode 7 months.

Table 10 shows the average scores of the 28 dogs, for each subgroup and for the first and second TT. Between first and second test, the dogs had undergone training. Average scores for the subgroups dog-dog and dog-human (threat) were significantly lower in the second test. The scores for the other subgroups show, at least, a trend for improvement. Training lead to a significant positive change in reactions in the test for the subgroup dog-dog ($p = 0.03$) and dog-human (threats) ($p = 0.02$). Graph 1 summarizes the results in a boxplot.

Table 10 – Average, Standard deviation, minimums and maximums of the aggregated scores (bundles) and minimums and maximums of the individual subtests comprising the bundles. Significance of the difference between the bundled results of the first and the second Temperament Test.

		T.1 Dog-Dog	T.2 Dog-Human (Threat)	T.3 Dog-Human (Friendly/ Neutral)	T.4 Dog-Human (Strange)	T.5 Other situations
1st Test	Average	1,64	1,98	1,41	1,64	1,30
	Standard Dev.	1,00	0,97	0,72	0,91	0,66
	Min.	1,00	1,00	1,00	1,00	1,00
	Max.	6,00	6,00	6,00	6,00	5,00
	Min (Bundle)	1,00	1,00	1,00	1,00	1,00
	Max. (Bundle)	6,00	4,40	3,40	5,00	3,60
2nd Test	Average	1,29	1,53	1,17	1,45	1,08
	Standard Dev.	0,53	0,66	0,32	0,94	0,18
	Min.	1,00	1,00	1,00	1,00	1,00
	Max.	5,00	5,00	5,00	5,00	5,00
	Min (Bundle)	1,00	1,00	1,00	1,00	1,00
	Max. (Bundle)	3,50	3,50	2,20	5,00	1,80
P-value		0,03	0,02	0,19	0,13	0,20

Graph 1 – Box-plots of the TT-scores per Bundle. Heavy lines indicate medians, the box extends from the 25th to the 75th percentiles, and the horizontal lines indicate minimum and maximum values, except for values more than three interquartile ranges from the nearest quartile, which are shown as individual dots.

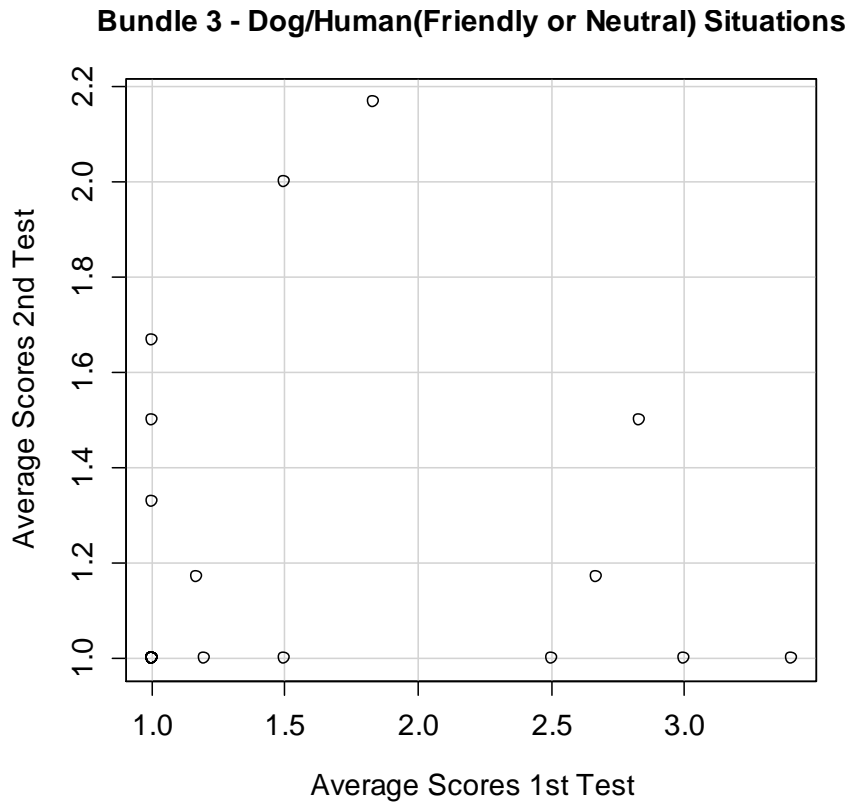


In general bundles showed greater dispersion before training, with bundles 1 and 2 featuring 50% of the dogs between scores 1 and 2 and 1 and 3, respectively. Bundles 3 and 5 already had medians of 1, not allowing for much downward change.

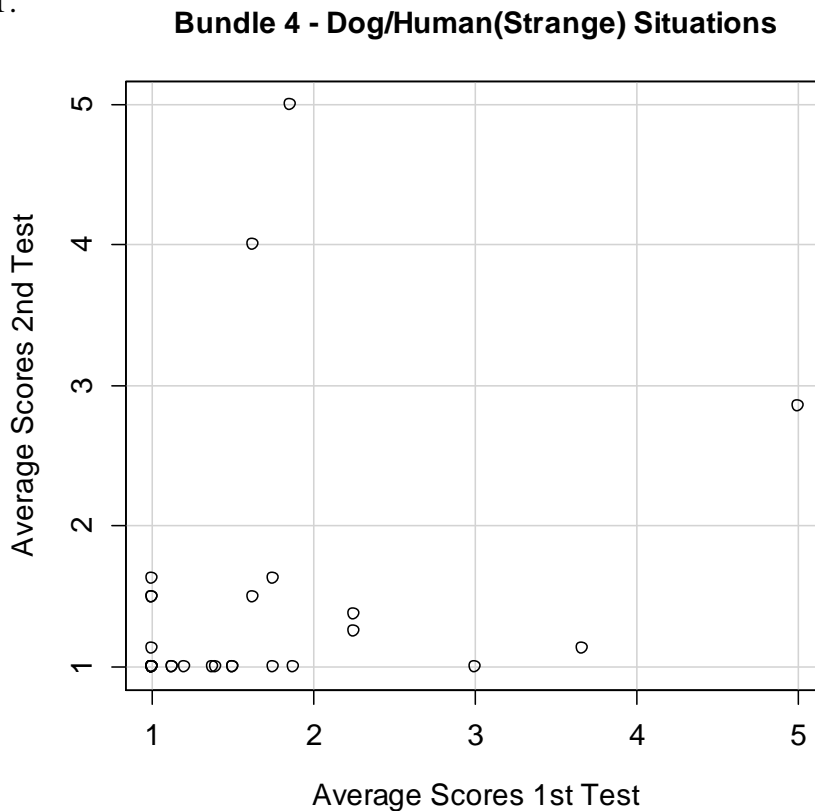
In two subgroups, bundle 1, Dog - Dog and bundle 2, Dog – Human (threatening) the P-values of 0,03 and 0,02 were indicative of significant change. The remaining three subgroup situations - Dog – Human (friendly); Dog – Human (strange) and Dog – Others – all had P-values above 0,05 this meaning that the change could not be considered statistically relevant. For some dogs changes in reactions and consequently scores had occurred. Scatterplot graphics (Graph 2 – 4) showed that for individual dogs scoring reduced in the second test.

In the subgroup 3 (dog-human (friendly) a score of 4 was never reached in the first Temperament Test, the highest being around 3.8, which was significantly reduced in the second Test, where it was 1. Some dogs did show higher scores in the second test than in the first one, but the rises never exceeded 0.7 point and that overall they all remained below 2.2.

Graph 2 – Scatterplot of the changes in average scores for bundle 3 from the 1st TT to the 2nd TT.

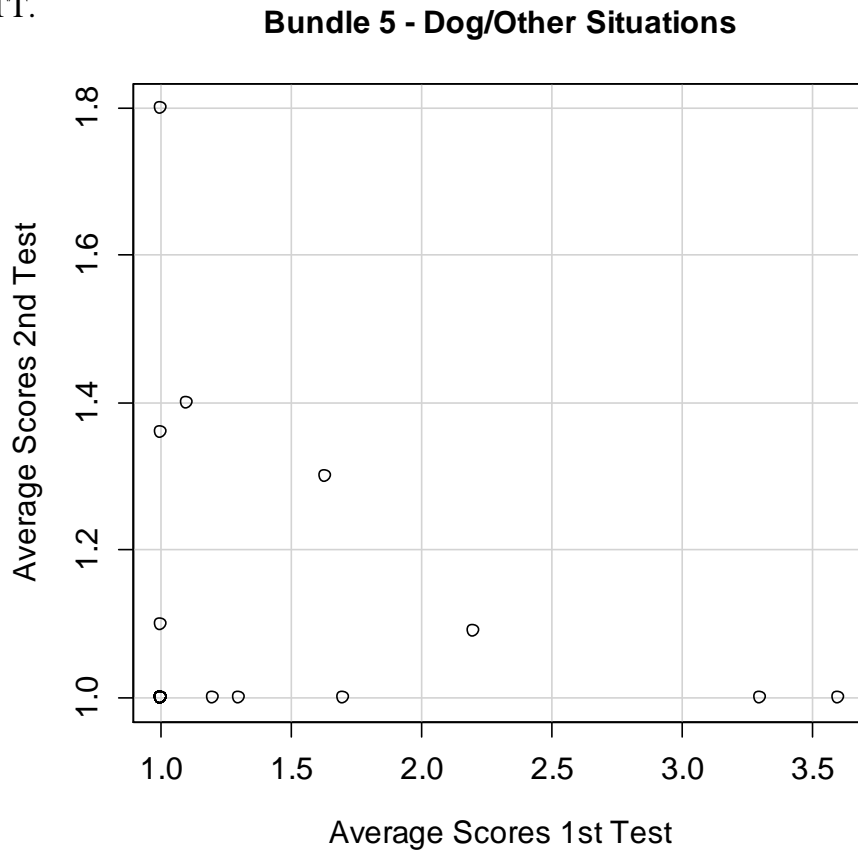


Graph 3 – Scatterplot of the changes in average scores for bundle 4 from the 1st TT to the 2nd TT.



The scatterplot referring to the bundled Dog – Human (Strange) situations shows a slight increase in the average scores of 5 dogs, which went from around 1 to around 1,5, but two dogs increased significantly from scores <2 to scores of 4 and 5.

Graph 4 – Scatterplot of the changes in average scores for bundle 5 from the 1st TT to the 2nd TT.



Similarly to the scatterplot graphic referring to the Dog – Human (Friendly/Neutral), in this bundle score 4 was never reached, those dogs which in the first test scored around 3 and 3.6 showed reductions to scores of 1 and those which showed an increase of scores, (from 1 to 1.8) in one case of one dog, remained under score 2.

7.4. Discussion

The aim of the study was to see whether (if and how) training – and, consequently, learning – affects the outcome in a Temperament Test - Retest situation. Due to the small sample size, only a limited evaluation could be done. Factors like sex, age, breed, time span between tests etc. could not be considered for statistical evaluation.

A very big proportion – 71% - of the tested dogs are pit bull type dogs, 8 % are other listed dogs, 7% are American Bulldog crossbreeds, which are also dogs phenotypically very similar to the listed breeds in opposition to only 15% other non-listed breeds, which included 3 shepherd type dogs and 1 Rhodesian Ridgeback. This breed bias is easily explained through the fact that for listed breeds the test is mandatory, while for other, non-listed breeds it is only advised in case of alleged or factual aggression. In fact, 32% of the dogs tested were only at the shelter because of their breed and subsequent non-compliance with the legal requirements.

The timespan elapsed between admission and the first TT and also between the first and the second test depended on several variables, including the availability of the tester and the time it took to schedule a test, as usually at the shelter several dogs are tested on the same date, but also on the individual progress of each dog during training. Some dogs with more pronounced behavioural issues needed longer – up to several years - in order to achieve the training goals, while others could be subjected to a re-test as early as 3 months after the first one, because the circumstances had altered enough to predict a successful outcome of the test. In the case of this specific dog, Dog nr.17 was retested after the weaning of her litter of puppies and some training sessions to mitigate her insecurity.

As for the relation of outcome and training, at the shelter, inquiries were conducted with the resident dog-trainer as well as with the staff responsible for each individual dog, besides an in-depth study of all individual existing records, in order to determine what kind of training each dog had been subject to during the time elapsed between the first and the second test.

When looking at the average values of the five bundles, it can be seen that in two cases the average values have decreased sufficiently for the reduction to translate in P-values

of $\leq 0,05$, which, suggests that the implemented training had the desired effect of reducing aggression in the test situations comprising these bundles. In the cases of bundles 3 and 5, Dog-Human (friendly) and Dog-Others, even the maximum scores were of 3.4 and 3.6, respectively, which comparatively is a low score in terms of reactivity. These bundles of tests are less likely to elicit aggression than the other three bundles, as the human behaves in a non-threatening way and the rest are miscellaneous situations which elicit aggressive reactions more on an individual basis. Therefore, starting off with low scores allows for less improvement and probability of upwards change which could explain why in these bundles the decrease was not statistically relevant.

As the results show, aggressive behaviour against humans was most often shown in situations that were threatening for the dog, or in those characterized by fast, abrupt, or strange movements of the test assistants, as was the case in bundles 2 and 4, Dog-Human (threatening) and Dog – Human (strange), which have the highest average values. The same types of situations were found to be aggression-eliciting by Mittmann (2002). This shows that dogs, independently of the breed, display aggressive behaviour toward the same triggers. Regardless of their breed, dogs are threatened by similar human attitudes and situations and individually having no better strategies to solve conflict, they resort to aggression (Schöning, 2000). Therefore, training is aimed teaching the dog alternative behaviours to solve conflict and improve its situation (Hiby, Rooney, & Bradshaw, 2004). Over time, stimuli and situations will generally be interpreted as less threatening and by changing the behaviour (reaction to stimulus) a re-evaluation of the perception of the stimulus can be achieved. This requires gradual increments and regular rewarding of desired behaviour, using shaping processes, luring and desensitization, in addition to management measures which reduce the probability of the dog being confronted with a stimulus above its momentary threshold (Yin, 2009). Management in general is easier to achieve at the shelter than in a home-environment, because the first one is a much more predictable place than the normal dog-owner would have access to in his daily routines. An alternative behaviour for conflict situations depends on the dog, as it must be one the dog shows comfortably and easily, but sitting and looking at the owner is a common choice (Yin, 2009).

The specific training item Desensitization and Counter-conditioning for contact with People (T4) was only discarded if the dog was particularly good with all people, and even

if this was the case some of the other training items cover the same area in a less specific extent. Of our n=28 only 2 of the dogs were so socially competent with people that specific training was not deemed necessary, namely Dog nr. 6 and Dog nr. 18. Dog nr. 6, was seized because she had attacked, bitten and killed a small dog and there were suspicions about her use or training in or for dogfighting. The evaluation showed her to be socially competent with other dogs of the same phenotype as her, but showing elements of the predation sequence when confronted with small dogs, which was attributed to lack of socialization to different types of dogs. Her scores in the first TT were consistently low with the exception of Sit.26, where in contact with a small dog of the opposite gender behind a fence she escalated to a score of 5. Sit 23 was not concluded with complete approach as the dog was showing rapid focus followed by threatening stare and tense body posture which under prolongation escalated to very high levels of arousal with screaming and pulling on the leash. In the second TT, undertaken 9 months after the first, both situations 23 and 26 were scored with 3, as Dog 6 was tested with a similar small dog as in the first TT. This time, even though she still showed the same rapid focus and stare when faced with the small dog, she only added antagonistic elements of communication when the other dog growled. In higher levels of arousal her communication maintained variability and her reactions were notably weakened in comparison to TT1. Dog nr. 18 had passed the first TT (version for young dogs) without any score higher than 2 but had to undergo a second TT because she had not concluded the test in a satisfactory manner because of increasing lameness.

Almost all dogs (n=26) were subject to specific training sessions of desensitization and counter-conditioning for contact with people, so they would learn new coping strategies in case of stress and not resort to aggression as a first option, and in general associate human presence in all its forms to positive events.

In the various bundles assessing the reaction of the dog in dog-human encounters, those which were deemed in need of DSCC with people also had different scores in the first TT. Considering the bundle Dog-Human (threatening), nine, namely Dogs 3, 4, 7, 9, 14, 15, 16, 17 and 26 reached scores of 5 - Biting, attempt at biting, attack with headthrust but without bite, threatening signals present. Dog 24 scored a level of 6 (the same as 5 but without threatening signals) in Sit 34 and the first TT was not completed successfully because he was too aroused to continue, after training he scored a maximum of 3 in the

second TT. All of these dogs' scores went down from TT1 to TT2 to maximum values of 2, except in the case of Dog 17 who maintained a score of 5 in Sit 34. This dog was a nursing female, mother to Dogs 11, 12 and 13 which may explain heightened insecurity and aggressiveness, the test was repeated three months later, after some training, with the potential adopter, but only those situations which had shown to be problematic in the first test. Although for statistical reasons the highest of two scores is used, (in this case a 5 when the test states 3-5 scores in situation 34, for example), the dog's behaviour was considerably more differentiated, with a more hesitant approach, more communication in terms of insecurity and stress in the face of threatening human (with growling and barking previous to bite) (Röhrs & Schöning, 2013), and an autonomous release of the bite to the arm. Also she showed increased "looking at the handler" as a coping strategy in conflict situations, which is one of the aims of the training. The cluster Dogs 11, 12 and 13 respectively, are a specific case because they are all members of a litter born at the shelter to female Dog 17 and which due to being raised in a shelter environment showed severe deficits in socialization even though the staff tried to compensate the sub-optimal conditions these puppies were subject to during the important socialization phase. They were extremely fearful and the TT1, a shorter version for young dogs, as they were only 8 months of age, could not be concluded because in several situations the animals laid down in a state of learned helplessness and the testing could not proceed. In the second TT, which was undertaken one year later and after extensive training they had significantly improved and scored maximums of 2 throughout the entire test. Dog nr.28 was a female who had significant trouble with the shelter environment and got behaviourally worse over the time, leading to her failing the second TT which was not even concluded because of extremely high levels of arousal and aggressive behaviour, which then led to her euthanasia.

The second bundle, assessing Dog – Human (Friendly/Neutral) showed 5 of the 28 dogs with scores of 4, namely Dogs 1, 2, 3, 5 and 7; two dogs which reached scores of 5: Dogs 4 and 16 and one of those, Dog 4 reaching a score of 6 in Sit 17. All other 21 remained ≤ 3 in all six situations comprising this bundle. This same bundle in TT2 showed that only 2 dogs had scores of 4, one of them, Dog 1, having reduced the number of situations scored with 4 from 3 to 1, the second, Dog 25, increased his score from a score 2 in Sit 17 and a score 1 in Sit 20 to two scores of 4 which reflect a deterioration of his behaviour which in ultimate analysis led to his euthanasia. Only one dog, nr. 27, showed a score of

5 in the second test, this being a dog which had passed the first TT, was then adopted and returned due to aggressive behaviour, failed the second test at the shelter over three years later, and passed a final TT after another two years of training. He remains at the shelter until the present date.

In the Dog-Human (Strange) bundle, that, as has been described previously, comprises those sub-tests in which humans behave in an unusual, prey-drive eliciting or subjectively threatening manner, such as wearing odd garments, crouching, limping, running, moving awkwardly or making odd sounds, the general outlay was as follows: 16 of the 28 dogs showed scores ≤ 3 , of the remaining 12, 3 had maximum scores of 4, 8 had maximum scores of 5 and only one dog, nr.4, scored a maximum of 6 in one sub-test, namely Sit.8, the stumble. In the second TT, for this bundle, in all 28 dogs, six scored maximums of 5, none scored higher than 5, 3 dogs scored maximums of 3, and the remaining ones scored ≤ 2 . The dog nr.4 which had scored 6 in the first TT was down to 5 in the second TT, 3 dogs which had scored lower in the first TT scored 5 in the second TT, which reflects the behavioural deteriorating which in fact led to their second fail and subsequent euthanasia. Dogs 16 and 17, maintained scores of 5, but in 16's case the number of situations scored with 5 went down from 6 to 3, and 17 maintained a score of 5 in Sit 8, but as in the previously described situation 34 this time it was a score of 3-5 and the communicative signals were much more differentiated than in the first TT, with very inhibited snapping and an increasingly fast focus on the handler in subsequent repetitions.

Some of the dogs that failed the first TT were not trained specifically for dog-dog interactions (No Desensitization and Counter-conditioning for Dog-Dog Contact) because their behaviour as assessed by the resident trainer and/or shelter staff and the results of the test showed social competence in intraspecies communication and therefore no need to add the DSCC in this sector. The dogs in this category were 9, all of which in the first TT in the dog-dog bundle scored ≤ 3 , over 50% (5 out of 9) of them scoring as low as 1, with one exception, dog nr.2 who scored a 4 in Sit. 23, in which two dogs of different genders pass the tested dog at a "normal" walking distance of around 2 m. Even without the specific training item in their list, in the second TT all dogs that had scored ≥ 2 reduced or maintained their score, except Dog 18, who went from 1 to 2 in Sit.23 which considering the rest of the test is a contextual variation of small scale which can be related to the personal sympathy towards the specific test-dog in this trial. The dogs which

had scored highest in the first TT, Dogs 2 and 9, were also the ones that showed the highest reduction of score, namely from 4 to 1 and from 3 to 1. This reduction of scale in the “no-DSCC group” is a normal phenomenon, as training has to be understood as an ongoing transversal process not limited to the specific training class or exercise, but subject to the four quadrants of operant conditioning (Yin, 2009), and daily interactions with qualified personal at the shelter provide plenty of opportunities to improve behaviour and work on social skills. Of the 28 dogs in this study, all but 5 were tried out in various constellations of other dogs, always bearing in mind that not getting along with a specific other dog does not reflect a general and immutable incapacity for social interaction with the same species, but rather that this skill can be improved and built up through use and multiple trials (Röhrs & Schöning, 2013). Dog 2, during the time between the first and the second TT proved herself a very useful dog in terms of social interaction, helping her designated caretaker when introducing new dogs with coarse social skills, as she had very good communication skills and biting inhibition, which made her a valuable member in the groups designated to test or receive these dogs.

Those 19 dogs that between the first and the second TT were subjected to Desensitization and Counter-Conditioning for Dog-Dog Contact, five dogs – Dogs 4, 11, 12, 13 and 20 had not much room for improvement at least on a numeric scale, considering that they scored maximums of 1 in the first test. One other dog, Dog 5, went from a maximum of 1 to a maximum of 2 in one situation, namely Sit.24, the stumble while passing another dog; Dog 25 scored 1 in all situations but the first TT had not been complete in this bundle, because of high levels of arousal and distress; and Dog 28 maintained her score of 5, in accordance with her general lack of rehabilitation success. Specifically, in the area of dog-dog contact, this female showed flagrant deficits as she had been raised in a closed off yard without any opportunity of same-species interaction and only very limited human contact. As fear is a major trigger for aggressive behaviour it has been proposed that dogs with insufficient experience (social, communicative and environmental) during their socialisation period(s) will subsequently be more ready to react aggressively, and be more inclined to escalate their aggression. Such dogs also show lower competence for regulating aggressive communication and social communication at large (Schöning, 2006). The dogs that showed most positive developments in terms of dog-dog contact after the first TT and training were Dog 3, who went from a scale 4 to a scale 2, Dog 6, from 5 to 3, Dog 14, from 4 to 1, Dog 15, from 4 to 2 and Dog 16, from 5 to 1. Dogs 24

and 26, both improved from a maximum score of 6 to 3 and 2, respectively, in this bundle, but their ongoing problems in human interaction led to their euthanasia.

While both DSCC-Humans and DSCC-Dogs are training items whose objective is very clearly stated in the problem they address as well as in the way they address it, the other training types were not very easy to define, nor are they very specific in terms of the problem they address. It is difficult to outline a formula which matches a specific training action to a specific improvement in terms of behaviour, even more so as the records are sparse and incomplete. The sheets to be filled in by the PCT of each dog and the cards to be annexed to the individual's history are not always sufficient in terms of information, to allow – as was our initial aim – an account of frequency, duration and number of repetitions of a training type throughout the time between Temperament Tests. The vocabulary and descriptive detail greatly varies between caretakers, and while some write detailed reports on each session, others, probably also due to time constraints (as the shelter is always very busy), only sum up the basic points.

Therefore, there was an attempt to stipulate a number of training types that most caretakers could agree on using. These however, often overlap in their aim, as the final goal is the same: calmer, more stable dogs which have good coping mechanisms for conflict situations and have learned to focus on their personal caretaker. Better social obedience is a goal as well as a strategy of controlling undesired behaviours. All training types and even seemingly “informal” activities such as tricks and agility concur to achieve this final goal because those, besides exercising the dog, also contribute to the mental balance by giving the animal cognitive stimulation, and improve the bond between dog and caretaker and the focus of the dog on the caretaker (Laser, 2008). For Dog 16, Agility classes were a turning point in his behavioural improvement, and his adoption sheet included the request of maintaining this activity in his new home, if possible.

The TT-Temperament Test Situations is a type of training that aims at preparing the dogs for the different situations in the battery test, some of which are quite harsh and unsettling, especially for dogs who have socialization deficits and are therefore wary of new/strange situations or objects. The training, is of course, not to be understood as a contextualized learning by heart of the sequence of the test, which would invalidate the result of the test, but rather a learning for life experience in which the dogs are taught how to react to novel and threatening or subjectively threatening situations, a skill which then is generalized in

other environments and other stimuli. In a shelter environment, care has to be taken to avoid the contextualized learning, as there are limited resources in terms of space, equipment and also time, and the training process should not mimic the final test in terms of location and sequence. Therefore, it is not possible to draw a direct correspondence between a training type and the bundle Dog – Other Situations. This bundle includes situations such as a simulation of an elevator filled with people, a noisy machine, balloons and a suddenly opening umbrella, a bike passing by and someone sweeping with a broom. All of those are covered in the TT-Temperament Test Situations, but the TT- Impulse Control and Bite Inhibition also covers many of the potentially unwanted behaviours as unprovoked biting of environmental stimuli/objects is one frequent behaviour shown by dogs with deficits in this area. Situations 22 and 35 are rarely tested in this group of dogs, because Sit.22 – a dog barking in the distance – does not make sense in a shelter environment as there are always barking dogs somewhere, and Sit.35, the burning lighter is a rather outdated sub-test which is no longer applied for animal welfare reasons. In the first TT only 8 dogs out of 28 showed noteworthy reactions and consequently scores higher than 1, Dogs 4, 10 and 14, scored maximums of 3, Dog 1, scored two situations with 4 and Dogs 2, 3, 16 and 28, all reached scores of 5 in some of the sub-tests. Dog 16, achieved level 5 scores in 6 of the 11 situations comprising this bundle, closely followed by Dog 3, who achieved 4 level 5 scores. After training, in the second TT, all these dogs reduced their scores to maximums of 2. In some cases, such as Dog 16, who went from 6 scores of 5 to no score higher than 1, and Dog 3, who also reduced her 4 scores of 5 to none higher than 1. Dog 28, did not even complete all situations of the second test, as her behaviour had gotten worse. Similar to this case, we have the appearance of two new dogs in the ≥ 3 group, in the second TT, Dog 25 and 26, which had scored 1 in the first Temperament Test and in the retest showed scores of 5 in some subtests of this bundle, as mentioned before, these were two dogs which had to be euthanized because they were not deemed safe to be put up for adoption even after extensively trained at the shelter.

7.5. Conclusions

The results of this study suggest that training does have an effect on the aggressive behaviour shown although in some situations the effect of the training was more evident than others. When considering the five bundles of sub-tests (Dog-Dog, Dog-Human

(threatening), Dog-Human (Friendly/Neutral), Dog-Human (Strange) and Others) in two cases, the situations of interaction with threatening humans and the dog to dog contact the average values were significantly lower after training than before training demonstrating a significant reduction of the scores. This indicates that training does improve the dog's capacity of using adequate coping mechanisms facing these situations. The training also dramatically increased the number of dogs passing the TT, considering that after being trained at the shelter, 23/28 dogs, 82,1%, passed the second Temperament Test.

Chapter 8 - Overall Conclusions and the Future Applicability of such a Temperament Test in Portugal

Passing a battery-type Temperament Test that screens for aggression, as is, in this case, the Standardized Temperament Test of Lower Saxony, tells us that the dog at the moment of the test, in the tested situations, did not show disturbed or inadequate aggressive behaviour – which does not guarantee that, for this dog, there is no stimulus capable of eliciting said behaviour. Also, short term changes of behaviour cannot be totally excluded, such as for example the possibility of a dog not being successful in its aggressive behaviour because it was muzzled, and subsequently not showing the same behaviour in other situations. Bearing this in mind, when trying to assess when and how a dog shows aggressive behaviour, Temperament Tests can be a useful tool, and they also can give us the necessary description (through the scaling method used) of the aggression shown, which can be essential in legal cases involving allegedly aggressive dogs. The test is valid in detecting a certain amount of risk a dog presents, and to qualify it in terms of which stimuli released the aggression. But they should neither be the only tool nor be used as single prospective means for characterising a dog, nor to decide which dogs should be euthanized or muzzled for life.

The whole picture must be taken into consideration, with special focus on the utility of training. Training can greatly alter behaviours that at a certain point of time assume themselves as problems, including aggression, and the fact that the great majority of dogs in this study have improved significantly, even under the temporal and economic constraints of a shelter environment, is a very auspicious result.

Voices rising against the utility of Temperament Tests screening for aggression in shelter dogs, have shared the concern that more effort and resources should be channelized into maximizing positive day-to-day interventions such as walking, socializing with people, playgroups with other dogs, games and training as a way of enriching the life of dogs that have already been relinquished and are now confined in a shelter (Patronek & Bradley, 2016). It is the author's opinion that it should not be a matter of using one or the other, but that we should use Temperament Tests in addition to more informal types of assessment and shelter management, not forgoing an objective intake story whenever possible, to obtain the most precise possible personality outline for the individual dog. A battery type Temperament Test, although being provocative in its nature and surely

stressful for the dog, can be necessary. This may be the case at overcrowded shelters with insufficiently trained staff which lack the opportunity or capacity for these more informal day to day assessments, or in cases where a very objective document or the assessment of an expert is of great importance, such as in legal cases, where it represents a forensic tool. For the Portuguese reality, this Temperament Test would provide an interesting starting point for further work in evaluating shelter dogs, those that have allegedly been involved in aggressive incidents and also those breeds subject to BSL. The present law, which still uses biologically incorrect terms such as “aggressive character” of an animal besides defining the municipal veterinarian as the person to make decisions about dogs that have been involved in incidents of aggression, can lead to misunderstandings or dubious decisions, and also fails in defining the role of a specialist in animal behaviour in these matters.

Besides evaluating and assessing the risk posed by a specific dog at a given moment, this Temperament Test gives us the quantitative and qualitative evaluations against which success/failure of the training can be measured and therefore allows for a more concise and scientific approach, reducing the risk of emotional decisions.

Bibliography

- Abrantes, R. (1987). The expression of emotions in man and canid. *Journal of Small Animal Practice*, 28(11), 1030–1036.
- Åkerberg, H., Wilsson, E., Sallander, M., Hedhammar, Å., Lagerstedt, A.-S., Larhammar, D., & Meyerson, B. (2012). Test for personality characteristics in dogs used in research. *Journal of Veterinary Behavior: Clinical Applications and Research*, 7(6), 327–338.
- Amat, M., de la Torre, J. L. R., Fatj??, J., Mariotti, V. M., Van Wijk, S., & Manteca, X. (2009). Potential risk factors associated with feline behaviour problems. *Applied Animal Behaviour Science*, 121(2), 134–139.
- Asp, H. E., Fikse, W. F., Nilsson, K., & Strandberg, E. (2015). Breed differences in everyday behaviour of dogs. *Applied Animal Behaviour Science*, 169, 69–77.
- Bamberger, M., & Houpt, K. A. (2006). Signalment factors, comorbidity, and trends in behavior diagnoses in dogs: 1,644 cases (1991-2001). *Journal of the American Veterinary Medical Association*, 229(10), 1591–1601.
- Bettencourt, I. (2013). *Estudo retrospectivo sobre a Epidemiologia da Dentada Canina na região de Lisboa e Vale do Tejo Estudo retrospectivo sobre a Epidemiologia da Dentada Canina na região de Lisboa e Vale do Tejo*. Universidade Lusófona.
- Bollen, K. S., & Horowitz, J. (2016). Behavioral evaluation and demographic information in the assessment of aggressiveness in shelter dogs. *Applied Animal Behaviour Science*, 112(1), 120–135.
- Böttjer, A. (2003). Untersuchung des Verhaltens von fünf Hunderassen und einem Hundetypus im innerartlichen Kontakt des Wesenstestes nach den Richtlinien der Niedersächsischen Gefahrtier-Verordnung vom 05.07.2000.
- Bowen, J., & Heath, S. (2005). *Behavioral Problems in Small Animals: Practical Advice for the Veterinary Team*. Philadelphia: Saunders Elsevier.
- Brackman, J. (2008). Can DNA Decipher the mix? Unraveling the genetic tapestry provides clues to breeds and their mixes. *The Bark*, 50, 1–5.
- Bradley, J. (2011). The Relevance of Breed in Selecting a Companion Dog. *National Canine Research Council*, 1–62.
- Bradshaw, J. (2011). *Dog Sense*. New York: Basic Books.
- Bruns, S. (2003). Aus dem Institut für Tierschutz und Verhalten (Heim- , Labortiere und Pferde) der Tierärztlichen Hochschule Hannover Fünf Hunderassen und ein Hundetypus im Wesenstest nach Faktoren , die beißende von nicht-beißenden Hunden unterscheiden.
- Campbell, W. E. (1975). *Behavior Problems in Dogs*. Santa Barbara: American Veterinary Publications Inc.
- Casey, R. A., Loftus, B., Bolster, C., Richards, G. J., & Blackwell, E. J. (2014). Human directed aggression in domestic dogs (*Canis familiaris*): Occurrence in different contexts and risk factors. *Applied Animal Behaviour Science*, 152, 52–63.

- Dawkins, R. (1989). *The Selfish Gene*. Oxford: Oxford University Press. Retrieved from <https://books.google.pt/books?id=go0e5sBRznYC>
- Del Amo, C., Jones-Baade, R., & Mahnke, K. (2001). *Der Hundeführerschein*. Stuttgart: Verlag Eugen Ulmer.
- Diederich, C., & Giffroy, J. M. (2006). Behavioural testing in dogs: A review of methodology in search for standardisation. *Applied Animal Behaviour Science*, 97, 51–72.
- Donaldson, J. (1996). *The Culture Clash*. James & Kenneth Publishers. Retrieved from <https://books.google.pt/books?id=bT-wIWut9S4C>
- Duffy, D. L., Hsu, Y., & Serpell, J. A. (2008). Breed differences in canine aggression. *Applied Animal Behaviour Science*, 114(3–4), 441–460.
- Fatjó, J., Ruiz-de-la-Torre, J. L., & Manteca, X. (2006). The epidemiology of behavioural problems in dogs and cats: A survey of veterinary practitioners. *Animal Welfare*, 15(2), 179–185.
- Fedderson-Petersen, D. (1992). *Hunde und ihre Menschen*. Stuttgart: Franckh-Kosmos-Verlag.
- Fedderson-Petersen, D. (2000a). *Grundlagen einer tierschutzgerechten Ausbildung von Hunden: Ethologisches Gutachten zur Verwendung von Elektroreizgeräten bei der Ausbildung von Hunden*. Dortmund: VDH e.V.
- Fedderson-Petersen, D. (2000b). Gutachten zu folgender Fragestellung: Ist bei allen Exemplaren der nachfolgend aufgeführten Hunderassen a priori aufgrund rassespezifischer Merkmale von einer gesteigerten Aggressivität und Gefährlichkeit gegenüber Menschen oder Tieren auszugehen: Pit-Bul. Retrieved May 10, 2016, from http://www.beta-dog.de/gleichgesinnte/fedderson_petersen_gutachten_ueber_gesteigerte_aggressivitaet_bei_bestimmten_rassen.php
- Fedderson-Petersen, D., & Ohl, F. (1995). *Ausdrucksverhalten beim Hund: Mimik und Körpersprache, Kommunikation und Verständigung*. Jena: Verlag Gustav Fischer. Retrieved from <https://books.google.co.uk/books?id=I0rgAAAACAAJ>
- Foyer, P., Bjällerhag, N., Wilsson, E., & Jensen, P. (2014). Behaviour and experiences of dogs during the first year of life predict the outcome in a later temperament test. *Applied Animal Behaviour Science*, 155, 93–100.
- Fratkin, J. L., Sinn, D. L., Patall, E. A., & Gosling, S. D. (2013). Personality Consistency in Dogs : A Meta-Analysis, 8(1).
- Gattermann, R. (1993). *Verhaltensbiologie*. Jena: Gustav Fischer Verlag. Retrieved from <https://books.google.pt/books?id=5z-qcQAACAAJ>
- Gebhardt-henrich, S. (2002). A behaviour test on German Shepherd dogs : Heritability of seven different traits A behaviour test on German Shepherd dogs : heritability of seven different traits. *Applied Animal Behaviour Science*, 79(2), 113–132.
- Gosling, S. D., & John, O. P. (1999). Personality Dimensions in Nonhuman Animals: A Cross-Species Review. *Current Directions in Psychological Science*, 8(3), 69–75.
- Hart, B. L., & Hart, L. A. (1985). Selecting pet dogs on the basis of cluster analysis of

- breed behavior profiles and gender. *Journal of the American Veterinary Medical Association*, 186(11), 1181–1185.
- Harvey, N. D., Craigon, P. J., Sommerville, R., McMillan, C., Green, M., England, G. C. W., & Asher, L. (2016). Test-retest reliability and predictive validity of a juvenile guide dog behavior test. *Journal of Veterinary Behavior: Clinical Applications and Research*, 11, 65–76.
- Hiby, E. F., Rooney, N. J., & Bradshaw, J. W. S. (2004). Dog training methods: Their use, effectiveness and interaction with behaviour and welfare. *Animal Welfare*, 13(1), 63–69.
- Hirschfeld, J. (2005). *Untersuchung einer Bullterrier-Zuchtlinie auf Hypertrophie des Aggressionsverhaltens*. Tierärztliche Hochschule Hannover.
- Horwitz, D. F., & Neilson, J. (Eds.). (2007). *Blackwell's Five-Minute Veterinary Consult Clinical Companion: Canine and Feline Behavior*. Wiley-Blackwell.
- Horwitz, D., & Mills, D. (2009). *BSAVA Manual of Canine and Feline Behavioural Medicine*. British Small Animal Veterinary Association. (2cnd ed.). Quedgeley: UK: BSAVA.
- Hsu, Y., & Serpell, J. a. (2003). Development and validation of a questionnaire for measuring behavior and temperament traits in pet dogs. *Journal of the American Veterinary Medical Association*, 223(9), 1293–1300.
- HundeGDVO. (2006). Hamburgisches Gesetz über das Halten und Führen von Hunden (Hundegesetz - HundeG). Retrieved October 23, 2016, from <http://www.landesrechthamburg.de/jportal/portal/page/bshaprod.psml?showdoccase=1&doc.id=jlr-HuGHARahmen&doc.part=X&doc.origin=bs&st=lr>
- Immelmann, K., Pröve, E., & Sossinka, R. (1996). *Einführung in die Verhaltensforschung*. Blackwell Wissenschafts-Verlag.
- Immelmann, K., Scherer, K. R., Vogel, C., & Schmoock, P. (1988). *Psychobiologie*. Weinheim, München: Psychologie Verlags Union.
- Slabbert, J. S. J. O. (1996). Early prediction of adult police dog efficiency - a longitudinal study.
- Johann, T. (2004). *Untersuchung des Verhaltens von Golden Retrievern im Vergleich zu den als gefährlich eingestuften Hunden im Wesenstest nach der Niedersächsischen Gefahrtierverordnung vom 5.7.2000*. Tierärztliche Hochschule Hannover.
- Jones, A. C., & Gosling, S. D. (2005). Temperament and personality in dogs (*Canis familiaris*): A review and evaluation of past research. *Applied Animal Behaviour Science*, 95(1–2), 1–53.
- Judson, J. (1995). *The Australian Canine Good Citizen Instructor's Handbook* (N.S.W. Ani). Sidney.
- King, T., Marston, L. C., & Bennett, P. C. (2012). Breeding dogs for beauty and behaviour: Why scientists need to do more to develop valid and reliable behaviour assessments for dogs kept as companions. *Applied Animal Behaviour Science*, 137(1–2), 1–12. <http://doi.org/10.1016/j.applanim.2011.11.016>
- Landsberg, G., Hunthausen, W., & Ackerman, L. (2013). *Behavior Problems of the Dog*

- and Cat* (3rd ed.). Elsevier Health Sciences UK. Retrieved from <https://books.google.pt/books?id=5rtQ8AazitAC>
- Landtag Rheinland-Pfalz. (2004). Landesgesetz über gefährliche Hunde (LHundG). Retrieved November 28, 2016, from http://landesrecht.rlp.de/jportal/portal/t/138p/page/bsrlpprod.psml?pid=Dokumentanzeige&showdoccase=1&js_peid=Trefferliste&fromdoctodoc=yes&doc.id=jlr-LHundGRP2004rahmen&doc.part=X&doc.price=0.0&doc.hl=0
- Laser, B. (2008). *Clickertraining - Das Lehrbuch für eine Moderne Hundeausbildung*.
- Ledger, R. A., & Baxter, M. R. (1997). The development of a validated test to assess the temperament of dogs in a rescue shelter. *Proceedings of the First International Conference on Veterinary Behavioural Medicine*, 87–92. Retrieved from http://agris.fao.org/agris-search/search/display.do?f=1998/GB/GB98183.xml;GB1997038282%5Cnhttp://eprints.lincoln.ac.uk/1880/18/1_16.pdf
- Marder, A., & Duxbury, M. M. (2008). Obtaining a Pet: Realistic Expectations. *Veterinary Clinics of North America - Small Animal Practice*, 38(5), 1145–1162.
- Marston, L. C., & Bennett, P. C. (2003). Reforging the bond - Towards successful canine adoption. *Applied Animal Behaviour Science*, 83(3), 227–245.
- McConnell, P. B. (2002). *The Other End of the Leash: Why We Do what We Do Around Dogs*. Ballantine Books. Retrieved from <https://books.google.pt/books?id=kBiLc1S4PHgC>
- Meyer, P. (1984). *Taschenlexikon der Verhaltenskunde*. Zürich: Paderborn : Schöningh.
- Miklósi, A. (2007). *Dog Behaviour, Evolution, and Cognition*. Oxford University Press.
- Mittmann, A. (2002). *Untersuchung des Verhaltens von 5 Hunderassen und einem Hundetypus im Wesenstest nach den Richtlinien der Niedersächsischen Gefährtierversordnung vom 05.07.2000*. Tierärztliche Hochschule Hannover.
- Murphy, J. A. (2016). Describing categories of temperament in potential guide dogs for the blind. *Applied Animal Behaviour Science*, 58(1–2), 163–178.
- Netto, W. J., & Planta, J. U. (1997). Behavioural testing for aggression in the domestic dog. *Applied Animal Behaviour Science*, 52(3–4), 243–263.
- NMELF. (2000). Niedersächsisches Ministerium für Ernährung, Landwirtschaft und Forsten: Wesenstest für Hunde.
- NMELF. (2003). Niedersächsisches Ministerium für Ernährung, Landwirtschaft und Forsten: Niedersächsisches Gesetz über das Halten von Hunden (NhundG). Nds. GVBL, 367.
- NMELV. (2011). Niedersächsisches Gesetz über das Halten von Hunden (NHundG) *) Vom 26. Mai 2011, 2011(L), 2–14.
- Ohl, F. (1999). *Körpersprache des Hundes: Ausdrucksverhalten erkennen und verstehen*. Stuttgart: Ulmer Verlag.
- Ott, S. A., Schalke, E., von Gaertner, A. M., & Hackbarth, H. (2008). Is there a difference? Comparison of golden retrievers and dogs affected by breed-specific legislation

- regarding aggressive behavior. *Journal of Veterinary Behavior: Clinical Applications and Research*, 3(3), 134–140.
- Overall, K. (2010). Breed specific legislation : How data can spare breeds and reduce dog bites, *186*, 277–279.
- Overall, K. (2013). *Clinical Behavioral Medicine for Small Animals*. St. Louis: Mosby-Year Book.
- Paroz, C., Gebhardt-Henrich, S. G., & Steiger, A. (2008). Reliability and validity of behaviour tests in Hovawart dogs. *Applied Animal Behaviour Science*, 115(1), 67–81.
- Patronek, G. J., & Bradley, J. (2016). No better than flipping a coin: Reconsidering canine behavior evaluations in animal shelters. *Journal of Veterinary Behavior: Clinical Applications and Research*.
- Pervin, L. A., & John, O. P. (1997). *Personality: theory and research* (7th ed.). New York: Wiley. Retrieved from <https://books.google.pt/books?id=ASIRAQAIAAJ>
- Peters, V., Sottiaux, M., Appelboom, J., & Kahn, A. (2004). Clinical and laboratory observations posttraumatic stress disorder after dog bites in children ´. *European Journal of Pediatrics*.
- Pfaffenberger, C. ., Scott, J. P., & Fuller, J. L. (1976). *Guide dogs of the Blind; their selection, development and training*. Amsterdam, Oxford, New York: Elsevier Verlag.
- Planta, J. & de Meester, R. (2007). Validity of the Socially Acceptable Behavior (SAB) test as a measure of aggression in dogs towards non-familiar humans. *Vlaams Diergeneeskundig Tijdschrift*, 76(5), 359–368.
- Rayment, D. J., De Groef, B., Peters, R. A., & Marston, L. C. (2015). Applied personality assessment in domestic dogs: Limitations and caveats. *Applied Animal Behaviour Science*, 163, 1–18.
- Reid, P. J. (2013). Animal Behavior Forensics: Evaluation of Dangerous Dogs and Cruelty Victims. In L. Milla & S. Zawistowski (Eds.), *Shelter Medicine for Veterinarians and Staff* (pp. 559–567). John Wiley&Sons Inc.
- Reisman, R. W. (2013). Veterinary Forensics: Medical Evaluation of Abused Live Animals. In L. Miller & S. Zawitowski (Eds.), *Shelter Medicine for Veterinarians and Staff* (pp. 383–404).
- Röhrs, K., & Schöning, B. (2013). *Hundesprache Mimik und Körpersprache richtig deuten*.
- Salman, M. D., New, J. G. J., Scarlett, J. M., Kass, P. H., Ruch-Gallie, R., & Hetts, S. (1998). Human and animal factors related to relinquishment of dogs and cats in 12 selected animal shelters in the United States. *Journal of Applied Animal Welfare Science : JAAWS*, 1(3), 207–226.
- Scarlett, J. M., Salman, M. D., New, J. G., & Kass, P. H. (2002). The role of veterinary practitioners in reducing dog and cat relinquishments and euthanasias. *Journal of the American Veterinary Medical Association*, 220(3), 306–311.
- Schöning, B. (2000). Warum beißt der Hund? *Deutsches Tierärzteblatt*, 904–913.

- Schöning, B. (2006). *Evaluation and prediction of agonistic behaviour in the domestic dog*. University of Bristol.
- Scott, J. P., & Fuller, J. L. (1965a). *Dog behaviour - The genetic basis*. Chicago: The University of Chicago Press.
- Scott, J. P., & Fuller, L. (1965b). *Genetics and the social behaviour of dogs*. Chicago: Chicago Press.
- Seiferle, E., & Leonhardt, E. (1984). *Wesensgrundlagen und Wesensprüfung des Hundes*. Kaltbrunn: Nachdruck Schweizerische Kynologische Gesellschaf.
- Seksel, K., Mazurski, E. J., & Taylor, A. (1999). Puppy socialisation programs: short and long term behavioural effects. *Applied Animal Behaviour Science*, 62(4), 335–349.
- Serpell, J. (1995). *The Domestic Dog: Its Evolution, Behaviour and Interactions with People*. Cambridge: Cambridge University Press. Retrieved from https://books.google.pt/books?id=I8HU_3ycrrEC
- Serpell, J., & Hsu, Y. (2001). Development and validation of a novel method for evaluating behavior and temperament in guide dogs. *Applied Animal Behaviour Science*, 72(4), 347–364.
- Sheperd, K. (2009). Ladder of aggression. In D. Horwitz & D. Mills (Eds.), *BSAVA Manual of Canine and Feline Behavioral Medicine* (pp. 13–16).
- Sheppard, G., & Mills, D. S. (2002). The development of a psychometric scale for the evaluation of the emotional predispositions of pet dogs. *International Journal of Comparative Psychology*, 15, 201–222.
- Stephen, J., & Ledger, R. (2007). Relinquishing dog owners' ability to predict behavioural problems in shelter dogs post adoption. *Applied Animal Behaviour Science*, 107(1–2), 88–99.
- Stur, I. (1987). Genetic aspects of temperament and behaviour in dogs. *Journal of Small Animal Practice*, 28(11), 957–964.
- Svartberg, K. (2006). Breed-typical behaviour in dogs—Historical remnants or recent constructs? *Applied Animal Behaviour Science*, 96(3), 293–313.
- Tamimi, N., Malmasi, A., Talebi, A., Tamimi, F., & Amini, A. (2013). Owner complaints of canine behavior in Iran-A preliminary survey. *Journal of Veterinary Behavior: Clinical Applications and Research*, 8(1), 26–31.
- Taylor, K. D., & Mills, D. S. (2006). The development and assessment of temperament tests for adult companion dogs. *Journal of Veterinary Behavior: Clinical Applications and Research*, 1(3), 94–108.
- R Core Team (2013). *R: A Language and Environment for Statistical Computing*. Viena, Austria: R Foundation for Statistical Computing. Retrieved from <http://www.r-project.org>
- Tschanz, B. (1993). Erkennen und Beurteilen von Verhaltensstörungen mit Bezugnahme auf das Bedarfs-Konzept. In *Leiden und Verhaltensstörungen bei Tieren* (pp. 65–76). Berlin: Birkhäuser Verlag.
- Vacalopoulos, A., & Anderson, R. K. (1993). Canine behavior problems reported by

- clients in a study of veterinary hospitals. *Applied Animal Behaviour Science*, 37(1), 84.
- Valsecchi, P., Barnard, S., Stefanini, C., & Normando, S. (2011). Temperament test for re-homed dogs validated through direct behavioral observation in shelter and home environment. *Journal of Veterinary Behavior: Clinical Applications and Research*, 6(3), 161–177.
- van der Borg, J. A. M., Netto, W. J., & Planta, J. U. (1991). Behavioural testing of dogs in animal shelters to predict problem behaviour. *Applied Animal Behaviour Science*, 32(1–2), 237–251.
- Voith, V. L., Ingram, E., Mitsouras, K., & Irizarry, K. (2009). Comparison of adoption agency breed identification and DNA breed identification of dogs. *Journal of Applied Animal Welfare Science*, 12(3), 253–262.
- Voith, V. L., Trevejo, R., Dowling-Guyer, S., Chadik, C., Marder, A., Johnson, V., & Irizarry, K. (2013). Comparison of Visual and DNA Breed Identification of Dogs and Inter-Observer Reliability. *American Journal of Sociological Research*, 3(2), 17–29. <http://doi.org/10.5923/j.sociology.20130302.02>
- Weiss, H. B., Friedman, D. I., & Coben, J. H. (1998). Incidence of dog bite injuries treated in emergency departments. *JAMA*, 279(1), 51–53.
- Wilsson, E., & Sundgren, E. (1997). The use of a behaviour test for the selection of dogs for service and breeding, I: Method of testing and evaluating test results in the adult dog, demands on different kinds of service dogs, sex and breed differences. *Applied Animal Behaviour Science*, 53(4), 279–295. [http://doi.org/10.1016/S0168-1591\(96\)01174-4](http://doi.org/10.1016/S0168-1591(96)01174-4)
- Yin, S. (2009). Low Stress Handling, Restraint and Behaviour Modification of Dogs & Cats.