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“Adopting a former street dog – A comparison of street and pet dog owner personality, dog characteristics and relationship”

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Ziemen Verena Maria

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Betreut von: Univ. Prof. Dr. Mag. Kurt Kotrschal

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*For Benji,*

*whose gaze once opened my eyes for the fascinating capability of bonding, even when all trust seemed to have vanished,*

*and also my heart for an unimagined capability of loving a dog.*

*Maybe it is the same...*

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## 1. Zusammenfassung

In dieser Studie wollten wir das Leben und die Hintergründe ehemaliger Straßenhunde, die nun in Österreich leben, genauer betrachten und herausfinden, ob es Unterschiede hinsichtlich Charakter und Bindungsverhalten zu hier aufgewachsenen Hunden gibt. Des Weiteren waren wir auch interessiert, ob sich Straßenhund-Besitzer von anderen Hundehaltern unterscheiden würden und untersuchten daher zusätzlich charakteristische Eigenschaften der Halter und die Beziehung der beiden mittels mehrerer Online Fragebögen (n=1233) und Verhaltensbeobachtungen in drei verschiedenen Testsituationen (n=83). Unsere Ergebnisse zeigten signifikante Unterschiede zwischen den beiden Besitzer-Gruppen auf, wobei Straßenhund-Besitzer eine weniger negative Einstellung Tieren gegenüber hatten (Mann-Whitney U test:  $U=92900.5$ ;  $n=1170$ ;  $p=0.001$ ), auf der Fantasy-Skala (FS) (Mann-Whitney U-test:  $U=97808.5$ ;  $n=1170$ ;  $p=0.017$ ) des Empathie Fragebogens höher lagen und dazu tendierten, in der Persönlichkeitsdimension Gewissenhaftigkeit (NEO Fünf-Faktoren-Modell Dimension 4) (t-test:  $t=1.958$ ;  $n=83$ ;  $p=0.054$ ) niedriger zu liegen als andere Hundebesitzer. Des Weiteren unterschieden sie sich hinsichtlich ihrer Bindungsmuster in zwischenmenschlichen Beziehungen, wobei sich Besitzer von Straßenhunden schwerer taten, anderen Menschen zu vertrauen (t-test:  $t=2.67$ ;  $n=1233$ ;  $p=0.022$ ) und mehr Angst davor hatten, verlassen zu werden (t-test:  $t=2.67$ ;  $n=1233$ ;  $p=0.013$ ) als andere Hundehalter. Zusätzlich unterschieden sie sich auch im Bindungsstil zu ihren eigenen Hunden, zu denen sie, verglichen mit anderen Hundebesitzern, eine weniger unsicher-distanzierte Bindung hatten (t-test:  $t=2.246$ ;  $n=950$ ;  $p=0.025$ ). Ehemalige Straßenhunde wurden außerdem als nervöser/ängstlicher (Mann-Whitney U test:  $U=93844.5$ ;  $n=1228$ ;  $p\leq 0,001$ ), weniger trainingsmotiviert (Mann-Whitney U test:  $U=97582.5$ ;  $n=1228$ ;  $p=0.001$ ) und weniger cool/freundlich (Mann-Whitney U test:  $U=102091$ ;  $n=1228$ ;  $p=0.015$ ) eingeschätzt als andere Hunde. Straßenhunde waren im Vergleich zu anderen Hunden in der Testsituation „Picture Viewing Test“ signifikant länger zu ihren Besitzern hin orientiert (Mann-Whitney U test:  $U=332$ ;  $n=83$ ;  $p\leq 0,001$ ) und näherten sich diesen auch häufiger an (Mann-Whitney U test:  $U=418$ ;  $n=83$ ;  $p=0.008$ ). Zusätzlich korrelierte vermehrtes Bindungsverhalten (Vokalisation) bei Straßenhunden im „Separation Test“ mit erhöhter Kooperationsbereitschaft im „Challenge Task“ ( $r_s=0.448$ ;  $n=22$ ;  $p=0.036$ ) und einem weniger nervösem Charakter der Hunde im Allgemeinen ( $r_s=-0.513$ ;  $n=22$ ;  $p=0.015$ ). Unsere Ergebnisse deuteten darauf hin, dass ehemalige Straßenhunde ihre Besitzer als Bindungsfiguren wahrnehmen, da sie, nach einer für sie stressigen Situation, den Kontakt zu ihren Besitzern suchten, obwohl viele von ihnen fern vertrauenswürdiger Menschen aufwuchsen.

## 2. Abstract

In this study we wanted to take a closer look at the life of former street dogs now living in Austria with owners in comparison with potential differences to pet dogs with common social careers. We also were interested in the individual characteristics of such street dog owners as compared to control owners. We examined dog and owner characteristics and relationships by means of online accessible questionnaires (n=1233) and behavior observations (n=83) in three different test situations. We found that street dog owners showed a less negative attitude towards animals (Mann-Whitney U test:  $U=92900.5$ ;  $n=1170$ ;  $p=0.001$ ), scored higher on the Fantasy Scale (FS) (Mann-Whitney U-test:  $U=97808.5$ ;  $n=1170$ ;  $p=0.017$ ) of the empathy questionnaire and tended to score lower in the personality dimension conscientiousness (NEO-Five Factor Inventory Dimension 4) (t-test:  $t=1.958$ ;  $n=83$ ;  $p=0.054$ ). Furthermore street dog owners differed from the control group in inter-human bonding patterns as they had more problems to trust other people (t-test:  $t=2.67$ ;  $n=1233$ ;  $p=0.022$ ) and had more fear to be left (t-test:  $t=2.67$ ;  $n=1233$ ;  $p=0.013$ ). Additionally street dog owners also differed in bonding patterns with their dogs as they showed a less insecure-distant bonding with them (t-test:  $t=2.246$ ;  $n=950$ ;  $p=0.025$ ). Former street dogs were rated as being more nervous/anxious (Mann-Whitney U test:  $U=93844.5$ ;  $n=1228$ ;  $p\leq 0.001$ ), less training-motivated (Mann-Whitney U test:  $U=97582.5$ ;  $n=1228$ ;  $p=0.001$ ) and less cool/friendly (Mann-Whitney U test:  $U=102091$ ;  $n=1228$ ;  $p=0.015$ ). Still, this does not mean that former street dogs would not be able to form good working relationships as we found that they were significantly longer oriented towards their owners (Mann-Whitney U test:  $U=332$ ;  $n=83$ ;  $p\leq 0.001$ ) and approached them more frequently (Mann-Whitney U test:  $U=418$ ;  $n=83$ ;  $p=0.008$ ) in the test situation “Picture Viewing Test”. Additionally more attachment behavior in street dogs in the “Separation Test” was correlated with a higher cooperation in the “Challenge Task” ( $r_s=0.448$ ;  $n=22$ ;  $p=0.036$ ) and a less nervous character ( $r_s=-0.513$ ;  $n=22$ ;  $p=0.015$ ). As the street dogs were seeking contact with their owners after a stressful situation we conclude that they regard their owners as attachment figures, although most of these dogs have not been raised in close proximity to trustworthy humans.

### 3. Introduction

Domestic dogs (*Canis familiaris* L. 1758) can be considered as one of the longest lasting and still enduring experiments in human history (Sutter & Ostrander 2004). As a consequence, more than 400 genetically distinct breeds with substantial variations in behavior, physiological and morphological phenotypes have originated of it (Neff & Rine 2006). Data from whole genome sequencing recently suggested dogs' origin in Eurasia (W Europe to SE China) some 30 000 years ago (Freedman et al. 2014; Wang et al. 2013). Wang et al. (2013) also identified genes, which resulted of positive selection during the domesticating process. These genes widely concur with the equivalent list of positively selected genes in humans and mainly affect digestion and brain development, which indicate a parallel evolution of humans and dogs. New adaptations, now allowing a starch-rich diet, denoted a crucial step in the early domestication of dogs (Axelsson et al. 2013). The presence of dogs can be verified in every human culture throughout history. They were deployed for various purposes, ranging from hunting to babysitting (Clutton-Brock 1984) and are capable to establish relationships with humans as easily as with conspecifics (Scott & McCray 1967; Scott 1980). A long shared history and a common toolbox of brain and physiological mechanisms facilitates socializing between humans and dogs and across species in general (Kotrschal 2009).

Nowadays the main reason why dogs are owned is companionship (Hart 1995). Dogs are frequently described by owners as a source of emotional support (Walsh 2009) and can have positive effects on the owner's welfare and health (Beetz et al. 2012; Stafford 2006; Headey 1999). So it is hardly surprising, that dogs are regarded as partners and family members and that relationship between humans and their dogs may show characteristics of attachment bonds (Topal et al. 1998; Prato-Previde et al. 2003; Palmer & Custance 2008). Bowlby and Ainsworth (Bowlby 1969; Bowlby 1973; Bowlby 1980; Ainsworth 1989) defined attachment as the close bond between a baby and his or her primary caregiver, in most instances the mother. Attachment behavior can most likely be observed when the attachment system is activated for example in stressful situations. The kind of attachment is expressed in the way in which attached and caregiver relate to each other. In essence, the caregiver is a safe haven the child can return to when feeling distressed and a secure base where the world can be explored from. The owner-dog relationship resembles the parent-child bond in many ways. For example, dog owners may also constitute a safe haven for their dogs in potential dangerous situations (Gacsi 2013). As personality has been shown to affect social relationships between humans (Asendorpf & Wilpers 1998) it is not surprising that human dog relationships can be affected by owner personality as well (Kotrschal et al. 2009; Kis et

al. 2012). However in the first place personality and attitude might mostly affect the choice what kind of dog suits the owner best and can be linked with the own expectations towards life with a dog.

### **3.1. Feral/Street dogs**

Due to many different reasons, former pet dogs can become homeless stray dogs. It is possible that these stray dogs form independent, isolated packs, which are considered as feral or “wild”. Several studies from different places such as India (Pal et al. 1998), North America, Italy (Boitani et al. 1995) and Australia (Boitani et al. 1995, Macdonald & Carr 1995) allow insight into the life of street or feral dogs. Wild populations of domestic dogs differ from their pet conspecifics by their lack of experience with humans and missing out on early socialization with them (Daniels & Bekoff 1989; Boitani & Ciucci 1995; Boitani et al. 1995). Stray dogs in contrast, may have experienced human contact, both in the positive nurturing sense or in socio-negative interactions. Due to the fact that the mother has the sole responsibility for food supply, the offspring has to be left alone for long periods of time, resulting in a high mortality rate (Boitani & Ciucci 1995). In some areas, it has been observed that these dogs were even hunting large prey together (Jhala & Giles 1991), in addition to scavenging waste, which is their main method of obtaining food (Butler et al. 2004). They are most active during dusk or dawn (Fox et al. 1975; Berman & Dunbar 1983; Boitani et al. 1995) and as wolves, wild domestic dogs also show some pack territoriality against other dogs and potentially humans (Boitani et al. 1995, Macdonald & Carr 1995).

### **3.2. Street dog characteristics and potential differences to common pet dogs**

Street dogs show a number of behavioral differences compared to pet dogs, which have experienced human care very early on in life. A stray dog mother, which has to raise her offspring in a potential dangerous and nutrient-poor environment, may be time constrained to provide maternal care for her pups. The quality and quantity of maternal behavior, especially licking, is associated with the development of oxytocin (OT) set points and receptors in the pups (Francis et al. 2002). Therefore, modulation of OT by early maternal care provides one of the major means of epigenetic regulation of offspring behavioral phenotype. OT play an important role in regulating social and anxiety-related behaviors, food intake, pain control and



stress-related responses, (Ferguson et al., 2000; Gimpl and Fahrenholz 2001; Takayanagi et al., 2005; Waldherr & Neumann 2007). OT release is associated with a reduction of the stress hormone cortisol and can dampen stress responses (DeVries et al. 2003; Uvnäs-Moberg 1998; Julius et al. 2012). Animals, stressed during pregnancy, can bear offspring with enhanced emotional reactivity (Ward & Weisz 1984; Weinstock et al. 1988) and maternal deprivation can also affect the development of fear (Francis et al. 1999a, b; Gonzalez et al. 2001). Generally, reactive animals are more cautious, sensitive and try to adjust to situations (Koolhaas et al. 1999; Sih et al. 2004; Groothuis & Carere 2005). Living in a potential dangerous environment, as stray dogs often have to, influences the behavioral phenotype of the offspring to more reactive and fearful individuals, which are also more susceptible to stress (Heiming et al. 2009). In the dog's behavioral development the formation of social bonds is related to the so-called 'sensitive period for socialization', lasting from the third to the twelfth week of age. Within this period, experiences with future social partners (also humans) are crucial for the development of social behavior or to establish individual relationships (Freedman et al. 1961; Scott & Fuller 1965; Lorenz 1981). Experiences and life strategies may also be different between street and pet dogs. Street dogs for instance need to ensure their survival all alone. They are forced to provide themselves with food, which is a crucial behavior trait and leads to an independent way of life.

In sum, street dogs experience a very different life, particularly in the early stages, than pet dogs. They grow and learn in a stressful, dangerous environment, rather than protected and controlled one, meaning they may become more reactive and fearful and are more likely to develop traits of a stressful individual. Furthermore, missing or insufficient socialization with people and lack of important resources such as food and water may also differentiate street from pet dogs and could make it difficult for them to integrate into a new home-environment successfully or to establish good working relationships with humans.

### 3.3. Aim of this study

Due to the fact that more and more people adopt former street dogs, who are rescued and rehomed by animal welfare organizations, this study aims to investigate by means of several questionnaires and behavioral observations the features of street dog owners, former street dogs and owner-dog relationship. We want to examine the motives of street dog owners and what differentiates them from other pet dog owners regards personality, empathy, inter-human relationships, attitude towards animals, attachment to the dog and interaction style.

Furthermore, we ask whether there is a difference in behavioral characteristics, “personality” and bonding behavior between former street dogs and ordinary pet dogs.

We expect street dog owners to be more empathic and to have a more positive attitude to animals as they have decided for assumed miserable and rescued street dogs, often with an unknown past. Furthermore they might score higher in the dimension agreeableness (NEO Five Factor Inventory Dimension 5). People scoring high in agreeableness have a helpful nature, tend to have more concern for others, greater social interest and a tendency to stand up for the betterment of society (Borkenau & Ostendorf 2008; Adler 1964). Also, we expect street dogs to be more reactive (shyer, more susceptible to stress, more nervous) than pet dogs and to show less bonding behavior in behavioral observations due to the difference between them and street dog background (missing socialization, bad experience with humans, more independent life style).

## 4. Methods

To investigate the differences between each dog group, and the owners and their relationships with the dog, this study has used several questionnaires and behavioral observations.

### 4.1. Behavioral Observations

#### 4.1.1. Subjects, Criteria and Recruitment

Subjects for behavioral observations were 83 human-dog dyads divided into 2 groups (owner pet dog dyads and owner street dog dyads). Given that a previous study has already shown that interaction and relationship patterns may be affected by the owner’s gender (Kotrschal et al. 2009), only female dog keepers were tested in both groups. Participants all came from Vienna or Vienna area. The first group was 61 owner pet dog dyads consistent of 30 female and 31 male dogs with mean age of  $3.7 \pm 1.8$  years, including various breeds and mongrels. Each pet dog was accompanied by his or her female owner (mean age of  $42.5 \pm 12.2$  years). Dogs were adopted (mean age of adoption was  $9.6 \pm 2.9$  weeks), mainly from a breeder (81%), were living as single dogs averaging for  $3.5 \text{ years} \pm 1.7 \text{ years}$  in the household and were all intact, none was in estrus nor were they pregnant at the time of observation. The second group was 22 owner street dog-dyads, consisting of 10 female and 12 male dogs

with a mean age of  $3.9 \pm 2.0$  years, all mixed breeds and all neutered with their owners (mean age of  $37.9 \pm 10.9$  years). Dogs were adopted by their new owners with a mean age of  $11.2 \pm 2.1$  month and were living with them on average for  $2.9 \pm 2.0$  years at the time of testing.

All of our subjects met the following criteria: Street dogs had to be adopted with a minimal age of 6 month and had been living for at least one year as single dogs with their new owners. Pet dogs had to be adopted as pups and the minimum age for participation was one year. In both groups the owner tested had to be the primary companion person of the dog. Age limit of dogs was 8 years and no further dog should been living in the household. Due to the fact that street dogs mostly arrive already neutered in Austria and that pet dog data was used from a previous data collection (same experimental setting and procedure), but with “intact” dogs, we had a difference in this specific criteria. However castration makes possible occurring behavioral differences rather conservative as neutered dogs were expected to show a moderation of behavioral characteristics, but an enhancement of anxiety related behavior. Owners were all volunteers recruited through advertising on different dog based websites, veterinary clinics, dog parks, dog training centers and newspapers.

#### 4.1.2. Experimental Setting

Tests were staged in a 33 m<sup>2</sup> test room, unfamiliar to the dogs, at the University of Vienna (Austria). The room was equipped with a table and two chairs for owner and experimenter in the right corner of the room, a dog blanket in the left corner of the room and a water bowl. The recordings were obtained by a camcorder (Sony DCR-TRV 33E) with a wide-angle conversion lens (Hama, video objective HR 0.45 HTMC Compact), which was mounted in a corner of the test room, in a way that the room could be observed completely. The test room was provided with fourteen pictures of human–dog interactions or portraits of dogs, which were placed on the windows and walls.

As we did not use any invasive methods during our study, ethical review was unnecessary according to Austrian law and University of Vienna rules.

### 4.1.3. Procedure

Data was collected between March 2012 and July 2012. We invited twenty two owner-street dog dyads, which met the criteria. After arriving owners were asked into a meeting room, where they were informed about the following procedure and the three test situations 1: “Separation Test“, 2: “Picture Viewing Test“, 3: “Challenge Task“. The owners were asked to behave as usual as possible in the test situations and to keep quiet when the dog was alone in the testing room, during test situation 1. Owners signed that they were informed about the procedure and that their dog is vaccinated against rabies. All owners also signed a form, authorizing the use of the data collected. Furthermore owners were informed that they were free to abandon the test situation at any time.

#### *Test situation 1: “Separation Test“*

This test situation was scheduled at the beginning of the meeting and took exactly 3 minutes. The owner, her dog and the experimenter (Verena Ziemen) entered the room together, which was novel to the dog. Then the owner was asked to unleash the dog, say goodbye to the dog as usual and leave the room together with the experimenter, who closed the door. The dog was free to explore the room, while the owner was able to observe the dog from outside on a monitor. After the three minutes, test situation 2 followed as the owner was asked to enter the room.

#### *Test situation 2: “Picture Viewing Test“*

14 dog pictures had been placed on the windows and walls of the experimental room and the owner was asked to write down three words she would associate with each of these pictures. The owner had 8 minutes to complete the task, while the dog could move freely within the room. The purpose of this test was to distract the owner’s attention from the dog and to observe the dog’s behavior. The experimenter was not present during this time. The test situation started when the owner opened the door to the test room and ended 8 minutes afterwards, when the experimenter entered the room, unless the owner had completed the task. Subsequently the owner was asked to fill out a personality questionnaire to assess the owner’s personality traits. Upon completion test situation 3 followed.

#### *Test situation 3: “Challenge Task“*

The owner was asked to lead the dog over the wire mesh bridge as efficiently and securely as possible with any kind of approach, except leashing the dog. The time limit was 4 minutes.

## 4.2. Online Questionnaire Survey

The online survey was conducted via the survey tool “*Limesurvey*” and was online available between April 2013 and July 2013. We collected data from 233 street dog owners (mean age  $37.2 \pm 11.8$  years) and 1000 pet dog owners (mean age  $39.0 \pm 13.0$  years). Participants, all coming from Austria, were also recruited by advertisements on several websites, in veterinarian clinics, around dog parks, dog training centers and in newspapers. The survey consisted of eight questionnaires (for detailed information see 4.3. Data Collection), a self-developed basic questionnaire to receive background information about the owner’s and the dog’s everyday life, including six different parts: 1. Personal data about the owner; 2. Information about owner and dog’s lifestyle; 3. Details about the relationship between owner and dog, including questions modified from the “Questionnaire for Anthropomorphic Attitudes” (Topal et al. 1997); 4. Information about the dog’s character; 5. Training details; 6. The attitude towards the dog, translated and modified from “The Dog Attitude Scale” (Johansson 1999). For measuring owner empathy we used the “Saarbrücker Persönlichkeitsfragebogen” (SPF; C. Paulus 2006), a German version of the “Interpersonal Reactivity Index” (IRI; Davis 1980, 1983). To investigate inter-human relationships, we employed the “Relationship Scale Questionnaire” (RSQ; Griffin & Bartholomew 1994). Attitude towards animals was measured via the questionnaire “Attitude towards Animals” (Fehlbaum et al. 2010). Dog personality was assessed by the “Monash Canine Personality Questionnaire” (MCPQ; Ley et al. 2009). The “Monash Dog Owner Relationship Scale” (MDORS; Dwyer et al. 2006) and the “Fragebogen zur Erfahrung mit Tieren” (FERT; Beetz 2012, unpublished) was used to investigate owner’s relationship and bonding pattern to the dog. Finally, street dog owners answered a specially developed “Street Dog Questionnaire” (developed by Verena Ziemen).

## 4.3. Data Collection

The video-tapes of the 83 dyads were behavior-coded with the aid of the software package THE OBSERVER XT (Version 10.0, Noldus Information Technology ©, The Netherlands). Registered were states (duration in seconds) and rates (frequency) of owner and dog behaviors (see Appendix 8.9, tables 1-3) in the 2 test situations “Separation Test” and “Picture Viewing Test”. Dog’s performance in walking over the mesh wire bridge during the test situation “Challenge Task” was observer rated, with a continuous scale of 1 to 5 (see Appendix, 8.9, table 4, rating 1. and 2.). The test room was divided into three different parts

(“next to door”, “middle to door”, “distant to door”) for coding the dog’s distance to the door. The videos of pet dog dyads were encoded by a group of four people, the street dog group by one person, who was also involved encoding the pet dog group. Mean inter- and intra-observer agreement (Cohen’s Kappa) on states, events as well as ratings was above 0.74. All statistical analyses were run with the software SPSS Statistic 18.0 (Chicago, IL).

| Behavior analysis | Inter-observer<br>(mean Cohen’s Kappa $\pm$ SD) | Intra-observer<br>(mean Cohen’s Kappa $\pm$ SD)<br>pet dog dyads/ street dog dyads |
|-------------------|-------------------------------------------------|------------------------------------------------------------------------------------|
| duration          | 0.97 $\pm$ 0.01                                 | 0.98 $\pm$ 0.03 / 0.96 $\pm$ 0.17                                                  |
| frequency         | 0.74 $\pm$ 0.01                                 | 0.80 $\pm$ 0.15 / 0.79 $\pm$ 0.01                                                  |
| observer ratings  | 0.78 $\pm$ 0.04                                 | 0.86 $\pm$ 0.06 / 0.91 $\pm$ 0.05                                                  |

#### 4.3.1. Street Dog Questionnaire

Street dog owners answered an extra developed questionnaire (1-5 Likert Scale) containing questions to background information, problem behavior and its improvement, satisfaction with the dog and attitude to street dogs. A Principal Component Analysis (PCA 1,  $n = 256$ , Bartlett-Test: KMO = 0.62; Varimax-rotation, factors explain 51.37% of the total variance) with 12 items concerning “street dog behavior” revealed 4 axis: independent/unattached (1), “overly anxious/phobic” (2), “defensive aggressive towards humans” (3) and “neurotic/unapproachable” (4) (see Appendix 8.1. for loadings of the factors).

#### 4.3.2. Owner Characteristics and Relationship

We collected questionnaire data from owners on everyday life with the dog, personality, empathy, inter-human relationships and attitudes towards animals and owner dog relationship. Furthermore we used data from behavioral observations.

##### *Everyday Life*

We analyzed the following questions from the basic questionnaire: “How is your present life situation?”, “What sex is your dog?”, “Is your dog allowed in your bed?”, “Does your dog receive any kind of medication at the moment?”, “Have you visited an agility course with your

dog?”, “Have you visited a dog school with your dog?”, “Have you completed a special dog training (therapy dog training, guard dog training, rescue dog training)?”.

A Principal Component Analysis (PCA;  $n = 1537$ , Bartlett-Test:  $KMO = 0.754$ ; Varimax-rotation, factors explain 41, 63 % of the total variance), performed with 13 items of the basic questionnaire concerning training and education style revealed 2 factors: “positive training methods” (1) and “negative training methods” (2) (see Appendix 8.2. for loadings of the factors).

### *Personality*

Owner personality was assessed via the German version (Borkenau & Ostendorf, 1993) of the NEO-Five Factor Inventory (1-5 Likert Scale) (Costa & McCrae 1992; McGrae & Costa 1987, 1989, 2003). This is a well- established and evaluated, empirical approach, which is highly practicable and fairly compatible with biological personality theory (Koolhaas et al. 1999). This 60-item instrument integrates the most important human personality features and measures normal adult personality in five domains: “neuroticism”, “extraversion”, “openness”, “agreeableness”, and “conscientiousness”.

### *Empathy*

Owner empathy was measured with the Saarbrücken Personality Questionnaire (1-5 Likert Scale; SPF; Paulus 2006), the German version of the Interpersonal Reactivity Index (IRI) (Davis 1980, 1983), which is one of the most commonly used instrument to the measurement of empathy. This 26-item questionnaire with a multi- dimensional approach measures empathy in four interrelated subgroups: “perspective taking” (PT), “fantasy scale” (FS), “empathic concern” (EC) und “personal distress” (PD).

### *Inter-human relationships*

The Relationship Scale Questionnaire (RSQ) with its 30 items (1-5 Likert Scale) was constructed by Griffin and Bartholomew (1994) to describe attachment styles of adults. It uses a four-categorical concept of Bartholomew und Horowitz (1991), contains items of the Adult Attachment Scale (Collins & Read 1990) and is based on Bowlby’s assumption (1975) that bonding experiences are organized in an inner working model with two dimensions “the image of oneself” and “the image of others”. A combination of high/low expression of the two scales “anxiety about abandonment” and “fear of intimacy” results in four possible bonding styles: secure, dismissive, preoccupied and fearful. These styles strongly correlate with the third scale “lack of trust”, the fourth scale “desire for independence” describes an additional characteristics.



### *Attitude towards animals*

This 27- item questionnaire (1-5 Likert Scale) (Fehlbaum et al. 2010) also allows cross-cultural comparisons of attitudes towards animals with respect to their position in society and their ability to emotions. Principal Component Analysis (PCA;  $n = 1414$ , Bartlett-Test:  $KMO = 0.841$ , Varimax-rotation, factors explain 55,82 % of the total variance), performed with 19 items of the questionnaire “Attitude towards Animals” presented 4 axis: “Negative attitude towards animals” (1), “serious vegetarians” (2), “animals feel like humans” (3) and “high investment in pet care” (4) (see Appendix 8.3. for loadings of the factors).

### *Owner dog relationship*

To measure relationship and bonding patterns between owner and dog as perceived by the owner, we employed two different questionnaires. The “Monash Dog Owner Relationship Scale” (MDORS; Dwyer et al. 2006) (1-5 Likert Scale) is based on the social exchange theory, which holds that benefits and perceived costs should be balanced in a good relationship. A Principal Component Analysis (PCA;  $n=1545$ , Bartlett-Test:  $KMO=0.806$ , Varimax-rotation, factors explain 55.43 % of the total variance) performed with 21 items of the MDORS revealed 6 axis: “dog as burden” (1), “dog as social supporter” (2), “dog as cuddling partner” (3), “fear of separation of the dog” (4), “dog as companion” (5) and “active relaxing” (6) (see Appendix 8.4. for loadings of the factors).

Additionally we used the “Fragebogen zur Erfahrung mit Tieren” (FERT; Beetz 2012, unpublished). The English translated version (1-5 Likert Scale) is based on the Relationship Questionnaire (RQ; Bartholomew and Horowitz 1991), which was adapted for human-dog-attachment styles and on the German version of the Inventory of Parent and Peer Attachment (IPPA, original questionnaire: Armsden & Greenberg, 1987, 2009; German Version: Zimmermann, 1992). Questions were adapted by exchanging the term “pet/companion animal” to the term “dog”.

A Principal Component Analysis (PCA;  $n=1539$ , Bartlett-Test:  $KMO=0.78$ , Varimax-rotation, factors explain 55.99% of the total variance) performed with 13 items revealed 4 axis: “secure/caregiving” (1), “secure” (2), “insecure/ambivalent” (3) and “insecure/distant” (4) (see Appendix 8.5. for loadings of the factors).

Following owner and interaction style relevant behaviors were analyzed: “owner orientation to dog”, socio-positive behavior (“nuzzle/kiss dog”, “hug dog”, “praise dog”, “give treat” were grouped), “touch dog” and “stroke dog” (see Appendix 8.9. Tab.1). Furthermore we analyzed the observer ratings (see Appendix 8.9 Tab. 4, rating 3.) of the test situation “Challenge Task”.



### 4.3.3. Dog Characteristics and Attachment Behavior

To investigate dog characteristics and attachment behavior, we used information from the basic questionnaire and the “Monash Canine Personality Questionnaire” (MCPQ; Ley et al. 2008, 2009). Furthermore we analyzed the observed behaviors from the “Separation Test“, “Picture Viewing Test“ and the observer ratings (see Appendix 8.9 Tab. 4, ratings 1. and 2.) of the test situation “Challenge Task”.

#### *Susceptibility of the dog to stress and the dog’s training motivation*

Principal Component Analysis (PCA; n=1538, Bartlett-Test: KMO=0.764, Varimax-rotation, factors explain 60.01% of the total variance) performed with 8 items of the Basic Questionnaire (1-5 Likert Scale) concerning susceptibility of the dog to stress in daily situations and the dog’s motivation to training revealed 2 axis: “Stressed dog” (1) and “training motivation” (2) (see Appendix 8.6. for loadings of the factors).

#### *Dog personality*

A Principal Component Analysis (PCA; n=1545, Bartlett-Test: KMO=0.81, Varimax-rotation, factors explain 55.43% of the total variance) carried out with 26 items of the “Monash Canine Personality Questionnaire” (1-5 Likert Scale; MCPQ; Ley et al. 2008, 2009) found 5 axis: “Active/excitable” (1), “obedient/reliable” (2), “insistent/goal-directed” (3), “nervous/anxious” (4) and “cool/friendly” (5) (see Appendix 8.7. for loadings of the factors).

#### *Analyzed Behaviors and observer ratings from observations in the test situations “Separation Test“, “Picture Viewing Test“ and “Challenge Task“*

The durations of following dog behaviors were analyzed: “dog next to door”, “dog distant to door”, “dog vocalization” (“bark”, “whimper”, “howl”, “growl”, “scream”, were grouped), “sniffing”, “dog mobile” (“dog in motion”, “running/trotting”, were grouped) “dog immobile” (“sitting”, “standing”, “lie head up”, “lie head down”, were grouped) “dog orientation to door”, “dog orientation to owner”, “dog next to owner”, “dog middle to owner”, “dog distant to owner” (see Appendix 8.9. Tab. 2 and 3).

Furthermore we analyzed the observer rating 1. and 2. of the “Challenge Task“ (see Appendix 8.9, Tab. 4).

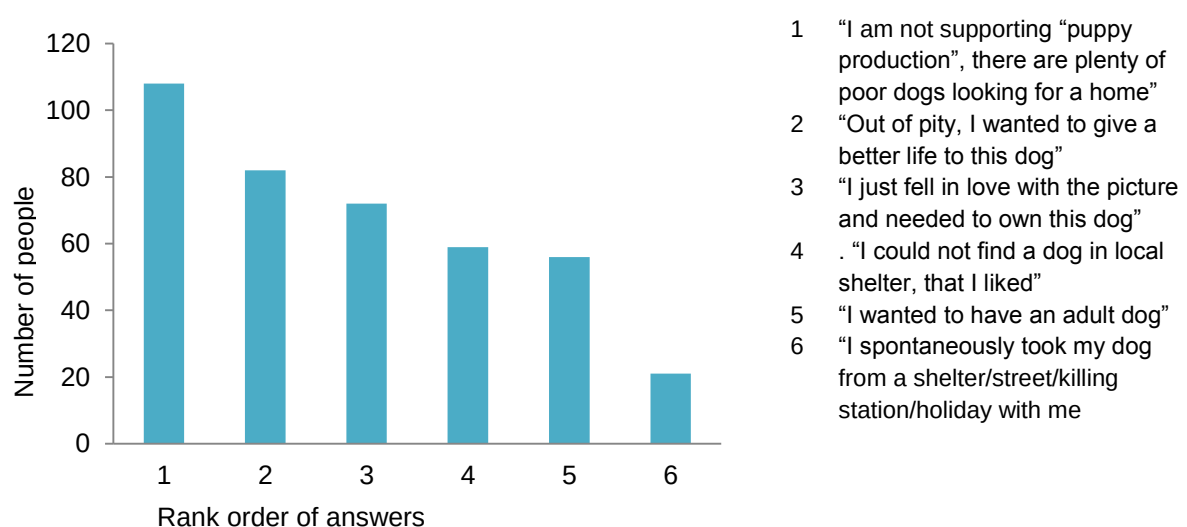
## 4.4. Statistical Analysis

Non-parametric Mann-Whitney U-test, parametric t-test and  $X^2$ -test was used as appropriate to investigate differences between the two groups (pet/street dogs and pet dog owners/street dog owners). For correlations non-parametric Spearman's rank correlation was employed. For data reduction of the questionnaires principal component analyses (PCA) were conducted.

## 5. Results

### 5.1. Evaluation of the Street Dog Questionnaire

Evaluation of the questionnaire revealed that former street dogs of our sample originally came from killing stations in the first place and from the streets or animal shelters in the second and third place. More than half of the owners (61%) did not know details about the former life of their dogs. Fig.1 shows the rank order of the main reasons (multiple answers were possible) why people have decided to adopt a former street dog. Furthermore 68% of our street dog owners were engaged in some kind of animal welfare. Nearly all of the owners (89%) stated that behavioral problems of their dogs had generally improved; 54% revealed that problems had improved within the first 6 months, in 24% of owners within the first year.



**Fig.1.** Rank order of different reasons dependent on the number of people, who answered the question: "Why have you decided for a former street dog?"

## 5.2. Owner Characteristics and Relationship

Street dog owners in contrast to pet dog owners showed some preference for female dogs ( $\chi^2$ -Test:  $df=1$ ;  $\chi^2=3.457$ ;  $p=0.063$ ) and allowed their dogs more frequently to sleep in the bed ( $\chi^2$ -Test:  $df=1$ ;  $\chi^2=4.404$ ;  $p=0.036$ ). Pet dog owners more often visited dog schools ( $\chi^2$ -Test:  $df=2$ ;  $\chi^2=12.698$ ;  $p=0.002$ ) and completed special trainings like hunting ( $\chi^2$ -test:  $df=2$ ;  $\chi^2=12.043$ ;  $p=0.002$ ) or guard dog training ( $\chi^2$ -Test:  $df=2$ ;  $\chi^2=8.642$ ;  $p=0.013$ ). Also, pet dog owners used negative training methods significantly more frequently than street dog owners (Mann Whitney U test:  $U=109978.5$ ;  $n=1228$ ;  $p=0.004$ ).

Comparisons of owner personality revealed that street dog owners showed a tendency to score lower in conscientiousness (NEO-FFI Dimension 4) (t-test:  $t=1.958$ ;  $n=83$ ;  $p=0.054$ ).

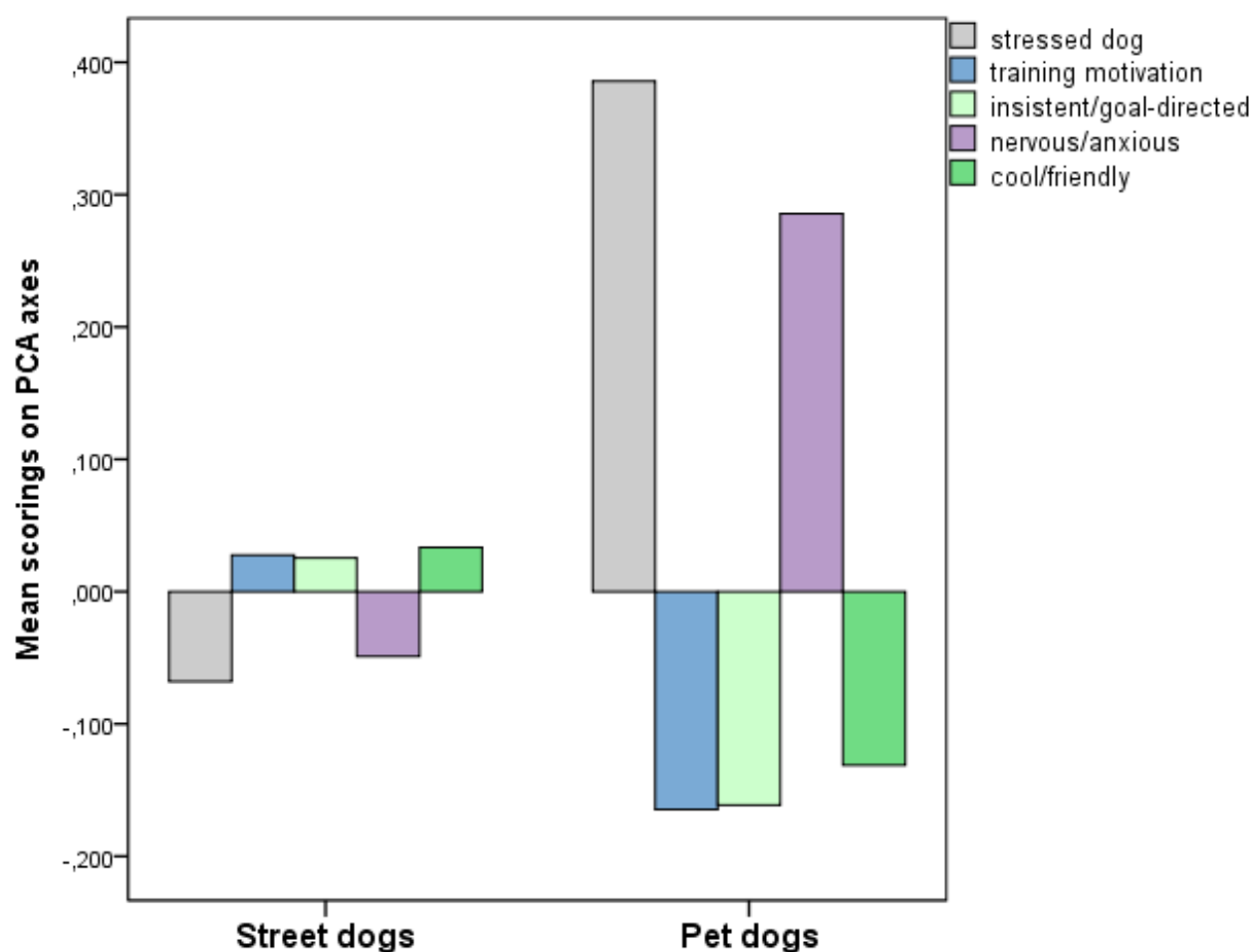
Besides, street dog owners reached significantly higher scores on the fantasy scale (Mann-Whitney U test:  $U=97808.5$ ;  $n=1170$ ;  $p=0.017$ ) and showed a tendency to also score higher on the empathic concern (EC) scale (Mann-Whitney U test:  $U=100980$ ;  $n=1170$ ;  $p=0.087$ ) than pet dog owners. Street dog owners also significantly differed from pet dog owners in two scales of the “Relationship Scale Questionnaire” as they scored higher on the scale “lack of trust” (t-test:  $t=2.67$ ;  $n=1233$ ;  $p=0.013$ ) and the scale “anxiety about abandonment” (t-test:  $t=2.67$ ;  $n=1233$ ;  $p=0.022$ ). Furthermore they tended to score higher on the scale “fear of intimacy” (t-test:  $t=2.67$ ;  $n=1233$ ;  $p=0.057$ ). We also found significant differences in the scales of the “Attitude towards Animals Questionnaire”. Thus, pet dog owners scored significantly higher than street dog owners on the scale “negative attitude towards animals” (Attitude towards Animals, PCA1 axis 1) (Mann-Whitney U test:  $U=92900.5$ ;  $n=1170$ ;  $p=0.001$ ), whereas street dog owners scored significantly higher than pet dog owners on the scale “serious vegetarians” (Attitude towards Animals, PCA1 axis 2) (Mann-Whitney U test:  $U=83896.5$ ;  $n=1170$ ;  $p\leq 0.001$ ) and tended to score higher on the scale “high investment in pet care” (Attitude towards Animals, PCA1 axis 4) (Mann-Whitney U test:  $U=99982.5$ ;  $n=1170$ ;  $p=0.055$ ).

There was no significant difference between street and pet dog owners in the scales of the MDORS. Regarding bonding styles to their dogs we found significant more insecure-distant (FERT, PCA1 axis 4) bonding patterns in pet dog owners than in street dog owners (t-test:  $t=2.246$ ;  $n=950$ ;  $p=0.025$ ). Street dog owners as well as pet dog owners, who allowed their dogs in the bed (Basic Questionnaire) were significantly more securely bonded (FERT, PCA axis 2) than other dog owners, who did not allow their dogs in the bed (Mann-Whitney U test:  $U=2613$ ;  $n=164$ ;  $p=0.033$  versus  $U=66234.5$ ;  $n=785$ ;  $p=0.001$ ).

Owner observational data of the “Picture Viewing Test“ did not differ between pet dog owners and street dog owners, except that pet dog owners touched their dogs more frequently (Mann-Whitney U test:  $U=398.5$ ;  $5$ ;  $n=83$ ;  $p=0.003$ ). Furthermore we found no differences in owners’ influence on the dog during the “Challenge Task”.

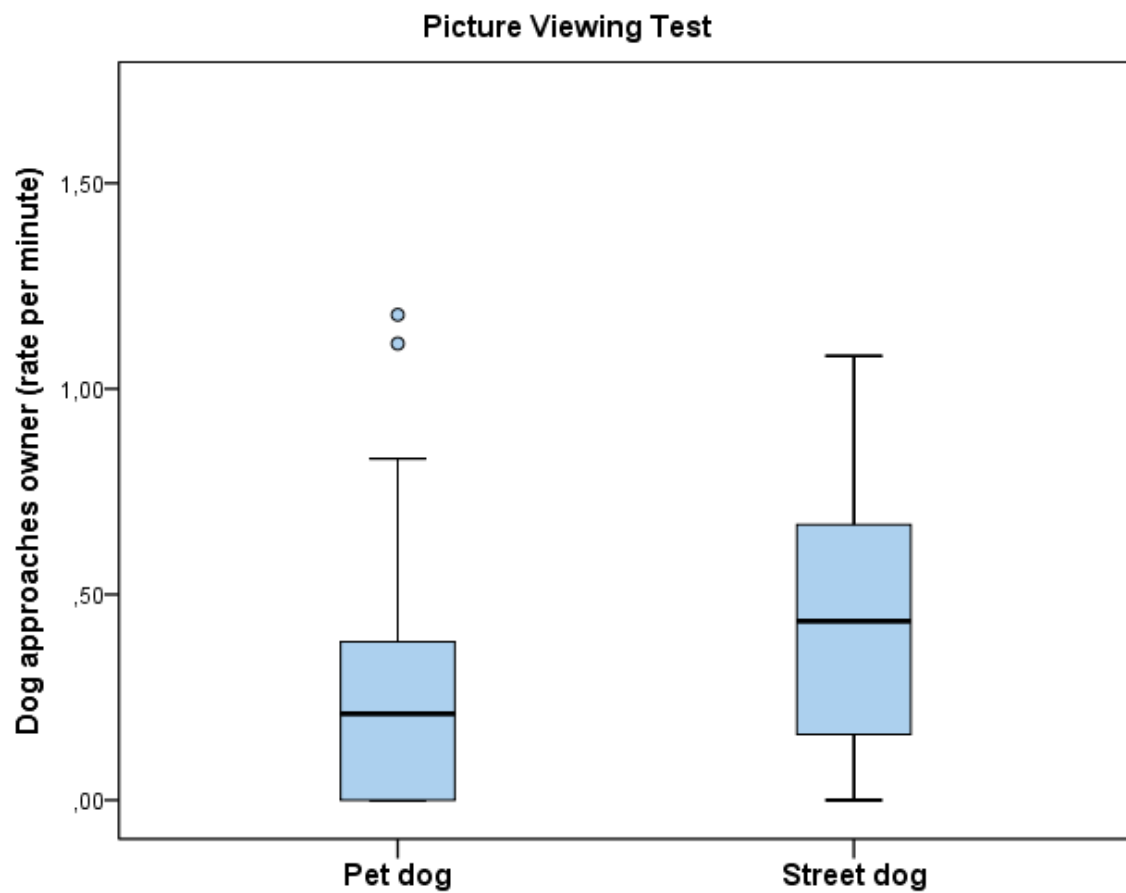
### 5.3. Dog Characteristics and Attachment Behavior

Comparisons of “Basic Questionnaire” data about dog’s welfare and motivation to training revealed significant differences. Street dogs were rated by their owners to be more stressed (Basic Questionnaire PCA2 axis 1) in daily situations (Mann-Whitney U test:  $U=88516.5$ ;  $n=1228$ ;  $p\leq 0.001$ ) and to have a lower training motivation (Basic Questionnaire PCA2 axis 2) than pet dogs (Mann-Whitney U test:  $U=97582.5$ ;  $n=1228$ ;  $p=0.001$ ). Street dogs were rated as being more “nervous/anxious” (MCPQ PCA axis 4) (Mann-Whitney U test:  $U=93844.5$ ;  $n=1228$ ;  $p\leq 0.001$ ) whereas pet dogs were rated as being more “cool/friendly” (MCPQ PCA axis 5) (Mann-Whitney U test:  $U=102091$ ;  $n=1228$ ;  $p=0.015$ ) and more “insistent/goal-directed” (MCPQ PCA axis 3) (Mann-Whitney U test:  $U=102899$ ;  $n=1228$ ;  $p=0.023$ ), compare Fig. 2.

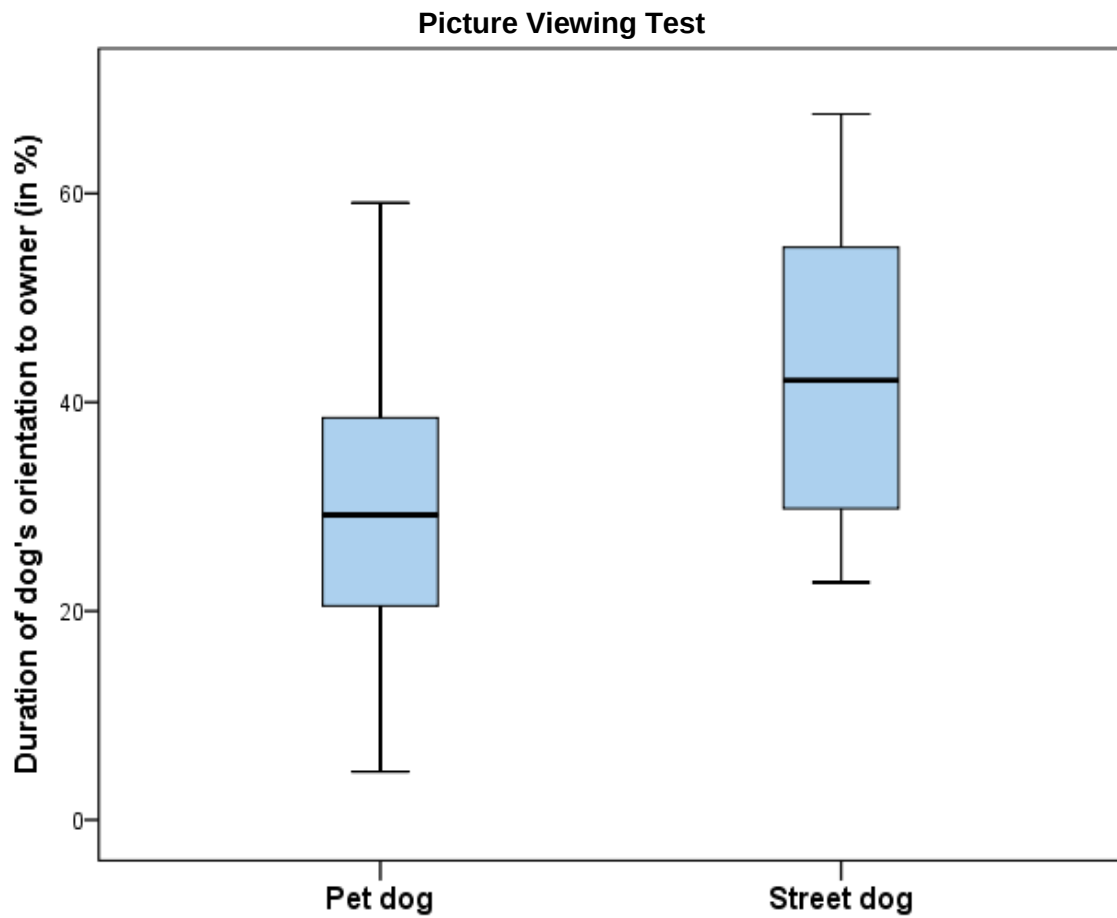


**Fig. 2** Mean scoring of street and pet dogs on PCA axis with significant differences.  $n=1228$ ,  $p(\text{stressed dog}) \leq 0.001$ ,  $p(\text{training motivation})=0.001$ ,  $p(\text{insistent/goal-directed})=0.023$ ,  $p(\text{nervous/anxious}) \leq 0.001$ ,  $p(\text{cool/friendly})=0.015$

Observational analyses revealed that street dogs stayed significantly less time distant to the door (Mann-Whitney U test:  $U=446$ ;  $n=83$ ;  $p=0.018$ ) in the “Separation Test” and spent less time sniffing the ground or objects in the room during the “Picture Viewing Test” (Mann-Whitney U test:  $U=481$ ;  $n=83$ ;  $p=0.050$ ) than pet dogs. Also, street dogs approached their owners more frequently (Mann-Whitney U test:  $U=418$ ;  $n=83$ ;  $p=0.008$ ) and were oriented to them for a longer time period (Mann-Whitney U test:  $U=332$ ;  $n=83$ ;  $p \leq 0.001$ ), see Fig. 3 and Fig. 4. Street and pet dogs did not differ in the “Challenge Task” regarding performance and cooperation. We found cooperation in the bridge task was positively correlated with vocalization at separation during the “Separation Test” ( $r_s=0.448$ ;  $n=22$ ;  $p=0.036$ ). Furthermore, we found a negative correlation between vocalization and dog personality as the more street dogs vocalized the less “nervous/anxious” they scored in the personality questionnaire (MCPQ, PCA axis 4) ( $r_s=-0.513$ ;  $n=22$ ;  $p=0.015$ ).



**Fig. 3** Rate of dog's approaches towards the owner during the "Picture Viewing Test" (Mann-Whitney U test:  $U = 418$ ;  $n = 83$ ;  $p = 0.008$ ).



**Fig. 4** Duration of dog's orientation towards the owner during the "Picture Viewing Test" (Mann-Whitney U test:  $U=332$ ;  $n=83$ ;  $p \leq 0.001$ ).

## 6. Discussion and Conclusion

Our results clearly show distinct differences between street and pet dog owners and between street and pet dogs as well. Street dog owners differed from pet dog owners in personality, empathy, attitude towards animals and as well as in their relationship styles with other humans and with their dog. As expected, street dogs were more nervous and more easily stressed, were less goal-directed and had a lower training focus as compared to pet dogs. Contrary to our prediction that we would find less close relationship patterns and bonding in street dogs as compared to other pet dogs, there were no such obvious differences. However their significantly longer orientation and more frequent approaches to owners in the “Picture Viewing Test” indicate a generally good working relationship between owners and former street dogs.

Our findings suggest that the average street dog owner seemed to be strongly determined by an idealistic attitude towards life. The two main arguments, why people decided to have street dogs (“not willing to support puppy production, there are enough poor dogs searching a home” and “out of pity, I wanted to give a better life to this dog”) indicate empathy with, and compassion for, animals. In addition more than half of our street dog owners were engaged in animal welfare and in contrast to our control pet dog owners they had a more positive attitude towards both, companion and wild animals. Also, street dog owners were rather eco-sensitive and serious vegetarians, believing others should also change to a vegetarian diet. This idealistic and beneficent image was further supported by our results of the empathy questionnaire. Street dog owners scored significantly higher on the fantasy scale (FS) and also higher on the empathic concern scale (EC), which implies a higher tendency to assess other-oriented feelings and being more concerned about unfortunate others. High scores on FS are correlated with higher emotionality and the tendency to empathize imaginatively into the feelings of fictitious characters (Davis 1983). The ability to fantasize about fictitious states has also been shown to be related with emotional reactions towards others and therefore also with helping behavior (Scotland et al. 1978). Actually these attributes would have supported our expectation, that street dog owners would score higher in the personality dimension agreeableness (Neo Five Factor Inventory Dimension 5) as people scoring high in this dimension tend to have more concern for others and are interested in social improvement (Borkenau and Ostendorf 2008). However street dog owners scored lower than pet dog owners in the NEO-FFI dimension conscientiousness. Persons scoring high in conscientiousness are well-organized, try hard to achieve their goals and think carefully before acting. People with lower scores in contrast act more spontaneously, impulsive and make rather decisions by gut instinct (Borkenau and Ostendorf 2008). Our results also



revealed clear differences in inter-human relationship patterns between street and pet dog owners. Street dog owners scored higher on the scales “lack of trust”, “fear of intimacy” and “anxiety about abandonment” indicating a more negative picture of others and which can be considered as measures of attachment insecurity. Contrary to insecurely bonded people, securely bonded people trust others, seek human proximity and have less fear of loss (Steffanowsky et al. 2001). By comparing our pet and street dog owner values of the scales “anxiety about abandonment”, “fear of intimacy”, and “lack of trust” with average values (compare Appendix 8.8. for RSQ scale values) one can see that dog owners generally seem to be more securely bonded as they reach lower scores in all of the three scales compared with the average. An explanation for this could be that dogs may provide “social support”, making the owners feel less vulnerable to inter-personal rejection and therefore act more openly towards new experiences with others. This means that dogs may function as a “secure base” for their owners, making them more amenable and fearless to “explore” new social environments. Dogs can indeed assume bonding functions (i.e. Kurdek 2008) and it is unquestionable, that many pet owners bond with their pets similar to family members (Bodsworth & Coleman 2001).

So, to have difficulties in trusting other humans, mostly due to disappointments and other issues in early life, could have promoted the choice for a piteous street dog, “disappointed” by life as well, like “problem shared is problem halved”. A study by Montoya (2008) indicated an association between interpersonal attraction and perceived similarities and this could be true for attraction to dogs as well. So, although street dog owners had a more insecure bonding pattern with humans, they scored lower compared to pet dog owners in the scale “insecure-distant” of the “Fragebogen zur Erfahrung mit Tieren” (FERT; Beetz 2012, unpublished), which provides information about the bonding to the own dog. Even if it is the case that already consisting bonding patterns in humans are very likely to be transformed to new relationships (Julius et al. 2009) this is actually not true for relationships with dogs. It was shown that there is no significant correlation between the bonding quality of adults with their parents and with their pets (Kurdek 2008). A study by Beetz et al. (2011) found evidence that insecurely bonded children could profit more from the presence of a therapy-dog than of a friendly human under social stress. This independency of bonding styles could be due to the fact that dogs show direct and authentic, non-judging behavior (Julius et al. 2012). The fact that street dog owners have a less emotional-distant relationship with their dogs fit the findings from our basic questionnaire, namely that street dogs are significant more frequently allowed to sleep in the bed. Therefore, this seems to indicate that those owners, whose dogs sleep in the bed, were significantly more securely bonded to their dogs compared to owners whose dogs are not allowed to do so. As human bonding patterns are

normally not transferred to bonds with the dog, this seems to suggest that bed-sleeping may promote a secure bond with the dog. When the dog is sleeping in the bed, dog and owner are feeling proximity and body warmth, whereby body closeness is correlated with positive feelings (Julius et al. 2012). Body contact also stimulates oxytocin release and thus strengthens the bonding. Oxytocin, the bonding hormone in mammals, facilitates pair bonding and has many positive effects as stress and fear reduction (Heinrichs et al. 2003; Detillion et al. 2004). A study showed that warm body contact between partners increases oxytocin in both parties (Grewen 2005). Our data suggests that pet dog owners seemed to have a different motive for having a dog compared to street dog owners. They usually get their dogs from local breeders, are more focused on education (visit significantly more often dog schools) or special training activities with their dogs and are more likely to use negative training methods than street dog owners. In contrast, street dog owners which may be considered as more impulsive decision-makers moved by an idealistic philosophy were focused less on training, but on dogs as close social partners, potentially also because they have somewhat less trust in inter-human relationships than pet dog owners.

Confirming our expectation, street dog differed significantly from average pet dog personality. Our data revealed a more stressed, nervous, anxious and less goal-oriented and training motivated character of former street dogs. This indeed indicated a rather reactive/shy coping style as reactive animals are also portrayed by being more neophobic, cautious and less insistent (Koolhaas et al. 1999). Pet dogs in contrast were described as rather cool and friendly. Behavioral observations showed significantly less sniffing in the “Picture Viewing Test” of street dogs additionally they spent less time in the “distant to door area” during the “Separation Test”. Less sniffing can be due to their more anxious, neophobic nature, thus our behavioral findings conformed to our questionnaire data. Furthermore street dogs were significantly longer oriented towards their owners and also approached them more frequently, which clearly demonstrated that street dogs were displaying attachment behavior towards their owners as they were seeking contact and proximity (Bowlby 1972; Prato-Previde 2003; Palestrini et al. 2005). Actively connecting with the attachment figure is helpful for stress regulation as being separated from the owner in an unfamiliar room can constitute a stressful situation for dogs (Palestrini et al. 2005). Wedl et al. (2010) found evidence that approaching their owners is associated with social attraction to them during the “Picture Viewing Test”. Increased contact seeking of street dogs could have been a reaction that they have experienced the situation (left alone in a new room) as more stressful compared to pet dogs due to their more anxious character. Therefore they might have felt more need to connect with their owners in order to reduce stress. The lower motivation to training in street dogs could be due to their rather reactive character as these animals are more cortisol

controlled, which is known to impair learning processes (Filipini et al. 1991; Diamond et al. 1992). However, the assessment of a dog's training motivation can also be very subjective. So the reason, why street dog owners rated their dogs as less training motivated could also be due to a lower owner focus on training or the less ambitious and goal-oriented character of street dog owners (less visited dog schools plus lower scores in the dimension conscientiousness compared to pet dog owners, explained above). In fact, street and pet dogs didn't differ in performance and cooperation in walking over the mesh wire bridge in the "Challenge Task". We found a relation of street dogs' vocalization during the "Separation Test" and their cooperation in the "Challenge Task" as longer vocalization was connected with higher cooperation. Vocalizing while being separated is a clear evidence of attachment behavior and has the purpose to seek and maintain contact with the attachment figure (Ainsworth & Bell 1970). Furthermore, vocalization of street dogs was negatively correlated with the dogs' characteristic feature "nervous/anxious" (MCPQ PCA axis 4). That means, these dogs, which were showing more attachment behavior, were less nervous and anxious, what is accompanied with a less stressful character. One can carefully conclude, that the attachment system in these owner-dog dyads was therefore good working as anxiolytic effects and stress reduction are the most important features of attachment figures.

### *Conclusion*

Our results clearly demonstrated that the average former street dog character clearly differs from pet dogs maybe due to experienced traumatic situations (killing stations), less socialization and a proactive character. However this character may also have the positive effect of making them more flexible and adjustable to new environments (Bohus 1987). Although preconditions for street dog socialization with their owners are less favorable than in case of pet dogs, our findings suggest that it can be successful, because former street dogs generally showed the ability to form working relationships and attachment bonds with their owners. These findings support the results of Gacsi (2001), who demonstrated the ability of shelter dogs forming attachment bonds with their new owners relatively quickly. This may be facilitated by a generally different expectation and motivation to dog keeping by their street dog owners as compared to pet dog owners. An empathic and sensitive interaction style may additionally be helpful in dealing with these dogs. However, a still greater focus on training and stress management may be recommended to improve stress coping in former street dogs.

The limitations of that study were that we had to compare neutered with unneutered dogs. However we did not believe that this difference was influencing our behavior observation data as castration is not supposed to be connected with attachment related behavior. But a higher and more equalized sample size would have been favorable. Nevertheless this study was important to gain knowledge about human-dog relationship patterns and to illuminate the complex mechanisms of dogs' bonding behavior and capability, especially of dogs with difficult or unknown background.

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## 8. Appendix

### 8.1. Street Dog Questionnaire (PCA 1 Behavior Part)

PCA 1, n = 256, Bartlett-Test: KMO = 0.62; Varimax-rotation, factors explain 51.37% of the total variance) with 12 items concerning “street dog behavior” revealed 4 axis: independent/unattached (1), “overly anxious/phobic” (2), “defensive aggressive towards humans” (3) and “neurotic/unapproachable” (4).

| Degree of owner agreement/disagreement to the questions                                                                                                             | Axis 1:<br>independent/<br>unattached | Axis 2:<br>overanxious/<br>phobic | Axis 3:<br>defensiv<br>aggressive<br>towards<br>humans | Axis 4:<br>neurotic/<br>unapproachable |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------|--------------------------------------------------------|----------------------------------------|
| 17. Wenn ich meinen Hund von der Leine lasse, ist er kaum abzurufen und entscheidet selbst, wann er zu mir zurückkommt.                                             | <b>,803</b>                           | ,060                              | -,108                                                  | -,009                                  |
| 18. Mein Hund sucht während eines Spazierganges meinen Kontakt] Bitte markieren Sie für die folgenden Aussagen, wie häufig das Verhalten auf Ihren Hund zutrifft    | <b>-,780</b>                          | ,075                              | -,063                                                  | -,135                                  |
| 21. Mein Hund trifft Entscheidungen ohne ein Kommando von mir abzuwarten.                                                                                           | <b>,707</b>                           | ,094                              | -,029                                                  | -,282                                  |
| 7. Mein Hund zieht sich viel zurück und ist sehr scheu. Dieses Verhalten zeigt/ zeigte mein Hund                                                                    | ,014                                  | <b>,413</b>                       | ,145                                                   | <b>,665</b>                            |
| 10. Mein Hund ist in bestimmten Situationen extrem ängstlich                                                                                                        | ,041                                  | <b>,728</b>                       | ,130                                                   | ,131                                   |
| 12. Mein Hund ist schnell gestresst und zeigt in unterschiedlichen Situationen Verhaltensweisen wie beispielsweise Auf und Ablaufen, sich Kratzen oder Hecheln.     | ,081                                  | <b>,758</b>                       | ,025                                                   | ,093                                   |
| 14. Mein Hund blickt manchmal hektisch um sich, als würde er Fliegen sehen, obwohl keine da sind oder er beobachtet intensiv den Himmel.                            | -,061                                 | <b>,630</b>                       | -,168                                                  | -,047                                  |
| 9. Mein Hund verteidigt sein Futter/Knochen etc.                                                                                                                    | -,213                                 | ,036                              | <b>,647</b>                                            | -,123                                  |
| 11. Mein Hund schnappt nach mir oder anderen, wenn man ihn berühren möchte.                                                                                         | ,179                                  | -,056                             | <b>,701</b>                                            | ,095                                   |
| 15. Mein Hund bellt oder knurrt manchmal Menschen an.                                                                                                               | -,011                                 | ,272                              | <b>,617</b>                                            | ,143                                   |
| 7. Mein Hund zieht sich viel zurück und ist sehr scheu. Dieses Verhalten zeigt/ zeigte mein Hund                                                                    | ,014                                  | <b>,413</b>                       | ,145                                                   | <b>,665</b>                            |
| 16. Mein Hund zeigt stereotypes Verhalten, wie sich im Kreis drehen, Rute fangen, unbewegte Objekte für längere Zeit fixieren, selbstzerstörerisches Verhalten etc. | -,162                                 | ,069                              | ,062                                                   | <b>,623</b>                            |
| 19. Mein Hund ist mit den meisten anderen Hunden gut verträglich und freundlich.                                                                                    | -,294                                 | ,275                              | ,372                                                   | <b>-,567</b>                           |

### 8.2. Training Methods

PCA; n = 1537, Bartlett-Test: KMO = 0.754; Varimax-rotation, factors explain 41, 63 % of the total variance), performed with 13 items of the basic questionnaire concerning training and education style revealed 2 factors: “positive training methods” (1) and “negative training methods” (2)

| Degree of owner agreement/disagreement to the questions                                          | Axis 1:<br>positive<br>Training<br>methods | Axis 2:<br>negative<br>training<br>methods |
|--------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------|
| 52. Wie oft haben Sie folgende Hilfsmittel bei der Erziehung Ihres Hundes verwendet?<br>Leckerli | <b>0,680</b>                               | -0,044                                     |

|                                                                                                               |              |        |
|---------------------------------------------------------------------------------------------------------------|--------------|--------|
| 52. Wie oft haben Sie folgende Hilfsmittel bei der Erziehung Ihres Hundes verwendet?<br>Spielzeug             | <b>0,719</b> | 0,042  |
| 53. Wie oft haben Sie folgende Erziehungsmethoden bei Ihrem Hund verwendet?<br>Mit Spiel oder Futter ablenken | <b>0,749</b> | 0,001  |
| 53. Wie oft haben Sie folgende Erziehungsmethoden bei Ihrem Hund verwendet?<br>Futter geben                   | <b>0,723</b> | -0,055 |
| 53. Wie oft haben Sie folgende Erziehungsmethoden bei Ihrem Hund verwendet?<br>Verbal loben                   | <b>0,506</b> | -0,019 |
| 53. Wie oft haben Sie folgende Erziehungsmethoden bei Ihrem Hund verwendet?<br>Spielen                        | <b>0,727</b> | -0,012 |

|                                                                                                                                                                                                                           |        |              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------|
| 50. Wie reagieren Sie, wenn sich Ihrem Hund auf der Straße ein fremder Hund nähert?<br>Ich ziehe meinen Hund mit der Leine in meinen Kontrollbereich und halte ihn an kurzer Leine bis der fremde Hund vorbeigegangen ist | -0,062 | <b>0,464</b> |
| 50. Wie reagieren Sie, wenn sich Ihrem Hund auf der Straße ein fremder Hund nähert?<br>Ich schimpfe meinen Hund, wenn er zu dem fremden Hund hinzieht                                                                     | 0,029  | <b>0,465</b> |
| 53. Wie oft haben Sie folgende Erziehungsmethoden bei Ihrem Hund verwendet?<br>Schimpfen                                                                                                                                  | 0,129  | <b>0,691</b> |
| 53. Wie oft haben Sie folgende Erziehungsmethoden bei Ihrem Hund verwendet?<br>Hund im Nacken schütteln                                                                                                                   | -0,062 | <b>0,575</b> |
| 53. Wie oft haben Sie folgende Erziehungsmethoden bei Ihrem Hund verwendet?<br>Hund zu Boden drücken                                                                                                                      | -0,031 | <b>0,604</b> |
| 53. Wie oft haben Sie folgende Erziehungsmethoden bei Ihrem Hund verwendet?<br>Den Hund in die gewünschte Position drücken (z.B. ins „Sitz“ drücken)                                                                      | -0,023 | <b>0,640</b> |
| 53. Wie oft haben Sie folgende Erziehungsmethoden bei Ihrem Hund verwendet?<br>Leinenimpuls (dem Hund einen Impuls oder Ruck an der Leine geben)                                                                          | -0,045 | <b>0,717</b> |

### 8.3. Attitude towards Animals

PCA; n = 1414, Bartlett-Test: KMO = 0.841, Varimax-rotation, factors explain 55,82 % of the total variance; axis: "Negative attitude towards animals" (1), "serious vegetarians" (2), "animals feel like humans" (3) and "high investment in pet care" (4)

| Degree of owner agreement/disagreement to the questions      | Axis 1<br>Negative attitude towards animals | Axis 2<br>militant vegetarians | Axis 3<br>animals feel like humans | Axis 4<br>high investment in pet care |
|--------------------------------------------------------------|---------------------------------------------|--------------------------------|------------------------------------|---------------------------------------|
| 1. Natur- und Umweltschutz ist sehr wichtig.                 | -,670                                       | ,114                           | -,046                              | ,016                                  |
| 2. Die Haltung von Heimtieren ist nutzlos.                   | ,633                                        | ,077                           | -,065                              | -,076                                 |
| 5. Tiere haben Gefühle, wie zum Beispiel Angst, Freude, etc. | -,726                                       | -,090                          | ,104                               | ,039                                  |
| 7. Hunde sind ideale Heimtiere.                              | -,445                                       | -,028                          | ,270                               | ,194                                  |
| 9. Wildtiere als Heimtiere zu halten ist in Ordnung.         | ,601                                        | ,026                           | ,055                               | ,031                                  |
| 13. Tiere können nicht denken.                               | ,561                                        | ,075                           | -,189                              | ,072                                  |
| 14. Hunde sind abscheuliche Tiere.                           | ,831                                        | ,164                           | ,009                               | -,034                                 |

|                                                                                                                                                    |       |       |       |       |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|-------|
| 16. Es ist akzeptabel, dass manche Leute das Fleisch bedrohter Wildtiere essen.                                                                    | ,600  | -,085 | -,010 | ,059  |
| 19. Katzen sind abscheuliche Tiere.                                                                                                                | ,677  | ,021  | -,024 | ,078  |
| 22. Die Aufzucht einer grossen Anzahl Nutztier drinnen (d.h. in Gebäuden oder Käfigen) für die Nahrungsproduktion (Fleisch, Milch) ist akzeptabel. | ,453  | -,340 | -,028 | ,170  |
| 24. Hunde sind sehr liebenswerte Tiere.                                                                                                            | -,643 | -,095 | ,087  | -,031 |
| 6. Alle Leute sollten Vegetarier sein und kein Fleisch essen.                                                                                      | ,006  | ,863  | ,152  | -,034 |
| 12. Es ist nicht akzeptabel, dass einige Leute Schweinefleisch essen.                                                                              | ,140  | ,876  | ,099  | -,028 |
| 18. Es ist kein Problem, dass manche Leute Rindfleisch essen.                                                                                      | -,087 | -,867 | -,109 | ,042  |
| 10. Die Gefühle von Tieren sind anders als die von Menschen.                                                                                       | ,098  | -,163 | -,716 | ,025  |
| 17. Tiere können denken wie Menschen.                                                                                                              | ,023  | ,060  | ,822  | -,043 |
| 21. Tiere haben dieselben Gefühle wie Menschen.                                                                                                    | -,132 | ,128  | ,849  | -,069 |
| 28. [Katze] Wieviel Zeit braucht es Ihrer Meinung nach etwa für die Pflege und Versorgung dieser Heimtiere pro Tag?                                | ,031  | -,106 | -,117 | ,848  |
| 29. [Hund] Wieviel Zeit braucht es Ihrer Meinung nach etwa für die Pflege und Versorgung dieser Heimtiere pro Tag?                                 | ,022  | -,006 | ,000  | ,854  |

## 8.4. Monash Dog Owner Relationship Scale

PCA; n = 1545, Bartlett-Test: KMO = 0.806, Varimax-rotation, factors explain 55.43 % of the total variance; 6 axis: "Dog as burden" (1), "dog as a social supporter" (2), "dog as cuddling partner" (3), "fear of separation of the dog" (4), "dog as companion" (5) and "active relaxing" (6) .

| Degree of owner agreement/disagreement to the questions                                                       | Axis 1:<br>Dog as burden | Axis 2:<br>Dog as social support | Axis 3:<br>Dog as cuddling partner | Axis 4:<br>Separation anxiety | Axis 5:<br>Dog as companion | Axis 6:<br>Active relaxing |
|---------------------------------------------------------------------------------------------------------------|--------------------------|----------------------------------|------------------------------------|-------------------------------|-----------------------------|----------------------------|
| 8. Es nervt mich, dass ich Dinge nicht mehr tun kann, die ich gerne gemacht habe bevor ich meinen Hund hatte. | <b>0,799</b>             | -0,027                           | -0,013                             | -0,131                        | 0,001                       | 0,009                      |
| 10. Es nervt, dass ich wegen meines Hundes meine Pläne manchmal ändern muss.                                  | <b>0,822</b>             | -0,089                           | -0,021                             | -0,115                        | -0,023                      | -0,058                     |
| 11. Mein Hund kostet zu viel Geld                                                                             | <b>0,448</b>             | -0,054                           | -0,061                             | 0,078                         | -0,052                      | 0,161                      |
| 16. Wie oft empfinden Sie das Versorgen Ihres Hundes als eine lästige Pflicht?                                | <b>0,592</b>             | -0,139                           | 0,066                              | -0,141                        | -0,123                      | -0,116                     |
| 18. Wie oft hindert Sie Ihr Hund daran Dinge zu tun, die Sie tun wollen?                                      | <b>0,778</b>             | -0,054                           | 0,008                              | 0,005                         | 0,054                       | 0,004                      |
| 13. Mein Hund ist mir gegenüber immer aufmerksam.                                                             | -0,109                   | <b>0,574</b>                     | -0,144                             | 0,089                         | 0,204                       | 0,012                      |
| 21. Wenn mich alle verlassen würden, wäre mein Hund noch immer für mich da.                                   | -0,044                   | <b>0,707</b>                     | 0,109                              | 0,102                         | -0,080                      | 0,086                      |
| 23. Mein Hund hilft mir harte Zeiten durchzustehen.                                                           | -0,047                   | <b>0,631</b>                     | 0,328                              | 0,229                         | -0,023                      | -0,006                     |
| 25. Mein Hund ist immer ein treuer Begleiter.                                                                 | -0,151                   | <b>0,745</b>                     | 0,085                              | 0,047                         | 0,138                       | 0,069                      |
| 27. Mein Hund ist immer da wenn ich Trost brauche                                                             | -0,080                   | <b>0,702</b>                     | 0,311                              | 0,098                         | -0,079                      | 0,113                      |
| 4. Wie oft küssen Sie Ihren Hund?                                                                             | -0,025                   | 0,026                            | <b>0,782</b>                       | 0,064                         | 0,020                       | 0,107                      |
| 12. Wie oft kaufen Sie Ihrem Hund Geschenke?                                                                  | 0,063                    | 0,152                            | <b>0,412</b>                       | 0,143                         | 0,114                       | 0,199                      |
| 15. Wie oft erzählen Sie Ihrem Hund Dinge, die Sie sonst niemandem erzählen?                                  | 0,043                    | 0,311                            | <b>0,524</b>                       | 0,120                         | 0,068                       | 0,021                      |
| 24. Wie oft umarmen Sie Ihren Hund?                                                                           | -0,079                   | 0,060                            | <b>0,728</b>                       | 0,049                         | 0,018                       | 0,103                      |

|                                                                                       |        |       |       |              |              |              |
|---------------------------------------------------------------------------------------|--------|-------|-------|--------------|--------------|--------------|
| 5. Ich wünschte mein Hund und ich wären nie getrennt                                  | -0,132 | 0,220 | 0,234 | <b>0,853</b> | -0,002       | 0,039        |
| 19. Ich möchte meinen Hund die ganze Zeit in meiner Nähe haben.                       | -0,135 | 0,226 | 0,127 | <b>0,870</b> | 0,092        | 0,071        |
| 9. Wie oft nehmen Sie Ihren Hund mit, wenn Sie jemanden besuchen?                     | -0,052 | 0,103 | 0,151 | 0,054        | <b>0,791</b> | 0,004        |
| 17. Wie oft nehmen Sie Ihren Hund im Auto mit?                                        | -0,055 | 0,000 | 0,003 | 0,018        | <b>0,807</b> | 0,050        |
| 7. Wie oft spielen Sie mit Ihrem Hund?                                                | 0,010  | 0,038 | 0,119 | -0,020       | 0,246        | <b>0,595</b> |
| 14. Wie oft geben Sie Ihrem Hund Leckerlis?                                           | 0,045  | 0,049 | 0,155 | 0,032        | -0,071       | <b>0,656</b> |
| 26. Wie oft haben Sie Ihren Hund bei sich während Sie entspannen z.B. beim Fernsehen? | -0,036 | 0,093 | 0,051 | 0,068        | -0,050       | <b>0,688</b> |

## 8.5. Fragebogen zur Erfahrung mit Tieren (FERT)

PCA; n = 1539, Bartlett-Test: KMO = 0.78, Varimax-rotation, factors explain 55.99% of the total variance; 4 axis: "Secure/caregiving" (1), "secure" (2), "insecure/ambivalent" (3) and "insecure/distant" (4)

| Degree of owner agreement/disagreement to the questions                                                           | Axis 1:<br>secure-<br>caregiving | Axis 2:<br>secure | Axis 3:<br>insecure<br>-<br>ambivalent | Axis 4:<br>insecure<br>-distant |
|-------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------|----------------------------------------|---------------------------------|
| 22. Ich kümmere mich gerne um meinen Hund.                                                                        | <b>,695</b>                      | -,064             | -,103                                  | ,016                            |
| 25. Ich habe gerne eine besondere Beziehung zu meinem Hund.                                                       | <b>,500</b>                      | ,399              | ,048                                   | -,189                           |
| 27. Ich fühle mich wohl dabei, die Verantwortung für meinen Hund zu übernehmen.                                   | <b>,681</b>                      | ,052              | -,116                                  | ,005                            |
| 29. Ich will eine sehr enge Beziehung zu meinem Hund haben.                                                       | <b>,711</b>                      | ,273              | ,005                                   | -,133                           |
| 30. Ich finde es in Ordnung, wenn mir viel an meinem Hund liegt.                                                  | <b>,797</b>                      | ,090              | -,075                                  | -,005                           |
| 32. Ich bin gerne für meinen Hund da.                                                                             | <b>,711</b>                      | ,273              | ,005                                   | -,133                           |
| 29. Ich will eine sehr enge Beziehung zu meinem Hund haben.                                                       | <b>,488</b>                      | <b>,498</b>       | ,074                                   | -,181                           |
| 34. Mein Hund weckt in mir den Wunsch, ihn zu umsorgen und zu beschützen.                                         | ,137                             | <b>,732</b>       | ,044                                   | -,101                           |
| 40. Ich möchte meinem Hund gerne öfters etwas Gutes tun (z. B. füttern, streicheln).                              | ,052                             | <b>,724</b>       | -,101                                  | ,095                            |
| 33. Ich mache mir Sorgen, dass mein Hund mich nicht so sehr liebt wie ich ihn liebe.                              | -,051                            | ,036              | <b>,843</b>                            | ,114                            |
| 37. Ich finde, dass mein Hund mir nicht so viel Liebe gibt, wie ich möchte.                                       | -,132                            | -,054             | <b>,828</b>                            | ,055                            |
| 23. Ich finde es schwierig, gefühlsmäßig von meinem Hund abhängig zu sein.                                        | -,040                            | -,054             | ,055                                   | <b>,738</b>                     |
| 24. Es ist mir sehr wichtig, von meinem Hund unabhängig zu sein.                                                  | -,002                            | -,293             | ,013                                   | <b>,667</b>                     |
| 26. Ich mache mir Sorgen, dass meine Gefühle am Ende verletzt werden, wenn ich mich zu sehr an meinen Hund binde. | -,108                            | ,282              | ,138                                   | <b>,577</b>                     |

## 8.6. Susceptibility of the dog to stress and the dog's training motivation

PCA; n= 1538, Bartlett-Test: KMO= 0.764, Varimax-rotation, factors explain 60.01% of the total variance; axis: "Stressed dog" (1) and "training motivation" (2)

| Degree of owner agreement/disagreement to the questions                                                           | Axis 1:<br>stressed<br>dog | Axis 2:<br>training<br>motivation |
|-------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------------|
| 36. Für wie stressanfällig halten Sie Ihren Hund?                                                                 | <b>,800</b>                | ,021                              |
| f37. Wie gestresst reagiert Ihr Hund in folgenden Situationen? 37.1 Lautes Stadtleben                             | <b>,720</b>                | -,024                             |
| 37. Wie gestresst reagiert Ihr Hund in folgenden Situationen? 37.3 In ungewohnter Umgebung                        | <b>,761</b>                | -,096                             |
| 37. Wie gestresst reagiert Ihr Hund in folgenden Situationen? 37.4 Bei Begegnungen mit fremden Personen           | <b>,750</b>                | -,054                             |
| 39. Wie schätzen Sie die tägliche Belastung Ihres Hundes ein bzw. wie stressintensiv ist der Alltag Ihres Hundes? | <b>,510</b>                | ,169                              |
| 46. Wie leicht können Sie Ihrem Hund etwas Neues beibringen?                                                      | ,000                       | <b>,873</b>                       |
| 47. Wie arbeitsfreudig ist Ihr Hund, wenn Sie mit ihm arbeiten?                                                   | -,012                      | <b>,867</b>                       |
| 48. Bringen Sie Ihrem Hund gerne etwas bei?                                                                       | ,025                       | <b>,830</b>                       |

## 8.7. Monash Dog Personality Questionnaire

PCA; n= 1545, Bartlett-Test: KMO= 0.81, Varimax-rotation, factors explain 55.43% of the total variance; axis: Active/excitable" (1), "obedient/reliable" (2), "insistent/goal-directed" (3), "nervous/anxious" (4) and "cool/friendly" (5)

| Degree of owner agreement/disagreement to the questions | Axis 1:<br>active/excitable | Axis 2:<br>obedient/reliable | Axis 3:<br>Insistent/goal-directed | Axis 4:<br>Nervous/anxious | Axis 5:<br>Cool/friendly |
|---------------------------------------------------------|-----------------------------|------------------------------|------------------------------------|----------------------------|--------------------------|
| Energiegeladen/dynamisch                                | <b>0,850</b>                | 0,143                        | 0,143                              | -0,040                     | 0,037                    |
| Hyperaktiv                                              | <b>0,653</b>                | -0,199                       | 0,069                              | 0,323                      | 0,002                    |
| Aktiv                                                   | <b>0,790</b>                | 0,340                        | 0,101                              | -0,037                     | 0,087                    |
| Ruhelos                                                 | <b>0,495</b>                | -0,197                       | 0,038                              | 0,432                      | -0,078                   |
| Lebhaft                                                 | <b>0,828</b>                | 0,247                        | 0,117                              | -0,004                     | 0,092                    |
| Erregbar                                                | <b>0,403</b>                | -0,055                       | 0,114                              | 0,404                      | -0,324                   |
| Aufmerksam                                              | 0,383                       | <b>0,593</b>                 | 0,142                              | -0,044                     | 0,016                    |
| Gelehrig                                                | 0,306                       | <b>0,683</b>                 | 0,118                              | -0,106                     | 0,029                    |
| Gehorsam                                                | -0,042                      | <b>0,845</b>                 | -0,098                             | 0,029                      | 0,092                    |
| Intelligent                                             | 0,341                       | <b>0,582</b>                 | 0,232                              | -0,078                     | 0,060                    |
| Folgsam                                                 | -0,066                      | <b>0,855</b>                 | -0,114                             | 0,046                      | 0,124                    |
| Zuverlässig                                             | -0,126                      | <b>0,714</b>                 | 0,139                              | -0,087                     | 0,210                    |
| Beharrlich                                              | 0,076                       | -0,039                       | <b>0,734</b>                       | 0,014                      | 0,095                    |
| Selbstständig                                           | 0,073                       | 0,061                        | <b>0,568</b>                       | -0,184                     | 0,170                    |
| Entschlossen/zielstrebig                                | 0,165                       | 0,137                        | <b>0,733</b>                       | -0,162                     | 0,040                    |
| Hartnäckig                                              | 0,066                       | -0,038                       | <b>0,816</b>                       | 0,005                      | -0,058                   |
| Durchsetzungsfähig                                      | 0,031                       | 0,128                        | <b>0,766</b>                       | -0,102                     | -0,063                   |
| Nervös                                                  | 0,278                       | -0,101                       | -0,069                             | <b>0,655</b>               | -0,334                   |
| Unterwürfig                                             | -0,050                      | 0,055                        | -0,207                             | <b>0,526</b>               | 0,353                    |
| Gelassen                                                | -0,391                      | 0,153                        | 0,164                              | <b>-0,428</b>              | 0,497                    |
| Furchtsam                                               | -0,023                      | -0,005                       | -0,103                             | <b>0,787</b>               | -0,126                   |
| Ruhelos                                                 | 0,495                       | -0,197                       | 0,038                              | <b>0,432</b>               | -0,078                   |



|                |        |        |        |              |              |
|----------------|--------|--------|--------|--------------|--------------|
| Ängstlich      | 0,023  | -0,037 | -0,142 | <b>0,793</b> | -0,186       |
| Erregbar       | 0,403  | -0,055 | 0,114  | <b>0,404</b> | -0,324       |
| Freundlich     | 0,069  | 0,178  | 0,048  | -0,090       | <b>0,740</b> |
| Unbekümmert    | 0,053  | -0,080 | 0,199  | -0,341       | <b>0,520</b> |
| Nichtaggressiv | -0,089 | 0,119  | -0,014 | 0,017        | <b>0,728</b> |
| Gelassen       | -0,391 | 0,153  | 0,164  | -0,428       | <b>0,497</b> |
| Gesellig       | 0,217  | 0,116  | 0,023  | -0,156       | <b>0,653</b> |

## 8.8. Values for scales of the Relationship Scale Questionnaire (RSQ) (Steffanowsky et al. 2001)

|                        | Bad Herrenalb<br>Messung bei<br>Aufnahme<br>(1996/97)<br>N = 305 |        | Nichtklinische<br>Stichprobe<br>(Mestel, 1999)<br>N = 48 |        | t-Test |       |
|------------------------|------------------------------------------------------------------|--------|----------------------------------------------------------|--------|--------|-------|
|                        | $M_A$                                                            | $SD_A$ | $M_N$                                                    | $SD_N$ | $t$    | $p$   |
| 1. Angst vor Trennung  | 3,01                                                             | 0,78   | 2,78                                                     | 0,64   | 2,15   | <.050 |
| 2. Angst vor Nähe      | 2,96                                                             | 0,82   | 2,56                                                     | 0,74   | 3,74   | <.001 |
| 3. Fehlendes Vertrauen | 2,94                                                             | 0,81   | 2,41                                                     | 0,72   | 5,10   | <.001 |
| 4. Wunsch nach Unabh.  | 3,82                                                             | 0,79   | 3,77                                                     | 0,64   | 0,54   | .739  |

## 8.9. Tables of observed Behaviors and Observer Ratings in the different Test Situations

| Tab. 1 Analyzed Behaviors of owner ("Picture Viewing Test") |                  |                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| owner orientation to dog                                    |                  | Owner head orientation towards dog. An imaginary line going from the owner's head straight ahead and touch or go through the dog. Orientation of the eyes not coded                                                                                                                                                              |
| stroke dog                                                  |                  | Owner strokes, scratches or pets dog, hand of owner is in repeating movement (always starts by a touch) and in contact with dog's body. When touching and stroking occur at the same time, stroke dog is always higher ranking than touch.                                                                                       |
| touch dog                                                   |                  | Owner touches dog (hand not in movement), hand of owner rests on dog, no holding context, but can occur while holding at the same time (with the other hand). Including short movements with the hand on the body of the dog. When touching and stroking occur at the same time, stroke dog is always higher ranking than touch. |
| owner socio-positive interactions                           | hug dog          | Owner hugs, cuddles dog                                                                                                                                                                                                                                                                                                          |
|                                                             | praise dog       | Owner praises dog, e.g. "good dog", also within talking context, only the praising word is coded every time it appears                                                                                                                                                                                                           |
|                                                             | nuzzle/ kiss dog | Owner rubs dog with face, or kisses dog                                                                                                                                                                                                                                                                                          |
|                                                             | give treat       | Owner gives the dog a treat (dog has to be able to get it if he/she wants), doesn't matter if the dog eats it or not.                                                                                                                                                                                                            |



| <b>Tab. 2 Analyzed Behaviors of dog (“Separation Test“)</b> |                            |                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| dog distance to door                                        | next to door               | Dog is next to door within reach distance (any part of the body within inside radius between door and 2nd mark), without body contact to door.                                                                                                       |
|                                                             | middle to door             | Dog is somewhere between distant and next to the door. Any part of the body within inside the radius between 2nd threat mark and distant to door mark line.                                                                                          |
|                                                             | distant to door            | Dog is at the opposite end of the room. Including when the dog is not visible, but still inside of the room (the only places where the dog is not visible is in the distance part of the room) Any part of the body outside next and middle to door. |
| dog mobile                                                  | in motion                  | Dog is in motion, which includes walking and scurry on the same spot, including turnarounds on the same spot. Dog walks forwards, backwards or sideward. One leg moves after the other. At least 2 legs in motion.                                   |
|                                                             | trotting/running           | Dog moves in jogging gait or moves in gallop. More than one leg moves at the same time.                                                                                                                                                              |
| dog immobile                                                | sitting                    | Dog sits.                                                                                                                                                                                                                                            |
|                                                             | lie head up                | Belly is orientated to the ground, shoulders don't touch the ground, head is upright without touching any objects or body parts of dog or person                                                                                                     |
|                                                             | lie head down, lie on side | Dog lies on side, one shoulder is in contact with the ground while the other shoulder is upturned and the belly is orientated to the side;                                                                                                           |
|                                                             | standing                   | Dog stands still, including reach up with forepaws.                                                                                                                                                                                                  |
| exploration                                                 | sniffing                   | Dog sniffs on the ground, chair, table or other objects;                                                                                                                                                                                             |
| vocalization                                                | bark                       | Dog barks with high to low tones with long rhythmic stanzas, mouth opened or closed; maximum break of two seconds.                                                                                                                                   |
|                                                             | whimper                    | Dog utters, soft, intermittent sounds, with closed to easy opened mouth, maximum break of two seconds.                                                                                                                                               |
|                                                             | growl                      | Dog utters a low, guttural, menacing sound, with or without showing the teeth, maximum break of two seconds                                                                                                                                          |
|                                                             | howl                       | Dog utters a long, high sound with little to wide open mouth, maximum break of two seconds                                                                                                                                                           |
|                                                             | scream                     | Dog screams loudly; utters a long, high sound, but with no regularity; more a hysterical uncoordinated sound; maximum break of two seconds                                                                                                           |

| <b>Tab. 3 Analyzed Behaviors of dog (“Picture Viewing Test“)</b> |                  |                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| orientation                                                      | orientation door | Head orientation towards door, an imaginary line going from the dog's head straight ahead, has to touch or go through the door.                                                                                                                                                           |
| contact seeking                                                  | approach owner   | Dog moves within reach distance (1 meter distance max) of owner and appears oriented towards owner, excluding parallel movements and moving behind in same speed; including threat. When the dog is in interaction (which can include body contact) with the owner, no approach is coded. |

|                    |                      |                                                                                                                                                                         |
|--------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | orientation to owner | Dog head orientation towards owner. An imaginary line going from the dog's head straight ahead and touch or go through the owner. Orientation of the eyes not coded     |
|                    | body contact owner   | Dog nudges owner with its muzzle; Dog reaches out with forepaw towards owner. Dog leans or rubs body or part of body against owner including leaping with body contact. |
| closeness to owner | next to owner        | Dog is next to owner within 1m distance.                                                                                                                                |
|                    | middle to owner      | Dog is somewhere between opposite and next to the owner.                                                                                                                |
|                    | distant to owner     | Dog is at the opposite end of the room (length or diagonal) as the owner.                                                                                               |

**Tab. 4 Ratings of dog's performance (1.), cooperation (2.) and owner's influence (3.) in the "Challenge Task"**

| 1                                                        | 2                                                                      | 3                                                                                              | 4                                                                   | 5                                     |
|----------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------|
| Does not apply at all                                    | Does rather not apply                                                  | Partially applies                                                                              | Largely applies                                                     | Fully applies                         |
| Rating 1. Dog's performance                              |                                                                        |                                                                                                |                                                                     |                                       |
| <b>Bridge wasn't entered at all</b>                      | <b>Bridge was entered</b>                                              | <b>Part of the bridge</b>                                                                      | <b>Half of the bridge</b>                                           | <b>Bridge successful</b>              |
| Dog didn't walk over the bridge and didn't even enter it | Dog didn't walk over the bridge, but entered it with one to three paws | Dog didn't walk over the bridge completely, but at least walked one to two steps on the bridge | Dog didn't walk over the bridge completely, but at least half of it | Dog walked completely over the bridge |

|                                                                                         |                                                                           |                                                                                         |                                                          |                                              |
|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------|
| Rating 2. Dog's cooperation                                                             |                                                                           |                                                                                         |                                                          |                                              |
| <b>Dog showed no cooperation</b>                                                        | <b>Dog showed little cooperation</b>                                      | <b>Dog showed moderate cooperation</b>                                                  | <b>Dog showed a lot of cooperation</b>                   | <b>Dog showed full cooperation</b>           |
| Dog wasn't cooperating at all and refuses totally (i.e. lying under table, no reaction) | Dog cooperated just a little bit and must be "motivated most of the time" | Dog cooperated less than half of the time voluntarily and has to be motivated partially | Dog cooperated with the owner more than half of the time | Dog cooperated with the owner the whole time |

| Rating 3. Physical influence of the owner                         |                                                                            |                                                             |                                                                  |                                     |
|-------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------|
| Constant influence of owner                                       | A lot of influence of owner                                                | Moderate influence of owner                                 | Little influence of owner                                        | No physical influence of owner      |
| Owner fixed the dog all the time (holding, lifting, tugging etc.) | Owner fixed the dog more than half of the time and partially just tied it. | Owner fixed the dog less than half of the time and tied it. | Owner nearly hasn't fixed the dog and if so, just tied it at all | Owner hasn't fixed nor tied the dog |

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## CURRICULUM VITAE

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### Education and Training

- |                   |                                                                                                                                                                                   |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10/2010 – 04/2015 | <b>Master studies in behavioral, neuro and cognition biology at the University of Vienna</b><br>Working group: Human-Animal Relationships Research Group                          |
| 10/2007 - 09/2010 | <b>Bachelor's degrees in biology at Ludwig- Maximilians- University of Munich</b><br>Major fields of study: Ecology, zoology, neurobiology, evolution biology, (final grade: 2.3) |
| 02/2007 - 05/2007 | <b>Clinic of Fish and Reptiles, LMU Munich</b><br>Employee as biological lab assistant<br>Main work: bacteriology, histology, hematology                                          |
| 10/2004 - 01/2007 | <b>Clinic of Fish and Reptiles, LMU Munich</b><br>Training in biological lab assistant                                                                                            |
| 09/1995 - 07/2003 | <b>Josef-Effner Gymnasium Dachau</b>                                                                                                                                              |
- 

### Experiences

- |                                         |                                                                                                                                                                                                                                                                         |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 07/2014                                 | <b>Student Poster Award at ISAZ Conference</b><br><b>Animals and Humans together: Integration in Society</b>                                                                                                                                                            |
| 06/2014 – 09/2014,<br>09/2013 – 12/2013 | <b>Scientific Assistant</b><br><b>University of Vienna, Human-Animal Relationships Research Group</b><br>i.e. data entry, coding of human dog videos, support in organizing a Lecture Series at the University of Vienna, organization of an online questionnaire study |

|                   |                                                                                                                                                                                                                                                                                                    |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 09/2011 – 11/2011 | <b>Internship for tropical marine conservation</b><br>in Busuanga island, Palawan, Philippines,<br>(C3 Community Centred Conservation)<br>i.e. GPS marking of sea grass beds, development of sea grass<br>assessment methodology, coastal research management<br>presentations at local university |
| 05/2011           | <b>Internship in behavioural biology at the Konrad Lorenz<br/>Research Centre</b><br>“Cooperativeness of Crows and Ravens after different<br>habituation”                                                                                                                                          |
| 05/2010 - 08/2010 | <b>Field studies for bachelor thesis about dominant ants</b><br>“Ecological Dominance of <i>Formica fuscocinerea</i> in a natural<br>habitat”, (final grade: 1.3)                                                                                                                                  |
| 06/2008 - 10/2010 | <b>Student assistant</b><br><b>Adolf-Butenandt- Institute of Physiological Chemistry</b>                                                                                                                                                                                                           |

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## Languages

|         |                 |
|---------|-----------------|
| English | fluency         |
| French  | basic knowledge |
| Latin   | basic knowledge |

Munich, 14. April 2015  
Verena Ziemen