Applied Animal Behaviour Science 160 (2014) 116–126

Contents lists available at ScienceDirect

Applied Animal Behaviour Science

journal homepage: www.elsevier.com/locate/applanim

Approach behaviour of shelter dogs and its relationships with the attitudes of shelter staff to dogs

Christine Arhant*, Josef Troxler

Institute of Animal Husbandry and Animal Welfare, Department for Farm Animals and Veterinary Public Health, University of Veterinary Medicine Vienna, Veterinärplatz 1, A-1210 Wien, Austria

ARTICLE INFO

Article history:
Accepted 31 August 2014
Available online 10 September 2014

Keywords:
Human–dog relationship
Attitudes to dogs
Welfare assessment
Animal shelter
Dog

ABSTRACT

The behaviour of animals towards humans is widely used to assess human–animal relationship and welfare in livestock. The aim of this study was to develop an approach test for dogs that is feasible in a surveillance setting, shows stability over a given time period and has good between-experimenter repeatability. To assess validity of the test, relationships between dog behaviour and attitudes of shelter staff to dogs, dog care and dog handling were explored.

The test consisted of approaching the front of a dog's kennel in a non-threatening manner. Dogs were categorized as "contact possible" if they approached and explored the experimenter and as "no contact possible" if they ignored, attacked, or barked or growled continuously. We tested 520 dogs in 29 shelters and a mean percentage of 76 ± 19% (mean ± S.D.) of dogs per shelter were categorized as "contact possible". Stability over time (mean number of days between two visits: 58) was tested on shelter level in nine shelters and resulted in a $r_s = 0.79$ ($p = 0.017$) and a non-significant Wilcoxon test ($p = 0.123$, visit 1: 79 ± 14%, visit 2: 83 ± 14%). Between-experimenter reliability was tested in 158 dogs and resulted in a Cohen's kappa of 0.86 ($p < 0.001$). To assess attitudes to dogs, 126 members of shelter staff completed a questionnaire. Relationships between the approach behaviour of the dogs and the attitude of several subsamples of shelter staff (based on the time staff worked with dogs) were analysed on shelter level. In the subsample working 80% or more of their time with the dogs ($N = 11$), more dogs approaching the experimenter was related to a more positive attitude to dogs ($r_s = 0.68$, $p < 0.05$) and a higher agreement to the use of positive dog handling ($r_s = 0.66$, $p < 0.05$). However, more dogs approaching the experimenter was related to staff feeling less comfortable during interactions with dogs in almost all subsamples (r_s ranging from −0.45 to −0.52, $p < 0.05$; N ranging from 19 to 28).

We conclude that our approach test can reliably be used in a surveillance setting. With regard to validity, we found that a positive attitude and positive handling seem to increase the willingness of dogs to approach an unknown person. However, a high proportion of approaching dogs might also reflect a low frequency of human interactions, and therefore poor welfare, caused by staff feeling uncomfortable during interactions with dogs. Further research is needed to clarify how quantity of interactions with humans influences the approach behaviour of shelter dogs.

* Corresponding author. Tel.: +0043 1 25077 4911; fax: +0043 1 25077 4990.
E-mail addresses: Christine.Arhant@vetmeduni.ac.at, arhant@gmx.at (C. Arhant), Josef.Troxler@vetmeduni.ac.at (J. Troxler).

http://dx.doi.org/10.1016/j.applanim.2014.08.013
0168-1591/

1. Introduction

Austrian law does not allow euthanasia of dogs merely because they are ownerless. Unwanted dogs are kept in shelters until they are adopted, die or are euthanized because of old age or disease. This means that dogs' average duration of stay in shelters in Austria (Arhant et al., 2011) is very long compared to other countries (Marston et al., 2004; Diesel et al., 2007). This presents the shelters with two challenges: successful rehoming even of problematic dogs, and optimization of husbandry to avoid dogs developing problems that are barriers to successful rehoming.

Human partners are an essential part of a dog's housing environment. Domestic dogs form attachment bonds with their owners (Palmer and Custance, 2008; Rehn et al., 2013), and the presence of the owner has been found to lower sympathetic arousal in threatening situations (Gácsi et al., 2013). Human interaction programmes can reduce stress in shelter dogs (Bergamasco et al., 2010; Shiverdecker et al., 2013). A central function of the caretaker–dog relationship in prevention and treatment of behavioural problems of shelter dogs is plausible.

The human–animal relationship is defined as "the degree of relatedness or distance between the animal and the human, i.e., the mutual perception which develops and expresses itself in their mutual behaviour" (Waiblinger et al., 2006). A positive human–animal relationship is associated with pleasant emotions and rewarding events such as feeding or grooming, whereas a negative relationship is characterized by unpleasant emotions and aversive events such as rough handling (Waiblinger et al., 2006).

The behaviour of stockpersons towards animals is known to depend on their attitudes to and beliefs about animals, animal care and handling (Hemsworth et al., 1989; Lensink et al., 2000; Waiblinger et al., 2002). The theory of reasoned action (Ajzen and Fishbein, 1980 cited after Hemsworth and Coleman, 2011) has been invoked to explain influences of attitudes on stockperson behaviour and can be roughly summarized to mean that people behave in a favourable way towards animals they like and in an unfavourable way towards animals they dislike.

The quality of the animal–human relationship can be assessed by measuring the animal's behaviour towards a human. For example, fear of humans leads to increased avoidance and reduced approach behaviour in chicks, rabbits and heifers (Jones, 1993; Csatadi et al., 2005; Mazurek et al., 2011). The reaction of a dog towards humans might be influenced by quantity and quality of interactions with humans such as shared activities (Bennett and Rohlf, 2007; Arhant et al., 2010) and use of training methods. Dogs trained with a higher proportion of punishment-based training methods interacted less with a stranger (Rooney and Cowan, 2011), and several questionnaire-based studies found correlations between aggressive or fearful dog behaviour towards humans and the use of punishment-based training methods (Hiby et al., 2004; Herron et al., 2009; Arhant et al., 2010). In the case of shelter dogs, positive human contact was shown to increase approach behaviour (Conley et al., 2014). Furthermore, a dog's reaction to a potential adopter seems likely to influence the decision whether to adopt the dog. People who adopted a dog reported that when they first met the dog it approached them, licked them or jumped up (Weiss et al., 2012); adopters preferred dogs who were quiet, alert, friendly and stayed at the kennel front (Wells and Hepper, 2000).

Human–animal relationship is an essential part of livestock welfare (Botreau et al., 2007) and welfare assessment protocols use animal-based parameters such as avoidance distance to assess the human–animal relationship on farms (Welfare Quality, 2009b,a). Animal-based parameters for use in surveillance or self-monitoring of animal welfare have to fulfil several criteria. They should be feasible, reliable, stable over time and valid (Knierim and Winckler, 2009).

The work presented here is part of a larger project on welfare of dogs and cats in animal shelters, which includes the task of developing animal-based parameters that can be used by official vets or shelter managers to assess the welfare of animals on shelter level. As part of this task, the first aim of the present study was to develop an approach test and investigate its feasibility for surveillance purposes, the stability over a given time period on shelter level and on individual level and its between-experimenter repeatability. The second aim was to develop a questionnaire to measure the attitudes of shelter staff to dogs and their beliefs about interactions with shelter dogs. Finally, we made a first attempt to assess the validity of the approach test by exploring relationships between attitudes of shelter staff and approach behaviour of the dogs.

2. Animals, materials and methods

2.1. Participating shelters, dog housing & general procedures

In total, 29 shelters housing dogs were visited. These shelters kept a median number of 105 animals (range: 14–1348), 24 dogs (range: 8–353) and 63 cats (range: 3–583).

In the 29 shelters we visited 45 dog housing sections. Of these, 24% consisted of dog kennels (pens constructed of mesh) with an indoor area and an adjacent outdoor run, 20% of kennels without an outdoor run, 29% of rooms (pens constructed of solid walls) with an adjacent outdoor run, 9% of rooms without an outdoor run and 18% were outdoor kennels. The mean space per dog was $22 \pm 15\ m^2$ (mean ± S.D.) in kennels or rooms with an adjacent outdoor run, $5 \pm 3\ m^2$ per dog in housing units with indoor area only and $29 \pm 14\ m^2$ per dog in outdoor kennels. The dogs were fed one to two times a day. On average, the dogs received a proportion of 55 ± 28% of dry food/dog pellets, 25 ± 18% of canned dog food and 16 ± 19% of meat and innards. The dogs were brought to outdoor exercise areas at least once a day in 48% of the shelters, at least twice a day in 42% of the shelters and less than once a day (1 to 3 times a week) in 10% of the shelters.

In order to assess test–retest reliability of the approach test and the questionnaire scales, nine shelters were visited twice. The mean number of days between the two visits was 58 ± 7 (range: 50–76). The assessment of the

test–retest reliability of the approach test included testing dogs twice by the same experimenter (experimenter 1) during visit 1 and visit 2. The test–retest reliability of the questionnaire was assessed by distributing the questionnaire to staff members who were willing to fill it in a second time.

To investigate between-experimenter repeatability of the approach test, dogs in 7 shelters were tested twice by two different experimenters. The first rater was always the same person (experimenter 1) and the second rater was one of three veterinary students. As the investigation of between-experimenter repeatability had the purpose of testing whether the approach test could be used easily by official vets or shelter managers, the "training" of the second raters consisted only in giving them written instructions.

During the visits, the attitudes questionnaires were distributed to shelter staff in the morning after our arrival at the shelter. Shelter staff were asked to complete the questionnaire by the afternoon. In some shelters this was not possible and the completed questionnaires were returned by mail. In total, questionnaire data from 28 shelters were obtained.

Dog housing facilities were assessed by two experimenters, always dressed in green single-use overalls. Experimenter 1 carried out the approach test and collected other data regarding the dogs. In six of the shelters visited only once, "experimenter 1" was a trained diploma student. A second experimenter evaluated kennel and dog facility design and furnishings. If possible, the approach test was carried out in the indoor sections of the dog houses. In some shelters, the dogs were kept in outdoor kennels or in exercise areas for the whole day. These dogs were tested outdoors. The approach tests were conducted between 9:00 a.m. and 5 p.m. at times requested by the shelter manager.

2.2. Approach test

The approach test was carried out as follows: the experimenter walked with slow and smooth movements along the corridor and approached the closed kennel door facing along the corridor, i.e. at an angle of 90 degrees to the kennel door. The experimenter stopped at a distance of approximately 30 cm from the kennel door without turning. She raised her extended arm sideways until the back of the hand almost touched the kennel door. The experimenter presented her hand to the dog for 5 s. Starring at the dog was avoided during the entire test.

A dog was categorized as "contact possible" if the dog approached and explored the experimenter. Frequently observed reactions were a dog approaching and stopping at the kennel door or some distance short of the door and sniffing in the direction of the experimenter or jumping up the kennel door and trying to lick the hand. Dogs that approached and explored by sniffing but barked or growled intermittently were included in the category "contact possible".

Dogs that ignored the experimenter or displayed behaviours that were intended to increase the distance to the experimenter such as attacks, hiding or uninterrupted barking or growling at the experimenter were classified as "no contact possible".

2.3. Attitudes questionnaire

The questionnaire was developed based on questionnaires used for assessing the human–animal relationship in dairy cattle, beef cattle and laying hens (Waiblinger et al., 2002; Niebuhr et al., 2009; Windschnurer et al., 2009) and a questionnaire for assessing interactions of dog owners with their dogs (Arhant et al., 2010). A preliminary version of the questionnaire was tested with members of shelter staff. After adjustment, the final questionnaire consisted of one section about personal characteristics of the respondent (gender, age, experience with animal care, hours of work per week, % time work with dogs) and the following 7 sections about dogs: characteristics of dogs (6 items), dogs as a social supporter (3 items), the importance of a dog's needs (7 items), feeling comfortable during interactions with dogs (6 items), quantity of interactions with dogs during work (6 items), quality of interactions/dog handling (7 items) and the perception of shelter work (5 items). The items were scored on seven-point-scales ranging for example from "do not agree at all" to "totally agree" (see Table 1). The questionnaire also contained similar questions about cats and sections about attitudes to sanitation and euthanasia. The results of these parts of the questionnaire are not reported here.

2.4. Data analyses

All statistical analyses were carried out with PASW 17.0. Access 2003 was used for the calculation of "shelter values" (for example the proportion of dogs showing contact behaviour or the shelter mean of the questionnaire subscales).

Test–retest reliability of the approach test was calculated on shelter level (proportion of dogs that were categorized as "contact possible", $N = 9$). For this purpose, a Spearman rank-correlation coefficient and a Wilcoxon-test were used. In addition, test–retest reliability was tested on individual level ($N = 112$) in dogs which were present during visit 1 and visit 2 by calculation of Cohen's Kappa and the index of concordance.

To investigate between-experimenter repeatability of the approach test, we used Cohen's Kappa and the index of concordance.

Relationships between the result of the approach test and individual characteristics of the dogs or the test situation were investigated using Chi-square tests of association for categorical variables and Mann–Whitney U tests for continuous data.

In order to group the items of the attitudes questionnaire to subscale scores, we carried out multiple principal component analyses followed by Varimax rotation. Bartlett's test of Sphericity was required to be significant and the Kaiser–Meyer–Olkin criterion should be at least 0.5. To include items in the final solution, the Anti-Image Correlation Matrix diagonal was required to be at least 0.5. Subscales were required to have an eigenvalue greater than one. Items were included in

Table 1
Factor structure and descriptive statistics of subscales and corresponding items of the dog attitudes questionnaire administered to staff members ($N = 126$) of Austrian animal shelters ($N = 28$).

	Factor loading	Min	Percentile 25	Median	Percentile 75	Max
Characteristics of dogs[a]	2 Subscales, 66% explained variance					
Positive characteristics		**3.3**	**5.3**	**6.0**	**6.7**	**7.0**
Dogs are playful	*0.901*	*2.0*	*6.0*	*6.0*	*7.0*	*7.0*
Dogs are cuddly	*0.917*	*2.0*	*5.0*	*6.0*	*7.0*	*7.0*
Dogs are eager to learn	*0.783*	*4.0*	*6.0*	*6.0*	*7.0*	*7.0*
Negative characteristics		**1.0**	**2.0**	**2.7**	**3.3**	**5.0**
Dogs are smelly	*0.809*	*1.0*	*1.0*	*2.0*	*4.0*	*6.0*
Dogs are potentially dangerous	*0.735*	*1.0*	*1.0*	*2.0*	*3.0*	*6.0*
Dogs are noisy	*0.710*	*1.0*	*3.0*	*4.0*	*4.0*	*7.0*
Needs of dogs[b]	2 Subscales, 59% explained variance					
Importance of activities		**2.8**	**5.8**	**6.2**	**6.6**	**7.0**
Twice a day contact to humans	*0.751*	*2.0*	*6.0*	*7.0*	*7.0*	*7.0*
Daily play	*0.732*	*3.0*	*6.0*	*6.0*	*7.0*	*7.0*
Daily contact to conspecifics	*0.694*	*2.0*	*6.0*	*6.0*	*7.0*	*7.0*
Daily materials to chew	*0.612*	*3.0*	*5.0*	*6.0*	*6.0*	*7.0*
Prevent from boredom	*0.578*	*3.0*	*6.0*	*7.0*	*7.0*	*7.0*
Importance of calm environment		**2.5**	**5.0**	**6.0**	**6.0**	**7.0**
Keep kennel calm	*0.897*	*2.0*	*5.0*	*6.0*	*6.0*	*7.0*
Low noise from barking	*0.892*	*2.0*	*5.0*	*6.0*	*6.0*	*7.0*
Feeling comfortable during work[c]	2 Subscales, 69% explained variance					
Feeling comfortable during interactions		**4.3**	**6.3**	**6.5**	**7.0**	**7.0**
Play with dogs	*0.756*	*4.0*	*7.0*	*7.0*	*7.0*	*7.0*
Train dogs	*0.781*	*4.0*	*6.0*	*7.0*	*7.0*	*7.0*
Walk dogs	*0.728*	*4.0*	*6.0*	*7.0*	*7.0*	*7.0*
Groom dogs	*0.699*	*3.0*	*6.0*	*6.0*	*7.0*	*7.0*
Feeling comfortable during cleaning		**2.0**	**4.0**	**5.0**	**6.0**	**7.0**
Cleaning of kennels	*0.924*	*3.0*	*4.0*	*5.0*	*6.0*	*7.0*
Disinfection of kennels	*0.946*	*1.0*	*4.0*	*5.0*	*6.0*	*7.0*
Quantity of interactions[d]	1 Subscale, 67% explained variance					
Likelihood of interactions		**1.0**	**4.0**	**4.8**	**6.0**	**7.0**
Caress dogs	*0.761*	*1.0*	*6.0*	*7.0*	*7.0*	*7.0*
Play with dogs	*0.875*	*1.0*	*4.0*	*6.0*	*7.0*	*7.0*
Train dogs	*0.891*	*1.0*	*3.0*	*4.0*	*6.0*	*7.0*
Provide dogs with mental stimulation	*0.877*	*1.0*	*3.0*	*4.0*	*6.0*	*7.0*
Walk dogs	*0.736*	*1.0*	*2.0*	*4.0*	*6.0*	*7.0*
Groom dogs	*0.745*	*1.0*	*4.0*	*5.0*	*6.0*	*7.0*
Quality of interactions[a]	2 Subscales, 59% explained variance					
Coercive dog handling		**1.0**	**2.0**	**2.7**	**3.3**	**6.0**
Use coercion	*0.662*	*1.0*	*1.0*	*2.0*	*3.0*	*6.0*
Raise voice	*0.786*	*1.0*	*3.0*	*4.0*	*5.0*	*7.0*
Physical punishment	*0.836*	*1.0*	*1.0*	*2.0*	*3.0*	*6.0*
Gentle & predictable dog handling		**4.0**	**5.7**	**6.3**	**6.7**	**7.0**
Be friendly	*0.650*	*3.0*	*5.0*	*6.0*	*7.0*	*7.0*
Be patient	*0.795*	*4.0*	*6.0*	*7.0*	*7.0*	*7.0*
Be predictable	*0.603*	*3.0*	*6.0*	*6.0*	*7.0*	*7.0*
Perception of work in shelter[a]	2 Subscales, 79% explained variance					
Work is stressful		**2.5**	**4.5**	**5.5**	**6.0**	**7.0**
Physical stress	*0.795*	*1.0*	*5.0*	*6.0*	*7.0*	*7.0*
Emotional stress	*0.822*	*1.0*	*4.0*	*5.0*	*6.0*	*7.0*
Work is pleasant		**4.0**	**6.5**	**7.0**	**7.0**	**7.0**
Work is fun	*0.952*	*4.0*	*7.0*	*7.0*	*7.0*	*7.0*
Like work very much	*0.950*	*4.0*	*6.5*	*7.0*	*7.0*	*7.0*

[a] Seven-point scale ranged from "do not agree at all" to "totally agree" (1–7).
[b] Seven-point scale ranged from "not important at all" to "very important" (1–7).
[c] Seven-point scale ranged from "feel very uncomfortable" to "feel very comfortable" (1–7).
[d] Seven-point scale ranged from "not likely at all" to "very likely" (1–7).

subscale scores if they had a loading of at least 0.5 and did not have a loading higher than 0.4 on any other component. Variables that did not fulfil these conditions were dropped from the analyses. To facilitate interpretation, the subscale scores were obtained by calculating the mean of the items included in the respective subscale.

To explore relationships between the subscales of the attitudes questionnaire, Spearman rank correlations were calculated.

To investigate test–retest reliability of the subscale scores, Spearman rank correlation coefficients, Wilcoxon-tests and the difference between score 1 and score 2 (score 1 minus score 2) were calculated.

To test for relationships between the behaviour of dogs during the approach test and the attitudes of shelter staff we calculated shelter values for each subscale of the questionnaire based on different subsamples of staff (including caretaker, shelter manager and administrative staff). We used the question "Please estimate the proportion of time you work with the dogs in your shelter" to include or exclude staff for the calculation of these shelter values (subsample 1: all members of staff; subsample 2: staff working ≥20% of the time with dogs, subsample 3: staff working ≥40% of the time with dogs, subsample 4: staff working ≥60% of the time with dogs, subsample 5: staff working ≥80% of the time with dogs). These values were then correlated with the proportion of dogs approaching in the respective shelters (Spearman rank correlation).

Due to the explorative nature of this work, we did not correct for multiple testing. Only significant correlations above 0.3 are interpreted.

The data presented here (approach tests and attitudes questionnaires) are subsets of a wider range of data on dog and cat housing and shelter management which were collected in the same series of visits to animal shelters.

3. Results

3.1. The dogs

In total, 520 dogs living in the shelter for a minimum of 4 weeks were tested with the approach test. Of these dogs, 67% were male and 33% female. We tested 10% small dogs, 27% medium-sized dogs and 63% large dogs. 54% were mixed breed, 23% were categorized as pure-bred dogs and further 23% were categorized as staff or bull-type dogs. 51% of the dogs were single-housed, 35% were housed in pairs, 7% in groups of three dogs and the remaining 7% were housed in groups of 4–17 dogs. The median age was 5 years (range: 0.5–15) and the median length of stay in the shelter was 9 months (range: 1–172). During the test of 33% of the dogs, a member of the staff was present.

3.2. Shelter staff

The participating members of shelter staff ($N = 126$) in our study were mainly women (85.5%, men: 14.5%). The median age was 29 years (range: 15–72). The work-related experience with animal care ranged between 0 and 35 years (mean ± S.D.: 8.5 ± 7.9 years). On average, participants had worked in a shelter for 5.7 ± 6.4 years. The mean duration of their work per week was 37.1 ± 14.9 h. The mean percentage of time they reported working with the dogs in the shelter was 35 ± 28%.

3.3. Approach test

3.3.1. Test–retest reliability of the approach test on shelter level

To evaluate test–retest reliability of the approach test on shelter level, nine shelters were visited twice. The mean number of dogs tested per shelter at visit 1 was 19 ± 9 (mean ± S.D.) (Total: 168 dogs). At visit 2, 23 ± 14 dogs per shelter were tested (Total: 207). The mean percentage of dogs that were present at both visits in the shelter and therefore tested twice was 58 ± 21% (range: 21–82%). Spearman rank correlation of the proportion of dogs per shelter showing contact behaviour revealed an acceptable level of test–retest reliability ($r_s = 0.76$, $p = 0.017$). Furthermore, no significant difference was found between visit 1 and visit 2 (Wilcoxon test: $Z = -1.540$, $p = 0.123$, visit 1: 79 ± 14%, visit 2: 83 ± 14%).

3.3.2. Test–retest reliability of the approach test on individual level

To assess test–retest reliability of the approach test on individual level, data of 112 dogs tested during visit 1 and visit 2 were compared. Agreement reached a substantial level (Landis and Koch, 1977) with a Cohen's Kappa of 0.62 ($p < 0.001$). The Index of Concordance indicates that 86.6% of the dogs were assigned to the same category during the test at visit 1 and the test at visit 2.

3.3.3. Between-experimenter repeatability of the approach test

To assess between-experimenter repeatability of the approach test a total of 158 dogs were tested by two experimenters during the same visit. The combined results of one first rater (FR) and three second raters (SR) yielded a Cohen's Kappa (κ) of 0.86 ($p < 0.001$) and an index of concordance (IC) of 95% ($N = 158$). This indicates almost perfect agreement (<0.81) (Landis and Koch, 1977). There were slight differences between the three second raters (FR-SR1: $\kappa = 0.87$, $p < 0.001$, IC = 97%, $N = 30$; FR-SR2: $\kappa = 0.92$, $p < 0.001$, IC = 97%, $N = 68$; FR-SR3: $\kappa = 0.80$, $p < 0.001$, IC = 92%, $N = 60$) but overall we were able to demonstrate high between-experimenter repeatability of the approach test.

3.3.4. Proportion of dogs showing contact behaviour and relationships with individual characteristics

On average, 76 ± 19% (mean ± S.D.) of the dogs per shelter were assigned to the category "contact possible" (min: 33%, Q25: 64%; median: 79%; Q75: 94%; max: 100%). A mean number of 18 ± 15 dogs per shelter were tested (total: 520 dogs). At the individual level, 69% of the tested dogs approached the experimenter. We tested for relationships of this behaviour with individual characteristics of the dog (sex, age, size, breed type, length of stay) or the test situation (staff present, number of dogs in kennel) and found only length of stay to be relevant (all other characteristics $p \geq 0.1$). Dogs that did not approach the experimenter had been in the shelter for a median time of 11 months, whereas dogs that did approach had a median length of stay of 8 months ($Z = -2.96$, $p = 0.003$).

3.4. Attitudes questionnaire

3.4.1. Factor structure and relationships between subscales of the attitudes questionnaire

It was possible to group most of the items into meaningful subscales (see Table 1), but all items relating to the dog as a social supporter were omitted from the analyses because the conditions of principal component analyses

Table 2
Relationships (Spearman rank correlations[a]) between subscale scores of the dog attitudes questionnaire in staff members of 28 animal shelters.

		Negative characteristics of dogs	Importance of activities	Importance of calm environment	Feeling comfortable during interactions with dogs	Feeling comfortable during cleaning	Likelihood of interactions with dogs	Coercive dog handling	Gentle & predictable dog handling	Work is stressful	Work is pleasant
Positive characteristics of dogs	*rs*	−0.08	**0.47**	0.26	**0.33**	0.12	0.16	−0.13	**0.30**	−0.00	0.27
	p	0.381	**<0.001**	0.004	**<0.001**	0.181	0.082	0.142	**0.001**	0.965	0.004
	N	122	**126**	121	**124**	126	118	122	**122**	115	116
Negative characteristics of dogs	r_s		−0.20	0.02	−0.10	−0.02	−0.10	**0.34**	−0.05	0.24	−0.14
	p		0.024	0.842	0.300	0.803	0.303	**<0.001**	0.593	0.013	0.148
	N		121	117	120	122	114	**119**	119	111	112
Importance of activities	r_s			**0.41**	0.26	0.20	0.14	−0.21	0.24	0.02	0.23
	p			**<0.001**	0.003	0.029	0.148	0.022	0.007	0.877	0.015
	N			**120**	123	125	117	121	121	114	115
Importance of calm environment	r_s				0.05	0.15	0.06	−0.11	0.25	0.21	0.18
	p				0.565	0.096	0.552	0.254	0.006	0.025	0.068
	N				118	120	113	118	119	109	110
Feeling comfortable during interactions with dogs	r_s					**0.32**	0.26	−0.01	0.20	0.15	**0.36**
	p					**<0.001**	0.005	0.922	0.031	0.122	**<0.001**
	N					**124**	117	120	120	113	**114**
Feeling comfortable during cleaning	r_s						0.16	−0.02	0.10	−0.00	0.06
	p						0.093	0.824	0.261	0.970	0.550
	N						118	122	122	115	116
Likelihood of interactions with dogs	r_s							−0.01	0.10	−0.02	0.26
	p							0.908	0.295	0.824	0.006
	N							116	116	111	112
Coercive dog handling	r_s								**−0.31**	**0.30**	−0.18
	p								**<0.001**	**0.001**	0.058
	N								**120**	**113**	114
Gentle & predictable dog handling	r_s									−0.14	0.19
	p									0.149	0.043
	N									112	113
Work is stressful	r_s										0.18
	p										0.057
	N										115

[a] Results with correlation coefficients ≥0.3 are in bold type.

Table 3
Results of Spearman rank correlations, Wilcoxon tests and the difference between scores at visit 1 and 2 (Diff = score 1 − score 2) to assess test–retest reliability of the subscales of the dog attitudes questionnaire in staff members of eight animal shelters (days between visit 1 and 2: 58 ± 7).

	N	r_s	Wilcoxon test	Diff min	Diff median	Diff max
Positive characteristics of dogs	16	0.79***	n.s.	−1.00	0.00	0.67
Negative characteristics of dogs	15	0.76***	n.s.	−1.00	0.00	1.00
Importance of activities	14	0.62*	n.s.	0.60	0.00	1.00
Importance of calm environment	16	0.82***	n.s.	−1.50	0.00	0.50
Feeling comfortable during interactions with dogs	16	0.83***	n.s.	−0.50	0.00	0.50
Feeling comfortable during cleaning	15	0.82***	n.s.	−1.00	0.00	1.50
Likelihood of interactions with dogs	16	0.69**	n.s.	−1.17	0.25	1.33
Coercive dog handling	15	0.75***	$p = 0.014$	−0.33	0.33	1.33
Gentle & predictable dog handling	14	0.41	$p = 0.039$	−1.00	−0.33	0.67
Work is stressful	15	0.80***	n.s.	−2.00	0.00	2.00
Work is pleasant	15	–	n.s.	0.00	0.00	2.00

n.s. $p > 0.1$.
*** $p \leq 0.001$.
** $p \leq 0.01$.
* $p \leq 0.05$.

were not fulfilled. In total, six items did not fulfil our requirements and were not included in further analyses.

Items intended to assess beliefs about characteristics of dogs resulted in two subscales. The subscale *positive characteristics of dogs* revealed that at least three quarters of the respondents agreed more or less that dogs are for example playful or cuddly (see Table 1). Caretakers reporting stronger agreement with those characterizations of dogs also ascribed a higher *importance* to regular *activities* such as play, social contact or chewing for the well-being of shelter dogs (see Table 2). Furthermore, there was a relationship between a higher rating of positive characteristics and *feeling* more *comfortable during interactions* with dogs as well as a higher level of agreement with the subscale *gentle & predictable dog handling. Negative characteristics of dogs* such as being smelly or noisy were agreed with by less than one quarter of the respondents. However, a more negative view of those characteristics of dogs was correlated with a higher level of agreement to *coercive dog handling* practices.

The importance of a dog's needs for well-being resulted in two subscales. Both, activities (*importance of activities*) and a calm environment (*importance of calm environment*) were considered to be important for dog well-being by at least three quarters of the respondents. The subscales *activities* and *calm environment* are positively related to each other.

Items asking how comfortable staff feel during work resulted in two subscales. Again, roughly three quarters of the respondents stated that interacting with dogs made them feel comfortable (*Feeling comfortable during interactions*). With regard to kennel cleaning, this applied to only half of the respondents (*Feeling comfortable during cleaning*). Furthermore, we found that staff who reported feeling more comfortable during interactions with dogs also felt more comfortable during kennel cleaning and experienced work as more pleasant (*work is pleasant*).

Items relating to the quantity of interactions with dogs resulted in one subscale (*likelihood of interactions*). About one quarter of the respondents stated that they were not likely to engage in interactions such as training or walking the dog whereas another quarter stated that they were likely or very likely to engage in such activities.

Quality of interactions resulted in two subscales. Three-quarters of the respondents agreed that *friendly, predictable and patient dog handling is important* to dogs. This is in accordance with the fact that three quarters of the respondents stated that they do not agree with the use of coercion and physical punishment in dogs. Only "raising the voice" was reported more often by shelter staff. Not surprisingly, there is an inverse relationship between the subscales *coercive dog handling* and *gentle & predictable dog handling*.

Items related to the perception of work in a shelter resulted in two subscales. About half of the participants agreed that work in the shelter is a cause of physical and emotional stress to them (*work is stressful*). Nevertheless, about three quarters of the respondents stated that they experience work as pleasant and that they like it very much (*work is pleasant*). Interestingly, the perception of being more stressed at work is related to a higher level of agreement with the use of coercive dog handling practices.

There were no correlations ≥0.3 of the attitudes subscales with personal characteristics of shelter staff such as age, experience with animal care or hours of work per week.

3.4.2. Test–retest reliability of the attitudes questionnaire

A small sample of 16 participants in 8 shelters filled in the questionnaire during visit 1 and 2 (46 staff members completed the questionnaire at the first visit in these shelters). In general, the correlations between subscales of questionnaire 1 and 2 suggested an acceptable level of test–retest reliability (above $r_s = 0.7$, see Table 3). Two subscales had borderline values with correlations of $r_s = 0.69$ (*likelihood of interactions*) and $r_s = 0.62$ (*importance of activities*). Merely, the subscale *gentle & predictable dog handling* correlated only moderately ($r_s = 0.41$). We then looked at the single items of this subscale and found that being friendly ($r_s = 0.43$, $p = 0.099$, $N = 16$) and being predictable ($r_s = 0.38$, $p = 0.149$, $N = 16$) had low to moderate correlations between visit 1 and 2 whereas the correlation of being patient was high ($r_s = 0.85$, $p < 0.001$, $N = 16$). For the subscale *work is pleasant* we were not able to calculate the correlation coefficient because at visit 1 there were only ratings with score 7.

Table 4
Spearman rank correlations between subscales of the dog attitudes questionnaire and the proportion of dogs approaching the experimenter on shelter level in 5 subsamples[a] of shelter staff. Significant results are in bold type ($p < 0.05$).

		% Of time staff members work with dogs				
		0–100%	≥20%	≥40%	≥60%	≥80%
Positive characteristics of dogs	r_s	0.16	0.20	0.14	0.37	**0.68**
	p	0.422	0.314	0.516	0.119	**0.022**
	N	28	28	24	19	**11**
Negative characteristics of dogs	r_s	0.04	0.10	0.02	0.06	−0.04
	p	0.831	0.601	0.938	0.806	0.913
	N	28	28	24	19	11
Importance of activities	r_s	−0.08	−0.06	−0.12	0.04	0.05
	p	0.692	0.780	0.582	0.866	0.893
	N	28	28	24	19	11
Importance of calm environment	r_s	0.06	0.05	−0.01	−0.18	−0.56
	p	0.754	0.817	0.967	0.490	0.091
	N	28	28	24	17	10
Feeling comfortable during interactions with dogs	r_s	**−0.45**	**−0.46**	**−0.52**	**−0.47**	−0.30
	p	**0.017**	**0.015**	**0.009**	**0.041**	0.367
	N	**28**	**28**	**24**	**19**	11
Feeling comfortable during cleaning	r_s	**−0.42**	**−0.38**	**−0.51**	**−0.46**	**−0.61**
	p	**0.028**	**0.048**	**0.011**	**0.050**	**0.045**
	N	**28**	**28**	**24**	**19**	**11**
Likelihood of interactions with dogs	r_s	−0.12	−0.14	−0.30	−0.32	−0.56
	p	0.547	0.473	0.162	0.179	0.075
	N	28	28	24	19	11
Coercive dog handling	r_s	−0.02	−0.11	−0.13	−0.10	−0.05
	p	0.917	0.572	0.544	0.697	0.893
	N	28	28	24	18	11
Gentle & predictable dog handling	r_s	0.08	0.07	0.13	0.30	**0.66**
	p	0.701	0.727	0.548	0.215	**0.027**
	N	28	28	24	19	**11**
Work is stressful	r_s	−0.22	−0.19	−0.19	−0.26	−0.38
	p	0.271	0.344	0.363	0.286	0.253
	N	28	28	24	19	11
Work is pleasant	r_s	−0.09	−0.14	0.06	0.17	−0.10
	p	0.642	0.489	0.771	0.497	0.768
	N	28	28	24	19	11

[a] Subsample 1: all members of staff; subsample 2: staff working 20% or more of the time with dogs, subsample 3: staff working 40% or more of the time with dogs, subsample 4: staff working 60% or more of the time with dogs, subsample 5: staff working 80% or more of the time with the dogs.

In most cases, the differences between the scores at visit 1 and 2 did not exceed one. However, the Wilcoxon tests revealed a significant difference between visit 1 and 2 for the subscales *coercive dog handling* and *gentle & predictable dog handling* (see Table 3). With regard to *coercive dog handling*, 53% of the respondents indicated a lower level of agreement with coercive methods at the second visit; 40% had the same score and only 7% indicated a higher level of agreement. The opposite was the case for *gentle & predictable dog handling*: 56% reported a higher level of agreement, 25% did not change in their rating and only 19% reported a lower agreement to *gentle & predictable dog handling* at the second visit.

3.5. Relationships of the approach test with attitudes questionnaire

Data from a maximum of 28 shelters were used to test for relationships between the subscales of the attitudes questionnaire and the proportion of dogs initiating contact with a stranger.

A consistent relationship was found between the behaviour of dogs during the approach test and how comfortable shelter staff feel during interactions with dogs and during cleaning the kennels. In all subsamples, except the one including only staff working 80% or more of the time with dogs, a higher proportion of dogs approaching the experimenter correlated with staff members reporting lower levels of feeling comfortable during interactions with dogs (correlations ranged from −0.45 to −0.52, $p < 0.05$ see Table 4). Furthermore, a lower level of feeling comfortable during cleaning correlated with a higher proportion of dogs initiating contact with a stranger in all subsamples (correlations ranged from −0.38 to −0.6, $p < 0.05$).

In the subsample of shelter staff working 80% or more of their time with the dogs we found that a more positive attitude to dogs and a higher agreement to the use of gentle and predictable dog handling practices was correlated with

a higher proportion of dogs approaching a stranger (see Table 4).

4. Discussion

The approach behaviour of a dog towards a human is a composite of both positive and negative emotional responses. Exploration of a novel object or an unknown person results from curiosity outweighing fear and is regarded as an indicator of positive emotions and thus, good welfare (Boissy et al., 2007; Araujo et al., 2010). Fear is a negative emotional state and highly relevant to welfare ("Five Freedoms" (Farm Animal Welfare Council (FAWC), 2009)). Since humans are an important part of a dogs' environment, fear of humans may impair dog welfare. A test assessing the behaviour towards humans, given that it is a valid measure of the quality of the animal–human relationship, might therefore be useful as one indicator in a dog welfare assessment protocol, similar to the use in farm animal welfare assessment (Waiblinger et al., 2006; Botreau et al., 2007). In shelter dogs, approach behaviour might additionally reflect management and enrichment practices that create the anticipation of a positive event when humans come to the kennel (Normando et al., 2009; Conley et al., 2014). In another part of this project, we found that on shelter level, approach behaviour of the dogs was related to the regular provision of toys, a higher proportion of meat in the meals, the provision of soft bedding in the kennels, and a higher frequency of caretaker rounds and kennel cleaning (Arhant et al., 2011). Shelter dogs approaching potential adopters might lead to more successful adoptions (Wells and Hepper, 2000; Luescher and Medlock, 2009; Weiss et al., 2012) and increased adoption rates increase the number of dogs a shelter can care for in a given time period (Scarlett, 2013).

Our intention was to test whether approach behaviour of shelter dogs can fulfil the requirements for animal-based welfare indicators (Knierim and Winckler, 2009) and whether it could be used as a measure of human–animal relationships in the shelter.

In particular, we investigated test–retest and experimenter-dependent reproducibility. We know of no previously published results on test–retest reliability of an approach test in shelter dogs on shelter level. The correlation of $r_s = 0.76$ was similar to results on avoidance distance tests in dairy cattle (Winckler et al., 2007) and tests of human–animal relationships in pigs (Temple et al., 2013). 87% of the individual dogs tested twice reacted in the same way at the first and second visits. Similar reproducibility was found when repeating a threatening approach towards a tethered dog and its owner after 6 to 24 months (Vas et al., 2008).

Reproducibility between experimenters is important if the approach test is to be used for surveillance purposes. 95% of the dogs tested by two experimenters were assigned to the same behaviour category, which is also comparable to Vas et al. (2008). Since the second experimenters only received written instructions about how to perform the test, results indicate a very good agreement between a trained and a relatively untrained tester. We note that since all the experimenters were women, it cannot be ruled out that male testers might produce different outcomes (Lore and Eisenberg, 1986; Wells and Hepper, 1999).

The present report is also the first assessment known to us of dog- and work-related attitudes in shelter staff. We found that, in general, shelter staff have a rather positive attitude to dogs and their work with dogs. The main results on associations between the subscales of the attitudes questionnaire indicate that thinking positively about dogs and their needs might result in positive behaviour towards dogs, staff feeling comfortable during interactions and staff enjoying work. In contrast, negative attitudes to dogs were found to be associated with coercive handling and stress during work. These relationships are comparable to findings on the human–animal relationship in livestock (Hemsworth and Coleman, 2011), and support the use of positive attitudes to dogs as a selection criterion for caretakers.

Most of the subscales had acceptable test–retest reliability. The lowest test–retest reliability was found for behavioural attitudes related to handling the dogs. Questions about this topic may be subject to effects related to the social desirability of answers (Holtgraves, 2004) or the sensitivity of questions (Tourangeau and Yan, 2007). The social desirability of an act was found to influence bias in self-reports compared to observer ratings (Gosling et al., 1998). If we assume that being gentle to the animals is socially desirable and using force to handle dogs is socially undesirable, then the second ratings on both dog handling scales changed in the direction of increased social desirability. A possible explanation is that the staff filled in the first questionnaire anonymously, but were asked at the end if they were willing to repeat the questionnaire at the second visit. To do this, they had to fill in their name, and in the second questionnaire, they were asked to fill in their name before answering the questions. Since non-anonymity is known to lead to more socially desirable answers to questionnaires (Richman et al., 1999; Durant et al., 2002; Lelkes et al., 2012), it seems likely that the results of the first questionnaires were more accurate. Despite the low to moderate test–retest reliability of the behavioural attitudes, we consider these items as very important because the quality of dog handling is known to influence dog behaviour towards humans (Herron et al., 2009; Rooney and Cowan, 2011); instead of discarding these results, we based our final analyses on the results of the anonymous first questionnaires. However, the presence of a methodological weakness must be conceded.

Extensive work on human–animal-relationship in livestock indicates that there are relationships between stockperson attitudes and stockperson behaviour (Hemsworth et al., 1989; Lensink et al., 2000; Waiblinger et al., 2002). In our study we did not observe the behaviour of the caretakers towards the dogs but we hypothesized that there would be relationships between the subscales of the attitudes questionnaire and the approach behaviour of the dogs mediated by the behaviour of caretakers towards the dogs.

The amount of time the respondents spent working with the dogs in the shelter varied greatly. Since we expected

that the more a caretaker interacted with the shelter dogs, the more strongly their attitude would influence the behaviour of the dogs, we stratified the caretakers according to the proportion of their time they spent working with dogs.

For dairy cattle, it is known that affective attitudes such as feeling comfortable in a given situation correlate with positive behaviour of both milkers and cows (Waiblinger et al., 2002). Lower avoidance distances in fattening bulls were related to farmers feeling more comfortable when entering a pen or talking to the animals (Windschnurer et al., 2009). Therefore, we expected that shelter staff feeling more comfortable during interactions with dogs would be related to a higher proportion of approaching dogs. Surprisingly, feeling more comfortable during interactions with dogs or during cleaning the kennels correlated with a lower proportion of dogs approaching the experimenter. This unexpected result might be a by-product of the need for human contact in dogs. In the animal shelters we visited, caretakers often complained about too little time for animal care and having to deal with aggressive dogs. Negative job experiences of animal caretakers in the literature are related to not having enough time per animal, being bitten or attacked by animals (Chang and Hart, 2002), and noise (Sales et al., 1997; Coppola et al., 2006). If caretakers feel uncomfortable they may tend to limit their care activities to the mandatory minimum. Since dogs in shelters already have very low levels of contact with humans, this further restriction might increase the dogs' motivation to seek human contact. This view is supported by the finding that shelter dogs form attachment bonds very quickly (Gácsi et al., 2001) and that they maintain closer proximity to an unfamiliar person than pet dogs (Barrera et al., 2010). This interpretation is also supported by our result from the subsample of staff who spent 80% or more of their time working with the dogs. In this subgroup, a higher likelihood of interactions with the dogs was related to fewer dogs approaching the experimenter. Furthermore in this subsample, the proportion of dogs approaching the experimenter correlated with agreement of staff with *positive characteristics of dogs* and a *positive attitude to gentle and predictable dog handling*. This result is in accordance with findings that positive milker behaviour is related to lower avoidance distances in dairy cows (Waiblinger et al., 2002), that dogs trained without using physical punishment are more likely to approach a stranger (Rooney and Cowan, 2011) and that shelter dogs treated with daily positive human contact spend more time near a person crouched against the kennel front (Conley et al., 2014).

Shelter dogs benefit from human interaction programmes (Luescher and Medlock, 2009; Normando et al., 2009; Bergamasco et al., 2010; Shiverdecker et al., 2013) and this benefit could probably be increased by using reward-only methods. Aversive methods, in contrast, cause stress in dogs (Beerda et al., 1998; Schalke et al., 2007) and are suspected to worsen or even cause behavioural problems (e.g. Hiby et al., 2004; Arhant et al., 2010; Casey et al., 2014).

With regard to the potential of our approach test to be used as an animal-based parameter for welfare assessment, we conclude that the requirements concerning reliability and feasibility are fulfilled. With regard to validity, the results are more ambiguous because the approach test seems to reflect contrary aspects of the human–animal relationship in animal shelters. On the one hand, positive interactions between humans and dogs seem to increase the willingness of dogs to approach an unknown person. On the other, an increased tendency to seek human contact can also result from a low frequency of interactions with shelter staff. Therefore, a high proportion of dogs showing contact behaviour could reflect either a positive quality of interactions with staff or an undesirably low quantity of human interactions. Therefore, further studies and probably the combination of approach tests with other parameters will be needed to develop valid indicators of human–animal relationship.

Acknowledgements

We are very grateful to all animal shelters and shelter staff who participated in our study. We thank Stephanie Lürzel for her critical review of the manuscript. Further we want to thank Cornelia Konicek, Ina Moser, Ramona Wogritsch, Tanja Wondra and other diploma students and interns for their support in data collection. We also thank Pedigree and "Verein Tierliebe" for their sponsorship. This project (project-number BMG-70420/0320-I/15/2009) was financed by the Federal Ministry of Health (BMG, Austria).

References

Ajzen, I., Fishbeim, M., 1980. Understanding attitudes and predicting social behaviour. Prentice-Hall, Englewood Cliffs, US.

Araujo, J.A., de Rivera, C., Ethier, J.L., Landsberg, G.M., Denenberg, S., Arnold, S., Milgram, N.W., 2010. ANXITANE® tablets reduce fear of human beings in a laboratory model of anxiety-related behavior. J. Vet. Behav. 5, 268–275.

Arhant, C., Bubna-Littitz, H., Bartels, A., Futschik, A., Troxler, J., 2010. Behaviour of smaller and larger dogs: effects of training methods, inconsistency of owner behaviour and level of engagement in activities with the dog. Appl. Anim. Behav. Sci. 123, 131–142.

Arhant, C., Binder, R., Kadlik, S., Wogritsch, R., Konicek, C., Troxler, J., 2011. Beurteilung von Tierheimen in Österreich. Report to Project BMG-70420/0320-I/15/2009. Institute for Animal Husbandry and Animal Welfare, Vienna.

Barrera, G., Jakovcevic, A., Elgier, A.M., Mustaca, A., Bentosela, M., 2010. Responses of shelter and pet dogs to an unknown human. J. Vet. Behav. 5, 339–344.

Beerda, B., Schilder, M.B.H., Van Hooff, J.A.R.A.M., De Vries, H.W., Mol, J.A., 1998. Behavioural, saliva cortisol and heart rate responses to different types of stimuli in dogs. Appl. Anim. Behav. Sci. 58, 365–381.

Bennett, P.C., Rohlf, V.I., 2007. Owner–companion dog interactions: relationships between demographic variables, potentially problematic behaviours, training engagement and shared activities. Appl. Anim. Behav. Sci. 102, 65–84.

Bergamasco, L., Osella, M.C., Savarino, P., Larosa, G., Ozella, L., Manassero, M., Badino, P., Odore, R., Barbero, R., Re, G., 2010. Heart rate variability and saliva cortisol assessment in shelter dog: human–animal interaction effects. Appl. Anim. Behav. Sci. 125, 56–68.

Boissy, A., Manteuffel, G., Jensen, M.B., Moe, R.O., Spruijt, B., Keeling, L.J., Winckler, C., Forkman, B., Dimitrov, I., Langbein, J., Bakken, M., Veissier, I., Aubert, A., 2007. Assessment of positive emotions in animals to improve their welfare. Physiol. Behav. 92, 375–397.

Botreau, R., Veissier, I., Butterworth, A., Bracke, M.B.M., Keeling, L.J., 2007. Definition of criteria for overall assessment of animal welfare. Anim. Welfare 16, 225–228.

Casey, R.A., Loftus, B., Bolster, C., Richards, G.J., Blackwell, E.J., 2014. Human directed aggression in domestic dogs (*Canis familiaris*): occurrence in different contexts and risk factors. Appl. Anim. Behav. Sci. 152, 52–63.

Chang, F.T., Hart, L.A., 2002. Human–animal bonds in the laboratory: how animal behavior affects the perspective of caregivers. ILAR J. 43, 10–18.

Conley, M.J., Fisher, A.D., Hemsworth, P.H., 2014. Effects of human contact and toys on the fear responses to humans of shelter housed dogs. Appl. Anim. Behav. Sci., http://dx.doi.org/10.1016/j.applanim.2014.03.008.
Coppola, C.L., Enns, R.M., Grandin, T., 2006. Noise in the animal shelter environment: building design and the effects of daily noise exposure. J. Appl. Anim. Welfare Sci. 9, 1–7.
Csatadi, K., Kustos, K., Eiben, C., Bilko, A., Altbäcker, V., 2005. Even minimal human contact linked to nursing reduces fear responses toward humans in rabbits. Appl. Anim. Behav. Sci. 95, 123–128.
Diesel, G., Smith, H., Pfeiffer, D.U., 2007. Factors affecting time to adoption of dogs re-homed by a charity in the UK. Anim. Welfare 16, 353–360.
Durant, L.E., Carey, M.P., Schroder, K.E.E., 2002. Effects of anonymity, gender, and erotophilia on the quality of data obtained from self-reports of socially sensitive behaviors. J. Behav. Med. 25, 439–467.
Farm Animal Welfare Council, 2009. Five Freedoms. Farm Animal Welfare Council, http://www.fawc.org.uk/freedoms.htm (date of access: 19 August 2014).
Gácsi, M., Topál, J., Miklósi, A., Dóka, A., Csányi, V., 2001. Attachment behavior of adult dogs (*Canis familiaris*) living at rescue centers: forming new bonds. J. Comp. Psychol. 115, 423–431.
Gácsi, M., Maros, K., Sernkvist, S., Faragó, T., Miklósi, Á., 2013. Human analogue safe haven effect of the owner: behavioural and heart rate response to stressful social stimuli in dogs. PLoS One 8 (3), e58475, http://dx.doi.org/10.1371/journal.pone.0058475.
Gosling, S.D., John, O.P., Craik, K.H., Robins, R.W., 1998. Do people know how they behave? Self-reported act frequencies compared with online codings by observers. J. Pers. Soc. Psychol. 74, 1337–1349.
Hemsworth, P.H., Barnett, J.L., Coleman, G.J., Hansen, C., 1989. A study of the relationships between the attitudinal and behavioural profiles of stockpersons and the level of fear of humans and reproductive performance of commercial pigs. Appl. Anim. Behav. Sci. 23, 301–314.
Hemsworth, P.H., Coleman, G.J., 2011. Human–Livestock Interactions: The Stockperson and the Productivity and Welfare of Intensively Farmed Animals. CAB International, Wallingford, UK.
Herron, M.E., Shofer, F.S., Reisner, I.R., 2009. Survey of the use and outcome of confrontational and non-confrontational training methods in client-owned dogs showing undesired behaviors. Appl. Anim. Behav. Sci. 117, 47–54.
Hiby, E.F., Rooney, N.J., Bradshaw, J.W.S., 2004. Dog training methods: their use, effectiveness and interaction with behaviour and welfare. Anim. Welfare 13, 63–69.
Holtgraves, T., 2004. Social desirability and self-reports: testing models of socially desirable responding. Pers. Soc. Psychol. Bull. 30, 161–172.
Jones, R.B., 1993. Reduction of the domestic chick's fear of human beings by regular handling and related treatments. Anim. Behav. 46, 991–998.
Knierim, U., Winckler, C., 2009. On-farm welfare assessment in cattle: validity, reliability and feasibility issues and future perspectives with special regard to the Welfare Quality® approach. Anim. Welfare 18, 451–458.
Landis, J.R., Koch, G.G., 1977. The measurement of observer agreement for categorical data. Biometrics 33, 159–174.
Lelkes, Y., Krosnick, J.A., Marx, D.M., Judd, C.M., Park, B., 2012. Complete anonymity compromises the accuracy of self-reports. J. Exp. Soc. Psychol. 48, 1291–1299.
Lensink, B.J., Boissy, A., Veissier, I., 2000. The relationship between farmers' attitude and behaviour towards calves, and productivity of veal units. Ann. Zootech. 49, 313–327.
Lore, R.K., Eisenberg, F.B., 1986. Avoidance reactions of domestic dogs to unfamiliar male and female humans in a kennel setting. Appl. Anim. Behav. Sci. 15, 261–266.
Luescher, A.U., Medlock, R.T., 2009. The effects of training and environmental alterations on adoption success of shelter dogs. Appl. Anim. Behav. Sci. 117, 63–68.
Marston, L.C., Bennett, P.C., Coleman, G.J., 2004. What happens to shelter dogs? An analysis of data for 1 year from three Australian shelters. J. Appl. Anim. Welfare Sci. 7, 27–47.
Mazurek, M., McGee, M., Crowe, M.A., Prendiville, D.J., Boivin, X., Earley, B., 2011. Consistency and stability of behavioural fear responses of heifers to different fear-eliciting situations involving humans. Appl. Anim. Behav. Sci. 131, 21–28.
Niebuhr, K., Arhant, C., Smajlhodzic, F., Wimmer, A., Zaludik, K., 2009. Evaluierung neuer Haltungssysteme am Beispiel von Volieren für Legehennen. Report to Project BMFG-70420/001-I/15/2007 Legevol and BMLFUW Nr. 100184 Legevol. Institute for Animal Husbandry and Animal Welfare, Vienna.
Normando, S., Corain, L., Salvadoretti, M., Meers, L., Valsecchi, P., 2009. Effects of an enhanced human interaction program on shelter dogs' behaviour analysed using a novel nonparametric test. Appl. Anim. Behav. Sci. 116, 211–219.
Palmer, R., Custance, D., 2008. A counterbalanced version of Ainsworth's strange situation procedure reveals secure-base effects in dog–human relationships. Appl. Anim. Behav. Sci. 109, 306–319.
Rehn, T., McGowan, R.T.S., Keeling, L.J., 2013. Evaluating the strange situation procedure (SSP) to assess the bond between dogs and humans. PLoS One 8 (2), e56938, http://dx.doi.org/10.1371/journal.pone.0056938.
Richman, W.L., Weisband, S., Kiesler, S., Drasgow, F., 1999. A meta-analytic study of social desirability distortion in computer-administered questionnaires, traditional questionnaires, and interviews. J. Appl. Psychol. 84, 754–775.
Rooney, N.J., Cowan, S., 2011. Training methods and owner–dog interactions: links with dog behaviour and learning ability. Appl. Anim. Behav. Sci. 132, 169–177.
Sales, G., Hubrecht, R., Peyvandi, A., Milligan, S., Shield, B., 1997. Noise in dog kennelling: is barking a welfare problem for dogs? Appl. Anim. Behav. Sci. 52, 321–329.
Scarlett, J., 2013. Population statistics. In: Miller, L., Zawistowski, S. (Eds.), Shelter Medicine for Veterinarians and Staff. Wiley-Blackwell, Ames, IA, pp. 13–20.
Schalke, E., Stichnoth, J., Ott, S., Jones-Baade, R., 2007. Clinical signs caused by the use of electric training collars on dogs in everyday life situations. Appl. Anim. Behav. Sci. 105, 369–380.
Shiverdecker, M.D., Schiml, P.A., Hennessy, M.B., 2013. Human interaction moderates plasma cortisol and behavioral responses of dogs to shelter housing. Physiol. Behav. 109, 75–79.
Temple, D., Manteca, X., Dalmau, A., Velarde, A., 2013. Assessment of test–retest reliability of animal-based measures on growing pig farms. Livest. Sci. 151, 35–45.
Tourangeau, R., Yan, T., 2007. Sensitive questions in surveys. Psychol. Bull. 133, 859–883.
Vas, J., Topál, J., Gyori, B., Miklósi, A., 2008. Consistency of dogs' reactions to threatening cues of an unfamiliar person. Appl. Anim. Behav. Sci. 112, 331–344.
Waiblinger, S., Menke, C., Coleman, G.J., 2002. The relationship between attitudes, personal characteristics and behaviour of stockpeople and subsequent behaviour and production of dairy cows. Appl. Anim. Behav. Sci. 79, 195–219.
Waiblinger, S., Boivin, X., Pedersen, V., Tosi, M.V., Janczak, A.M., Visser, E.K., Jones, R.B., 2006. Assessing the human–animal relationship in farmed species: a critical review. Appl. Anim. Behav. Sci. 101, 185–242.
Weiss, E., Miller, K., Mohan-Gibbons, H., Vela, C., 2012. Why did you choose this pet?: Adopters and pet selection preferences in five animal shelters in the United States. Animals 2, 144–159.
Welfare Quality, 2009a. Welfare Quality Assessment Protocol for Cattle. Welfare Quality Consortium, Leylstad, Netherlands.
Welfare Quality, 2009b. Welfare Quality Assessment Protocol for Poultry (Broiler, Laying Hens). Welfare Quality Consortium, Leylstad, Netherlands.
Wells, D.L., Hepper, P.G., 1999. Male and female dogs respond differently to men and women. Appl. Anim. Behav. Sci. 61, 341–349.
Wells, D.L., Hepper, P.G., 2000. The influence of environmental change on the behaviour of sheltered dogs. Appl. Anim. Behav. Sci. 68, 151–162.
Winckler, C., Brinkmann, J., Glatz, J., 2007. Long-tem consistency of selected animal-related welfare parameters in dairy farms. Anim. Welfare 16, 197–199.
Windschnurer, I., Boivin, X., Waiblinger, S., 2009. Reliability of an avoidance distance test for the assessment of animals' responsiveness to humans and a preliminary investigation of its association with farmers' attitudes on bull fattening farms. Appl. Anim. Behav. Sci. 117, 117–127.