

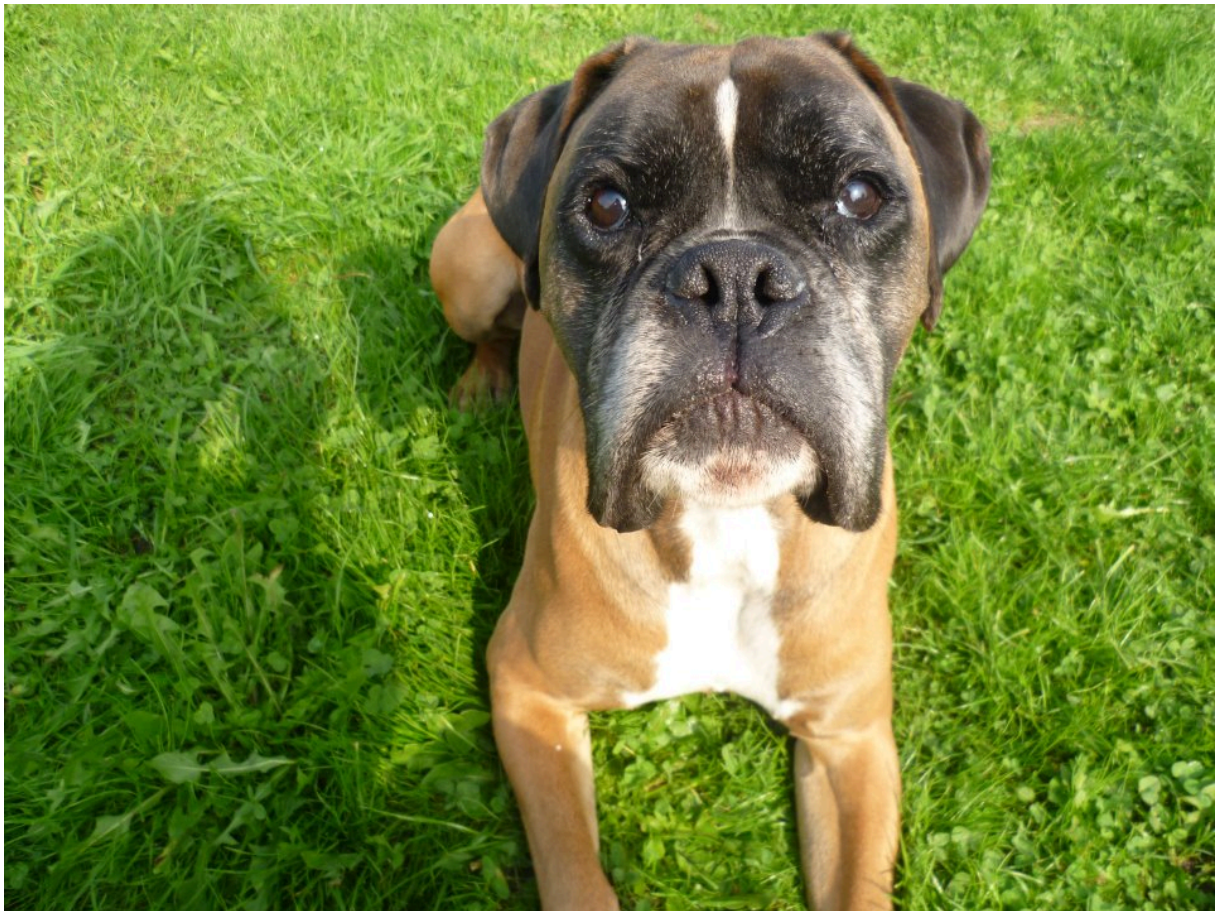
Behavioural problems in a population of shelter dogs in the Netherlands

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Abstract

In the Netherlands, 28 percent of dog owners experience one or more behavioural problems with their dog. In 2012, 11.679 dogs were submitted to the Dutch shelters and 7.6 percent of the population of shelter dogs was euthanized. 36 percent of all euthanasia in the Dutch shelters happened in 2010 because of behavioural problems. It is to date unknown how many dogs in the Dutch shelters have behavioural problems, and which behavioural problems are most common. This knowledge can greatly aid in finding fitting new homes for these dogs and in this way prevent problem situations in the new home, which could result in re-relinquishment to the shelter and even euthanasia. In this research, the prevalence of 12 predetermined common behavioural problems was tested in 47 dogs from three shelters in the Netherlands by means of a questionnaire and a behavioural test. All those behavioural problems were seen to some extent, with the exception of coprophagy which was not seen at all. The most seen behavioural problem was attention-seeking behaviour, which was noted for 40 out of 46 dogs in the questionnaire. 39 out of 47 dogs showed aggression during the behavioural test. 38 out of 47 dogs showed, both by assessment of the behavioural test and questionnaire, evidence for separation anxiety. The knowledge and acknowledgement of behavioural problems in shelter dogs can greatly improve their welfare during their time at the shelter. When these problems can be accurately addressed in the shelter, dogs can have a greater chance of being successfully rehomed. A better coupling of the dog to the new owner by providing adequate information can prevent behavioural problems to arise in the new home, cause a reduction of the number of returned dogs to the shelter and possibly a reduction of euthanasia because of (unknown) behavioural problems.

This research is part of a large research set up by the "Hondenbescherming" about general relinquishment of dogs to the shelter. The research was split up in two researches; the first is about the reasons for relinquishment that owners gave to the shelter (Hermsen 2012) and the second part is the present research. The first research part has been done by a psychology student by means of researching the forms that previous owners filled in at time of relinquishment and in-depth interviews. Not only reasons for relinquishment, but also possible behavioural problems were asked of the previous owners. The report of this research is available on request at the "Hondenbescherming".

1. Introduction

In the Netherlands, approximately 30.9 percent of all households has one or more pet dogs (Forum Welzijn Gezelschapsdieren 2011). Dutch research has proven that 28 percent of all dog owners experience one or more behavioural problems with their dogs (Endenburg and Knol 1994). An Irish research (Wells and Hepper 2000) focused on 556 owners who returned their dog to one particular shelter and answered a questionnaire about this. In this population, 68.3 percent of respondents experience behavioural problems with their dog. Almost 90 percent of these owners returned their dog to the shelter because of problem behaviour. This behaviour not only leads to problems within the house environment, but also within society, such as biting incidents in public, and often ends in the relinquishment of dogs to the shelter or euthanasia (Miller 1996).

The latest published yearly report of the Dierenbescherming (2012), states that in that year 11.679 dogs came, in one way or another, into the shelters that are part of the Dierenbescherming. 7129 of these dogs were submitted as stray dogs, 2729 dogs were submitted to the shelter by their owner, and 900 dogs were returned to the shelter by their new owner after being placed from the shelter. The same report states that 7.6 percent of shelter dogs were euthanized that year. In the yearly report of 2010, it was stated that 36 percent of all euthanized dogs in the shelter were euthanized because of behavioural issues.

When dogs are relinquished to a shelter by their owner, problem behaviour is most often cited as the reason (Wells and Hepper 2000, Marston and Bennett 2003). Behaviour, and in particular aggression, is also the single most common reason for dogs to be returned to the shelter by their new owners (Wells and Hepper 2000). Patronek et al. (1996) found in their American research that dogs with behavioural problems were more likely to be relinquished to shelters than dogs that had no behavioural problems. Salman et al. (2000) asked American pet owners about the reasons for relinquishment to the shelter and found that 22% of dogs that were brought to the shelter were relinquished because of bite incidents. Other behavioural issues that were stated as reasons for resignation were aggression towards humans (17%), escaping (16%), destructive behaviour whether outside and/or inside (15%), disobedience (13%), problems between said pet and other pets (13%), aggression towards animals (11%), house soiling (9%) and too much vocalizing (8%). A similar research was set up in the Netherlands. The "Hondenbescherming" (Dutch society for the protection of dogs), who created the possibilities for this research, at the same time as this research also worked with a different student in another research that focused on the reasons for relinquishment to the shelter in the Netherlands by means of questionnaires and interviews with relinquishing owners in the same shelters as the present research. In the other, unpublished, research (Hermsen 2012), it was shown that of all relinquishments, owners stated that 23% happened because of behavioural reasons (either behavioural problems or a biting incident). The most frequent behavioural problems that were seen were excessive barking (27.9%), destructiveness (15.6%), hyperactivity (10.9%), house training problems (15.2%), aggression towards people (52.2%), aggression towards dogs (30.4%) and aggression towards other pets (8.7%). Within the aggression towards people category, it was shown that 43.8% of these dogs showed aggression towards children, 18.8% showed fearful aggression and 6.3% showed dominance aggression.

Not only do problem behaviours influence the parting from the original owner, but they also are of importance in the successful adoption to the new owner. Next to that, problem behaviour in

the shelter can lead to a detrimental care for the dog by the shelter caregivers and can thus decrease wellbeing. Regular exercise and human contact have shown to reduce stress and to help dogs to achieve better scores on a behavioural test (Coppola et al. 2006, Menor-Campos et al. 2011, Bergamasco et al 2010). The conduction of a behavioural test is already used by multiple researchers as a prediction of later behaviour problems in the home following adoption (Hennessy et al, 2001).

The prediction of (potential) problem behaviours in the new home on the basis of test results when compared to the prediction based on solely the opinions of the staff of animal shelters has shown to be much more accurate (van der Borg et al. 1991). Besides, problem behaviour might not always be reported during relinquishment of the dog to the shelter. Specifically the prevalence of aggression may not be accurately reported if the owners are aware that aggressive dogs may not be accepted by the shelter (Marston et al. 2003). It is harder to find a new home for dogs with problem behaviour and the time that these dogs spend in the shelter is therefore often longer, which makes it more expensive for the shelter to give shelter to dogs with problem behaviours. To fasten or simplify the procedure of relinquishment, some problem behaviours might not be stated (at all, or in a lesser manner) by the previous owners. Shame and the idea of "having failed" with raising a good pet, can also be reasons to diminish problem behaviours at the moment of relinquishment. Stephen and Leger (2006) showed that reporting of problem behaviour by relinquishing owners is sometimes not predictive and advised that it should not be relied upon, thus creating a need for a behavioural test in the shelter.

In some cases, without a behavioural test shelter staff may not take notice of problem behaviour (van der Borg et al 1991). The problem behaviour might not be shown in the shelter by the dog, shelter staff might not notice it or shelter staff underestimate the problem behaviour. Shelter staff handles dogs in a different manner than do regular dog owners, and the shelter environment is very different from the home situation (Diesel et al. 2008, Taylor et al. 2006). For instance, feeding procedures in shelters are oftentimes strict (both for safety and practical reasons) and at home this situation might account for problems with the new owners when food guarding is present. In this way, there might be a misconception about the assessment of behavioural problems by shelter staff and also communication about this to the adopting owners.

The results of this research might possibly be used in the manufacturing and provision of adequate information about obtaining a dog from the shelter and responsible dog ownership. Also, based on this research, shelters might preventive or therapeutically interfere with the detection of behavioural problems. This can contribute to a better and faster coupling of a dog to the new owner and to improve the welfare of shelter dogs (Hennessy et al. 1998, Tuber et al. 1999). When the behavioural problems of a particular shelter dog become clear, this can be anticipated and possibly cause a reduction of the number of returned dogs and even euthanasia because of unknown or unclear behavioural problems (De Palma et al. 2005). Finally, by acknowledging problem behaviour in shelter dogs, it might be possible to even prevent the possible arising of problem behaviour in these shelters.

Research question

What is the prevalence of 12 behavioural problems within a population of shelter dogs in 3 shelters in the Netherlands?

The purpose of this research was to identify the prevalence of the 12 most commonly identified behavioural problems in dogs in a population of shelter dogs in the Netherlands. The 12 used

behavioural problems were chosen from a literature research (Salman et al. 2000, Van den Borg 1991, Knol 1987, Legder and Baxter 1996) combined with the expert opinion of the supervisors of this study. They were, in no particular order: pulling on leash, disobedience, fear, aggression, high excitability, separation anxiety, house training problems, sexual problems, attention seeking behaviour, demolition behaviour, coprophagy and excessive vocalizing. Aggression was subdivided into types of aggression that occur most frequently (Beaver 1983, Borchelt 1983); towards humans, cats, dogs and/or objects and stimuli. Car-related problems are often named as problem behaviour in the above mentioned researches, however it was chosen not to include this in the behavioural test for practical reasons. Straying is problem behaviour that cannot be tested with a behaviour test, and that also cannot be noted by the caretakers in the shelters. Therefore this problem behaviour is not tested in this research.

2. Material and methods

2.1 Procedure and selection

In collaboration with the “Hondenbescherming”, three shelters in the Netherlands were selected to participate in this research. The shelters were chosen based on their previous collaboration with the “Hondenbescherming”, and consist of Dierenopvangcentrum Amsterdam, Dierentehuis Den Bosch and Dierenopvangcentrum Tilburg. Since problem behaviour in shelters may not always be immediately and easily visible to shelter staff, thus the sole use of questionnaires might be not reliable enough (Diesel et al 2008, Taylor et al 2006, van den Borg et al 1991), behavioural testing will be also performed at a selection of dogs present at the shelters. There are several behavioural tests that are (partly) validated (amongst others, Bollen and Horowitz 2008, Netto and Planta 2007, Planta and de Meester 2007, van den Borg et al 1991). The behavioural test that was used in the current research was based on these researches and modified based on the expert opinion of the supervisors of this research. Standardization of the test was obtained by identifying and controlling all potential sources of variability so that the only variable was the dog’s response (Diederich and Griffoy 2006). The same assessor was used for every test. Every test was afterwards reviewed by the same person and intra-observer reliability was obtained by using video recording and the use of a standardized behavioural scoring system. Besides performing the behavioural tests, a short questionnaire was prepared and submitted to the caretakers of the tested dogs. This questionnaire included questions about behaviour that may insufficiently be shown in the behavioural test (such as house soiling), or behaviours that cannot be tested at all in the behavioural test but can be noted by the caretakers (such as destructive behaviour).

Dogs were not tested earlier than 72 hours after their arrival at the shelter. This acclimatization period is necessary because research has shown that within this period, dogs show a large individual variation in their behaviour and measurable stress parameters (Hiby et al 2006, Bollen and Horowitz 2008), and because it is shown that the stress level during this period is high to such a degree that testing in this period will not generate an reliable outcome (Hennessy et al 1997). This can be explained by (among others) the stress that the dog experiences when transported to the shelter, the introduction of the dog to a new environment in the shelter, and the separation of the dog to persons the dog is close to (Bergeron et al 2002, Hennessy et al 1997). Although a longer acclimatization may be desirable for the reliability of behavioural tests (Deterd Oude Weme 2012), this was impracticable for this current study, because the shelter staff placed a dog in a new home as soon as possible and would not hold on to dogs for the purpose of this study for a given amount of time.

The tests took place at the shelters, where the dogs were placed in a special test room or outside on the grounds in a disclosed area with as little input from other dogs as possible. Assistance was present in the form of a permanent caregiver from the shelter who accompanied the dog and was able to help during the test. The tests were filmed and subsequently the behaviour and possibly present behavioural problems were identified.

The dogs that were included in the test were selected at random. Dogs younger than 6 months were not included in the test. Testing a young puppy is a poor predictor of their future behaviour when compared to testing an older dog (Jones and Gosling 2005). However, shelter staff sometimes decided to exclude a dog beforehand because of various reasons such as intensive

training of the dog or that a dog would be too aggressive to provide a safe working environment which happened in one case. An overview of the participating dogs can be seen in Table 1.

Shelter	Name	Reason for stay	Breed	Sex	Status	Age	Duration
Amsterdam	Joris	Stray	Labrador	Dog	Neutered	3 years	Unknown
Amsterdam	Spetter	Stray	Am Staff	Bitch	Neutered	5 years	8 months
Amsterdam	Face	Stray	Am Staff	Dog	Neutered	6 months	3 weeks
Amsterdam	Bolt	Custody	Am Staff	Bitch	Neutered	7 years	3 months
Amsterdam	Blekka	Relinquishment	Am Staff	Dog	Neutered	5 years	3 months
Amsterdam	Blitz	Stray	Maltese	Dog	Intact	9 years	9 days
Amsterdam	Yoeri	Stray	Shih Tzu	Dog	Intact	10 years	10 days
Amsterdam	Zende	Relinquishment	Jack Russell	Dog	Neutered	7 years	8 days
Amsterdam	Bono	Custody	Am Bulldog	Dog	Intact	7 years	6 days
Amsterdam	Illyn	Relinquishment	Dachshund	Dog	Neutered	9 months	14 days
Amsterdam	Yuri	Stray	Am Staff	Dog	Neutered	7 years	7 months
Amsterdam	Romeo	Custody	Am Staff	Dog	Neutered	3 years	8 months
Amsterdam	Bo	Custody	Labrador X	Bitch	Unknown	1 year	2 months
Amsterdam	Roxy	Relinquishment	Am Staff	Bitch	Unknown	3 years	8 months
Amsterdam	Star	Custody	Am Staff	Bitch	Intact	2 years	9 months
Tilburg	Blacky	Relinquishment	Labrador	Dog	Intact	11 months	8 days
Tilburg	Dev	Stray	Shepherd	Dog	Intact	3 years	2 months
Tilburg	Pablo	Relinquishment	Am Bulldog	Dog	Neutered	1 year	1 month
Tilburg	Devil	Relinquishment	Am Staff	Dog	Neutered	5 years	3 weeks
Tilburg	Lyko	Stray	Shepherd	Dog	Intact	2 years	1 month
Tilburg	Chico	Relinquishment	Shepherd X	Dog	Intact	1 year	5 weeks
Tilburg	Chelsea	Relinquishment	Am Staff	Bitch	Intact	3 years	6 months
Tilburg	Dana	Relinquishment	Am Staff	Bitch	Intact	1 year	1 month
Tilburg	Djoeka	Stray	Jack Russell	Dog	Intact	1 year	3 months
Tilburg	Dorus	Relinquishment	Maltese	Dog	Neutered	9 years	10 days
Tilburg	Jumper	Stray	Jack Russell	Dog	Intact	5 years	2 weeks
Tilburg	Lady	Stray	Shepherd X	Bitch	Intact	12 years	7 days
Tilburg	Ross	Relinquishment	Shepherd	Dog	Neutered	2 years	3 days
Tilburg	Noa	Relinquishment	Shepherd	Bitch	Intact	9 months	2 months
Tilburg	Dean	Unknown	Shepherd X	Dog	Neutered	5 years	3 months
Den Bosch	Kees	Stray	Shepherd	Dog	Intact	2 years	1 year
Den Bosch	Speedy	Relinquishment	Retriever	Dog	Neutered	8 years	1 year
Den Bosch	Zorro	Relinquishment	Unknown X	Dog	Neutered	10 years	2.5 weeks
Den Bosch	Bailey	Stray	Unknown X	Dog	Neutered	Unknown	3.5 years
Den Bosch	Bo	Unknown	Maltese	Bitch	Unknown	Unknown	Unknown
Den Bosch	Isabelle	Stray	Am Staff	Bitch	Neutered	4 years	18 months
Den Bosch	Kruimel	Stray	Unknown X	Dog	Intact	10 years	4 weeks
Den Bosch	Oetel	Relinquishment	Shepherd	Dog	Intact	2 years	3 months
Den Bosch	Silly	Unknown	Unknown X	Bitch	Unknown	4 years	3 months
Den Bosch	Brendie	Relinquishment	Maltese	Bitch	Unknown	10 years	Unknown
Den Bosch	Flipper	Stray	Shepherd	Dog	Unknown	Unknown	3 weeks
Den Bosch	Liedje	Relinquishment	Jack Russell	Dog	Unknown	Unknown	18 months
Den Bosch	Lientje	Custody	Jack Russell X	Bitch	Unknown	4 years	8 weeks
Den Bosch	Lotte	Custody	Maltese	Bitch	Unknown	3 years	8 weeks
Den Bosch	Raya	Unknown	Unknown X	Bitch	Unknown	Unknown	2 months
Den Bosch	Steffie	Stray	Am Staff	Bitch	Unknown	Unknown	1 month
Den Bosch	Tippie	Relinquishment	Maltese	Bitch	Intact	Unknown	2 weeks

Table 1: Overview of dogs that participated in the research

2.2 Conduction of the behavioural test

The tests were conducted in a designated in-house test room that was present in both Amsterdam and Tilburg. In Den Bosch, a disclosed area outside was used because of the lack of a suitable test room inside. The dogs had never been in these areas before. For safety reasons, from part 3 of the test onwards, the dogs were attached to a hook in the room or to a pole in the ground by means of a collar and a leash. The length of this leash was seen as a safety circle, which the researcher did not enter because of safety reasons.

The test was performed by the researcher, with the help of someone from the shelter staff who acted as an attendant of the dog. In this way, it was possible to score any support-seeking behaviour by the dog, and it also came in helpful for restoration of the dog's behaviour after a test component for some dogs. The attendant was allowed to calm the dog down in between sections of the test by means of speaking to the dog and/or petting the dog, depending on their own assessment of the need for the dog for this support. Each shelter had one attendant who was involved in all the dogs of that shelter. The researcher acted as an observer and practiced behavioural scoring previous to the research together with shelter staff to minimize errors in this way as much as possible.

The test was filmed with a video camera that was first held by the attendant for the first component of the test ("Kennel" test), after that it was held by the researcher ("Leash behaviour" test) and subsequently it was placed on a tripod ("Basic commands" up to "Threatening approach" test). The researcher handled the camera during the "Cats" test. For the "Separation anxiety" test, the camera again was placed on a tripod.

An overview of the complete behavioural test can be seen in attachment 1.

2.3 Scoring of the behavioural tests

The behavioural tests were filmed with a camera, after which the clips were watched on a computer and analyzed. Analysis of behaviour happened according to a scoring system and every test was separately analyzed. At this point, no behavioural problems were recorded; only behavioural patterns were scored by using behavioural coding. Behavioural coding focuses on individual behaviours, for instance noting how many times a dog shows its teeth (Hennessy et al 2001, van der Borg et al 1991). Although the reliability and validity of behavioural coding is not yet accurately researched in dogs (Jones and Gosling 2005), it is used because of its supposed objectivity and because of the lack of a validated alternative. Behavioural coding was done according to the "Gedragselementenlijst van de hond t.b.v. gedragsbeoordeling" (version 1.1) as established by Joanne van der Borg on June 1st, 2010. This list is in the possession of the author and is available upon request. This list of behavioural elements is distinguished into three categories; posture, behaviour and stress signals. This division is also made in this research during the scoring of the tests. It was noted when, and in which sequence, multiple postures, behaviours and stress signals were present during one test. Also the recovery time after showing certain postures or stress signals was noted. Next to the elements of behaviour as described by Joanne van der Borg in the above mentioned list sexual behaviours, (dis)obedience, and pulling on the leash during the test were also scored.

2.3.1 Pulling on leash

Lucidi et al (2005) describe pulling on a leash as part of a behavioural problem fitting in the pattern disobedience. Goddard and Beilharz (1986) also noted leash behaviour in their behavioural test for guide dogs. For this research, this item is modified to fit the separate behavioural problem “Pulling on leash” from “Disobedience”. This section was scored during the test “Leash behaviour” by visual aspects that come with pulling on a leash by the dog (stance of the dog, behaviour of the dog and stance of the attendant) and additional verbal information that was given by the attendant during the walk when visual aspects were not informative enough.

2.3.2 Disobedience

Disobedience as a problem behaviour is described in the research done by Lucidi et al (2005). They describe a number of obedience exercises that were not validated. Three disobedience factors were selected to be included in this research.

- “Leash behaviour” by noting the (dis)obedience of following up the command “Follow”
- “Basic Commands” by noting the (dis) obedience of following up the commands “Here”/”Come”, “Sit” and “Down”/”Lie down”. For some dogs, commands were not something they had obviously learned and thus could show obedience to.
- Tests where mouthy grabbing of items was involved and the command “Loose” was necessarily given; “Fake hand”, “Play”, “Umbrella”, “Dolls”. Not all dogs held on to (one of) these items and thus not every dog could be included in this test.

2.3.3 Fear

Fearfulness is the most frequently examined temperament trait by behavioural research (Jones and Gosling 2005). King et al (2003) researched the fear of novel and startling stimuli in dogs and used an umbrella for this, which was also used in the present research. Svartberg (2005) validated specific personality traits for predicting typical behaviour in everyday life by comparing the results of a standardized behavioural test with questionnaires filled in by owners. His results suggest that non-social fearfulness and fear of strangers were correctly measured in the test and that a dog with a fearful personality trait can be most accurately measured by the fear of novel non-social stimuli. Dowling-Guyer et al (2011) validated a behavioural test in which (amongst others) fearfulness was detected as an element of canine personality. Jones and Gosling (2005) described in their review that fearfulness was often assessed by recording reactions to novel stimuli or situations.

Firstly, all the behaviours that were shown by the dogs that could account for fear, as described in the “Gedragselementenlijst van de hond t.b.v. gedragsbeoordeling” (version 1.1) by Joanne van der Borg on June 1st, 2010, were noted. Then, these behaviours were categorized into traits, as described in the “Eigenschappenlijst t.b.v. TOP-gedragstest” (version 1.1) by Joanne van der Borg on June 1st, 2010. This last list is also in possession of the author and available on request. Next to the fearful traits, recovery traits were also described by Joanne van der Borg in the “Eigenschappenlijst” and noted in this research. These traits are shown below.

No fear: Dog shows “startle movement”, “shrink away” and/or “fleeing”, in combination with a neutral or high tail

Moderate fear: Dog shows “startle movement” and/or “shrink away” in a semi-low or low posture, and/or dog shows “huddled body” and/or “freeze” in a semi-low posture

High fear: Dog shows “fleeing” in a semi-low or low posture, and/or shows “huddled body” and/or “freeze” in a low posture, during up until half of the test

Panic: dog shows “fleeing” in a semi-low or low posture, and/or shows “huddled body” and/or “freeze” in a low posture, during longer than half of the test

No recovery: Dog shows the same or a lower posture than the posture during the initial fearful reaction of the dog on the stimulus, and does not approach the stimulus

Partial recovery:

- Dog takes on the initial posture as it had before the initial reaction on the stimulus, but keeps seeking support from the attendant
- Dog shows the same or a lower posture than the posture during the initial fearful reaction of the dog on the stimulus, but does approach the stimulus

Full recovery:

- Dog takes on the initial posture as it had before the initial reaction on the stimulus, and does not seek support from the attendant strongly
- Dog shows “shake off”

2.3.4 Aggression

Validation of a test for aggression has extensively been done, amongst other by Netto and Planta (1997). They validated aggression scores on a behavioural test for dog-biters and man-biters versus non-biters, which they divided on the basis of an owner questionnaire. Their results indicated that their behavioural test is a valid instrument for measuring a dog’s tendency to attack humans and dogs. Bollen and Horowitz (2008) use a non-validated behavioural test as a prediction of aggressive behaviour and suggested that failure of their behavioural evaluation was an accurate predictor of aggressiveness. Schoening and Bradshaw (2006) also validated behavioural tests for aggression. Kroll et al. (2004) tested the predictive value of a doll and an artificial hand, also used in this research, when compared to histories of behaviour toward children. They found an indication that the doll was a useful component in determining the aggressive tendency of a dog towards children. Testing elements that were used in these researches were included in the current research.

For this behavioural problem, again firstly all the aggressive behaviours and stress signals were scored from the tests, as described in the “Gedragselementenlijst van de hond t.b.v. gedragsbeoordeling” (version 1.1) by Joanne van der Borg. Then, aggression was divided into different traits as noted in the “Eigenschappenlijst” by Joanne van der Borg. In this last list, aggression is divided into the categories “threatening behaviour” and “biting behaviour”. Each of these categories is then divided into three parts; fearful, insecure and secure.

The following threatening behaviours were scored: “freeze”, “fixate”, “pull up lip”, “showing teeth”, “growling”, “growl-barking”, “short bark” and “fixated barking”.

- Fearful threatening: Showing any of the above mentioned threatening behaviours in a low posture
- Insecure threatening: Showing any threatening behaviours in a semi-low posture, or in a neutral or high posture with stress signals present
- Secure threatening: Showing any threatening behaviours in a neutral or high posture with no stress signals present”

The following biting behaviours were scored: “snapping”, “falling-out”, “biting”, “aggressive play biting” and “shaking of prey”.

- Fearful biting: Showing any of the above mentioned biting behaviours in a low posture
- Insecure biting: Showing any biting behaviours in a semi-low posture, or in a neutral or high posture with stress signals present
- Secure biting: Showing any biting behaviours in a neutral or high posture with no stress signals present

Next, different forms of aggression could be seen in different subtests, some of which specifically designed to show the presence of these problem behaviours

1. Aggression towards humans

- a. *Territorial aggression.* This form of aggression was noted by scoring aggression within the tests “Friendly approach kennel”, “Stare kennel”, “Jogger kennel”, “Food bowl kennel”, “Friendly familiar approach kennel” and “Collar kennel”. When a dog only showed aggression within the test “Food Bowl Kennel”, this was noted under 1.b; Food bowl aggression.
 - b. *Food bowl aggression.* This form of aggression was noted by scoring aggression within the test “Food bowl kennel”. Marder et al. (2013) tested food-related aggression in shelter dogs and validated this with owner reports after adoption. They saw that in their sample of shelter dogs, the observation of food bowl aggression during the behavioural test was associated with this behaviour after adoption for 55% of the dogs. 22% of the dogs that showed no food bowl aggression in the shelter, did show this behaviour at their home after adoption. Tests happened during the daytime, and all dogs had been able to eat in the morning.
 - c. *Aggression towards children.* During the “Doll”-test, dolls that showed close resemblance to a child (both dark and light colored) were used. The reliability of using a doll was researched in multiple cases and it is controversial, however in some cases dogs with a history of aggression towards children display more aggressive reactions towards a doll (Netto and Planta 1997, Kroll et al. 2004). Penny and Reid (2001) found that dogs with a history of aggression towards children responded differently to a doll stimulus than dogs with no such history. Van der Borg et al (1991) also saw that testing aggression towards children using a life-size doll was useful.
 - d. *Miscellaneous.* Planta and de Meester (2007) developed and validated the SAB-test as a measure of aggression in dogs towards non-familiar humans (outside a territorial context). Aggression towards humans but not specifically directed as in *a, b and c*, was noted in this category. Miscellaneous aggression could be seen during “Leash behaviour”, “Friendly approach”, “Basic commands”, “Jogging” and “Threatening approach”.
1. *Aggression towards objects and stimuli.* This form of aggression could be seen during “Object play”, “Novel object”, “Noise” and “Doorbell”. If during these tests redirection-aggression would take place towards other objects or towards nearby humans, this would also be noted within this form of aggression.
 2. *Aggression towards dogs.* This form of aggression could be seen during the “Other dog” tests and during the “Fake dog” test. The use of a fake dog has, amongst others, been researched by Barnard et al. (2012). They concluded that the dog device was perceived as a real dog that elicited specie-specific social signals. Van den Borg et al. (1991) developed a behavioural test that validly identified potentially aggressive dogs including

aggression towards other dogs. Goddard and Beilharz (1985) used an adult other dog as a stimulus to test intraspecific aggression and validated dominance aggression in their test.

3. *Aggression towards cats.* For adopting owners, it is of great importance to know whether a dog can get along with cats. There has been little research in the field of including cats in a behavioural test. Seksel et al. (1999) researched the social behaviour of puppies to a cat in a wire cage but did not validate this test. During the present test, a dog would walk past cats in an enclosed area which was the home area of the cat.

2.3.5 High excitability

Ledger and Baxter (1997) validated excitability as a temperament trait in shelter dogs. High excitability was in the present research scored by three parameters; mobility, activity and vocalizing. Joanne van der Borg notes “mobility” as a trait in the “Gedragselementenlijst”. It is explained as the amount of locomotion with which the dog reacts to environmental stimulants. “Mobility” can either be too frequent or too accelerated to become a behavioural problem. Hiby et al. (2006) note activity-parameters that were noted in this research. These are “standing on hind legs”, “circling movement”, “mouthing”, “pawing” and “jumping up”. “Circling movement” was differentiated from a compulsory circling movement (which was not seen during this research). Panting and wiggling of the tail are also activity-parameters as noted by Hiby et al. Panting was in this research not scored as an activity-parameter because this can also relate to an increased body temperature. Wiggling of the tail can be present in a multitude of behavioural patterns (Quaranta et al. 2007) and was not scored in any of the tests. Vocalizing was scored when “barking” or “squeaking” were present during the test. A scale was designed to distinguish four intensities within high excitability based on how many times each behaviour was seen during the subtest. When actions of excessive activity were seen from one or two times during a subtest this was seen as a low intensity; from 3 times upwards as a moderate intensity, when these behaviours would be present during at least half the duration of the subtest it was seen as a high intensity, and when it would be present during (almost) the complete duration of the subtest it was seen as a very high intensity.

2.3.6 Separation anxiety

Ledger and Baxter (1997), amongst others, validated separation anxiety as a problem behaviour that can be detected in a behavioural test. Separation anxiety was tested by leaving on the dogs unattended in a separate room in Den Bosch, and in the test room in Amsterdam and Tilburg. The dogs were allowed to roam freely. The dogs had never been in these spaces before this research. The windows and doors of the room were blinded with towels and/or paper and visual and audial input from outside was as minimized as possible. The dogs were filmed by the video camera during this period, which lasted 5 minutes. Basse et al. (2010) showed that one can predict separation anxiety by showing of either “standing at the door and barking” during longer than 40 seconds, or “howling and scratching at the door” during longer than 10 seconds. Blackwell et al. (2003) and Voith et al. (1985) showed that the expression of “vocalizing”, “demolition behaviour”, “urinating”, “defecating” and “fear” are predictable for separation anxiety during a behavioural test. When during this test, a dog showed one or more of the above-mentioned behaviours, it was noted as possible separation anxiety.

2.3.7 Sexual problems

Sexual problems were noted by scoring “riding” or “clamping” on any object or person during the complete test.

2.4 Questionnaire

The use of questionnaires, where the caregiver assesses the typical behaviour of the animal in specific situations, is a useful method in investigation of behaviours that cannot be seen during the behavioural tests. The questionnaire in this research was specifically designed for that goal. To keep the questionnaire as short and easy to fill out as possible, there was only a little amount of questions about problem behaviours that could also be noted in the behavioural test. The questionnaire can be seen in attachment 2 and is based on the questionnaire made by Hsu and Serpell (2003). Their questionnaire was developed based on data from a large number of dogs and was validated by comparing their questionnaire to behaviour clinic assessments. Hsu and Serpell questioned the dog owners, whereas in the present research shelter staff is questioned. Thus, some questions needed to be modified to fit a shelter environment. Some behavioural problems included in the present research are not included in the research by Hsu and Serpell. These are demolition behaviour, house soiling, sexual problems, coprophagy and excessive barking. Therefore, separate questions about those behavioural problems were added based on the expert opinion of the supervisors of this research. The accompanying caretaker of the dog was asked to fill in the questionnaire, which could be done either on paper or digital.

2.4.1 Separation anxiety

Hsu and Serpell (2003) noted 13 elements of separation anxiety, which were validated by cross-referencing their questionnaire with the outcome of behavioural testing which was done separately by behavioural specialists. These elements were slightly modified for this research for simplification and organization of the questions, and to incorporate the shelter environment. A total of 10 elements were included in the questionnaire. “Shaking”, “excessive salivation”, “restlessness”, “squeaking”, “barking”, “howling”, “chewing or scratching at items in the room”, “loss of appetite”, “only eating when person present” and finally “exaggerated reaction to person entering the kennel” were all questioned about when the dog was left or about to be left on its own. Hsu and Serpell explained that the tendency to vocalize or engage in destructive behaviour when separated can be preceded by behavioural and autonomic signs of anxiety such as restlessness, trembling and excessive salivation. Thus, in this questionnaire, shelter staff was not only asked about behaviour during separation (which is generally hard to assess by shelter staff because of the presence of multiple dogs in one room), but the preceding period of separation was also assessed.

2.4.2 Sexual problems

Shelter staff was asked whether a dog rides or clamps on persons, other animals or objects.

2.4.3 Attention-seeking behaviour

Hsu and Serpell (2003) validated 6 elements within the behavioural pattern “attention-seeking behaviour” within the use of a questionnaire. These elements were modified to fit into the questionnaire of this research. The elements that were questioned about, were “strong attachment to one of the caretakers”, “following of a caretaker by walking”, “seeking or making

physical contact with a caretaker”, “jumping up against caretaker”, “vocalizations directed at the caretaker” and “agitation when caretaker gives attention to other person or dog”.

2.4.4 Demolition behaviour

Duffy et al. (2014) showed that the chewing on inappropriate objects can validly be predicted by relinquishing owners. In this way, it could be possible for shelter caretakers to predict this behaviour. In the questionnaire, it was asked whether the dog showed any demolition behaviour and if yes, give an (open) explanation about which items were demolished.

2.4.5 House training problems

Van den Borg et al. (1991) note in their research that house soiling is a problem behaviour that is very accurately predicted by shelter staff. Duffy et al. (2014) showed that “urination when left alone” can validly be predicted by relinquishing owners. In the questionnaire, it was asked whether the dog was fully house trained, thus there would never be defecation and/or urination by the dog in its kennel (both inside and outside). Furthermore it could be noted whether the dog only soiled the outer kennel or only the inner kennel. Lastly it could be noted if the dog would not be house trained at all.

2.4.6 Coprophagy

In the questionnaire it could be noted that a dog would eat feces of himself, of other dogs or of other animals. Most of the dogs that participated in this research were normally walked outside of the shelter on surrounding roads, which made it possible for caregivers to assess this subject. Some dogs were not walked outside. For situations where it could not be assessed whether dogs exhibited coprophagy, an “unknown” category was present.

2.4.7 Excessive vocalizing in kennel

Excessive vocalization in the kennel can possibly predict excessive vocalization at a home situation. To learn about a possible excessive amount of vocalizing in the kennel, shelter staff is asked about “barking”, “whining”, “howling” and “squeaking”. In consultation with shelter staff and researchers, it is thought that mostly all shelter dogs do this to a certain amount. So, in this questionnaire it is asked whether the dog does this more than can be expected of the average shelter dog. Also, it is important to know whether the dog does this spontaneously or only when other dogs already started.

3. Results

3.1 Behavioural tests

3.1.1 Pulling on leash

47 dogs participated in the test “Leash behaviour”. 18 dogs showed the problem behaviour “Pulling on leash” during this test. For 10 of these 18 dogs, this happened in combination with showing the problem behaviour “High excitement”.

3.1.2 Disobedience

During the test “Basic commands”, it was seen that 10 out of 45 dogs did not follow at least one of the commands “sit”, “come”/“here” or “(lie) down”.

The command "Follow" at the test “Leash behaviour” appeared to have no effect at all on actual behaviour on the leash, and was therefore omitted in the assessment of the behavioural problem Disobedience.

3.1.3 Fear

Fear was a behavioural problem that could be seen in all the conducted tests. Only during the separation anxiety test, fearful behaviour was not separately noted but taken into account of the problem behaviour “Separation anxiety”. Every test had 47 participating dogs unless otherwise noted. The intensity of the fear was divided into three; moderate, high and panic (see Table 2.3.3). Next to fear itself, it was noted when no recovery from that fear happened.

	Moderate fear	High fear	Panic	No recovery
Friendly approach kennel	4	0	0	
Stare kennel	2	0	1	
Jogger kennel	5	3	0	1 (high fear)
Food bowl kennel (n=46)	4	0	0	
Friendly familiar approach kennel	1	0	0	
Collar kennel	1	0	0	
Leash behaviour	0	0	0	
Friendly approach	4	0	0	
Basic commands	1	0	0	
Object play (n=45)	1	0	0	
Doll	4	2	0	
Novel object	14	3	2	3 (high fear)
Noise	9	1	2	1 (panic)
Doorbell	0	0	0	
Other dog/big (n=46)	4	0	0	
Other dog/small (n=46)	2	0	0	
Fake dog (n=42)	6	2	0	
Jogging (n=46)	4	1	1	
Threatening approach	6	4	0	
Cats (n=46)	5	3	0	

Table 2: Number of dogs that showed fearful behaviour, measured in three intensities, and number of dogs that showed no of partly recovery (n=47 unless shown otherwise)

In Table 2, it was not noted if and how many dogs showed fearful behavior in multiple behavioural subtests; one dog could be showing fearful behaviour in multiple subtests or even during the complete test. Therefore it was integrated how many dogs in total showed the different intensities in fearful behaviour during the complete test. This is shown in Table 3. 12 dogs showed no fear at all during the whole behavioural test. For “Low fear (total)”, dogs could show the fearful behaviour “Moderate fear” in a maximum of 3 subtests. For “Moderate fear (total)”, dogs could show “High fear” in a maximum of 2 subtests and “Moderate fear” in a maximum of 2 subtests. For “High fear (total)”, dogs could show “High fear” in a minimum of 3 tests onwards, or shows “Panic” in one test. For “Panic (total)”, dogs show “Panic” in one or more test in combination with other fearful behavioural intensities in other tests.

Total intensity of fear	Number of dogs
No fear	12
Low fear	22
Moderate fear	5
High fear	5
Panic	3

Table 3: Number of dogs that showed the different intensities of fearful behaviour during the complete test (n=47)

3.1.4 Aggression

Aggression was scored during every subtest. As described above, different forms of aggression were noted; towards humans (which was subdivided in territorial, food bowl, children and miscellaneous), towards objects and stimuli, towards dogs and towards cats.

	Fearful threatening	Insecure threatening	Secure threatening	Fearful biting	Insecure biting	Secure biting
<i>Aggression towards humans – Territorial</i>						
Friendly approach	1	5	1	0	3	0
Stare	1	8	0	0	0	0
Jogging	1	8	1	0	1	0
Familiar friendly approach	1	0	0	0	0	0
Collar	0	0	0	0	0	0
<i>Aggression towards humans - Food bowl aggression</i>						
Food bowl (n=46)	0	9	0	1	5	0
<i>Aggression towards humans – Children</i>						
Doll	0	8	0	0	4	1
<i>Aggression towards humans – Miscellaneous</i>						
Leash behaviour	0	0	0	0	0	0
Friendly approach	2	9	0	0	3	0
Basic commands	0	1	0	0	0	0
Jogging (n=46)	1	5	2	0	5	0
Threatening approach	0	7	1	0	0	0
<i>Aggression towards objects or stimuli</i>						
Novel object	1	4	1	0	1	1
Noise	0	3	0	0	0	0
Door bell	0	1	0	0	0	0
Object play (n=45)	1	3	0	0	0	0
<i>Aggression towards dogs</i>						
Other dog/big (n=46)	0	16	1	0	3	2
Other dog/sm (n=46)	0	13	1	0	2	0
Fake dog (n=42)	0	5	0	0	0	1
<i>Aggression towards cats</i>						
Cats (n=46)	0	9	1	0	0	0

Table 4: Number of dogs that showed aggression during the behavioural test (n=47 unless shown otherwise)

In the results seen in table 4, it was not noted if and how many dogs showed aggressive behaviour in more different behavioural subtests. Therefore it was also calculated how many dogs showed no aggression at all and how many dogs showed aggression during a number of subtests. This can be seen in table 5. In this table, the types and intensities of aggression that are described above are taken together.

Type of aggression	Number of dogs
No aggression	8
Aggression towards humans – total	25
Aggression towards humans – territorial	15
Aggression towards humans – food bowl	11
Aggression towards humans – doll	10
Aggression towards humans – miscellaneous	17
Aggression towards objects and stimuli	12
Aggression towards dogs	21
Aggression towards cats	10

Table 5: Number of dogs that showed no aggression, and number of dogs that did show aggression during every test (n=47)

Finally, severity of aggression was researched. 39 out of the total of 47 dogs showed aggression. 11 of those 39 dogs showed threatening or biting behaviour in a high intensity with a duration of minimal half of the subtest. 17 of 39 dogs showed simultaneously threatening and biting behaviour. One dog out of those 39 dogs showed biting behaviour with no preceding threatening behaviour.

3.1.5 High excitability

High excitability is a behavioural problem that could be noted in every test and the results of this can be seen in Table 6. A scale was designed to distinguish four intensities within high excitability based on how many times each behaviour was seen, see 2.1.5.

	Low intensity	Moderate intensity	High intensity	Very high intensity
Friendly approach kennel	19	2	3	1
Stare kennel	15	6	1	1
Jogging kennel	11	2	4	3
Food bowl kennel (n=46)	2	0	3	1
Friendly familiar approach kennel	14	2	6	0
Collar kennel	8	0	3	0
Leash behaviour	12	1	4	0
Friendly approach	9	3	5	1
Basic commands	4	0	6	0
Object play (n=45)	11	2	5	0
Doll	11	0	7	1
Novel object	4	0	3	0
Noise	1	0	0	0
Doorbell	5	1	1	0
Other dog/big (n=46)	10	3	8	0
Other dog/small (n=46)	12	3	7	1
Fake dog (n=42)	5	2	5	0
Jogging (n=46)	7	3	7	0
Threatening approach	4	0	0	0
Cats	1	0	2	0

Table 6: Number of dogs that showed “High excitement” in four different intensities during the tests (n=47)

On the basis of these results, the number of dogs that showed “High excitement” needed to be calculated. This could either be throughout the whole test or only in some tests. The results of this can be seen in Table 7. Out of 47 dogs, 8 dogs showed no degree of “High excitement”, and 39 dogs showed “High excitement” to some extent. Because of the large number of dogs that showed “High excitement”, four degrees of “High excitement” were distinguished; “Low amount”, “Moderate amount”, “High amount” and “Very high amount”. To score “Low amount”, the dog could show “Low intensity high excitement” or “Moderate intensity high excitement” in a maximum of 5 tests, and could show “High intensity high excitement” in a maximum of 1 test. To score “Moderate amount”, the dog could show “Low intensity high excitement” or “Moderate intensity high excitement” in an unlimited amount of tests, and could show “High intensity high excitement” in a maximum of 3 tests. To score “High amount”, the dog needed to show “High intensity high excitement” in more than 3 tests. To score “Very high amount”, the dog could show “Very high intensity” in 1 or more tests.

Degree of “High excitement”	Number of dogs
None	8
Low amount	14
Moderate amount	8
High amount	14
Very high amount	3

Table 7: Amount of dogs that showed different degrees of “High excitement” during the complete test (n=47)

3.1.6 Separation anxiety

The separation anxiety test was performed in 39 dogs. Not all dogs were included in this because shelter staff sometimes would decide against it for unknown reasons. As described in paragraph

2.3.6, there were several parameters with which separation anxiety could be measured. There were 20 dogs that showed no separation anxiety. 19 dogs showed one or more behaviours that Blackwell et al. (2003) and Voith et al. (1985) described as possible separation anxiety. Out of these 19 dogs, 8 dogs showed behaviours that also Basse et al. (2010) described as possible separation anxiety.

3.1.7 Sexual problems

To score sexual behavioural problems, the dog would have to ride or clamp on an object, person or other (fake) dog during any part of the test. Two dogs out of the total of 47 dogs showed these behaviours. One dog showed these during the “Doll test” and during the “Fake dog” test. One dog showed these behaviours only during the “Fake dog” test.

3.2 Questionnaires

46 out of the total of 47 handed out questionnaires were filled in. One questionnaire was lost and could not be answered again by the shelter staff. A few questionnaires were not filled in completely, in which case shelter staff was contacted to obtain the missing answers.

3.2.1 Separation anxiety

For “Separation anxiety”, 10 behaviours could be predicting for this behavioural problem as described in 2.4.1. According to shelter staff, 15 dogs showed no behaviours predicting “Separation anxiety”. As shown in Table 8, 31 dogs showed at least one up to 7 behaviours predicting “Separation anxiety”.

Number of behaviours	Number of dogs
None	15
1	11
2	7
3	8
4	1
5	1
6	2
7	1
>7	0

Table 8: Number of dogs that show no behaviours predicting “Separation anxiety” up to the number of dogs that show more than 7 behaviours predicting “Separation anxiety” (n=46)

3.2.2 Sexual problems

As reported by shelter staff, out of 46 dogs one dog performed “Riding” on humans. The dog did not perform “Riding” on other dogs or objects.

3.2.3 Attention-seeking behaviour

For “Attention-seeking behaviour”, 7 behaviours could be predicting for this behavioural problem as described in 2.4.2 According to shelter staff, 6 dogs showed no behaviours predicting “Separation anxiety”. As shown in Table 9, 40 dogs showed at least one up to 5 behaviours predicting “Separation anxiety”.

Number of behaviours	Number of dogs
None	6
1	20
2	9
3	10
4	0
5	1
>5	0

Table 9: Number of dogs that show no behaviours predicting “Attention-seeking behaviour” up to the number of dogs that show more than 5 behaviours predicting “Attention-seeking behaviour” (n=46)

3.2.4 Demolition behaviour

As reported by shelter staff, 9 out of 46 dogs showed “Demolition behaviour” to some extent. The items that were mostly demolished were the items present in the kennel (dog bed, blanket, pillow), for some dogs the demolished items were variable or unknown.

3.2.4.5 House training problems

Shelter staff noted that 11 out of 46 dogs soiled both their outside- and inside-kennel. 19 out of 46 dogs soiled only their outside kennel but not their inside kennel. It should be noted 1 dog who according to shelter staff did not soil its kennel, during the behavioural test had soiled its kennel.

3.2.6 Coprophagy

Out of these 46 dogs, according to shelter staff none performed “Coprophagy”, whether it is own feces, feces of other dogs or feces of a different species.

3.2.7 Excessive vocalization in kennel

A total of 24 dogs out of 46 dogs performed “Barking”, “Whining”, “Howling” and/or “Squeaking” more than can be expected of the average shelter dog according to shelter staff. 21 dogs performed these behaviours on their own accord, while 3 dogs only performed these behaviours when other dogs have started it.

4. Conclusion

To conclude the results of this research, both the behavioural test and the questionnaire were assessed and integrated. For each dog, it was assessed whether the result of the behavioural test and the questionnaire would match. Indications for each behavioural problem, whether it came from the behavioural test or from the questionnaire, would generate a positive score for this behavioural problem.

The purpose of this research was to make an inventory of the prevalence of the 12 most common behavioural problems, in a group of 47 shelter dogs in the Netherlands. A summary of this is stated in Table 9. 18 out of 47 dogs showed evidence that they could have the behavioural problem "Pulling on leash". "Disobedience" is a problem behaviour that 10 out of 47 dogs showed evidence for. 35 out of 47 dogs showed "Fearful" behaviour to some extent, to different stimuli. 10 out of those 35 dogs showed fearful behaviour of moderate or high intensity. 3 of those 35 dogs showed an extremely high amount of fear. 39 out of 47 dogs showed aggressive behaviours in the behavioural test, both threatening and biting behaviour. 11 of those 39 dogs showed aggressive behaviours with a high intensity. 17 of those 39 dogs showed biting behaviour. During the behavioural test, 39 out of 47 dogs showed "High excitability" to some extent, to different stimuli. 25 of those 39 dogs showed "High excitability" in a moderate, high or very high intensity. In the behavioural test it was seen that 19 out of a total of 39 dogs showed behaviours that can indicate "Separation anxiety". In the questionnaire shelter staff noted that 31 out of 46 dogs showed one or more signs of "Separation anxiety". Out of the 15 dogs that according to the questionnaire showed no signs of "Separation anxiety", seven dogs did show "Separation anxiety" behaviours during the behavioural test. It can be concluded that, taking these results together, 38 out of 47 dogs showed evidence that they could have the behavioural problem "Separation anxiety". According to the questionnaire, one dog showed "Sexual problems". In the behavioural test, two dogs showed "Sexual problems", one of which was also the dog that showed "Sexual problems" according to the questionnaire. It can be concluded that two dogs out of 47 dogs showed evidence that they could have the behavioural problem "Sexual problems". As stated in the questionnaire, 40 out of 46 dogs showed one or more signs of "Attention-seeking behaviour". 11 out of 46 dogs showed three or more of these signs, indicating that they express the problem behaviour in a higher rate. As reported by the questionnaire, nine dogs out of 46 dogs show evidence that they could have the behavioural problem "Demolition behaviour". Shelter staff noted that 30 out of 46 dogs showed the problem behaviour "House-training problems". None of the 46 dogs that were included in the questionnaire were known to possibly have the behavioural problem "Coprophagy". Finally, 21 out of 46 dogs show evidence that they could have the behavioural problem "Excessive vocalization", according to the questionnaire.

Problem behaviour	Prevalence
Pulling on leash	38 %
Disobedience	21 %
Fear (moderate, high or very high)	28 %
Aggression	83 %
Aggression (high intensity)	23 %
Biting	36 %
High excitability (moderate, high or very high)	53 %
Separation anxiety	81 %
Sexual problems	4 %
Attention-seeking behaviour	24 %
Demolition behaviour	20 %
House-training problems	65 %
Coprophagy	0
Excessive vocalization	46 %

Table 9: The prevalence of the 12 most common behavioural problems in the population of shelter dogs used in this research

5. Discussion

Reliability of a behavioural test consists of inter-observer reliability and of internal consistency. In the present behavioural test, there was only one observer and this observer practiced behavioural scoring previous to the research together with shelter staff to minimize errors in this way as much as possible. Re-testing the dogs and see if it generates the same results can prove the reliability of a behavioural test and questionnaire. Some researchers put a small amount of time between the test and the re-test, other use up to months (Jones and Gosling 2005). Van der Borg et al. (2010) tested the reliability of their behavioural test by comparing the test outcomes with re-test outcomes. They saw that aggression scores were significantly higher during the first test in the morning than in the second test in the afternoon. In this research, it was pursued to use as many reliable sources as possible to base the behavioural test. Still, this test as a whole was not tested for reliability, which is a shortcoming. No re-test was done to improve the reliability.

Validity is an issue that is very important when researching by means of a behavioural test and questionnaire. The validity of a test is proven not only by correct prediction of the occurrence of (potential) problem behaviour but also by the correct prediction of the absence of (potential) problem behaviour with the future owner.

To accurately validate a test, the purpose of the test must be clear (Netto). The purpose of this test was to solely identify problem behaviours of shelter dogs, not to value them or to use the outcome as a measure for suitability for training, rehoming or euthanasia. Mostly all the previous research that has been used to construct the present behavioural test and research had a different purpose and were validated for this purpose, which was mostly suitability for rehoming. Also, the prevalence of problem behaviour in a certain population is of huge influence on the incidence of finding false positive and false negative results. The prevalence of problem behaviour in shelter dogs in the Netherlands is, to the author's knowledge, not yet researched up till now.

In this research, we used where possible validated subtests in different researches to base our tests upon. The aspects of validity are very precisely explained by Jones and Gosling (2005). Content validity tests if the test really measures what it should and whether the components of the measure cover all aspects of the behaviour in question. A behavioural response that is seen in the test is a generally a combination of temperament and the current environment. Environmental factors in the shelter that can obscure a correct measurement are arousal, novelty and the lack of escape routes. Beerda et al. (1997) stated that testing procedures should be standardized because a proportion of the observed behavioural variance may be due to differences in stressor properties and the protocols used by different researchers. Increases in frequencies of vocalizations and behavioural elements associated with fear and submission (snout licking, paw lifting and a lowered posture) may occur in dogs that experience stress and not because they actually have the problem behaviour "fear", for example. Construct validity is the extent to which the items within a test actually measure the broad construct that they were designed to measure. This splits into convergent validity (does the dog show fear in more than one question/subtest) and discriminant validity (when a dog shows fear in one question/subtest, does it fail to show an other trait in other questions/subtests?). Jones and Gosling (2005) showed in their review that for the multitude of behavioural tests, evidence for convergent validity is reasonably promising. The lowest validity coefficients were associated

with the “activity” dimension, which can be associated with the “high excitability” researched in the present research. The strongest interpretable validity coefficients are associated with the fearfulness dimension, which can be associated with the problem behaviour “fear” in this research. This would mean that the results for the problem behaviour “fear” are the most valid one. Hsu and Serpell (2003) examined discriminant validity for the development of their questionnaire, which was also used extensively in this research. They found an overall good validity with the major exception that they found no association between attachment and stranger fear/stranger aggression. Goddard and Beilharz (1986) found a high correlation between fearfulness and avoidance responses during a behavioural test for guide dogs. Finally, criterion validity is the extent to which an association between the scores for each factor and an external criterion can be demonstrated (Jones and Gosling 2005). The external criterion is the “gold standard”, for example the report of an owner post-adoption, which is disputable as a golden standard. Owner reports (for example, often used post-adoption owners) are prone to measurement errors in assessment of dogs.

One case of particular interest, Poulsen et al. (2010) showed that there was no significant correlation between an initial behaviour test in the shelter and a re-test after re-homing assessment scores in tests that involved direct contact with the assessor (such as touching). There was a significant correlation between the test and the re-test during assessment tests that did not involve direct contact between the dog and the assessor such as play and reaction to noise. During the present research, there were quite a few items that involved direct contact with the assessor, of which the results should be interpreted with caution.

Christensen et al. (2007) researched that certain types of aggression (territorial, predatory and intra-specific) are not validly exhibited during their temperament testing. They used the testing protocol “Assess-a-Pet” by S. Sternberg, which has not been validated before this. They excluded dogs that showed aggression during their test for re-homing, and sent questionnaires to the new owners. They found that 40.9% of dogs that showed no aggression during the test exhibited lunging, growling, snapping and/or biting after adoption. They hypothesized that the dog might have been too tired, sick, stressed or otherwise inhibited to exhibit aggressive behaviour. In a shelter, there are a lot of situations that can inhibit the dog such as disease that is not noted by shelter caregivers, sleep deprivation and (social) stress. On the other hand, stress and the shelter environment can on it’s own also lead to aggressive behaviour.

Another reason for this invalidity may be that a dog’s trigger for aggressive behaviour might differ from the stimulants used in the test. Dolls and fake dogs were used for the notation of aggression towards children and other dogs because, in the experience of the researchers, dogs generally focus on the shape of an object before they notice smell and movement. However, these olfactory cues cannot be underestimated. Wells and Hepper (2003) showed that dogs used mainly olfactory cues and to a lesser extent visual directional information to determine the correct direction of a human-laid trail. Filiatre et al. (1991) showed in their research that an olfactory effect of a dog in relation to a human depends on whether the adult is known to the dog or not. In this way, especially the first few seconds of behavioural reaction of the dog are important (Slabbert and Odendaal 1999) when a dog more relies on visual cues and before it can realize by other cues that the fake dog is in fact not a actual dog. It is still possible that the dolls and fake dog were only seen as an unknown novel en thus intimidating object by some dogs, instead of being seen as a child or real dog (King et al. 2003). Barnard et al. (2012) evaluated the validity of using a doll and a fake dog as surrogates to evaluate child-directed and dog-directed

aggression. Their results showed that both the objects elicited more social behaviour than the control object. Aggression towards dogs is strongly dependent on sex, age, hormonal status, familiarity and behavioural response of the other dog. This makes it hard to assess in a behavioural test using fake dogs or even other dogs. Although shelter environments often contain many potential stimulus dogs to use for assessment of intraspecific aggression, this research only used two stimulus dogs for each test, which is not plausible for the range of dogs that he/she may encounter on the street. The tested dog and the stimulus dog were also on leash for safety reasons this makes the assessment of play escalating to aggression and off-leash aggression difficult. In the “Doll” test, both a light and dark colored doll were used, because in the experience of the researchers some dogs react differently to the differently colored dolls based on experience with a certain color of skin. In this research, no difference in reaction was seen between both of the colors of dolls.

Another point that can be made is that some behaviours that were presented in this study as problem behaviours, might actually be adaptive from the shelter environment. Netto notes that a fearful response to a novel object is actually physiologically adapted behaviour to a new stimulus by means of flight. The question can be asked whether it would actually be a “problem behaviour” for a dog not to respond in this adaptive way. Beerda et al. (1998) note that specifically stimuli that could not be anticipated by dogs (such as loud noises used in the present research) tended to induce a low posture, which can might indicate an intense acute stress response (measured by salivary cortisol). Another example of adaptive behaviour is the “Excessive vocalizing in kennel” that shelter staff could note in the questionnaire, when present in a noise-polluted and stressful shelter environment.

When designing this research, it was for some behavioural problems difficult to determine whether it should be assessed by the questionnaire, by the behavioural test or by a combination of both. The two behavioural problems that were researched by both the questionnaire and the behavioural test were “Separation anxiety” and “Sexual problems”. To keep both the behavioural test and the questionnaire as short and simple as possible, they were designed to have as little as overlap as possible. The reason for including sexual problems in both assessments is that no extra proceedings were necessary during the behavioural test to test it. For separation anxiety, using the behavioural test would in hindsight be sufficient to test this problem behaviour. For the other problem behaviours we also used validated research to select one method and that should have been the case for this problem behaviour too, even though the questionnaire did yield some extra cases of possible separation anxiety. When results were inconclusive between the behavioural test and the questionnaire, for instance when a dog would show “Separation anxiety” in the behavioural test but not in the questionnaire (and vice versa), in the conclusion it was stated that the dog possibly did have this behavioural problem. A behavioural trait or problem can go unnoticed by shelter staff, or it can be underestimated, thus not noted in the questionnaire. During the behavioural test, it can be possible that the dog does not show some behavioural problems while they would indeed be present.

Dogs were tested after a noted acclimatization period. Although a longer acclimatization may be desirable for the reliability of behavioural tests (Deterd Oude Weme 2012), this was impracticable for this current study, because the shelter staff placed a dog in a new home as soon as possible and would not hold on to dogs for the purpose of this study for a given amount of time.

Some tests did not work out the way they were designed, and some tests did not generate any response. This is explained below.

Standardization of the complete test was pursued (Taylor and Mills 2006) however in some cases it was more challenging and could not be completely obtained. In the “Kennel” test, it would occasionally happen that the dog was out of reach from the fake hand. Reaction to the fake hand was scored anyway. The “Jogger” test was sometimes difficult to perform because of too small of a space available in front of the kennel, thus could not be executed for all the dogs in the way it was meant to be. The reactions for “Putting on leash” and “Friendly approach” could sometimes not be differentiated because these sometimes (accidentally) happened simultaneously. The “Food bowl” test was sometimes not fully implemented because the dog already had finished eating before it could be petted, or was too far away to be petted. Sometimes it was not possible to get close enough to the dog in the testing area after it was fixed to the fence or hook, to fully perform tests in which close contact was necessary because it would mean that the tester would be coming too close inside of the safety circle. With some dogs, the test “Play” was not performed; this was because either the attendant or the researcher judged this situation as possibly unsafe. For the test “Other dog”, it was pursued that the other dogs (two) that were shown to the test subject would first of all be stable enough to participate, and furthermore be of the same sex, where one would be bigger than and one would be smaller than the dog that underwent testing. However sometimes it was not possible to find a stable dog with those characteristics and it was needed to use dogs of a different sex or of the same size. Also, in some cases the other dog would not respond in a stable manner to the dog that was being tested. During the test “Cats”, the dog was walked past an enclosure with multiple cats, which were randomly chosen and were different for each dog. The cats did not respond in the same manner towards all the dogs. For “Sudden Noise”, it was important that the noise would be loud and sudden enough that the dog would possibly be startled. Auditory stimuli have been used in behavioural tests by many researchers (Svartberg and Forkman 2002 for instance) to test startle reactions and recovery. Sometimes during the test, a very loud noise was accidentally not realized, as the noise would be too quiet. The test was not repeated due to possible habituation resulting in a less reliable result. Sometimes it was not possible to perform the test with the darker doll, because the light doll was on a stick and therefore it was a safer situation to test while the dark doll needed to be held by hand. When the dog would respond aggressively towards the light doll, the dark doll test was not performed for safety reasons.

The “Doorbell” test did not evoke a response in any of the dogs. This might be explained by the fact that the dogs were not in their own environment by being in the test room. It might have evoked a response when the test would have been conducted in their kennel. An example of this is one dog, which did not respond to the “Doorbell” test during his test, but overheard the doorbell during the testing of another dog when he was in his kennel and did respond at that moment by barking.

Regarding “Disobedience”, it is hard to distinguish disobedience with never having learned commands. Also it seemed that some dogs that showed a high level of “High excitability”, would not follow up commands during the test, whereas they normally would follow up (as stated by shelter staff). Obedience to the command “Follow” when walking on a leash did not happen in any of the dogs. Most dogs seemed to be so excited by the fact that they were out of their kennel and being walked in a new environment with a lot of dogs around them, that obedience to this command did not take place. Obedience to the command “Loose” was initially noted during the test but later discarded because of a high probability of interference of disobedience with high excitability and/or aggression. Within the test “Friendly approach in kennel”, out of 47 dogs 1 dog grabbed the fake hand with its mouth and did not respond to the command “Loose”. This happened in combination with play behaviour. Within the test “Friendly

approach”, out of 47 dogs 2 dogs grabbed the fake hand with their mouth and did not respond to the command “Loose”. This happened for both dogs in combination with insecure biting behaviour. Within the test “Object play”, out of 45 dogs 1 dog grabbed the object and did not respond to the command “Loose”. This happened in combination with a state of high excitement. One of these 4 dogs that showed no response to the command “loose”, also did not follow up basic commands during that test.

During the test, “Demolition behaviour” could be seen during several tests. “Demolition behaviour” is a behavioural problem that often goes together with “Separation anxiety” (when there are no people present) or be seen as a solitary behavioural problem (when there are people present) in a home environment, and it was specifically noted during the “Separation anxiety” test. However, “Demolition behaviour” was also seen with the umbrella, dolls and fake dogs. It was hard to distinguish this demolition behaviour from fear or (redirectional) aggression.

Finally, for “House soiling”, it was asked in the questionnaire whether this happened and it was not included in the behavioural test. Urination and defecation could happen naturally during subtests of the behavioural test such as “leash behaviour” and “cats” when the dog was being walked outside. In the test room, urination or defecation can be “marking” behaviour by the dog. Testing in Den Bosch happened in an area outside, where urination and defecation could not be seen as a prediction of problem behaviour within the house.

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Appendices

Appendix 1: Protocol behavioural test

De test wordt uitgevoerd in een testruimte (asiel Amsterdam) of buiten (asiel Den Bosch en Tilburg). Voor de laatste twee asielen geldt dat er rond de testplaats geen zichtbare katten of honden mogen zijn. De te testen hond zal vanaf onderdeel 3 worden vastgemaakt aan een fixeerpunt.

De test wordt uitgevoerd door de onderzoeker, waarbij één helper van het asiel fungeert als begeleider van de hond. Herstel van de hond na een testonderdeel moet worden vastgelegd, de begeleider moet tussen de testonderdelen door vriendelijk doch terughoudend reageren op de hond.

De test zal worden gefilmd met een videocamera die wordt vastgehouden door de begeleider (kenneltest) vervolgens door de onderzoeker (leash behaviour), vervolgens wordt deze op een statief geplaatst (basic commands – threatening approach). De onderzoeker zal de camera hanteren tijdens het Cats-onderdeel. De ruimtelijke plaatsing van het statief wordt van tevoren bepaald.

De voorwerpen die worden gebruikt zijn uit het zicht van de hond geplaatst totdat het desbetreffende onderdeel begint.

1. Kennel test

a. Friendly approach with fake hand

Vanaf het moment dat de hond zicht heeft op de onderzoeker, loopt deze naar de hond toe met de kunsthand uitgestrekt richting de snuit van de hond. De onderzoeker spreekt bemoedigend tegen de hond en bukt om de hond te aaien met de kunsthand.

Duur: 30 s

b. Stare

De onderzoeker staat stil voor de kennel in een rechte houding en staart de hond in de ogen.

Duur: 10 s

c. Jogger test

De onderzoeker rent in joggend tempo, met de naphand in de richting van de hond, voor de kennel langs.

Duur: 20s

d. Food bowl test with fake hand

De onderzoeker plaatst een bak met brokken in de kennel terwijl de begeleider met hond op een afstand van > 5m staat. De begeleider laat de hond los in de kennel. De onderzoeker benadert de voerbak met de naphand en probeert de hond te aaien tijdens het eten.

Duur: 30 s

e. Friendly approach in kennel

De deur van de kennel wordt geopend en de onderzoeker benadert de hond op een vriendelijke manier met bemoedigende woorden.

NOTITIE: Bij angst of agressie totaal of op dit punt, wordt gevraagd aan de begeleider dit onderdeel uit te voeren, idem onderdeel e.

f. Collar

De hond wordt een halsband en riem omgedaan en wordt mee de kennel uitgenomen en overhandigd aan de begeleider.

2. Leash behaviour (from kennel to testing space) including command "VOLG"
De begeleider begeleidt de hond richting de testruimte, waarbij zoveel mogelijk de hond zijn natuurlijk gedrag wordt vertoond. Duur: 15 s. Vervolgens wordt de hond enigszins gestuurd door het commando "Volg" uitgesproken door de begeleider. Duur: 15 s.

Voor het volgende gedeelte van de test wordt de hond gefixeerd aan een object binnen de testruimte met de riem door de begeleider.

3. Friendly approach and petting (fake hand)
De onderzoeker benadert de hond met vriendelijke bewoordingen, houdt de neophand voor de snuit van de hond en aait deze met de neophand.
Duur: 20s
4. Basic commands (come, sit, down)
De onderzoeker vraagt de commando's "Kom/Hier", "Zit" en "Af/Lig" van de hond zonder daarbij extra stimulatie te gebruiken.
Duur: 5s per commando
5. Object play, including command "LOS"
De onderzoeker nodigt de hond uit te spelen met flos, daaropvolgend met kong aan een touw. De onderzoeker spreekt hierbij bemoedigend tegen de hond. Er wordt een trekspel gespeeld met de hond, waarbij na 5 s het commando "Los" wordt gegeven. Wanneer de hond niet loslaat, wordt dit commando heviger gegeven, uiteindelijk zal worden geruild voor een brokje.
Duur: 20s
6. Doll on hand (light and dark)
De onderzoeker loopt de ruimte uit en komt terug met een pop aan de hand, hiermee loopt de onderzoeker op de hond af en loopt langs de hond heen en weer. De pop kan zo dichtbij komen dat de hond hier directe interactie mee kan aangaan in de vorm van ruiken, happen et cetera.
Idem voor de donkere pop.
Duur: 20s per pop
7. Novel object (umbrella)
De onderzoeker pakt een paraplu en klapt deze uit in de nabije omgeving van de hond boven haar hoofd, en legt deze vervolgens op de grond in de nabije omgeving van de hond, zodat de hond de uitgeklapte paraplu bijvoorbeeld kan besnuffelen.
Duur: 10s
8. Noise (hitting object)
De onderzoeker slaat op een object waarbij een geluid vrijkomt dat voor de hond plotseling is (de hond ziet de handeling niet). De begeleider kan hierbij worden ingeschakeld om de hond af te leiden door middel van commando's. Het object kan een kastdeur zijn of een houten deur.
Duur: 1s
9. Front door bell
Het geluid van een voordeurbel wordt afgespeeld door de onderzoeker op een afstand van 2 meter van de hond.
Duur: 5s

10. Jogging past, with/without artificial hand

De onderzoeker rent op een joggend tempo op een afstand van 1 meter langs de hond, eerst twee keer heen en weer zonder nephand en interactie, daarna met aan de zijde van de hond de nephand waarbij de hond interactie kan aangaan met de nephand (snuffelen, happen et cetera).

Duur: 30s

11. Threatening approach

De onderzoeker loopt op een voor de hond bedreigende wijze waarbij de onderzoeker zichzelf breed maakt en een licht gebogen houding richting de hond heeft en de hond aanstaart, op de hond in vanaf een afstand van 8 meter tot een afstand van 1 meter. De hond wordt 3 s aangestaard, waarna de onderzoeker de hond de rug toekent en wegloupt.

Duur: 10s

12. Other dogs (same sex, bigger and smaller one)

De begeleider haalt een stabiele hond van grotere grootte en dezelfde sexe en loopt hiermee op veilige afstand (een afstand waarbij de honden niet in direct contact met elkaar kunnen komen) 2 keer heen en weer langs de testhond. Idem voor een hond van kleinere grootte.

Duur: 20s per hond

13. Fake dog

De onderzoeker loopt met een nephand aan een riem richting de hond en laat de nephand zo dicht bij de hond komen dat interactie kan plaatsvinden (ruiken, happen, et cetera). Vervolgens wordt de nephand omgedraaid en wordt weggelopen met de nephand.

Duur: 20s

14. Walking past cats

De hond wordt aan de riem door de begeleider langs de kattenverblijven gelopen waarbij de hond één of meerdere katten in zicht krijgt. 1 kat is in principe gewenst, er worden niet specifiek meerdere katten opgezocht. De hond heeft 5 s zicht op de kat, waarna weer met de hond wordt weggelopen van de kattenverblijven. De hond moet op een veilige afstand van de katten blijven.

Duur: 20s

15. Separation

De onderzoeker zet de statief met camera in een separate ruimte van de testruimte, dit kan de kantine zijn van het asiel of een kantoor en zet deze in een hoek met zoveel mogelijk zicht op de deur. De onderzoeker verlaat de ruimte. De begeleider leidt de hond in de separate ruimte, maakt een kortdurige interactie met de hond gedurende 30 s (aaien), en verlaat dan de ruimte. Het gedrag van de hond wordt gedurende 3 minuten geregistreerd.

Appendix 2: Questionnaire

Antwoorden worden omcirkeld, meerdere antwoorden per vraag zijn mogelijk en aanvullingen zijn mogelijk op de achterkant van het blad.

1. Algemene vragen

- a. Hoe lang zit de hond al in dit asiel?
- b. Heeft de hond
 - i. Een vaste verzorger
 - ii. Wisselende verzorgers, zo ja hoeveel.....?

2. Problemen samenhangend met verlatingsangst

Wanneer de hond alleen gelaten wordt of **zal worden**, vertoont deze dan:

- a. Trillen
- b. Kwijlen
- c. Rusteloosheid
- d. Janken
- e. Blaffen
- f. Piepen
- g. Kauwen of krabben aan deuren, vloer, tralies
- h. Verminderde eetlust
- i. De hond eet alleen als er iemand bij de kennel staat
- j. Vertoont de hond een overdreven (enthousiaste) begroeting als de verzorger de kennel betreedt

3. Aanhankelijkheids/aandachtsvragend gedrag

Vertoont de hond:

- a. Een sterkte aanhankelijkheid aan één van de verzorgers
- b. Het lopend volgen van een verzorger
- c. Fysiek contact zoeken/maken met de verzorger, bijvoorbeeld pootjes geven
- d. Tegen de verzorger opspringen
- e. Vocalisaties (janken, blaffen, piepen) gericht op de verzorger
- f. Agitatie wanneer de verzorger aandacht geeft aan een ander persoon
- g. Agitatie wanneer de verzorger aandacht geeft aan een andere hond

4. Sloopgedrag

Vertoont de hond sloopgedrag?

- a. Ja, namelijk.....
- b. Nee
- c. Onbekend

5. Zindelijkheid

Is de hond zindelijk:

- a. Geheel not
- b. Alleen in binnenverblijf
- c. Alleen in buitenverblijf
- d. In beide verblijven
- e. Onbekend

6. Corprofagie

Eet de hond ontlasting:

- a. Nooit
- b. Ja, eigen ontlasting

- c. Ja, ontlasting van andere honden
- d. Ja, eigen ontlasting en die van andere honden
- e. Ja, ontlasting van (andere diersoort)
- f. Onbekend

7. Seksuele problemen

Probeert de hond te rijden op:

- a. Personen
- b. Andere honden
- c. Objecten
- d. Onbekend

8. Overmatig vocaliseren

Blaft, jankt, huult, of piept de hond meer dan verwacht mag worden van de gemiddelde asielhond?

- a. Nee
- b. Ja, maar blaft/jankt/huult/piept daarbij altijd mee met andere honden
- c. Ja en blaft daarbij op eigen initiatief
- d. Onbekend