



Separation related behavioural problems in dogs: The role of owner-dog interactions.

Judith Hoogeveen
Student number: 3259161
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Supervisor: Alessia Ortolani

Utrecht University, Dept. Animals in Science and Society
Animal Welfare & Laboratory Animal Science

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Abstract

The aim of this study was to investigate owner-dog interactions in a group of owners with dogs showing separation related behavioural (SRB) problems. We observed a group of 22 owners of dogs with severe separation-related behaviours (SRB), as reported by their owners, and a group of 7 owners of dogs without any overt sign of SRB problems. SRB dogs were selected by using a screening questionnaire via the telephone. The observation took place in a consultation room of the Veterinary Clinic at Utrecht University. Before the observation, all dogs were fitted a non-invasive Polar heart rate monitor. The standardized observation procedure took place in three phases: (1) the table phase, the dog stays on the examination table next to the owner for 5 min, (2) the separation phase, the dog is left alone in the consultation room for 5 min, and (3) the reunion phase, the owner returns to the consultation room and remains there with his/her dog for 5 min. During the entire observation procedure, dogs (and owners) were filmed by three separate cameras. Three saliva samples (home, after table phase, after separation phase) were collected from all dogs to measure salivary cortisol. Right before the observation, dog owners completed a short questionnaire about prevalence of SRB symptoms in their dogs. At home the owners completed a more comprehensive 'Quality of life' questionnaire. Dogs' and owners' behaviours were scored post-observation from videos. The owner's body interactions and owner's vocal interactions directed to the dog during the table phase are the focus of this study. The findings from this study were first compared to those from a previous study (I. Hoogendam, 2012), which used similar methodology, and then data from both studies were combined.

However, in the combined data set no significant differences in any owners' behaviours between the SRB and non-SRB group were found. Significant positive correlations were found in all owners between the following owners' behaviours: owner's 'vocal control' and owner's 'talks to dog', owner's 'vocal control' and owner's 'non-verbal commands', owner's 'comfort talk' and owner's 'talks to dog'. 'Total owner to dog body interaction' behaviours and owner's 'comfort talk', 'total owner to dog body interaction' behaviours and 'total owner to dog vocal interactions'. In the SRB group, a significant negative correlation was found in the owners' behaviours: owner's 'petting' behaviours and owner's 'pushing dog' behaviours. In the non-SRB group, a significant positive correlation was found in the owners' behaviours: owner's 'touching' behaviours and owner's 'comfort talk'. Significant correlations were found in the small questionnaire: the frequencies of 'destroying behaviour' by the dog when left alone and owner's 'petting' behaviours. The frequencies of 'attention seeking behaviour' by the dog when other pets get attention was significantly positively correlated to 'total owner to dog body interaction behaviours' combined.

1. Introduction

Separation of the dog from his owner by actual or virtual absence may induce a 'fear' response in some dogs, commonly referred to as separation related behavioural problems (SRB). SRB is a common behavioural problem in dogs, and is diagnosed in 14-39% of the behavioural consults (Parthasarathy et al., 2006). This behavioural problem is one of the reasons why many owners may relinquish their dog (Parthasarathy et al., 2006). SRB can include destructive behaviour, excessive vocalizations, automutilation, scratching at doors and walls, jumping on doors, vomiting and urinating/defecation (Konok, et al 2011). Less severe forms of SRB are characterized by drooling, pacing and shivering (Parthasarathy et al, 2006).

Some researchers suggest that 'hyper-attachment' to the owner is one of the main causes of SRB problems in dogs. Hyper-attachment means that the dog stays continuously in the vicinity of the owner and remains in physical contact with the owner (Takeuchi et al., 2000; Flannigan and Dodman, 2001). According to Appleby and Pluijmakers (2004), hyper-attached dogs are stressed in absence of the owner and these dogs respond with stress related behaviour when they notice separation signals of the owner. In a study of Flannigan and Dodman (2001), SRB dogs tended 3-5 times more to follow their owner inside the house and showed over-excited greeting (longer than 2 minutes) behaviour when reunited with their owner.

According Parthasarathy et al. (2006), hyper-attachment behaviour is not a relevant discriminating factor for making and SRB diagnosis. Their study shows that 65% of the dogs without SRB also follow their owner from room to room (Parthasarathy et al.,2006). In addition, dogs whose owners report SRB problems, do not show more affection (vicinity, body contact, eye contact) and quick tail wagging to the owner in the reunion stage than dogs without separation anxiety (Konok et al, 2011).

It may be that some owner's behaviours can influence the attachment-behaviours of the dog. However, some authors argued that spoiling activities (feeding from the table, allowing to sleep on the owner's bed) are not more common in hyper-attached dogs (Voith, 1992). Possibly these owner's spoiling behaviours lead not to hyper-attachment of the dog (Flannigan and Dolman, 2001). Furthermore, an association between SRB and spoiling activities was not found (Flannigan and Dolman, 2001; Mc Crave, 1991). Beside these 'spoiling' behaviours of the previous studies it is interesting to look at the differences between the 'vocal interactions' and 'body interaction' behaviours of the owners of the SRB group and the non-SRB group in this study.

In this study, we investigated the interaction between owners and their dogs during a standardized observation performed in a veterinary clinic setting. Owner-dog interactions in owners who reported having dogs with severe SRB problems were compared with a group of owners who reported no signs of SRB problems in their dogs. In particular, the owner's 'body interactions' and 'vocal interactions' directed to their dogs were observed in both groups (SRB dogs and non-SRB dogs) during the *table phase* of the test procedure.

Hypotheses:

The hypothesis of this study is: owners of the SRB group display more comforting vocal and body interaction behaviours than the owners of the non-SRB group. We also expected to see some correlations, which are found in a previous vet study of E.G. ten Hove (2012). These correlations included: a positive correlation between owner's 'vocal control' and owner's 'non-verbal commands', a positive correlation between owner's 'petting' behaviour and 'vocal comfort', a positive correlation between owner's 'vocal comfort' and 'vocal control' and a positive correlation between 'owner to dog directed behaviours' and 'dog to owner directed' behaviours. (E.G. ten Hove, 2012).

2. Materials and methods

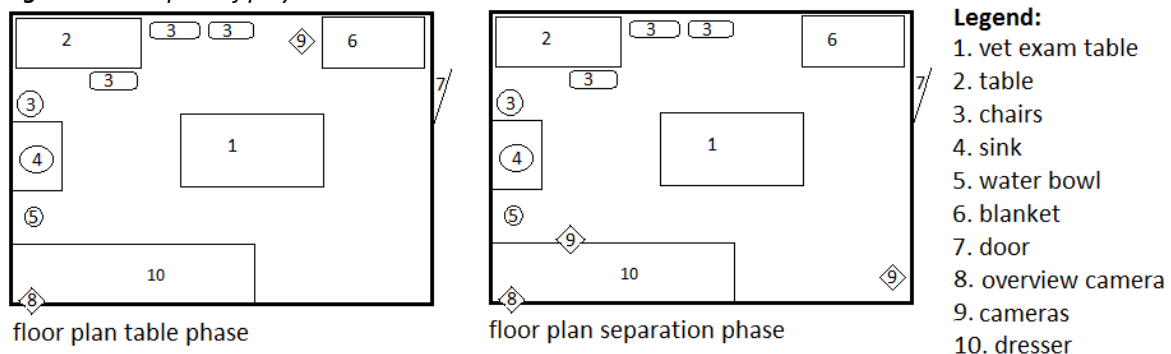
2.1.1 Dogs

In the beginning of the study, owners which contacted us for the SRB-study by telephone or e-mail, had been contacted by telephone. A screening list (appendix I) was used for distinguish which dog should or should not be invited for the test. The first questions were to screen the dogs for the selection criteria. The selection criteria for this study were: a minimal age of 11 months, minimal 3 months in property of this owner, no (severe) sicknesses or medications which influences the study (behavioural therapy for example). The other questions in the screening list were about separation-related behaviours like howling, barking, defecation/urination and not eating/drinking in absence of the owner and over-excitement greeting behaviour, following and attention seeking behaviour when the owner is present. Dogs are selected which were most positive for the indicators of separation anxiety, indicated a higher possibility that the dog had trouble being left alone. From the 52 completed questionnaires, a selection of 22 dogs was made. Beside these SRB dogs, 8 dogs are selected for the control group. These non-SRB dogs meet the requirements of the selection criteria, but do not show signs of SRB in absence of the owner. After the selection was made, we have made an appointment for the test.

2.1.2 Test procedures

Twice a week, two owners with their dogs were invited to participate in the research at the Utrecht University Animal Behaviour Clinic. We tests take always place in the afternoon at approximately the same time, the first test around two pm and the second test around three pm. Two poly rooms are used, poly room 13 for introduction and acclimatization, poly room 15 for the test procedure (figure 1). The test procedure was performed by standardized procedures and according the protocol of the study of I. Hoogendam (2012). The test consists of 3 phases: the table phase, separation phase and reunion phase. Each phase lasted 5 minutes. The whole test procedure is described below. Between the two tests, the rooms are ventilated. By doing this, any possible disturbances, like pheromones and odours, are minimalized. Control dogs are always tested first, to make sure that there are no influences from the SRB dogs.

Figure 1: Floor plan of poly room 15



On the test day, the owners obtain a saliva sample of their dog according to clear written instructions (appendix II). By arrival at the clinic, the owner(s) and dog are picked up by one researcher in the general waiting room and are welcomed to poly room 13. The dogs were able to explore the room and the owner are given a clear explanation of the test and were asked permission to perform the test. The materials used for the *Polar® heart rate monitor* were showed to the dogs. Then, the researcher left the room and the 5 minutes acclimatisation time started. During this period, the owner answered a questionnaire (appendix III). This questionnaire is about the owner's experience with the separation-related behaviour of their dog.

When the 5 minutes are completed, the owner with the dog were entering poly room 15 (possible other owners stay in poly room 13). Here, the dog was taking on the veterinary examination table

and the researchers fitted the *Polar® heart rate monitor* on the chest of the dog. After this, the owner and dog are left alone with one researcher and from this moment, the table phase started. The owner was standing nearby his dog and was free to interact with the dog. The researcher filmed the dog and talked to the owner, to make an attempt to unbend the owner. In connection with possible disturbances of the polar or with analysing the videos, the dogs were not allowed to lay down or jumping of the table.

After the 5 minutes table phase, the other researcher entered the room and the dog was taken of the examination table and was free to move in the poly room. 5 minutes after the end of the table phase a saliva sample was taken. Then, the researchers left the room and the owner gets 10 seconds to say goodbye to the dog. When the owner left the room and when the door is closed and locked, the 5 minutes during separation phase starts. In this phase, the dog was filmed by 3 cameras; an overview camera and two cameras for 2 different spots (the door and the chairs).

After that, the owner entered the room and the reunion phase started. In this phase, the owner was free to interact with the dog. 5 minutes later, the researchers and possible other owners going to poly room 15. 10 minutes from the start of the separation phase, the second saliva sample was taking. After this last sample, the test is finished. The temperature of the room was measured before the table phase starts and on the end of the test when the second saliva monster was taken.

2.1.3 Data collection:

For recording the inter-beat intervals in the dogs, a Polar RS800CX training computer with a polar WearLink® W.I.N.D. transmitter was used. The dog's and owner's behaviour were filmed using two Sony digital HD video cameras and one fitted overview video camera. The time clocks of the Polar and the time clock of the cameras were synchronised before the start of the observation. This was done for comparison between heart rate and the behavioural data. The saliva samples were taken by the owners with a braided 'cotton rope' (Part no 5016.00, Salimetrics®). The ropes were put into a 'Swab Storage Tube' (Part no. 5001.05, Salimetrics®).

2.2. Data analyses:

2.2.1. Behaviour analysis:

The videos of the table phase are analysed for 5 categories; the dog's mouth behaviour, the dog's head behaviour, the dog's tail behaviour, the owner body interaction and the owner vocal interaction. The behaviour of the dog were scored according the ethograms of the study of E.G. ten Hove (2012)(appendix IV), with an modification for the smacking behaviour. In E.G. ten Hove's (2012) study, the smacking behaviour was not scored 2 seconds before or after other mouth behaviours. In our study, smacking behaviour is always scored. The behaviour of the owner were also scored according the ethograms of the study of E.G. ten Hove (2012) (appendix IV).

The researchers are trained with the dogs of I. Hoogendam's (2012) study to become a trained researcher. Each category was trained separately and when the inter reliability of > 85% was reached for a category, the researcher was qualified to score that category in the dogs (appendix V). After all the videos are analysed, the intra reliability was done and a reliability of > 90% was achieved for each category (appendix VI). The data were corrected for the 'out of sight' time and the proportions for frequencies and durations were made for all of the dog's and owner's behaviours.

2.2.2 Cortisol analysis:

On the end of the test days, the saliva samples are weighted and centrifuged at 3000 rpm for 15 minutes. The samples are stored frozen at -20°C. Samples taken by the owner at home, which weigh less than 50mg were taking once more one week later by the owner. When all the tests were finished, the cortisol in the saliva was measured with high-sensitive enzyme immunoassay kits according to the protocol of the manufacturer (Salimetrics, State College, PA). The ELISAs used 25 µl

of saliva for singlet determinations, most of the samples are done in duplo. Samples less than 50 µl are diluted with 'Assay Diluent' (Part no 8005, Salimetrics®) to get 50 µl. Samples less than 10 µl saliva are diluted with 'Assay Diluent' (Part no 8005, Salimetrics®) to get 25 µl and were done simple (only 2 samples). Of the 87 saliva samples, 7 samples were excluded because of a too low amount of saliva. Therefore, one dog (Bowie) was excluded for the cortisol measurement, because this dog had too low saliva for the 3 samples. (appendix VII)

2.2.3. Heart rate:

Data collected from the Polar were used to calculate the mean heart rate (bpm) and the RR-interval (the interval between two following R-waves in an electrocardiogram). The root mean square of successive differences (RMSSD) was calculated for the table phase. The RMSSD is a measure used to estimate the high frequency beat-to-beat variations that represents vagal regulatory activity (von Borell, 2007).

2.2.4. Statistical analysis:

All the data; behavioural data, heart rate and cortisol, were statistically analysed using SPSS (version 20). The data of the table phase was differentiated in the SRB group, the non-SRB group and all dogs together. The parameters of the owner's behaviour were visualized using descriptive statistics (histograms, box plots, etc.). The data were analysed using inferential statistics. Non-parametric statistical tests (the data was not normally distributed) were used and Mann-Whitney U tests were used for comparisons between SRB and non-SRB group. Correlations between all the data were done using Spearman's Rho correlation tests.

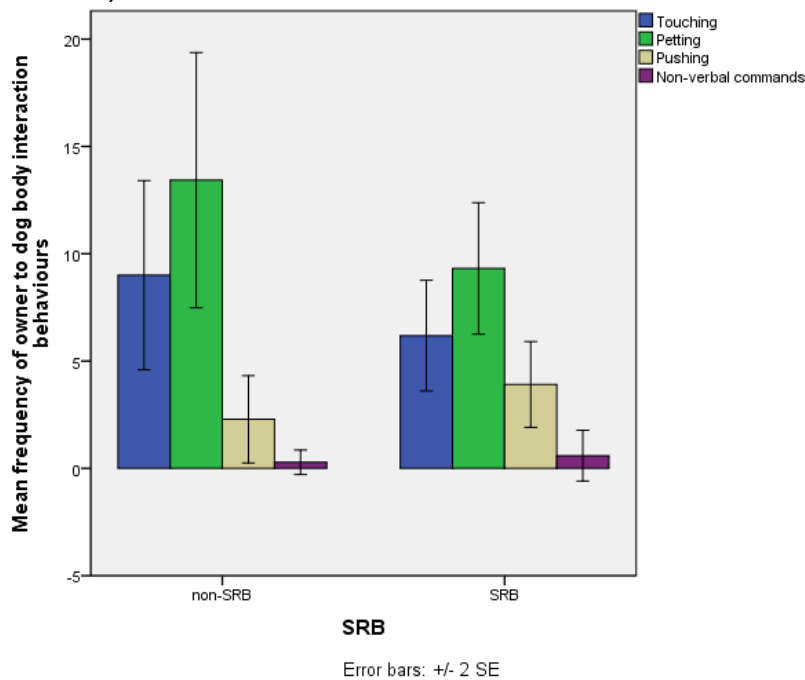
Results

1. Owner behaviour directed to the dog: table phase

Figure 2a shows the owner behaviour (frequencies) directed to the dog's body displayed by owners of SRB and non-SRB dogs during the 5 minutes table phase of our study; figure 2b shows the owners body interaction behaviours of I. Hoogendam's (2012) study. No significant differences between SRB and nonSRB dog owners were found in our study, or in I. Hoogendam's study or in both studies combined.

Figure 2: Owner 's behaviours directed to the dog's body in owners of SRB and non-SRB dogs displayed during the 5 minutes table phase

a. this study



b. I. Hoogendam's (2012) study:

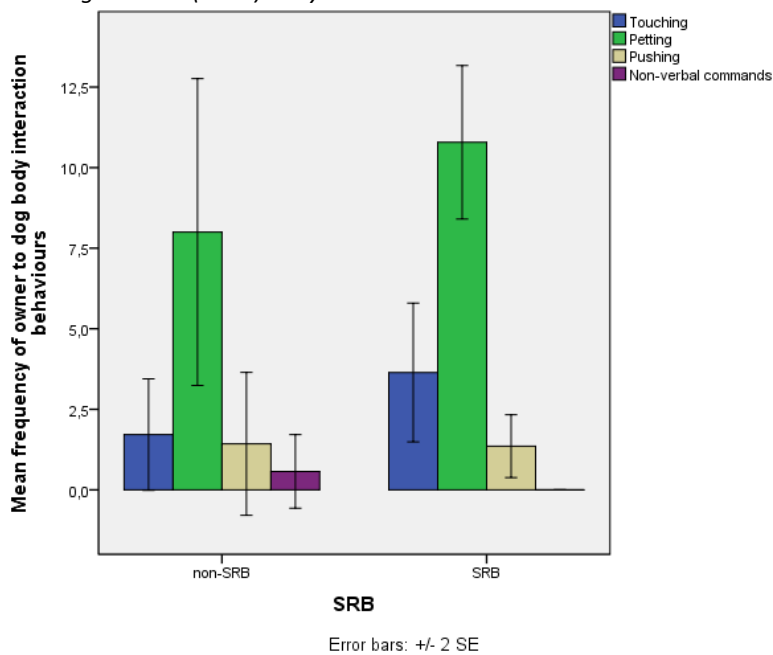
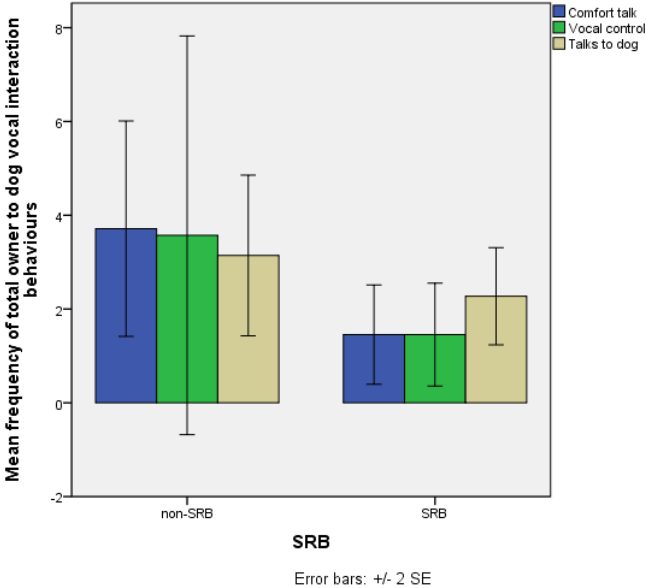


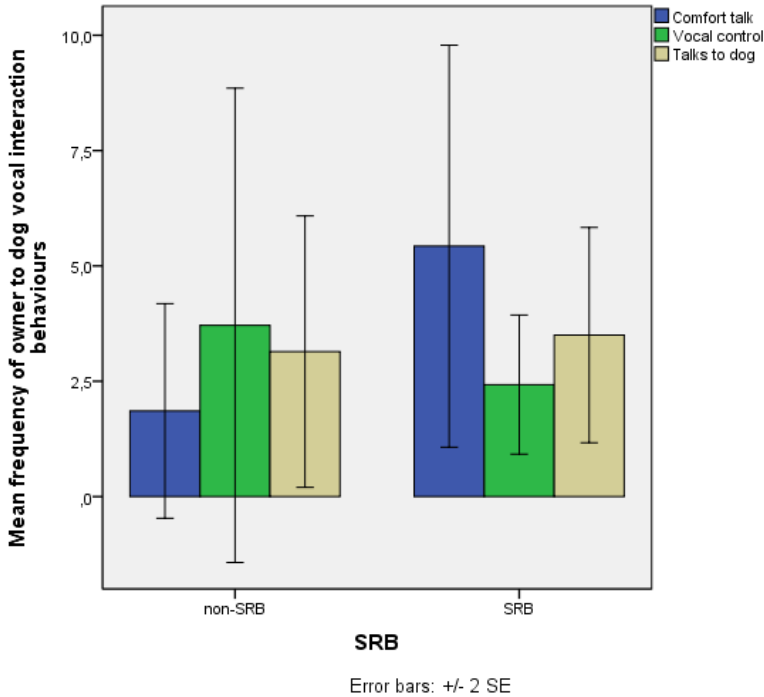
Figure 3 shows the owner vocal interaction (frequencies) directed at the dog by owners of SRB and non-SRB dogs during the 5 minutes table phase of our study. Figure 2b shows the owner’s vocal behaviour of I. Hoogendam’s study. In our study, only one significant difference between the owners of the SRB and non-SRB group was found. Significant more ‘comfort talk’ was displayed by owners of non-SRB dogs (Mann-Withney U test: $U=38.500$, $n=29$, $p=0.048$). But this result was not significant when data from both studies were combined. In fact, the trend was reversed in I.Hoogendam’s study, but not significant.

Figure 3: Vocal interaction directed at the dog by owners of SRB and non-SRB dogs displayed during the 5 minutes table phase

a. this study:



b. I. Hoogendam’s (2012) study:



The 'total owner to dog body interaction' behaviours combined ('touching', 'petting', 'pushing dog', 'examining dog' and 'non-verbal commands' behaviours) are positively correlated to 'comfort talk' (Spearman's Rho: $r_s = 0.414$, $n = 52$, $p = 0.002$) (figure 7), 'total owner to dog body interaction' behaviours are also positively correlated to 'total owner to dog vocal interactions' combined ('comfort talk', 'vocal control' and 'talks to dog') (Spearman's Rho: $r_s = 0.440$, $n = 29$, $p = 0.017$) (figure 8).

Figure 7: 'total owner to dog body interaction' behaviours versus 'comfort talk' displayed by the owners

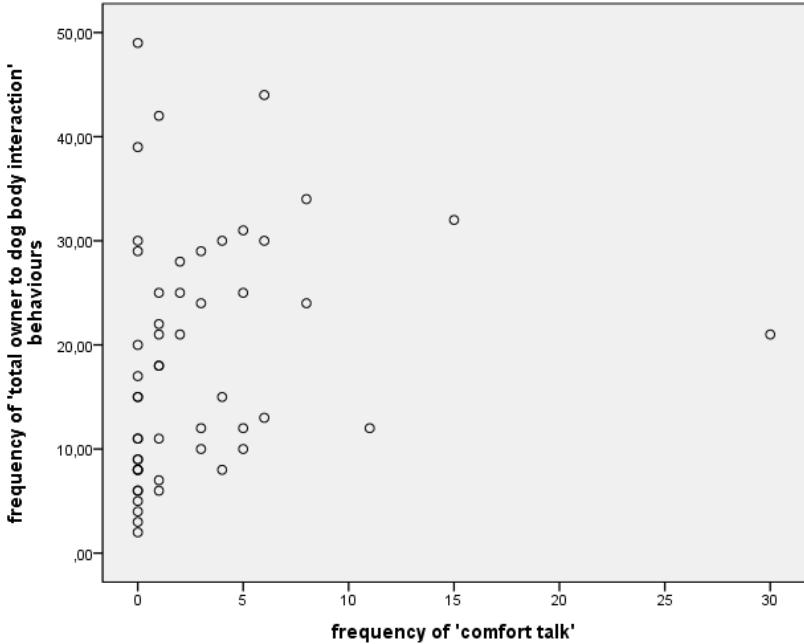
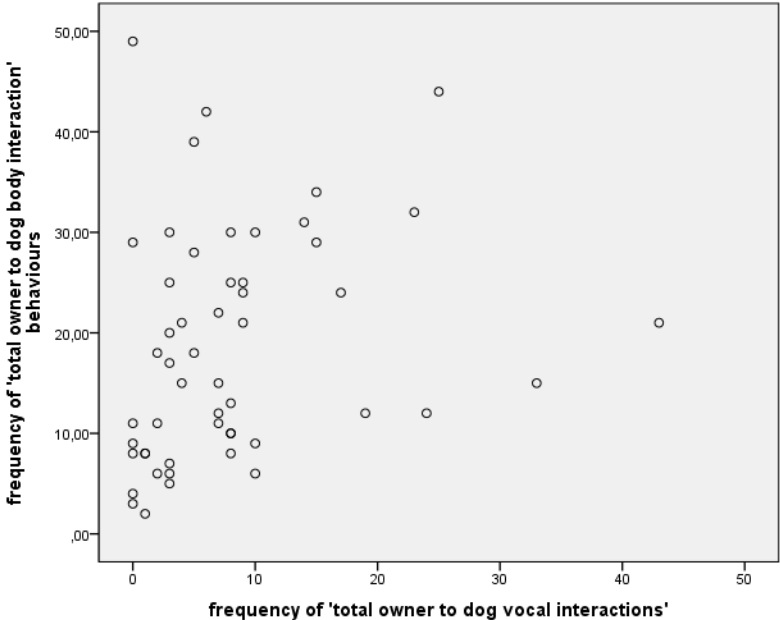
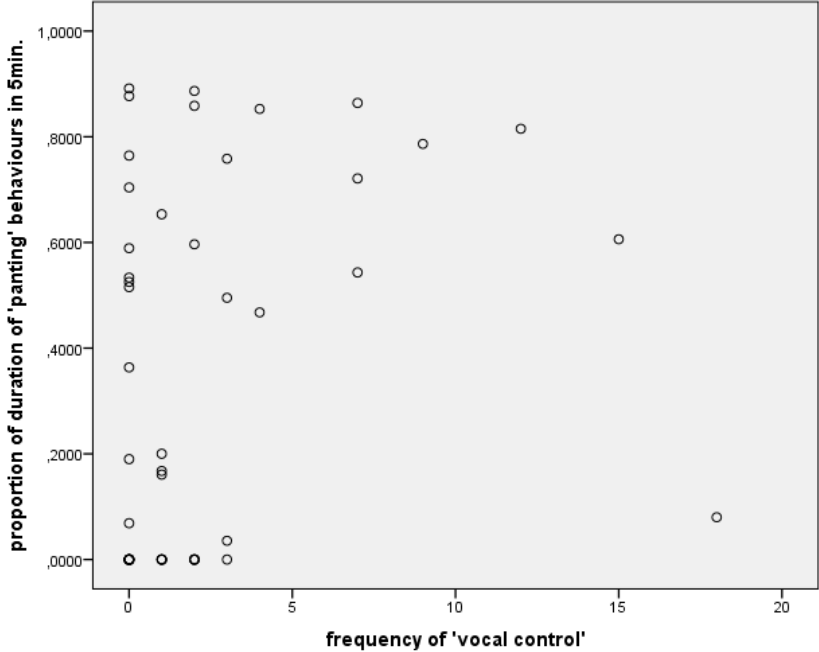


Figure 8: 'total owner to dog body interaction' behaviours versus 'total owner to dog vocal interactions'



An interesting trend was seen in the correlation with 'panting behaviour': 'Panting' and 'vocal control' are positively correlated (Spearman's Rho: $r_s = 0,313$, $n = 50$, $p = 0.027$) (figure 9). However, this correlation was not significant after Bonferroni correction

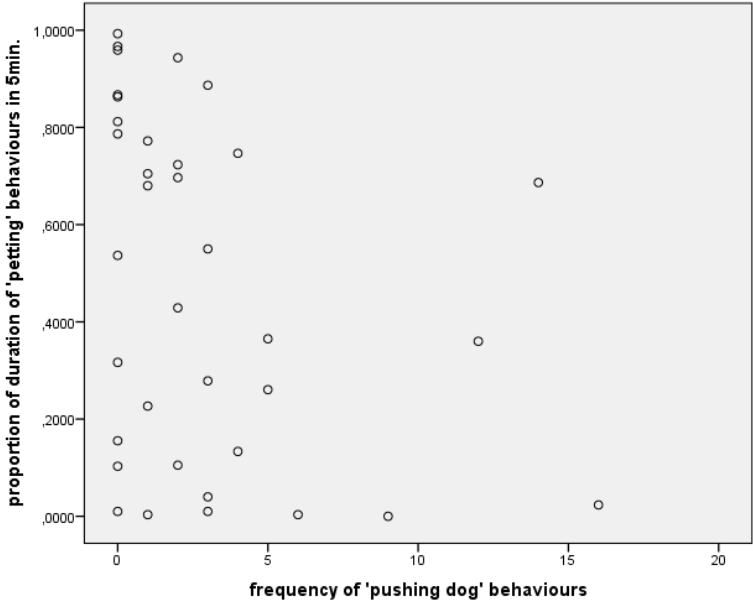
Figure 9: 'Panting' behaviours displayed by the dogs versus 'vocal control' displayed by the owners



SRB-dogs:

When we look only at the dogs of the SRB-group, the owner's behaviours 'petting' and 'pushing dog' are significantly negatively correlated (Spearman's Rho: $r_s = -0.400$, $n = 36$, $p = 0.016$) (figure 10).

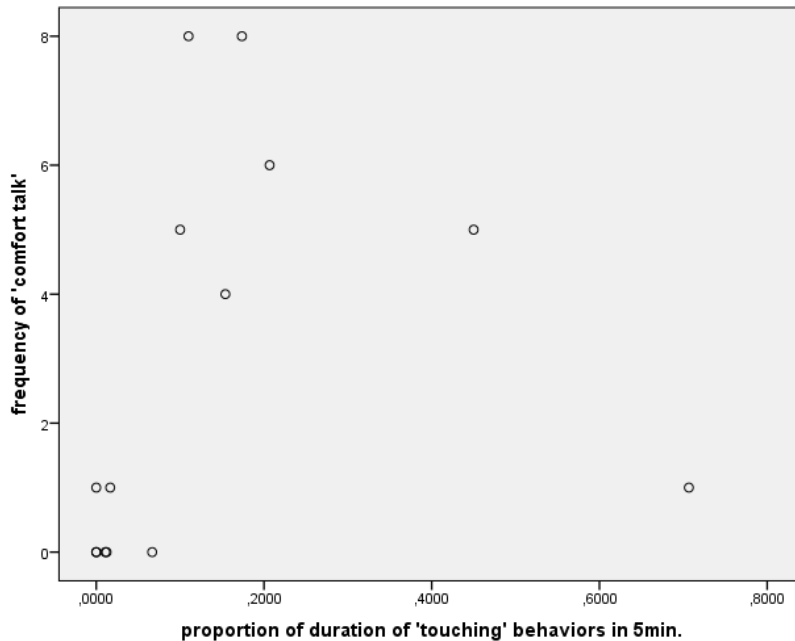
Figure 10: 'petting' behaviours versus 'pushing dog' behaviours displayed by the owners of the SRB-group



Non-SRB dogs:

In the non-SRB-group, the owner's behaviours 'touching' and 'comfort talk' are significantly positively correlated (Spearman's Rho: $r_s = 0.687$, $n = 14$, $p = 0.007$) (figure 11).

Figure 11: 'comfort talk' versus 'touching' behaviours displayed by the owners of the non-SRB-group



3. Owner's questionnaire answers and owner's behaviours displayed to the dog

The occurrence of 'destroying behaviour' by the dog when left alone, reported by the owner on a 5 point Likert scale (1 = Never to 5 = Always), and 'petting' behaviours are significantly positively correlated (Spearman's Rho: $r_s = 0.419$, $n=29$, $sig=0.024$) (figure 12). The occurrence of 'attention seeking behaviour' by the dog when other pets get attention, reported by the owner on a 5 point Likert scale (1 = Never to 5 = Always), was significantly positively correlated to 'total owner to dog body interaction behaviours' combined ('petting', 'touching' behaviours) (Spearman's Rho duration: $r_s = 0.472$, $n = 28$, $sig = 0.011$) (figure 13).

Figure 12: 'destroying' behaviors by the dog when left alone versus 'total owner to dog vocal interaction' displayed by the owners

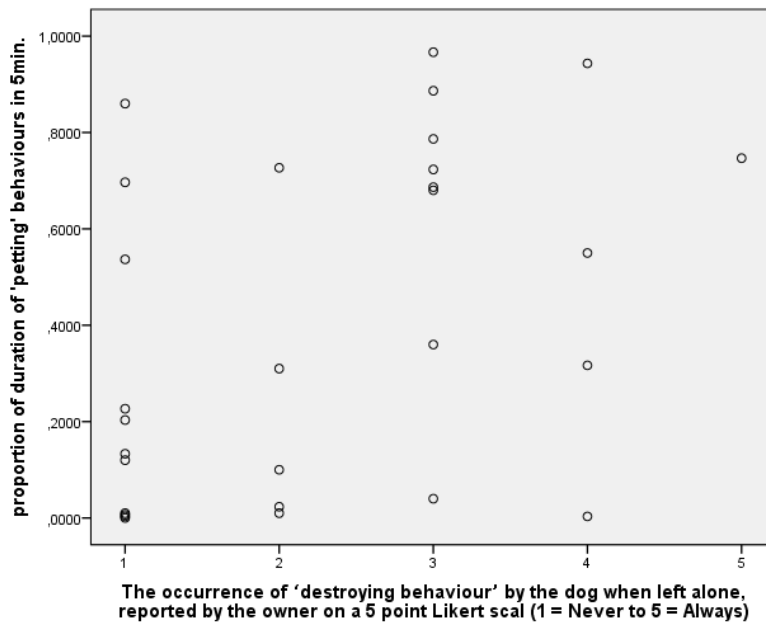
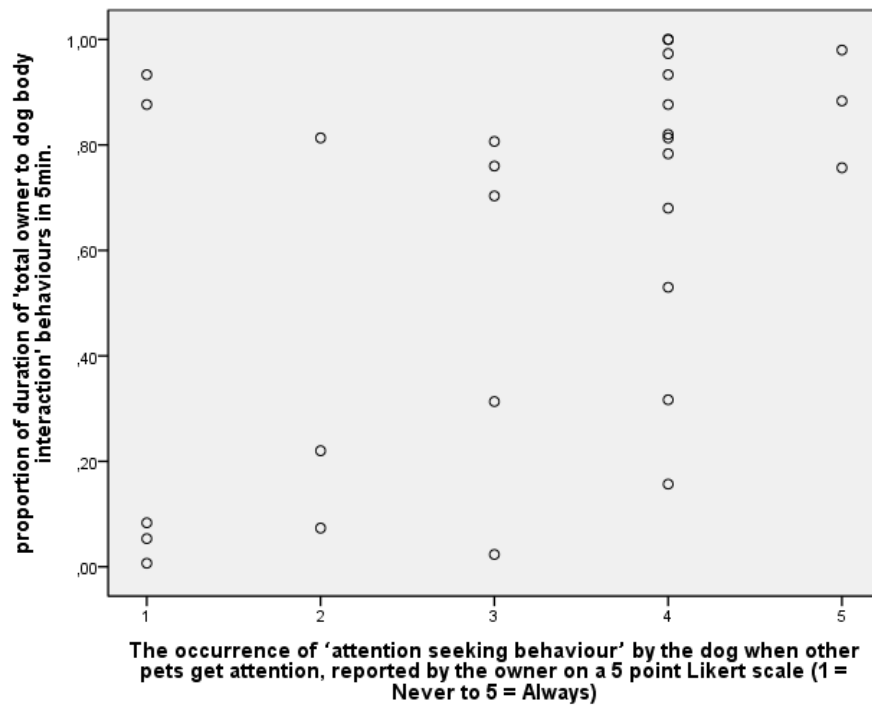
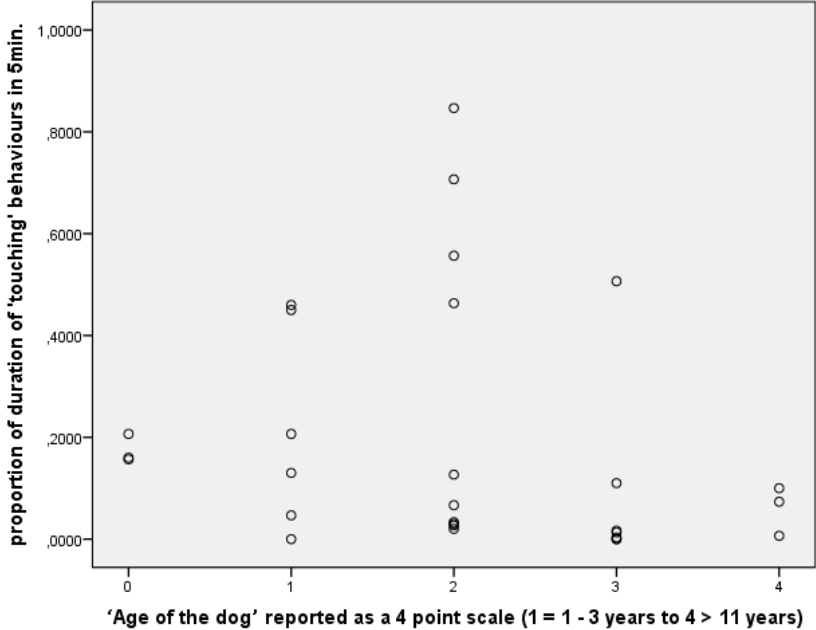


Figure 13: 'attention seeking' behaviour by the dog when other pets get attention versus 'total owner to dog vocal interactions'



No significant correlations were found when we looked at the following variables from the Quality of life questionnaire: age owner, sex owner, number of owners, experience with dogs, previous owners, age dog, breed dog and the owner physical interactions (touching, petting) and vocal interactions (comfort talk, control, talks to the dog). An interesting trend was seen when we looked at the 'age of the dog' and 'touching' behaviour. 'Touching' behaviour, see appendix for definition, of the owner is negatively correlated with 'Age of the dog' reported as a 4 point scale (1 = 1 - 3 years to 4 > 11 years). However, this is not significant. (Spearman's rho: $r_s = -0.336$, $n = 26$, $p = 0.093$)(figure 14).

Figure 13: 'touching' behaviours displayed by the owner versus 'age of the dog'



4. Discussion

4.1. Owner directed behaviours

It is interesting to look at the differences between the 'vocal interactions' and 'body interaction' behaviours of the owners of the SRB group and the non-SRB group in this study. We expected to see more 'vocal interactions' and 'body interaction' behaviours of the owner directed to the dog in the SRB group. However, the results of this study show significant more 'comfort talk' by the owners of the non-SRB group. This significant difference is a point of discussion since it was not significant when the data are combined with the previous study of I. Hoogendam (2012). I. Hoogendam's (2012) study showed a different outcome of this parameter and in fact, the trend was reversed (not significant). The significant difference may be a result of sample size in this study.

4.2. Correlations

All dogs:

Some correlations found in this study are in line with the results of a previous analysis of E.G. Ten Hove (2012) in the study by Ortolani et al. (2012). In this previous study 'vocal control' and 'non-verbal commands' were significantly positively correlated. This positive correlation was also significant in this study, so owners who gave more 'vocal control' often used more non-verbal commands. This suggests a 'controlling interaction style' by these owners.

Significant correlations between 'petting' and 'comfort talk' and 'comfort talk and 'vocal control' in E.G. Ten Hove's (2012) study were not found in this study. Beside these correlations within the 'owner behaviours', E.G. Ten Hove's (2012) found a significant positive correlation between 'owner to dog-directed' behaviours and 'dog to owner-directed' behaviours. However, in this study 'dog to owner-directed' behaviours combined (dog's head to body/face of the owner, licking/sniffing owner) were not significantly correlated to 'owner to dog-directed' behaviours (petting, touching, comfort talk etc.). This suggests that dogs who display more 'dog to owner-directed behaviours' dogs do not receive more physical or vocal attention by their owners.

A significant positive correlation between 'comfort talk' and 'talks to dog' was seen in this study. Furthermore, 'comfort talk' is also positively significantly correlated to 'total owner body interaction' behaviours. So owners who displayed more 'comfort talk' often displayed more of both 'talks to dog' and 'body interaction' behaviours and this can be a 'comforting interaction style' of these owners. These owners could be attempting to relax or support their dogs.

The positive significant correlation between 'total owner to body interaction' behaviours and 'total owner to dog vocal interactions' suggests that owners who displayed more 'body interaction' behaviours often displayed more 'vocal interactions'. This might be due to the appearance of two owner interaction styles: owners who hardly display any interactions directed to the dog and owners who display both 'vocal' and 'body interaction' behaviours. However, the percentages of low frequencies of both vocal and body interactions is 14% and for high frequencies of both vocal and body interactions is also 14%, so it seems to be more a gradual scale of both behaviours instead of an all or none phenomenon.

'Panting' is one of the behavioural responses which have been reported to occur during acute stress (Beerda 1997). 'Panting' behaviour shows an interesting trend in this study. It seems that the 'panting dogs' get more 'vocal control' compared to 'non-panting dogs'. The origin of this (marginally-significant) correlated behaviours can be explained in two different ways. (1) The owner's 'vocal controlling' behaviours might be a response of the 'panting' behaviour of the dog or (2) the 'controlling' behaviours might have induced stress in the dogs which is reflected in 'panting'

behaviour of the dog. So it is interesting for future analysis to look at the sequential analysis to explain the origin of these behaviours.

SRB group:

In the SRB group the owner's behaviours 'petting' and 'pushing dog' are negatively correlated. It seems to be that owners who display more petting behaviours display less pushing behaviours. However, previous studies do not found these correlation.

Non-SRB group:

In the non-SRB group the owner's behaviours 'touching' and 'comfort talk' are positively correlated and this could be explained because both behaviours appear to be comforting behaviours with the possible intent of supporting or attempting to relax the dog.

4.3. Owner's questionnaire answers

We expected significant positive correlations between the separation-related behaviours according the questionnaire answers and the comforting behaviours since we expected that SRB-owners display more comforting vocal and body interaction behaviours to their dog. Two correlations were found. The occurrence of 'destroying behaviour' by the dog when left alone, as reported by the owner in the questionnaire, and 'petting' behaviour shown by the owner during the observation on the table phase are positively correlated and the 'attention seeking behaviour' by the dog when other pets get attention and 'total owner to dog body interaction behaviours' combined are positively correlated. It seems to be that owners of dogs with more severe SRB according the questionnaire answers display more 'petting' and more 'total owner to dog body interaction' behaviours in the table phase. However, in a previous study of A. Soppe (2012), the SRB owners pet their dogs less in the separation phase. This suggests that owners may behave differently on the table and after separation. For this reason future analysis of the separation phase is necessary to compare the results of the table phase with the separation phase.

Studies about separation anxiety describe some associations between features like age and sex of dog and owner, owner's experiences with dogs, any previous owners of the dog, number of owners of the dog etcetera. Y. Takeuchi et. al.(2000) found that male dogs had a higher probability of elevated levels of SRB than females and E.A. Mc Crave (1991) found that SA-dogs are likely to be of mixed breed. G. Flannigan et. al. (2001) found that SA was significantly associated with dogs which live in homes with only 1 adult and J. Serpel (1996) found a statistically significant association of SA with previous dog ownership. Therefore, correlations between these variables from the 'Quality of live' questionnaire and the owner's behaviour are interesting. However, no significant correlations were found. An interesting trend was seen when we look at the 'age of the dog' and 'touching' behaviour. 'Touching' behaviour of the owner is (non-significantly) negatively correlated with 'Age of the dog' reported as a 4 scale point (1 = 1 - 3 years to 4 > 11 years). The older dogs of the study were less touched than the younger dogs. This difference may be explained by a difference in behaviours compared to younger dogs. However, we didn't look for correlations between the age of the dog and the behaviour of the dog, so this should be looked at in future study.

5. Conclusion

No significant differences in owner's behaviours between the SRB and non-SRB group were found. It seems to be that the behaviour of the owner during the 'table phase' of this study is not predictable for the separation related behaviours, as reported by their owners. Further research can be done for analysing the separation phase to reclassify SRB dogs on the basis of their responses instead of the report of the owner.

Some correlations between owner's 'vocal interactions' and body interaction' behaviours were found. Which are;

- Non-verbal commands are significantly positively correlated to vocal control
- Total owner to body interactions are significantly positively correlated to both comfort talk
- Total owner to body interactions are significantly positively correlated to total owner to dog vocal interactions.

Some of these significant positive correlations suggest that owner's behaviours consist of a controlling interaction style and a comforting interaction style.

The 'dog to owner-directed' behaviours combined (dog's head to body/face of the owner, licking/sniffing owner) were not significantly correlated to 'owner to dog-directed' behaviours. This suggests that dogs who display more 'dog to owner-directed behaviours' do not receive more physical or vocal interactions of their owners.

Correlations were found between some owner's questionnaire answers and owner's behaviours displayed to the dog. Which are:

- The occurrence of 'destroying behaviour' by the dog when left alone, reported by the owner on a 5 point Likert scale (1 = Never to 5 = Always) is significantly correlated to 'petting' behaviours
- The occurrence of 'attention seeking behaviour' by the dog when other pets get attention, reported by the owner on a 5 point Likert scale (1 = Never to 5 = Always), was significantly positively correlated to 'total owner to dog body interaction behaviours' combined ('petting', 'touching' behaviours)

No correlations were found between age owner, sex owner, number of owners, experience with dogs, previous owners, age dog, breed dog from the Quality of life questionnaire combined with owner's behaviours.

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7. Appendix

7.1. Appendix I

Checklist eigenaren met honden

Naam Tel
Naam hond Ras
Geslacht teef reu E-mailadres:

Vertellen aan eigenaren dat ze brief met speekselmonstername krijgen

Adres

Straat: huisnr:
Postcode Woonplaats

1. Ouder dan een jaar? Ja Nee
2. Gezond? Ja Nee

Zo nee, wat zijn de klachten?

3. Medicijnen? Ja Nee

Indien ja, wat voor medicijnen?

4. Waarom denkt u dat uw hond verlatingsangst heeft? Wat doet hij/zij dan precies?

.....
.....

- Blaffen/huilen/piepen Ja Nee
- Buren klagen Ja Nee
- Vernielzucht Ja Nee
- Poepen en plassen in huis Ja Nee
- Hyperactief Ja Nee
- Eten snel opeten als eigenaar thuiskomt Ja Nee
- Volgen door het huis Ja Nee
- Aandacht vragen Ja Nee
- Uitbundig begroeten (ook bij 5min weg?) Ja Nee

5. Wordt uw hond of is uw hond pas geleden behandeld door een gedragstherapeut voor 'verlatingsangst'?

Ja Nee

Hoe lang? medicijnen?

6. Heeft u hond andere gedragsproblemen, bijvoorbeeld 'agressie' of andere 'angstproblemen'?

Ja Nee

7. Is uw hond ooit agressief geweest tegen een dierenarts?

Nooit Zelden Soms Vaak Altijd

8. Welke dagen en tijden bent u beschikbaar om naar de faculteit Diergeneeskunde in Utrecht te komen voor ons onderzoek?

Ma, di, do en vrij tussen 14.00 en 17.00u.
In weekend: bij uitzondering.
Di en do = gedragskliniek in Poli

Notes: Comments on person

9. Heeft u nog vragen?

.....
.....

Informatie

De Faculteit Diergeneeskunde, Departement Dier in Wetenschap en Maatschappij, van de Universiteit Utrecht doet onderzoek naar het welzijn van honden in Nederland. Gedragsproblemen die optreden bij honden met verlatingsangst zijn wijdverspreid in de Nederlandse hondenpopulatie en kunnen een belangrijk welzijnsprobleem zijn voor deze honden.

Doel

Het doel van dit onderzoek is om de gedrags- en fysiologische kenmerken (i.e. hartslag en cortisol) van honden met verlatingsangst te meten in een gestandaardiseerde omgeving, zoals in een dierenartsenpraktijk. Onze bevindingen kunnen zowel een bijdrage leveren voor het beoordelen van het welzijn in honden als voor het diagnosticeren van verlatingsangst in honden.

Wij zoeken:

1. Lichamelijk gezonde honden die ouder zijn dan 11 maanden;
2. Honden die ernstige kenmerken van verlatingsangst laten zien. Dit zijn gedragingen die de hond alleen vertoont wanneer hij/zij alleen wordt gelaten:
 - a. frequent en intensief blaffen, huilen en/of piepen. Buren kunnen hierover klagen;
 - b. het huis van de eigenaren slopen (bijv. bankkussens aan stukken scheuren);
 - c. hyperactief zijn: de hond gaat bijvoorbeeld krabben aan deuren en ramen en rusteloos rondlopen;
 - d. in huis plassen en poepen;
3. Honden die niet op medicatie staan voor verlatingsangst.

Wat gaat er gebeuren?

- Indien uw hond geschikt is voor het onderzoek, zal u worden uitgenodigd om naar de Universiteitskliniek voor Gezelschapsdieren te komen;
- Tijdens het onderzoek zal uw hond gefilmd worden en de hartslag van uw hond zal met een non-invasieve Polar® hartslagmeter worden gemeten.
- Aan het einde van het onderzoek wordt er wat speeksel van uw hond afgenomen voor cortisol bepaling.
- Het hele onderzoek zal ongeveer 45 minuten in beslag nemen.

Wij bieden:

- Gratis een gedrags- en fysiologisch onderzoek van uw hond.
- De eigenaar kan het onderzoeksrapport na onze analyse kosteloos toegestuurd krijgen.
- De onderzoeksresultaten kunnen de eigenaren een beter beeld geven over het aanpassingsvermogen van hun honden en hoe welzijnsbelemmerend de verlatingsangst voor hun honden is

7.2. Appendix II

Hoe verzamelt u speeksel bij uw hond?

Lees voor te beginnen de instructies helemaal door. Zie ook de achterzijde voor de instructies met illustraties.

Benodigdheden:

- Schaar
- Pen of stift
- Bijgeleverde envelop met inhoud

In de bijgeleverde envelop zitten:

- 2 handschoenen
- 1 touw
- 1 testbuis (testbuis bestaat uit 2 delen; een binnenste en buitenste buis. Deze buizen graag in elkaar laten zitten)
- 1 etiket

Voordat u gaat beginnen, laat uw hond wat lekkers ruiken, bv. hondenvoer of hondenkoekje (hij/zij mag dat niet opeten of eraan likken), zodat de speekselproductie op gang komt.

De touwen graag te allen tijde met de bijgeleverde handschoenen vastpakken

1. Trek de bijgeleverde handschoenen aan
2. Open het zakje en pak 1 van de 2 touwen aan een van de uiteindes vast.
3. Stop circa 5 cm van het andere uiteinde van het touw in de bek van uw hond

Let op: *Als uw hond op het touw gaat sabbelen/kauwen is dit prima. Als uw hond het touw wil uitspugen, houdt de snuit dan voorzichtig, maar wel stevig dicht.*

4. Houdt het touw 60 seconden in de bek van de hond. Tel hardop mee. Als de hond het touw uitspuugt, stop met tellen en stop het touw terug in de bek. Tel dan verder waar u bent gebleven. Om het speeksel op gang te krijgen, kunt u voer of een snoepje laten ruiken, niet eten.

5. Stop na de 60 seconden het deel van het touw dat in de bek van de hond heeft gezeten in het bovenste deel van de testbuis en knip het andere uiteinde van het touw af met een schaar.

6. Zorg ervoor dat u een schone schaar gebruikt. Maak de schaar eventueel schoon met water en zeep.

Let op: *Het buisje bestaat uit twee delen; een binnenste en een buitenste buis. Wanneer het touw in de buis wordt gestopt, moeten de twee buisjes in elkaar blijven zitten. Om de buisjes in elkaar te laten zitten, houdt u het buisje net onder het dopje vast, zodat de twee buizen in elkaar geklemd blijven. Haal het dopje hierna met een draaibeweging van het buisje af.*

7. Sluit de testbuis met het dopje

8. De handschoenen mogen nu uit

9. Schrijf de datum, naam van de hond en tijdstip afname met pen of stift op het etiket en plak op de testbuis (bv: naam hond, dag/maand/jaar, tijd h:mm)

10. Neem de testbuis mee naar de Faculteit Diergeneeskunde

Nadat de test is uitgevoerd mogen de handschoenen weggegooid worden. Het reserve touw gelieve mee terugnemen naar de Faculteit Diergeneeskunde.



Stap 1
Trek handschoenen aan



Stap 2
Pak het touw aan een van de uiteindes vast



60 sec

Stap 3 + 4
Stop circa 5 cm van een van de uiteindes van het touw in de bek van de hond en houd het touw 60 sec in de bek



Stap 5
Stop na de 60 sec het deel van het touw dat in de bek van de hond heeft gezeten in de testbuis



Stap 6
Knip het uiteinde van het touw af



Stap 7
Sluit de testbuis met het dopje



Stap 8
Schrijf de datum en de naam van de hond op het bijgeleverde etiket en plak het op de testbuis



Stap 9
Neem de testbuis mee naar de Faculteit Diergeneeskunde

7.3. Appendix III

AANVULLENDE VRAGENLIJST over uw hond.

Uw naam Naam hond

Tel E-mail

Ras Geslacht teef reu

Gecastreerd/gesteriliseerd Ja Nee Geboortedatum hond Onbekend

10. Laat u uw hond wel eens alleen thuis? Ja Nee

11. Hoe lang laat u gemiddeld uw hond alleen thuis per keer?

.....

12. Waar is uw hond als u hem/haar alleen thuis laat?

Binnen Buiten Anders,

Indien 'binnen', kunt u aangeven waar uw hond zich bevindt?

Los rondlopend In een afgesloten ruimte, In een afgesloten bench

In een kennel Anders,

13. Volgt uw hond u door het huis wanneer u op het punt staat weg te gaan?

Onbekend Nooit Zelden Soms Vaak Altijd

14. Valt u nog andere zaken op aan het gedrag van uw hond als u weggaat?

.....

15. Blaft, piept en/of huilt uw hond als hij/zij alleen thuis is?

Onbekend Nooit Zelden Soms Vaak Altijd

Hoe weet u dat?

16. Klagen uw burens over het geluid dat uw hond maakt als u hem/haar alleen thuis laat?

Onbekend Nooit Zelden Soms Vaak Altijd

17. Vernielt uw hond in uw huis als hij/zij alleen thuis is?

Onbekend Nooit Zelden Soms Vaak Altijd

18. Is uw hond hyperactief als hij/zij alleen thuis is? (krabben aan deuren en ramen, rusteloos rondlopen, hijgen)

Onbekend Nooit Zelden Soms Vaak Altijd

Hoe weet u dat?

19. Poept of plast uw hond in het huis als hij/zij alleen thuis wordt gelaten?

Onbekend Nooit Zelden Soms Vaak Altijd

20. Is uw hond moe/uitgeput wanneer u thuiskomt (na de begroeting)?

Onbekend Nooit Zelden Soms Vaak Altijd

21. Hoe begroet u de hond wanneer u thuiskomt?

Helemaal niet uitbundig 1 2 3 4 5 Heel erg uitbundig
 Onbekend

22. Hoe begroet de hond u wanneer u thuiskomt?

Helemaal niet uitbundig 1 2 3 4 5 Heel erg uitbundig
 Onbekend

23. Begroet de hond u ook zo als u maar heel even weg bent gegaan? (bijv. 5 min)

Onbekend Ja Nee Anders,

24. Eet uw hond wanneer hij/zij alleen thuis is? (bijv. voer, botten, beloningskoekjes etc.)

Onbekend Nooit Zelden Soms Vaak Altijd

25. Drinkt uw hond wanneer hij/zij alleen thuis is?

Onbekend Nooit Zelden Soms Vaak Altijd

26. Heeft uw hond een sterke band met 1 bepaald lid van uw huishouden?

Ja (met wie?)..... Nee Anders,

27. Heeft uw hond de neiging om u (of anderen uit uw huishouden) te volgen door het huis van kamer naar kamer?

Onbekend Nooit Zelden Soms Vaak Altijd

28. Heeft uw hond de neiging om dicht naast u (of anderen uit uw huishouden) te gaan zitten?

Onbekend Nooit Zelden Soms Vaak Altijd

29. Heeft uw hond de neiging om aandacht te vragen als u zit, door een poot te geven of met haar/zijn neus tegen u aan te duwen?

Onbekend Nooit Zelden Soms Vaak Altijd

30. Wordt uw hond onrustig (blaft/jankt, springt op of probeert tussenbeide te komen) wanneer u (of anderen uit uw huishouden) aandacht geeft aan andere personen?

Onbekend Nooit Zelden Soms Vaak Altijd

31. Wordt uw hond onrustig (blaft/jankt, springt op of probeert tussenbeide te komen) wanneer u (of anderen uit uw huishouden) aandacht geeft aan andere honden of dieren?

Onbekend Nooit Zelden Soms Vaak Altijd

32. Als u hond problemen heeft met niet alleen thuis kunnen zijn, wanneer is dit dan begonnen?

..... n.v.t.

33. Hebben er bepaalde gebeurtenissen (bijv. een verhuizing, een geboorte, uw hond naar een pension, het langdurig thuisblijven van de eigenaar) plaatsgevonden waarna uw hond problemen kreeg met alleen thuis blijven?

Ja, specificeer Nee n.v.t.

Dit is het einde van deze vragenlijst. Hartelijk dank voor het invullen.

Indien we nog vragen hebben aan de hand van dit onderzoek, mogen wij dan contact met u opnemen?

Ja Nee

7.4. Appendix IV

Dog behaviors	Code	Scored as
Head orientation		
Head directed owner body	B	Duration
Head directed vet	V	Duration
Head directed camera	C	Duration
Head directed Environment	E	Duration
Head directed owner face	F	Duration
Hiding head	I	Duration
Head out of sight	U	Duration
Head high	H	Duration
Head low	L	Duration
Head shake	S	Duration
Glance Camera	Gc	Frequency
Mouth movement		
Licking lips	L	Frequency
Panting	P	Duration
Smacking	M	Frequency
Vocalizations (Yelp, Whine, Bark, Growl, Grunt)	V/ Y,W,B,G,R	Frequency
Yawning	Y	Frequency
Bare teeth	B	Frequency
Licking (table/ self/ owner/leash)	I/ T,S,O	Frequency
Sneezing	Z	Frequency
Sniffing (air/table/ self/ owner/leash)	F/ T,S,O	Duration
Mouth out of sight	U	Duration
Nothing	X	Duration
Tail position		
Low 180 (wagging)	L/ W	Duration
High 0 (wagging)	H/ W	Duration
Middle 90 (wagging)	M/ W	Duration
Between legs 270 (wagging)	B/ W	Duration
Tail on Table (wagging)	T/W	Duration
Tail out of sight (wagging)	U	Duration
Tucked tail	D	Duration

Owner-Dog behaviors	Code	Scored as
Owner body interaction		
Touch (head/body/legs)	T/ H,B,L	Duration
Petting dog (head/ body/ legs)	P/ H,B,L	Duration
Push dog (head/ body/ legs)	M/ H,B,L	Frequency
Examine dog (head/ body/ legs)	E/ H,B,L	Frequency
Non-verbal control	N	Frequency
Leash jerk	J	Frequency
Kiss	K	Frequency
Hug	G	Frequency
Leash pull	R	Frequency
Collar pull	C	Frequency
No interaction	X	Duration
Owner vocal interaction		
Comfort talk	T	Frequency
Control	C	Frequency
Talks to the dog	D	Duration
Talks to the vet	V	Duration
Talks to the researcher	R	Duration
Talks to the other owner	O	Duration
No interaction	X	Duration

7.5. Appendix V

Inter-observer reliability head behavior

Appie

gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J	
B	26	18	25	0,69	0,96	M/L 41/59 = 0,69
E	24	21	24	0,88	0,88	M/J 51/53 = 0,96
I	0	5	0	0	1	
F	3	2	2	0,67	0,67	
L	0	1	0	0	1	

Muffin

gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J	
E	17	14	13	0,82	0,76	M/L 30/36 = 0,83
C	6	6	6	1	1	M/J 51/53 = 0,96
B	8	7	8	0,88	1	
Gc	2	1	0	0,5	0	
L	0	1	0	0	1	
F	1	1	0	1	0	
I	1	1	3	1	0,33	

Mojo

Gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J	
E	15	13	14	0,87	0,93	M/L 29/34 = 0,85
L	2	2	2	1	1	M/J 32/34 = 0,94
C	3	3	2	1	0,67	
B	10	9	10	0,9	1	
F	2	2	2	1	1	
I	1	0	1	0	1	
Gc	1	0	1	0	1	

Spike

Gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J	IOR J/L	
E	9	9	10	1	0,9	0,9	M/L 24/26 = 0,92
B	11	10	10	0,91	0,91	1	M/J 25/27 = 0,93
F	3	2	3	0,67	1	0,67	
C	3	3	3	1	1	1	

Dexter

Gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J	IOR J/L	
E	16	16	16	1	1	1	M/L 31/32 = 0,97
C	13	14	13	0,93	1	0,93	M/J 31/31 = 1,00
L	2	2	2	1	1	1	

Gc	4	4	1	1
----	---	---	---	---

Nano

Gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J	IOR J/L	
E	42 (34)	29	38	0,69 (0,85)	0,9	0,76	M/L 69/79=0,87
C	23	24	23	0,96	1	0,96	M/J 76/82=0,93
I	1	1	1	1	1	1	
B	14	10	12	0,71	0,86	0,83	
S	1	1	1	1	1	1	
L	4	4	4	1	1	1	
U	1	1	1	1	1	1	
F	3	0	2	0	0,67	0	

Scottie

Gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J	
E	20	19	21	0,95	0,95	M/L 37/41=0,90
B	10	10	9	1	0,9	M/J 39/41=0,95
C	8	9	8	0,98	1	
Gc	2	0	2	0	1	

Inter-observer reliability M/L totaal 261/307=0,85

Inter-observer reliability M/J totaal 305/321=0,95

inter-observer reliability M/L laatste 5 190/212=0,90

Inter-observer reliability M/J laatste 5 203/215=0,94

IOR = inter-observer reliability

M/L = Marjolein vergeleken met Laura

M/J = Marjolein vergeleken met Judith

Inter-observer reliability mouth behavior

Muffin

Gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J		
P		21	21	21	1	1	M/L 60/62=0,97
Y		6	6	6	1	1	M/J 59/62=0,95
L		34	32	31	0,94	0,91	
Fo		1	1	1	1	1	

Appie

Gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J		
L		14	15	14	0,93	1	M/L 23/24=0,96
M		1 (?)	0	0	0	0	M/J 23/23=1,00
P		9	9	9	1	1	
Fa		0	0	1	1	0	

Spike

Gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J		
M		4	3	4	0,75	1	M/L 3/4=0,75
							M/J 4/4=1,00

Scottie

Gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J		
L		9	8	9	0,89	1	M/L 8/10=0,80
Fa		1	0	2	0	0,5	M/J 10/11=0,91

Mojo

Gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J		
Ft		2	2	2	1	1	M/L 4/4=1
U		2	2	2	1	1	M/J 4/4=1

Kaya

Gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J		
L		41	44	46	0,93	0,89	M/L 62/66=0,94
P		20	19	20	0,95	1	M/J 63/68=0,93
Fs		2	2	2	1	1	

Sky

Gedrag	Marjolein	Laura	Judith	IOR M/L	IOR M/J		
L		49	46	51	0,94	0,96	M/L 75/83=0,90
P		25	26	25	0,96	1	M/J 79/83=0,95
Y		1	1	1	1	1	
U		1	2	1	0,5	1	
Fs		3	0	1	0	0,33	
Is		2	2	2	1	1	

Geaccepteerd dat de gedragingen Fs en Fa een lage reliability houden, komen niet vaak voor en is niet het belangrijkste.

Inter-observer reliability M/L totaal 235/253=0,93

Inter-observer reliability M/J totaal 242/255=0,95

IOR = inter-observer reliability

M/L = Marjolein vergeleken met Laura

M/J = Marjolein vergeleken met Judith

7.6. Appendix VI

Intra-observer reliability

Mouth - Roxan

gedrag	1e keer	2e keer	IOR
U	2	2	1
M	3	3	1
L	37	37	1
P	14	14	1
Y	3	3	1

Totale intra-observer reliability mouth: 100%

Head - Chico

Gedrag	1e keer	2e keer	IOR
E	23	22	0,96
Gc	5	5	1
C	13	13	1
B	6	5	0,83
I	1	1	1

Totale intra-observer reliability Head: 96%

IOR = intra-observer reliability

7.7. Appendix VII

Cortisol verdunning en aantal metingen

naam	sample	verdunningsfactor	enkelvoud/duplo	opmerkingen
Roxan	Home	3,333333333	duplo	
	Table	1	duplo	
	Separation	1	duplo	
Brownie	Home	1	duplo	
	Table	1	duplo	
	Separation	1	duplo	
Dino	Home	1	duplo	
	Table	1	duplo	
	Separation	1	duplo	
Jessy	Home	Missing value		
	Table	1	duplo	
	Separation	3	duplo	
Tom	Home	1	duplo	
	Table	1	duplo	
	Separation	1	duplo	
Lobke	Home	1	duplo	
	Table	1	duplo	
	Separation	1	duplo	
Chica	Home	1	duplo	licht verkleurd
	Table	1	duplo	licht verkleurd
	Separation	1	duplo	licht verkleurd
Suske	Home	1	duplo	
	Table	1	duplo	
	Separation	1	duplo	
Kika	Home	1	duplo	licht verkleurd
	Table	1	duplo	
	Separation	1	duplo	
Kiara	Home	1	duplo	
	Table	1	duplo	
	Separation	1	duplo	
Inja	Home	1	duplo	
	Table	1	duplo	
	Separation	1	duplo	
Chico	Home	1	duplo	
	Table	2	duplo	
	Separation	2	duplo	
Kai	Home	1	duplo	
	Table	1	duplo	
	Separation	1	duplo	

Timba	Home	1	duplo	licht verkleurd
	Table	1	duplo	
	Separation	1	duplo	
Pauline	Home	1	duplo	
	Table	Missing value		
	Separation	6,25	enkelvoud	
Gerrit	Home	1	duplo	
	Table	1	duplo	licht verkleurd
	Separation	1	duplo	
Nina	Home	2	duplo	
	Table	1	duplo	
	Separation	2	duplo	
Lemon	Home	1	duplo	2x bepaald
	Table	2	duplo	
	Separation	1	duplo	
Pinto	Home	3	duplo	
	Table	1	duplo	
	Separation	2	duplo	
Fenna	Home	1	duplo	
	Table	1	duplo	
	Separation	1	duplo	
Rocky	Home	1	duplo	licht verkleurd
	Table	1	duplo	
	Separation	1	duplo	
Jessy (2)	Home	1	duplo	
	Table	2	duplo	
	Separation	Missing value		
Pippa	Home	1	duplo	
	Table	1	duplo	
	Separation	1	duplo	licht verkleurd
Luna	Home	1	duplo	
	Table	2	duplo	
	Separation	3	enkelvoud	
Bammes	Home	1	duplo	
	Table	1	duplo	
	Separation	1	duplo	
Saartje	Home	1	duplo	
	Table	1	duplo	
	Separation	1	duplo	
Dino	Home	1	duplo	
	Table	1	duplo	
	Separation	1	duplo	
Milo	Home	2	duplo	
	Table	Missing value		

	Separation	Missing value		
Bowie	Home	Excluded		
	Table	Excluded		
	Separation	Excluded		